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Thermosolutal instability of Rivlin-Ericksen fluid under the effect of suspended particles and compressibility in porous medium

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ABSTRACT

The thermosolutal instability of a layer of elastico-viscous fluid permeated with suspended particles in porous medium under the effect of compressibility is considered. For stationary convection it is found that medium permeability, suspended particles and compressibility have destabilizing effects on the convection. Solute gradient has stabilizing effect on the convection.

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Sustainable Agriculture through Biocomposts

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Assistant Director General (Human Resource Management)

Foreword

The agricultural production worldwide generates huge amount of waste. The unscientific management of the agri-waste is causing enormous ill-effects on the environment. The technological advancements coupled with policy interventions on biocomposting can transform this huge global stock of agricultural waste into a valuable plant nutrient bio-resource. As per FAO, the biocomposting is regarded as a climate-resilient farm technology for managing agricultural waste which also brings agricultural sustainability, better eco-system services and better rural livelihoods specifically in developing world. It is high time to work on this agrarian issue to bring a sound biocomposting technology and biocompost utilization in agriculture. Intensive production systems especially in productive agro-ecological regions have implicated directly and indirectly with a set of vulnerabilities known as climate change, chemical contaminated food, deteriorated soil and water ecosystem. Currently, we need to take care of quality production, environmental sustainability as well as redefined and redesigned farm innovations so as to compete the global market while encompassing on doubling farmers' income by 2022 using such bio-resources.

The progress of Indian agriculture through scientific innovations is exemplary throughout the world. The contributions of scientific community, policy planners and above all our dedicated farming community have been remarkably marching ahead towards significantly achieving the food self-sufficiency, nutritional security vis-à-vis livelihood security of agrarian masses. Our dwindling farm economy needs rejuvenation with new policy–, technology–, and market/demand–driven farm innovations like biocomposting technology and its application in sustainable agriculture, thus, safeguarding farmers' welfare with diversified organic farm production systems and farm enterprises to generate better farm incomes with efficient management of such bio-resources through proactive governance.

The Biomass Utilization Unit (BUU-IARI) of IARI, New Delhi is one of the pioneer unit of R & D on bio-composting technology and its application in agricultural production systems. The generation and compilation of relevant information on recent advances in bio-composting technology and its application in agricultural production systems in a book form entitled, "***Sustainable Agriculture through Biocomposts***" by the scientists of Division of Agronomy, ICAR-Indian Agricultural Research Institute, New Delhi, India is a quite timely and useful endeavour. This compilation would definitely shape-up our current agri-waste and biomass management practices to address above emerging matrix of agriculture problems in holistic manner.

The Division of Agronomy at IARI is engaged in quality research and trainings in the area of bio-composting technology and its application in agricultural production systems. The authors have made a commendable effort in systematically tailoring the information on recent advances in bio-composting technology and its use in various

crop production systems of the country. This comprehensive book will be of immense help to faculty, researchers and PG students of not only NARES system but also to professionals of other teaching, research and extension related organizations of regional, national and international repute.

With a great rapture and satisfaction, I place on record my hearty appreciations and congratulations to the authors.

March 31, 2018

(A.K. Vyas)
Former President
Indian Society of Agronomy

Preface

Food security, food quality, soil health sustainability and climate resilience are the key thrust areas for the advancement of agricultural R & D. Organic farming as well as application of organics in conventional agriculture is being looked upon as one of the strategies to meet the above priorities. At the same time, we are dependent enough on organic sources to meet out the nutritional requirement of our crops in addition to chemical fertilizer use to feed huge global population in general and India in particular. On the other, the chemical fertilizers are in short supply besides their high escalating prices and ill-effects on soil-plant-human-environment interface. Thus, we need to up-scale and scale-up the R & D capabilities to produce abundant organic sources of plant nutrients while using farm and livestock waste. In post-green revolution era, a huge amount of agricultural waste is produced in the country which needs to be scientifically disposed-off in an environment-friendly mode like conversion into valuable composting materials as organic source of plant nutrients.

At national level, great emphasis is being given on organic farming as well as integrated nutrient management strategies. But, meagre research efforts have been made to generate sufficient amount of quality organic manures using advanced bio-composting technologies. At grassroot level, still we are using inefficient conventional composting methods which are producing low quality composts and causing environmental hazards. The Biomass Utilization Unit (BUU-IARI) of IARI, New Delhi is one of the pioneer unit of R & D on bio-composting technology, its utilization and capacity building under ICAR/NARES system. This unique IARI unit has developed and validated many microbe-mediated and farm-machinery driven bio-composting and utilization protocols in collaboration with different IARI Divisions for the last 10 years. In nutshell, the documentation of the bio-composting technologies and their utilization in agriculture would be of immense importance to spread these technologies to agrarian and rural India through NARES scientific workforce in the book format.

Hence, an attempt has been made here to generate and compile the relevant information on recent advances on 'Sustainable Agriculture through Biocomposts' in a book form entitled, "***Sustainable Agriculture through Biocomposts***" to address the biocompost production and its application in agriculture. The book consists of 07 sections covering 26 chapters. Section-I relates to organic agriculture, bio-composts and their significance, Section-II deals with biocomposting technologies and biocomposting machinery, Section-III deals with microbial inoculants for biocomposting and sustainable agriculture, Section-IV covers plant nutrition and soil health management through biocomposts, Section-V deals with biocomposts and pest management, Section-VI relates to biocomposts and energy management, Section-VII deals with organic manures, biocomposts and organic production systems. p.

We are highly grateful to Dr. A.K. Singh, Acting-Director; Dr. R.K. Jain, Dean and Joint Director (Education); Dr. K.V. Prabhu, Joint Director (Research), Dr. J.P. Sharma, Joint Director (Extension), ICAR-Indian Agricultural Research Institute, New Delhi for providing the opportunity and constant encouragement in bringing out this publication. We are highly thankful to ICAR, New Delhi for technical and financial support to bring-out this publication. This book would be of enormous use to UG and PG students, and faculty of ICAR and SAU's in India. This publication will also be useful for researchers and academicians of other teaching, research and extension related organizations of regional, national and international repute. There could be some deficiencies in this publication, which the authors would like to improve upon in future. The authors welcome the suggestions from readers for further improvement in the book manuscript.

March 31, 2018
New Delhi, India

Shiva Dhar
Anchal Dass
Anil K. Choudhary

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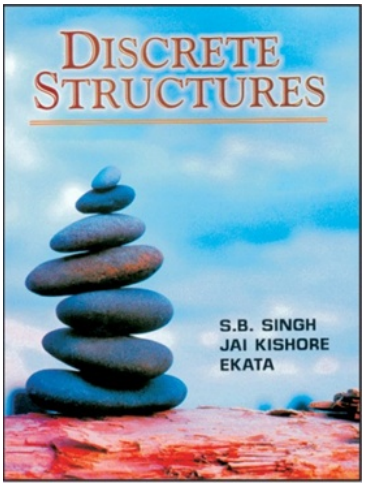

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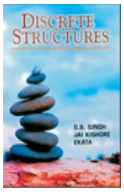

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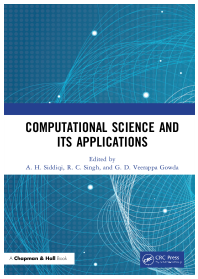

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ABSTRACT

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An Environmental Benign Approach for the Assessment of Water Quality during Kumbh at Allahabad

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ABSTRACT

Water is one of the most plenty natural resources of the earth. It is important to all living resource which is getting polluted because of anthropogenic activities. The present study was carried out with an aim to impact of mass bathing during Kumbh in 2013 at Allahabad. Water sample was collected from three major location of Allahabad Namely Daraganj, Salori and Sangam for the physiochemical and biological analysis such as pH, temperature, biological oxygen demand, dissolve oxygen etc. It was concluded from the result that water quality of river Ganga shows significant changes during mass bathing. The present study indicates that the water was not fit for bathing as well drinking purposes.

Keywords: River Ganga, Water quality, Allahabad, Physiochemical properties

1. INTRODUCTION

Water is one of the essential resource for all the living resources on earth. Ganga river known as mother Ganges worshipped by Hindu as they have faith that a dip in "Holy River" washes away all the sins and it is their path towards heaven, is now one of the most polluted

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river [1]. Now a day's water is contaminated due to increasing population, industrial growth, agriculture activities cause major water pollution.

Allahabad is one of the oldest city which is located in southern region of the Uttar Pradesh which is known for river Ganga such as the Kumbh Mela, Chhat Puja. Kumbh Mela is one of the largest religious gathering on earth where around 85 million Hindu from around the world participated at holy city Prayag, Mass gathering attract people and leads to number of health issue by dumping flowers, plastic in to the water body.

Present throws light on the effect of mass bathing on water quality of river Ganga at three different Ghats of Allahabad to analyze the change from Jan-Feb with time interval.

2. MATERIAL AND METHODS

A systematic study was carried out for determining the impacts of mass bathing on water quality. This portion describes methods used for experiments during analysis. Water sample was collected from three different sites. During analysis temperature was recorded at fixed sites with the help of thermometer and other tests was carried out in laboratory with different methods.

Following sites were the sampling sites

Site 1: Sangam

Site 2: Salori

Site 3: Daraganj

Physio chemical methods used for analysis of water

S. N	Parameters	Methods
1	pH	PH meter
2	Temperature	thermometer
3	TDS	Gravimetric Method
4	COD	Open flux method
5	BOD	Winkler's Method
6	DO	Winkler 'method

3. RESULT AND DISCUSSION

3. 1. Temperature

This investigation shows that temperature increases at different after snan with given time interval. While maximum value of water temperature was recorded 20.7 ºC at the same bathing ghat after the fifth Royal Bath.

Date	Month	Site1-Saangam	Site2-salori	Site2-draganj
15/1/13	January	16.5	16.7	16.2
29/1/13	January	18.2	18.1	17.3
11/2/13	February	19.8	18.9	19.1
17/2/13	February	18.8	19.8	19.8
27/2/17	February	20.6	20.2	20.7

3. 2. pH values

This investigation shows that pH values was recorded between 7.2-8.9. The minimum pH value was noted 7.2 at bathing ghat of Daraganj before the third Royal bath, while maximum pH value was noted 8.9 at Sangam ghat.

Date	Month	Site1-Saangam	Site2-salori	Site2-draganj
15/1/13	January	8.9	7.5	8.5
29/1/13	January	8.1	7.8	8.2
11/2/13	February	8.2	7.1	7.2
17/2/13	February	8.7	8.13	8.5
27/2/17	February	8.6	8.2	8.3

3. 3. TDS (mg/L)

Total dissolve solid is an important tool for water quality. In this investigation TDS ranged between of 392.2-794.3 mg/l. The highest TDS (794.3 mg/l) was found at Bathing ghat of Sangam after the third royal bath while the lowest TDS (392.2 mg/l) was found at the bathing ghat of the Salori after the third Royal bath**.**

Date	Month	Site1-Saangam	Site2-salori	Site2-draganj
15/1/13	January	460	402.5	508.35
29/1/13	January	678	693.8	478.6
11/2/13	February	794.3	496	693.89
17/2/13	February	569.6	679.4	456.8
27/2/17	February	667.8	680.8	700.1

3. 4. COD (mg/L)

This is a valuable parameter for the analysis of water quality to check chemical load in water body.in present investigation value of COD ranged between 44 mg/l - 110 mg/l. The mimmum value was recorded 44 mg/l at Sangam before the second Royal Bath and the maximum value was recorded 110 mg/l at Salori ghat after the fifth royal Bath.

Date	Month	Site1-Saangam	Site2-salori	Site2-draganj
15/1/13	January	62	72	50
29/1/13	January	60	87	59
11/2/13	February	65	81	51
17/2/13	February	59	91	61
27/2/17	February	53	110	56

3. 5. BOD (mg/L)

Biological oxygen demand is the test analysis to check the oxygen requirement by microorganism. It is a valuable tool for the analysis of organic load inti the water body. In this investigation Bio-Chemical Oxygen Demand (BOD) ranged between 4.24-9.6 mg/l. The Minimum BOD (4.24 mg/l) was found at bathing ghat of Sangam before the first Bath, while the maximum BOD (9.6 mg/l) was found at the bathing ghat of Salori during Fifth Royal bath.

Date	Month	Site1-Saangam	Site2-salori	Site2-draganj
15/1/13	January	7.55	7.55	7.5
29/1/13	January	8.2	8.2	8.2
11/2/13	February	9.2	9.2	9.1
17/2/13	February	8.9	9.0	9.0
27/2/17	February	7.9	9.6	8.6

3. 6. DO (mg/L)

Dissolve oxygen is the assessment of purity of water. In this investigation result reveals that Dissolved Oxygen (DO) ranged between 6.1-8.9 ppm. The Maximum DO (8.9) was found at Sangam before the fourth Royal bath while the minimum DO (6.1) was found at the Salori ghat after the fifth Royal bath.

Date	Month	Site1-Saangam	Site2-salori	Site2-draganj
15/1/13	January	7.3	7.45	8.3
29/1/13	January	8.9	7.5	8.7
11/2/13	February	7.9	8.7	7.6
17/2/13	February	8.1	6.2	7.9
27/2/17	February	8.4	6.1	8.1

4. CONCLUSIONS

On the basis of physio-chemical analysis it is concluded that the quality of river water degraded during mass bathing. From the overall study and data it is concluded that water from the study area is alkaline in nature with more total solid and other parameters like higher BOD,DO,TS,TSS, TDS, values in Ganga river water is unfit for drinking purpose at selected sites.

Results clearly indicate that organic matter and untreated sewage were mixing in the river during the period of Maha Kumbh and purification is required for domestic consumption

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Importance of Physico-Chemical and Bacteriological Parameters in Reckoning Water Quality: A Review

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Abstract

Since it is impractical to assess water quality simply by its appearance, so various parameters (physical, chemical and bacteriological) has to be considered while evaluating water quality. A selection of parameter for determining water quality is totally based on the purpose of its use and the extent of required water quality and purity.

Levels of chemicals like Calcium ,Magnesium, Chlorides, Dissolved Oxygen (D.O), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD) as well as pH, Colour, Temperature, Transparency, Turbidity ,Odour ,microbial pathogens etc. are some of the important parameters in water quality assessment. The present review paper depict about the importance of various parameters in reckoning water quality to check its suitability for drinking purpose, industrial purpose or marine life etc.

Keywords*: Biochemical oxygen demand (BOD), Parameters, Turbidity, microbial pathogens*

1. Introduction

Water is the most important resource present in ecosystem. Life is impossible without water. The quality of water usually defined according to its physical, chemical and biological characteristics .Now a days, water quality is degrading due to human activities and contaminants. As a result of water contamination water quality is degrading. Regular consumption of contaminated water results into serious water borne diseases. About 80% of diseases in human being are caused by water (Neeraj Kalra,2012).Therefore it is mandatory to analyse water quality at regular interval of time .This review article is to assess various parameter of water which describe water quality.

2. Material and Methods

Contaminants or pollutants affect the water quality in a symbiotic manner and it cannot be detected only with particular physical, chemical or biological parameter .All the parameter that defined water quality are equally responsible in characterising water quality and therefore its uses .Following parameters should be analysed for water quality assessment :

2.1. pH (Potential of Hydrogen)

pH is the measure of hydrogen ions in the water. According to BIS (Bureau of Indian Standards), pH level of water should have desirable limit 6.5 to 8.5 .Water with lower pH is considered acidic while water with higher pH is alkaline in nature.

2.2. Electrical Conductivity

Conductivity is a measurement of the ability of an aqueous solution to carry an electrical current .It is directly related to concentration of ions in water. According to BIS, desirable limit of conductivity should be 600 µm/cm.

2.3. Alkalinity

It can be defined as tendency of water to neutralise acids .Potable water should have 120mg/L of alkaline ions and the maximum permissible limit is 600mg/L. High alkaline water cause eye irritation in humans and disease like chlorosis in plants (Sisodia & Moundiotiya ,2006). Alkalinity is measured by acid base titration and is expressed in mg/L in term of $CaCO_3$ equivalent.

2.4. Total Dissolved Solids (TDS)

It is a measure of combined content of all organic and inorganic substance contained in water in

ionized/molecular /suspended form .It is calculated by TDS meter and according to BIS, permissible limit of TDS in water should be 500mg/L .

2.5. Temperature

It is the most important factor that affect metabolic rate of living organisms. It is measured by thermometer and should be max 20-25 ^{0}C.

2.6. Hardness

Hardness can be defined as soap precipitating power of water or property of water which prevent leather formation with soap. The limit of total hardness (temporary and permanent) for drinking water is to be within 300mg/L in terms of $CaCO_3$ equivalents .It is done by complexometric titration using standard EDTA and EBT as indicator. High concentration of hardness results in heart disease and kidney stones.

2.7. Chloride

Presence of organic pollution in water results in high concentration of chlorides (Yogendra and Pottaiah, 2008).Acc to BIS, the permissible limit of chlorides in water is 250mg/L .In drinking water ,high chloride content results in laxative effect (Ravi Prakash and Rao 1989) .Chloride can be determined by Argentometric titration using potassium chromate as indicator. The end point is considered when white precipitate of AgCl converts into red precipitate of Ag_2CrO_4.

2.8. Turbidity

Presence of turbid particles defined turbidity of water .It is measured by Nephelometer which measures the intensity of scattered light by turbid particles of water at right angle to the incident beam of light in comparison with the intensity of light passing through the sample.

2.9. Appearance

Potable water should appear clear.

2.10. Sulphate

Sulphate ions usually occur in natural waters .These are measured by the Nephlometric method in which concentration of turbidity is measured against concentration of synthetically prepared sulphate solution.

2.11. Calcium

A complexometric titration is considered by using standard EDTA solution and EBT as indicator in presence of ammonia buffer for maintaining pH at 10.

2.12. Magnesium

A complexometric titration is considered by using standard EDTA solution and EBT as indicator in presence of ammonia buffer for maintaining pH at 10.

2.13. Iron

Our blood has an important element which is iron. Drinking water must contain a maximum of 0.3 ppm of iron in it (P.Tambkar 2013).

2.14. Sodium and potassium

Flame photometer is used for measuring the concentration of sodium and potassium in water. The instrument used for the elemental determination is standardized with the known concentration of sodium ion (1 to 100 mg/l) and potassium ion (1 to 5 mg/l). Water softened by Zeolite process contains high concentration of sodium while Potassium is a fundamental element in both plant and human nutrition and occurs in groundwater as a result of mineral dissolution (APHA 2005).

2.15. Fluoride

Fluoride is determined by ELICO spectrophotometer. High concentration of fluoride in water leads to dental fluorosis and skeletal fluorosis.

2.16. Microbial Pathogens

It is the method of evaluating number of bacteria present in water which are responsible for its bad taste and odour. Bacteriological analysis can be carried out by Plate count method. This method depends on growing a colony of bacteria on a nutrient medium .The colony gets visible to the naked eye and can be counted easily. For accuracy, the dilution of the original sample must be done in such a manner so that on average between 30 and 300 colonies of the target bacterium is grown on the nutrient medium.

Various parameters with their analytical methods and BIS specifications

S. No.	Parametrs	Equipments/ Methods	Bis Specifi cations
1.	$_{p}$H	$_{p}$H	6.5-8.5
2.	Electrical conductivity	Conductivity meter	600 µm/cm.
3.	Alkalinity	Acid base titration	200 mg/L
4.	TDS	TDS meter	500 mg/L
5.	Temperature	Thermometer	20-25^{0}C
6.	Hardness	Complexometric titration	300mg/ L
7.	Chloride	Argentometric titration	250mg/ L
8.	Turbidity	Nephlometer	1 NTU
9.	Appearance	Eye	Clear
10.	Sulphate	Nephlometer	200mg/ L
11.	Calcium	EDTA Method	75mg/L
12.	Magnesium	EDTA Method	30mg/L
13.	Iron	Redox Titration	0.3mg/ L
14.	Sodium & Potassium	Flame photometer	1-100 &1-5 mg/L
15.	Fluoride	ELICO Spectrophotometer	1 mg/L
16.	Microbial pathogens	Plate count method	Very few

3. Literature Review

Several research papers were considered and referred on physico-chemical analysis of water which may be surface water as well as ground water of various cities. These parameters are compared with BIS specification to evaluate the quality of water for its suitability for drinking purpose, irrigation purpose and domestic purpose. The comprehensive literature review was carried out by referring standard journal and reference books.

Vikas Tomar et.al [01] collected water samples from 67 locations during pre and post-monsoon seasons of the year 2011 from Karnal district, Haryana and were analysed for chemical characteristics. It was found the water contains a large concentration of sodium-calcium bicarbonate and magnesium bicarbonate salts during pre and post-monsoon seasons of the year 2011 respectively.

Sarala C.et.al [02] has studied the physico-chemical parameters of the surrounding wells of Jawaharnagar in Andhra Pradesh. The bore wells data was collected from the study area for two seasons i.e., post monsoon in December 2007and pre monsoon in June 2008. The groundwater is acidic in nature and very hard. It was done by using Arc GIS software. The study reveals that the total hardness and fluoride concentrations were high in water samples.

Yadav (2010), Rasayan, did experimental work on physico–chemical properties of ground water taken from four blocks (Suar, Milak, Bilaspur, Shahabad) of Rampur district, Uttar Pradesh, India. Only eight locations show quality of ground water suitable for drinking water.

Shah (2012), report about quality of drinking water samples of kathalal territory, Gujarat .Water samples from twenty different locations bore wells water samples were collected for physico-chemical analysis. Studies shows that most of water samples in that area were suitable for drinking purpose and only simple water treatment methods are enough to make the water potable.

V. Pradhan, M. Mohsin, B. H. Gaikwad [05] has studied water quality of Chilika Lake during the month of January 2012. It was observed that all the parameters were above permissible limit except few samples.

S. Chandra, A. Singh and P. K. Tomar [06] have described, lake water is a source of drinking and domestic use water for rural and urban population of India. Water from Porur lake of Chennai, Hussain Sager lake of Hydrabad and Vihar Lake of Mumbai was analysed. For this, lakes water samples were collected from six different sites and various physico-chemical parameters were analysed .Some heavy metals like Iron, Zinc, Cadmium, Mercury, Nickel and Chromium were analyzed in those samples. Water pollution indicates that these parameters were many times higher than the prescribed limit by the WHO & BIS standard.

Rajesh Kumar (2011), carried out water analysis of ground water quality in and around shahzad Nagar block of Rampur district, Uttar Pradesh, India. For water analysis, ground water samples from twenty five locations were selected and analysis of water was carried out using standard methods. Physico-chemical parameters were compared with WHO, USPH, European and ICMR Standards shows considerable variation. The statistical analysis

showed that electrical conductivity has positive and significant correlation with TDS, Calcium, sodium, sulphate, magnesium etc.(Makwana, 2012).They carried out work on drinking water collected from fifteen sampling stations of water (bore well, wells and lacks) of Gandhinagar territory area to determine water quality index.Analysis shows that parameters of drinking water shows the variation from prescribed value.

M. Pejaver and M. Gurav [08] have explained, the two lakes namely Kalwa and Jail lake of Thane city were considered to study various physico-chemical parameters for the period of 6 months. The Jail Lake was found to be more polluted than the Kalwa Lake.

S. Hussaina, V. Maneb, et al. [09] have studied various samples from treatment plant of Ahmedpur, Dist Latur .Various physico chemical properties like pH, conductivity, Turbidity, TDS, Dissolved oxygen, fluoride, chloride, Sodium, Sulphate, etc. were analysed and the values were compared for treated and untreated water samples.

Usha (2013) carried out work on urban water bodies in Bilari town of Moradabad (Uttar Pradesh) to determine water quality index and fitness of Ground water samples in three different months January, June and September 2011.Samples were collected from ten different sites. Analysis of ground water samples were carried out for different physico-chemical parameters. Water quality index shows that contamination of water increases day by day. So require treatment for purification before use.

4. Conclusion

Water pollution is not only disastrous to humans but also threatening to animals, birds and marine animals. Due to this, aquatic life is destroying and its reproductive ability is reducing. Such polluted water is inadequate for drinking, agricultural and industrial purpose. The purpose of present review paper is to bring an intense awareness in society about the importance of quality of water, as water quality is dependent on the type of the pollutant added and the nature of self purification of water. So water pollution can be minimized by simple housekeeping and management practices.

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Structural and optical characterization of NiSe film grown by screen-printing method

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In present investigation NiSe films were grown by economical screen-printing method. Optimum conditions for growing good quality screen-printed films were found. The films were characterized for their structural and optical properties. The polycrystalline nature of films with hexagonal structure was confirmed through XRD analysis. Direct type of optical band gap of 1.75 eV for the NiSe film was confirmed by optical characterization.

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Study of newly appeared $\gamma - gamma$ band.. in 104-108Mo

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Synthesis and Characterization of Emulsion Polymerization of Acrylate Monomers

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ABSTRACT

A recently developed successful approach to achieve the balance of properties involves the copolymerization of film forming monomers like acrylates and methacrylates. The copolymerization of acrylate based monomer having different alkyl group offers the opportunity to study the effect of the alkyl substituents on the polymer properties. The objective is to study their copolymerization behavior with acrylate or combination of acrylates of varying chemical nature using free radical initiator and to correlate the composition of the copolymers with their physical properties suitable for its use as coating on hard surfaces.

Keywords: Acrylate, Emulsion, Copolymerization, Coating

1. INTRODUCTION

The copolymerization of acrylate or methacrylates having different alkyl group offers the opportunity to study the effect of the alkyl substituents on the polymer properties. The usual effect of increasing the side chain length in methacrylate and acrylate derived from straight and branched chain alcohols is expected to affect the rate of copolymerization, as well as thermal, mechanical and optical properties of the copolymers. MMA can copolymerize with variety of vinyl monomers[1-4] like methyl acrylate (MA), ethyl acrylate (EA), ethyl hexyl acrylate (EHA), ethyl hexyl methacrylate (EHMA), styrene (St), etc. to yield copolymers with improved

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flow behavior, better impact strength, heat and abrasion resistances. The ability to tailor the rigid and stable methacrylates alone or in combination with acrylates to fit specific application requirements such as outstanding clarity, dimensional stability, and unusual chemical and light stability of this class of materials has spurred its growth and have made methacrylic esters a prime candidate for numerous and diverse applications. These copolymers find applications as paints, automotive coatings, viscosity index improvers, medicines, adhesives and substitute for glass in solar collectors.

Coatings based on acrylic esters are being used since last four decades via solvent evaporation mechanism for the formation of film on different substrates. Because of environmental hazards related to solvent evaporation and its cost, the ambient cured water borne systems are emerging as one of the better option for achieving superior properties in high performance applications. The increasing cost of solvents that simply evaporate and disappear from coating is another driving force for the development of water-borne industrial coatings. From among the commonly used binders in organic coatings, the acrylic type resins is one of the most common class of resins which find application as binders. Acrylic resins may be used alone or as blend with other resins to form the suitable binder system for coatings. Binders are the backbone of any paint. It is the only component that must be present; other components included optionally, depending on the desired properties of the cured film. The binder imparts adhesion, binds the pigments together and strongly influences properties such as gloss potential, exterior durability, flexibility and toughness. Binders include synthetic or natural resins such as acrylics, vinyl-acrylics, vinyl acetate/ethylene (VAE), polyurethanes, polyesters, melamine resins, epoxy or oils.

2. MATERIALS AND METHOD

2. 1. Experimental Materials

Monomers methyl methacrylate (MMA), butyl acrylate (BA) (Aldrich) and ethyl hexyl acrylate (EHA) were purified before use by alkali wash method. Free radical initiator potassium persulfate (KPS; Thomas Baker) and emulsifier sodium lauryl sulphate (SLS; Thomas baker) were used as received. Deionized water was used throughout the experimental work.

Polymerization

The polymerization reactions were carried out in 500 mL three necked round bottom flask equipped with reflux condenser, stirrer, dropping funnel and thermometer. Polymer latex samples were prepared by thermally initiated free radical polymerization of MMA with BA or EHA. The Polymerization reaction was carried out at 70 ±1 °C, using SLS as emulsifier and KPS as initiator for 3h. The percentage conversion of polymers are varied with the monomer feed ratio in previous study [5]. The actual feed compositions and designations of polymers are given in Table 1 and 2.

2. 2. Physical properties

The physical properties of copolymers were studied as a coated film. The polymers were coated by deposition of a small amount of synthesized latex on glass and metal plates, which were air-dried at 60 °C.

(i) Hardness

Pencil hardness measurements have been used by the coatings industry for many years to determine the hardness of clear and pigmented organic coating films. The hardness of the films was measured according to ASTM: D 3363 test method [6]. In this test the pencil is held firmly against the film at a 45° angle (point away from the operator) and pushed away from the operator in a 6.5-mm (1⁄4-in.) stroke. The process is started with the hardest pencil and continued down the scale of hardness to either of two end points: one, the pencil that will not cut into or gouge the film (pencil hardness), or two, the pencil that will not scratch the film (scratch hardness). The films on the coated mild steel panels were tested for its scratch hardness using H, 2H and 4H pencils.

(ii) Adhesion test

Adhesion of the dried latex film was determined according to ASTM D3359 [7] by using crosscut adhesion tester. These test methods cover procedures for assessing the adhesion of coating films to metallic substrates by applying and removing pressure-sensitive tape over cuts made in the film. An X-cut is made through the film up to the substrate and, pressure-sensitive tape is applied over the cut. The tape is then removed, and adhesion is assessed qualitatively on the 0 to 5 scale.

(iii) Flexibility

Flexibility of the dried latex film was measured according to ASTM D522 [8] with ¼ inch mandrel bend tester (Sheen Instrument, U.K.) consisting of a rotating panel-bending arm 180° around.

(iv) Gloss

Gloss is a measure of the coated surface to reflect light and it is an important property of coating when the purpose is to provide aesthetic or decorative look to the surface. Gloss of the films was measured at 60º angle of reflectance using a digital mini gloss meter (Sheen, UK) calibrated against internal standard of known refractive index and the results are reported in gloss unit (GU) as per ATSM D523-99 [9].

Table 1. Feed composition of monomers (MMA/BA) used during the synthesis

Polymer code	Mole ratio of monomers		Weight percentage of monomers		Amount of MMA (g)	Amount of BA (g)
	MMA	BA	MMA	BA		
SA_1	9	1	90	10	43.75	6.25
SA_2	8	2	80	20	37.9	6.25

SA_3	7 3	70	30	32.3	17.1
SA_4	6 4	60	40	27.0	23.0
SA_5	5 5	50	50	21.9	28.1

Table 2. Feed composition of monomers (MMA/EHA) used during the synthesis.

Polymer code	Mole ratio of monomers		Weight percentage of monomers		Amount of MMA (g)	Amount of EHA (g)
	MMA	EHA	MMA	EHA		
SE_1	9	1	90	10	41.5	8.5
SE_2	8	2	80	20	34.2	15.8
SE_3	7	3	70	30	28.0	22.0
SE_4	6	4	60	40	22.5	27.5
SE_5	5	5	50	50	17.6	32.4

3. RESULTS AND DISCUSSION

3. 1. Physical properties of polymer latex

The films of the copolymer latexes synthesized using varying feed composition of MMA:BA and MMA:EHA were prepared by coating the latexes on glass and metal panels. The properties viz. hardness, adhesion, flexibility, gloss and water resistance of coated films were evaluated and the results have been summarized in Table 3 and 4.

Hardness: Hardness of polymer latex coated films were determined by using pencil hardness tester with a calibrated set of drawing leads ranging from 6B (softest) to 6H (hardest). The sharpened pencil with circular flat lead end was fixed to the hardness tester and pushed away in a 6.5 mm stroke on the coated surface. The process of testing was started with the hardest pencil (6H) and subsequently the pencils of lower hardness were used to check scratch behavior of the polymer films was observed. The hardness of the films prepared by copolymer latexes

are given in Table 3 and 4. It was observed that the pencil hardness of the coating based on PMMA was 4H, which has not decreased in case where SA_1 and SA_2 latexes and were used as coatings. Whereas it decreased to 3H in case of SE_1 and SE_2 latex coatings. The hardness of the coating decreased with the increase in BA and EHA content in the feed used for synthesis of copolymers. The hardness for $SA_3$and SE_3coating was 2H, and it was H for SA_4 and SA_5 coatings. The hardness of the films prepared using the copolymers based on SE_4 and SE_5 were found to be H and films were soft in nature, therefore their use in coating is limited and SE_3 was found to be better because of its average hardness. From the above results it is clear that the latexes based on homopolymers of MMA and that the copolymers containing higher MMA content were too hard for uses in common coating applications. The hardness of the films prepared by using the copolymers based on 6:4 and 5:5 molar ratios of MMA:BA and MMA:EHA were found to be lowest and these films were quite tacky and soft and therefore their use in general applications as coating is not very satisfactory. In view of the above results for the films prepared using feed ratio7:3 MMA: BA (SA_3) and MMA:EHA (SE_3) was found to be very significant due to the fact that films will hard in nature. The result shows that the hardness of the coating decreased with the increase in BA and EHA content in the feed used for the synthesis of copolymers. From the above results it is apparent that the latexes based on homopolymers of MMA and that the copolymers containing higher MMA content were quite hard and brittle and not suitable for end use of coating applications.

Adhesion: The synthesized polymeric latexes were checked for their adherence on the metal surface by using the cross hatch adhesion tester. The coating prepared by using polymeric materials which adhere well to the substrate on which they are applied. A variety of established method can be used to determine how well a coating is bonded to the substrate. The cross hatch test is a simple, and easy to check adhesion behavior of coatings on the substrate. The adhesion for SA_4 and SA_5 films were 3B which decreased to B for SA_1 and 2B for SA_2 and SA_3 film. The SA_4 and SA_5 latexes had good adhesion property among all the prepared copolymer latexes. The adhesion property depends on the copolymer composition and glass transition temperature (Tg). PMMA polymer latexes have B adhesion value while PBA had 5B, highest adhesion among all the synthesized latexes. The reason for lower adhesion of PMMA is its higher Tg (110 °C) while PBA have lower Tg (-54 °C). As the concentration of BA in copolymer of MMA-BA increases, adhesion also increases. The reason for strong adhesion of SA_4 and SA_5 latexes films, due to their low glass transition temperature [10]. The cross hatch test is a simple way to check adhesion behavior of coatings on the substrate. The cross hatch adhesion tester is used to check the adherence of synthesized polymer latexes films on metal surfaces. The adhesion for all the synthesized polymer films quantitatively ranged between B to 5B where B shows the poor adhesion which increased to 5B. PMMA polymer latexes have lowest adhesion among all the synthesized polymer latexes while PEHA discuss polarity had highest adhesion 5B. The reason for lower adhesion of PMMA is its higher glass transition temperature. The adhesion for SE_5 films was 4B which decreased to 3B for the films based on SE_3 and SE_4. The adhesion for SE_2 and SE_1 was 2B and B, respectively. The SE_5 latexes had good adhesion property among all the prepared copolymer latexes due to which such copolymer systems are not suitable for the coatings on exterior surfaces. The films prepared by SE_3 and SE_4 are seems to be appropriate for coating applications because of good adhesion and comparatively hard nature. From the above results it could be said that as the concentration of BA and EHA in the copolymer increases, adhesion increases due to their lower value of glass transition temperature.

Flexibility: Flexibility is the ability of a material to be bent without cracking or undergoing another failure. The more common way for determining a coatings flexibility, or percentage elongation, is to bend a thin gauge coated steel panel around a mandrel as described by ASTM D522 (test method for mandrel bend test mandrel size ¼' attached organic coatings) The result of flexibility for all the polymer latexes are given in Table 3 and 4. Based on this qualitative measurement it is apparent that the film became flexible as the concentration of higher acrylates in the copolymer increased. The film of PMMA polymer latexes cracked on bending whereas the PBA films pass the mandrel test. The films of SA_1 and SA_2 did not pass the mandrel test whereas the films of SA_3, SA_4, and SA_5 pass the flexibility test indicating that SA_1 and SA_2 film were comparatively harder. The three films exhibit good flexibility and adhesion. This could be attributed to the open molecular structure (non-compact) and distance between chains in the cured film of copolymer latexes. The film of PEHA is soft in nature and passes the flexibility test easily. The film of SE_1 copolymer lattice did not passes the test because of hard in nature while the film prepared by other copolymer latexes viz. SE_2, SE_3, SE_4, and SE_5 passes the flexibility test. The results it was found that the incorporation of EHA monomer increases the flexibilty of the polymer latexes because of its branched chain structure.

Gloss: Waterborne coating compositions such as paints containing emulsion-polymerized binders are frequently applied to substrate for decorative as well as for protective reasons. Fundamental appearance parameter is the gloss of the dried coating. In many instances high gloss is required and this has been difficult to achieve with paints based on aqueous emulsion polymers. The gloss is measured of the cured film at 60° angle of reflectance using Triglossometer. The numerical values of the gloss of the cured films of latexes based on PMMA, SA_1, SA_2, SA_3, SA_4, and SA_5, have been presented in Table 3. The gloss values are plotted as a function of monomer ratio in Figure 1. It could be seen that the gloss of the films lies between 32 to 95 GU. The values of gloss of the cured films based on PMMA, SE_1, SE_2, SE_3, SE_4, and SE_5, have been presented in Table 4 and the gloss values are plotted as a function of monomer feed ratios (Figure 2). It could be seen from the Figure that the gloss of the polymer latexes lie between 32 to 95 GU. It is apparent from the data that the gloss of the coatings decreased with the increase in BA and EHA content in monomer feed. This might be a consequence of the hindered film formation. The results of all the above physical properties show that the films of MMA based latexes with higher acrylate incorporation had acceptable properties for coating applications where the combination of high hardness and high flexibility is required.

Table 3. Physical properties of polymer films

Polymer	Hardness	Adhesion	Gloss	Flexibility
PMMA	4H	B	95	Cracked
PBA	H	5B	32	Pass
SA_1	4H	B	80	Fail
SA_2	4H	2B	78	Fail
SA_3	3H	2B	76	Pass

SA_4	2H	3B	65	Pass
SA_5	H	3B	55	Pass

Table 4. Physical Properties of the Coated Films

Polymer	Hardness	Adhesion	Gloss	Bend Test
PMMA	4H	B	95	Cracked
PEHA	H	5B	30	Pass
SE_1	3H	B	78	Hard
SE_2	3H	2B	75	Pass
SE_3	2H	3B	72	Pass
SE_4	H	3B	61	Pass
SE_5	H	4B	57	Pass

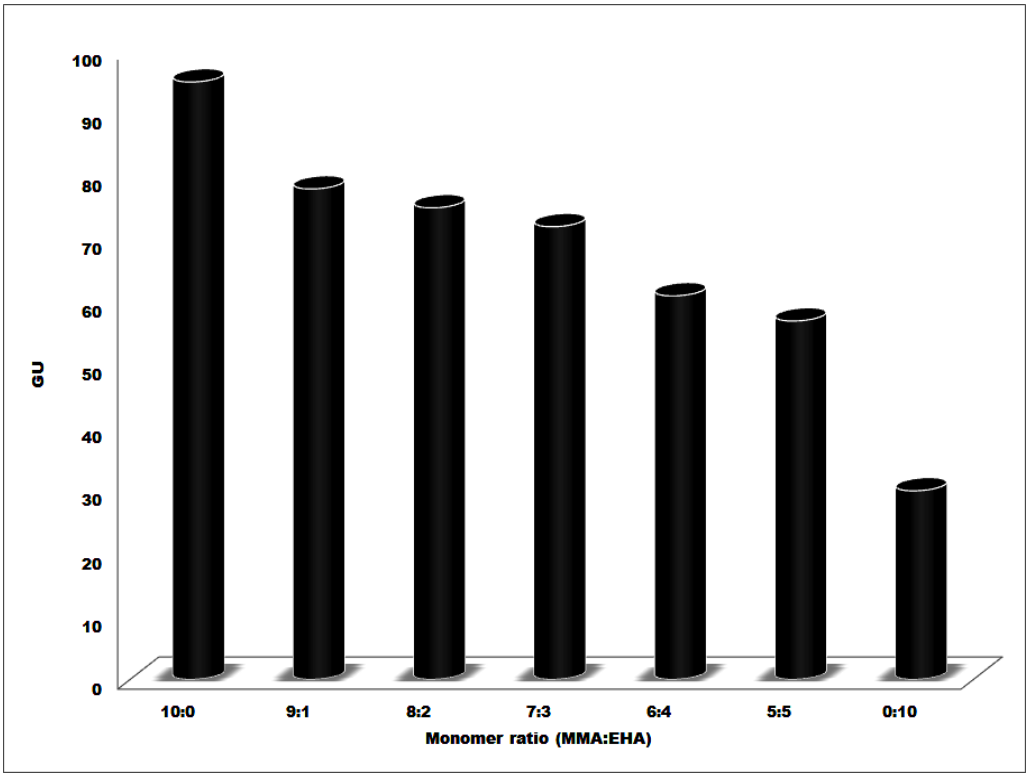

Figure 1. Effect of EHA content on the Gloss of MMA-EHA copolymer.

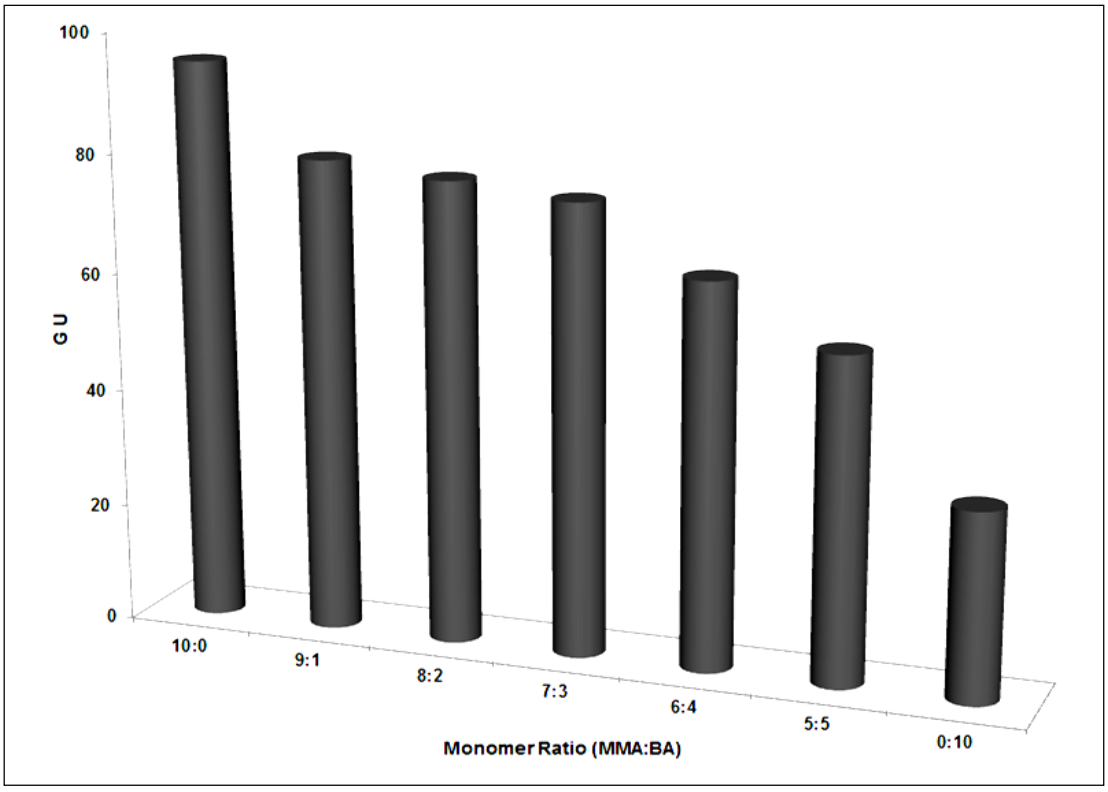

Figure 2. Effect of BA content on the Gloss of MMA-BA copolymer.

4. CONCLUSIONS

The physical properties viz. hardness, adhesion, flexibility and gloss of polymer films were evaluated by ASTM standards. It was observed from the results that the physical properties of the films were affected by the molar ratio of monomers used during their synthesis. The films had good flexibility with the higher content of BA or EHA in the feed whereas gloss decreased. The acceptability of latexes for coating applications was assessed by comparing their physical properties. It was observed that the copolymer latexes synthesized with 7:3 and 6:4 MMA: BA molar ratios had more suitability for their use in coatings. While in case of MMA: EHA copolymers the suitable molar ratios for coating application were 8:2 and 7:3.

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Enhancement in Stabilization Properties of Soil Using Waste Polypropylene Plastic Fiber

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ABSTRACT

Plastic fibres are found in different forms on earth as polyethylene or polypropylenes commonly known as polythene or plastic bags and badly affect the environment due to its non biodegradable nature. It may be recycled but in reality it is not in general practice, a large amount of these plastic fibres causing different environmental impact on earth. It is not biodegradable and takes more than 200 years to decompose. In our project work we have tried to reinforce the soil to stabilize it and make efficient use of this reinforced soil in various civil engineering works as embankment, dams, earth retaining structures, foundations, bridges, buildings etc. The aim of this project is to study and investigate the use of waste plastic fibre in geotechnical applications. for this purpose small pieces of plastic bags are thoroughly mixed in soil in different amount by its weight and performed different tests like Specific Gravity, OMC, MDD, Tri-axial test, Atterberg's limits etc. to determine its engineering and index behaviour. Polypropylene fibres imparted the reinforcing property to the soil due to which its shear strength and stabilization property are enhanced. The results obtained are compared for the different samples and inferences are drawn towards the usability and effectiveness of fibre reinforcement as a replacement for deep foundation or raft foundation, as a cost effective approach. Plastic fibres are similar to the roots of trees and vegetation which provides an excellent bonding to improve the soil and the suitability of natural slopes which further reduce the soil erosion. Results are found in the favour of utilization of plastic fibres in soil as reinforcement since the values of cohesion and angle of internal friction are considerably enhanced.

KEYWORDS - Polypropylene Fibre, Waste Utilization, Soil Stabilization, Sustainability.

INTRODUCTION

For any land-based structure, the foundation is very important and has to be strong to support the entire structure. In order for the foundation to be strong, the soil around it plays a very critical role. Thus we have to put a proper understanding and knowledge about the various properties of soils and the factors which affects these properties. Here, in this work, soil properties has modified with the help of randomly distributed polypropylene fibres obtained from waste materials. The improvement in the shear strength parameters of the soil has been made using this polypropylene fibre and comparative studies have been carried out between natural soil and modified soil. Generally plastic is found in various forms so it waste plastic is also available in variable form i.e. waste HDPE & LDPE (polyethylene), polypropylenes, plastic bottles etc. So we can utilize the available plastic in the form of fibres for experimental purposes. Here in this work I used polyethylene fibres after cutting polyethylene in different width to length ratios and then these fibres are mixed randomly with soil in different weight percentages. Plastic fibers when mixed with soil behave like a fibre reinforced soil. When plastic waste/fibres are randomly distributed throughout a soil mass, they imparts strength, isotropy and reduces chance of developing potential planes of weakness. During Stabilization of a soil mass there is a considerable change in shear strength and shrink swell potential of a soil, thus it helps improving the load bearing capacity of a sub grade soil to support pavement and foundations. Mixing of plastic waste fibres with soil can be done by concrete mixing plants or by self propelled rotary mixers on large scale and on small scale these fibres can be hand mixed. The most important improvement achieved through stabilization include better soil gradation, reduction in plasticity index or swelling potential, and increase in durability and strength. During wet condition stabilization may also used to provide a working platform for construction operation.

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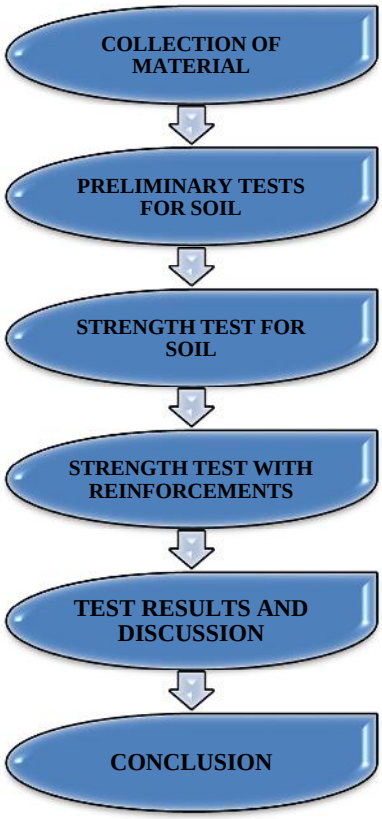
METHODOLOGY

The following tests are being carried out well before the reinforcement is added to properly determine the property of soil. These tests are used to find out the various characteristics of the soil. These tests help in determining properties such as size of soil, specific gravity, cohesiveness, Atterberg;s limits etc. The whole process is given by the following flow chart-



(i) Specific Gravity of Soil

Specific gravity of a substance denotes the number of times that substance is heavier than water. Specific Gravity of soil is determined in unreinforced soil and in different condition of reinforced soil. The value of different specific gravity is tabulated below-

Table 1- Specific Gravity of unreinforced and reinforced soil.

Soil Type	Specific Gravity
Normal Soil	2.52
Soil sample mixed with Fibres (0.15%)	2.52
Soil sample mixed with Fibres (0.20%)	2.51
Soil sample mixed with Fibres (0.25%)	2.51

(ii) Determination of Liquid Limit of Soil

This test is done to determine the liquid limit of soil as per IS: 2720 (Part 5) – 1985. The Liquid Limit of fine-grained soil is the water content at which soil behaves like a liquid, but has small shear strength.

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Table 2- Liquid Limit of unreinforced and reinforced soil.

Soil Type	Liquid Limit
Normal Soil	28.9%
Soil sample mixed with Fibres (0.15%)	Cannot be determined due to fibre
Soil sample mixed with Fibres (0.20%)	Cannot be determined due to fibre
Soil sample mixed with Fibres (0.25%)	Cannot be determined due to fibre

(iii) Determination of Plastic Limit of soil

This test is done to find out the plastic limit of soil, as per IS: 2720 (Part 5) – 1985. The plastic limit of fine-grained soil is the water content of the soil below which it ceases to be plastic. It begins to crumble when rolled into threads of 3mm dia.

Table 3- Plastic Limit of unreinforced and reinforced soil.

Soil Type	Plastic Limit
Normal Soil	10.5%
Soil sample mixed with Fibres (0.15%)	Cannot be determined due to fibre
Soil sample mixed with Fibres (0.20%)	Cannot be determined due to fibre
Soil sample mixed with Fibres (0.25%)	Cannot be determined due to fibre

(iv) Determination of Shrinkage Limit

The shrinkage limit is the water content where further loss of water content will not result in any more volume reduction of soil.

Table 4- Shrinkage Limit of unreinforced and reinforced soil.

Soil Type	Shrinkage Limit
Normal Soil	8.45%
Soil sample mixed with Fibres (0.15%)	Cannot be determined due to fibre
Soil sample mixed with Fibres (0.20%)	Cannot be determined due to fibre
Soil sample mixed with Fibres (0.25%)	Cannot be determined due to fibre

(v) Determination of Optimum Moisture Content & Maximum Dry Density

Optimum water content or optimum moisture content (OMC) of the soil is the water content at which soil can be compacted to the maximum dry density (MDD).

Table 5- Optimum Moisture Contents & Maximum Dry Densities of unreinforced and reinforced soil.

Soil Type	OMC	MDD
Normal Soil	12.59%	1.91g/cc
Soil sample mixed with Fibres (0.15%)	12.57%	1.91g/cc
Soil sample mixed with Fibres (0.20%)	12.57%	1.90g/cc
Soil sample mixed with Fibres (0.25%)	12.56%	1.89g/cc

(vi) Determination of Shear Strength Parameters-

c & Φ are the shear strength parameter in which c is the cohesion of soil and Φ is angle of internal friction or angle of shearing resistance.

Table 6- Cohesion and angle of internal friction of unreinforced and reinforced soils.

Soil Type	c	Φ
Normal Soil	0.33kg/cm^2	11.15^0
Soil sample mixed with Fibres (0.15%)	0.35kg/cm^2	11.63^0
Soil sample mixed with Fibres (0.20%)	0.37kg/cm^2	12.01^0
Soil sample mixed with Fibres (0.25%)	0.37kg/cm^2	12.82^0

IMPORTANT OUTCOMES

There is remarkable change in consistency limits, maximum dry density and shear strength parameters of soil. Various test conducted on different sets of samples shows that results are in the favour of using polypropylene or plastic fibre in an appropriate amount in soil sub grade, while a simple drawback of the use of plastic fibre in soil that the permeability of soil is reduced little bit but overall performance of stabilized soil is good.

CONCLUSIONS

Fibre reinforcement will work as binding material so it can be used for strengthening of soil on erodible areas. Reinforced soil can be used for slope stabilization and soil retaining structures. Reinforced soil will not be prone to sudden failures; progressive failure will always be there. Overall it can be seen that fibre reinforced soil can be used for ground improvement technique especially in engineering projects on weaker soils. Although plastic fibres are non-degradable in nature so the stabilization takes place for a long duration. The problem of soil erosion can be reduced by using fibres in weak soils which are susceptible to erosion during wet weathers. Hence the sustainability of soil can be increased.

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PERFORMANCE ANALYSIS OF RANDOMIZED ALGORITHM FOR OPTIMAL QUERY PLAN GENERATION IN DISTRIBUTED ENVIRONMENT.

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Abstract: The method of finding the optimal processing method to answer a query is called Query optimization, whereas a collection of various sites, distributed over a computer network is called Distributed database. In Distributed Database, the site communicates with each other through networks. The processing cost and the transmission cost are the important issues arise during evaluation of query cost. Several algorithms have been developed to find the best optimal solution for a particular query; however they all have their certain limitations. Hence, to find the optimal cost for a particular query is emerging as an open challenge for many researchers. Therefore the cost-based query optimization technique has emerged as an important concept for dealing with the query optimization. With the help of fragmentations one can replicate each fragment to various distributed sites, since the same data may be accessed from applications that executes at a number of sites. In this paper, the concepts of randomized algorithms have been explored. The two best know randomized algorithms are Simulated Annealing and Iterative Improvement, which have been implemented and their results have been compared on the number of optimal query plan generated and the average query processing cost. The attempts have been made to proposed and implemented the concept of two phase query optimization algorithm, which is also known as hybrid approach which works in two, phase: in first phase we apply iterative improvement algorithm followed by simulated annealing algorithm. The results of the experiments are also compared on the previous two factors i.e no. of query plan generated and average query processing cost by varying the number of relation and the no of distributed sites participating.

Keyword: ***"Iterative Improvement, Simulated annealing, Two Phase Optimization".***

I. INTRODUCTION

A randomized algorithm can be used for optimizing the optimal query plans as it cost very low, in terms of memory and time consumption. Randomized algorithms are one of the best algorithms for finding optimal query plan. The working of the randomized algorithm starts with selecting some random plans and then it compares the cost of the neighbor plan. This process continues till it finds a plan which has no neighbor having lesser cost, for a pre-defined number of neighbors. Randomized algorithm generates the best optimal query plan. One of the key advantages of random strategy is the constant space overhead. The generation of optimal query plan totally depends on the concepts of search strategies and search space. The search space consists of the collection of all possible query execution plans. It primarily focuses on finding the optimal query execution plan. The query execution plans developed by the search space produces the similar results after execution [4]. The main task of the search strategies is to find the execution plans in cost effective and efficient manner. Dynamic programming strategy forms the base for most of the search strategies [1]. There are basically two techniques which can be implemented to solve the problems related to search strategy [2]. The first and foremost approach is deterministic approach which builds a plan on base relations and then join it with one or more than one relation at each interval, until the entire plan is generated. The partial query plan that does not produce the optimal plans is removed [1] [2], due to which the reduction in the optimization cost is achieved. The second approach which is referred to as randomized strategy may be

Diagnosis of Pulmonary Tuberculosis using fuzzy Inference System

Publisher: IEEE

Ekata ; Praveen Kumar Tyagi ; Neeraj Kumar Gupta ; Shivam Gupta **All Authors**

Abstract

Document Sections

I. Introduction

II. Neuro Fuzzy Diagonistic Intelligence System for Pulomonary Tuberculosis

III. Simulation Based Results and Discussion

IV. Conclusion

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Artificial intelligence is a set of real time computational methodologies to address complex real-world problems. In this paper, Neurofuzzy Inference System for analysis of pulmonary tuberculosis (TB)disease is discussed. For effective result, simulation is being done by using the realistic causes of pulmonary TB. The Neurofuzzy system is used for decision making based on a predefined rule based upon the symptoms of the patient are taken as inputs and the corresponding TB risk quotient is evaluated as the output. This crisp result obtained allows us to diagnose the low or high risk of the disease in the patient. Hybrid learning algorithm is applied for minimization of error in the output.

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Contents

I. Introduction

As concern about rural areas or villages, some time patients hardly get any medical assistance. Online diagnosis of some chronic diseases is increasingly becoming popular day by day. The paper thus proposes intelligence based virtual doctor that uses the service of online diagnostic system [1] for the people to get an easy check up and analysis report based on the individual medical condition. According to the report patient may consult the specialist doctor. The spine of this system is the “knowledge base” which is indeed a well-organized collection of conventional data base with simple if-then rules and practices prevalent in that perspective. Diagnosis and treatment of Tuberculosis, a painful communicable disease, will be focused using artificial intelligence approach.

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Abstract:
Online exchange of information is very common now a day. It offers opportunity & challenges to extract knowledge for individual use. There are different techniques to achieve this purpose. Therefore in this paper details about web mining especially about web content mining is presented. A comprehensive review about web mining techniques and their use in getting structured, semi structured and unstructured data from the ocean of information (World Wide Web) is also presented. Further opinion mining is explored as an application of web content mining for academic data to reinforce existing academic teaching learning process.

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I. Introduction

Size of W3 (Information Space) is increasing very fast day by day because documents are connected through links. Reason of this is people awareness and dependency on the internet for the various purposes like business, shopping, education, banking, health, blogging, feedbacks etc. But this is also facts that major part of such information space is in unstructured in nature means in text form. Therefore major challenge is how to extract and use relevant information from such big information space.

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Investigation of renewable energy potential in union territory of Lakshadweep islands

Publisher: IEEE

M. Shariz Ansari ; Manaullah ; Mohd. Faisal Jalil **All Authors**

Abstract

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I. Introduction

II. Renewabl Energy Potential in UTL

III. Comparative Analysis

IV. Result and Discussion

V. Conclusion

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Abstract: The Energy Supply of most islands depends mainly on expensive oil derivative importation; the others are linked by usually a week electricity grid connection to the main ... **View more**

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Abstract:

The Energy Supply of most islands depends mainly on expensive oil derivative importation; the others are linked by usually a week electricity grid connection to the main land. Due to high Energy Costs, the islands are proving to be excellent test beds for the introduction of new technologies, and some islands are trying to become so-called renewable Islands to satisfy their energy demand mainly or entirely from indigenous and renewable sources, thus increasing the security of supply, and employment opportunities, without increasing the cost significantly along with environmental pollution mitigation. A great deal of work has been carried out in this specific aspect of energy supply on different Islands in the world. Unfortunately due to Island specific energy use profile, resources and different kind of environmental

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conditions, study to One Island can't be applied to other islands. The main source of electricity in Lakshadweep Island is Diesel Generators even though there is an abundance of renewable energy sources such as solar, wind and biomass. In this paper an investigation has been made to find out total available potential of solar, wind and biomass in five islands of union territory of Lakshadweep (UTL).

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Contents

I. Introduction

The Lakshadweep Island group lies in the Arabian sea and consists of 36 small size islands scattered about 200–400 Km from the western coast of South India between latitude 81°15' N and 11°45' N and longitude 72°00 E and 74°00' E, of these 11 Islands are inhabited [1]. Out of these 36 Islands only Kavaratti and Androth Islands have area greater than 4 Km^2 and population greater than 10,000 persons and Kavaratti is the Capital of UTL. Lakshadweep has a tropical climate with summer's temperature ranging from 35°C to 22°C and winter temperatures lies between 32° to 20°C. Humidity levels are high through the year and ranges from 70-80%. The Island experience moderately high rainfall of 1000 mm a year with the major share from the southwest monsoons [2]. The Lakshadweep islands are identical in structure and formation and their tops are built on coral reefs. The soil has been derived from coral limestone. It is essentially coral sandy soil underlined by limestone and gravel of different shapes and size. The land has 85 to 98 percent calcium carbonate, which is totally unfavorable for any type of cultivation[3]. Thus the natural eco-structure of these islands is not conducive to agricultural development. However, it is suited for coconut plantation, which is done here to a great extent. The feudal character of land tenure that existed in the islands earlier was abolished in 1965 and ownership was transferred to the tenants of the land. The majority of land holdings (almost 90%) at present are thus less than 1.0 Ha in size. Limited land and the ownership of these small holdings, which mostly belongs to the local population, is a major constraint for the Administration for utilizing the land for other purposes[4].

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Figures

References

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Reconfiguration of photo voltaic arrays under partial shading conditions

Publisher: IEEE

Cite This PDF

Mohd Faisal Jalil ; Ritu Saxena ; Mohd Shariz Ansari ; Noman Ali **All Authors**

Abstract

Document Sections

I. Introduction

II. System Description

III. Different Configuration Schemes of PV Array Under Partial Shading Conditions

IV. Result & Conclusion

Authors

Figures

Abstract: Photovoltaic (PV) array are prone to huge amounts of power deficit due to partial shading on the array. The shading pattern of a solar panel if examined helps to improve ... **View more**

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Abstract:
Photovoltaic (PV) array are prone to huge amounts of power deficit due to partial shading on the array. The shading pattern of a solar panel if examined helps to improve the efficiency of a Solar panel. The output of the module declines when shaded by nearby buildings, tree branches or module dust. The output declines proportionally to the amount of shading. Shading on a single module causes the current in the string to fall. Due to partial shading the arrays characteristics exhibits multiple peaks. This paper analyzes the various configurations under partial shading conditions. The performance of Series Parallel (SP), Honey Comb (HC), Bridge link (BL), Total Cross Tie (TCT) with and without bypass diode are compared for 6×6 photovoltaic array using MATLAB/Simulink. This paper also propounds a method to configure the modules to

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enhance the power output of the PV system. The PV array is positioned by “Number Place” Method. This method minimize the effect of shading and also lessen the peaks occurs in different configuration with bypass diodes connected.

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Contents

I. Introduction

The infinite, renewable, clean and noiseless nature of the solar energy makes it of the most preferred sources of renewable energies which is increasingly finding application areas in today's human life. However, despite of the mentioned advantages, this clean energy source has some disadvantages which should be overcome for an efficient use [1]. High production costs of Photo Voltaic panels, less availability of efficient energy storage devices and dependency of energy production on the environmental conditions is some of the main issues which comes while production of solar energy. The amount of energy produced by solar panels totally depends on the incident solar irradiance on the panel surface. Energy production is subjected to variations as the received solar irradiance is not constant at any time instance, variation may be caused by the variations of the position of the sun in the sky during a day or shading effects caused by passing clouds, neighboring buildings etc [1] [6]. Partial or full shading/full dark conditions of solar modules caused by any reason have a direct effect on their power output. When it is comes to large-scale photo voltaic plants, these effects may cause large amounts of economic losses and effectively reduce the overall efficiency of the PV systems[5]. Therefore, estimation of the power yield under different environmental conditions and finding methods to overcome the negative effects of the mentioned conditions and finally

improving the efficiency of the PV generation systems has been considered by many researchers during the recent years [1].

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Figures

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Chapter 22
SVPWM Based Inverter Design for Synchronization of Renewable Energy with Grid

Shivam Saway, Shivani Sachan and Ankit Singhal

Abstract This paper aims to Synchronize the three phase Space vector pulse width modulated inverter with the AC grid. Phase, frequency and amplitude of the AC grid is tracked using the synchronous rotating frame phase locked loop while of inverter are controlled using PI controller. The primary application of the proposed synchronization method is for the distributive generation with renewable energy resources in which power converter plays an integral role.

Keywords SVPWM · Synchronous rotating frame phase locked loop · Proportional integral current controller · LCL filter with series damping resistance

22.1 Introduction

In the last few years renewable energy have experienced one of the largest growth areas in percentage of over 30% per year, compared with the growth of coal and lignite energy. The goal of European community is to reach 20% in 2020, but EU-27 energy is only 17% of the world energy. In fact countries like China and India requires continuously more energy (china energy share has increased 1 point every year from 2000). Even India has uplifted its goal to 175GW of energy form renewable energy resources by 2022. This paper presents a method to interconnect the renewable energy sources generation with our conventional AC grid. Synchronous rotating frame phase locked loop are used to track the phases angle of the AC grid [1, 2] and proportional integral current controller is used to and sync the renewable energy resource generation with AC Grid [3]. SVPWM is used to

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control the output voltage [4] of the inverter of renewable energy generation. A LCL filter with series damping is used to limit the harmonics content of current injected into the AC Grid [5, 6].

22.2 Two-Dimensional Model

The block diagram of the proposed model is shown in Fig. 22.1. The grid voltage angles have been tracked by using the Synchronous rotating frame Phase locked loop. The control strategy is in the Synchronous Reference Frame. The Synchronous reference control can also be called as the dq control. The three phase AC variables are converted to DC variables to work in dq Frame. This is done to achieve the control of variables easily. The active and Reactive power are obtained to set the reference for the active and reactive current controller. The current controller here used are the Proportional Intergral current controller because of its satisfactory performance while working with the DC variables. Proportional integral current controller is used for the current error compensation. Synchronous rotating frame Phase locked loop is used to Synchronize the system with the phase angle of the grid. It is also used to observe the grid conditions to comply with the grid codes.

22.2.1 Power Block

The power block in the proposed model uses the active and reactive power from the grid and generates the reference active and reactive current for obtaining the

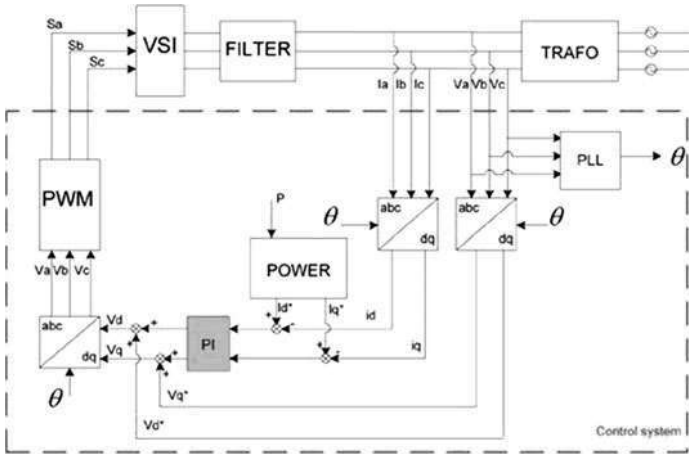

Fig. 22.1 Block diagram of proposed model

required reference signal for the Pulse Width modulation. The concept of power invariance has been employed to generate reference active and reactive current.

22.2.2 PWM Block

The PWM block uses the reference signals as the input and Generates the gate pulses for the six switches of the voltage source Inverter. The gate pulses in this model has been generated by employing the Space Vector Pulse Width Modulation Technique.

22.2.2.1 Space Vector Pulse Width Modulation

The conceptual scheme behind Space Vector Pulse Width Modulation Technique is that if the reference voltage space vector is rotated in space at a very high frequency then the periphery obtained will be close to circle. Hence, the wavefrom obtained from it will be close to sinusoidal waveform. In space vector pulse width modulation there are eight states of voltage space vector out of which six are the active states and the other two are the zero states. The vector corresponding to the active states and zero states are called active vector and zero vector respectively [4]. The voltage space vectors are shown in Fig. 22.2. The average voltage variation in the Space Vector Pulse Width Modulation Technique is shown below in Fig. 22.3.

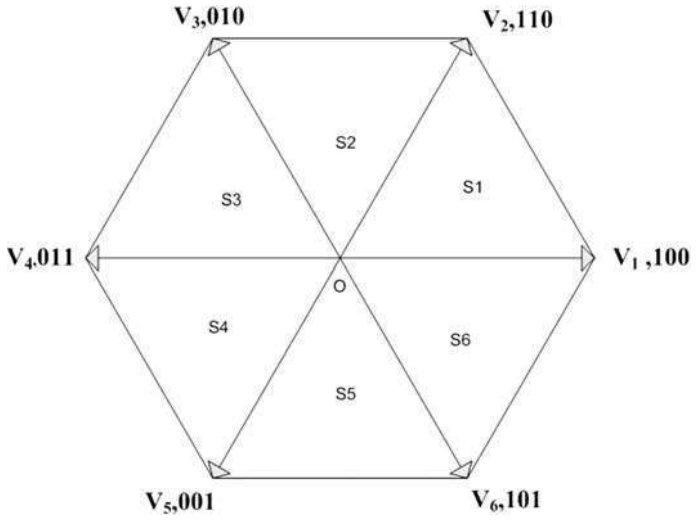

Fig. 22.2 Voltage space vector diagram

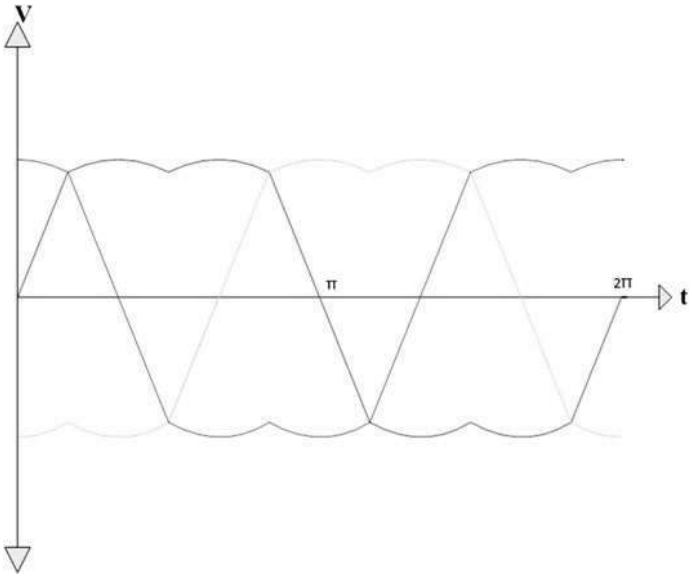

Fig. 22.3 Average voltage variation

22.2.3 Simulation

The simulation of the proposed model is done using matlab Simulink 2009b. The DC link voltage is 725 V and the load is of 5 kW with resistive nature. The grid has been represented by three phase sinosuidal voltage source at 50 Hz of frequency of amplitude of phase to phase voltage equal to 400 V.

22.2.4 Simulation Results

The simulation results are presented in this section. Figure 22.4 shows the simulink model of the proposed design and Fig. 22.5 shows the Synchronous rotating frame Phase locked loop output. Figure 22.6 shows the FFT analysis of the inverter output current with total harmonic distortion of 2.02%. Figure 22.7 FFT analysis of filter output current with total harmonic distortion of 0.87%. Figures 22.6, 22.8 and 22.9 shows the Power generated from renewable energy and sharing of Power between load and Grid respectively. The results are shown for both ideal and non ideal grid condition. To show the non ideal grid condition results the variation in grid voltage amplitude and frequency are done. Figures 22.10 and 22.11 shows the non ideal grid condition results.

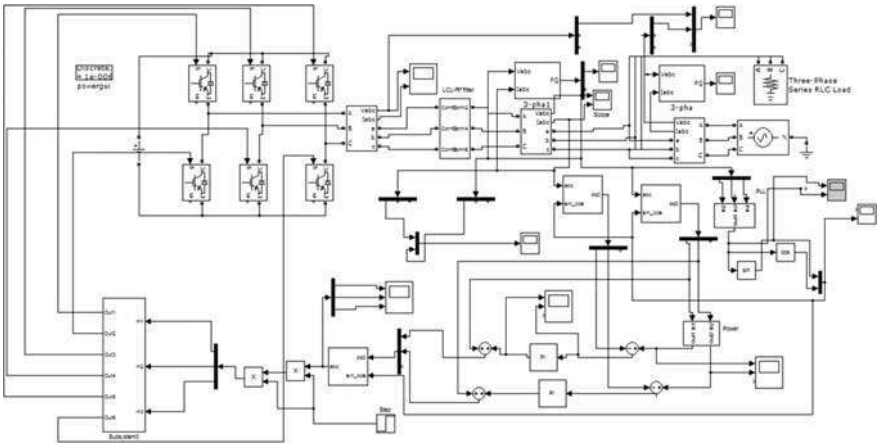

Fig. 22.4 Matlab simulink model of proposed design

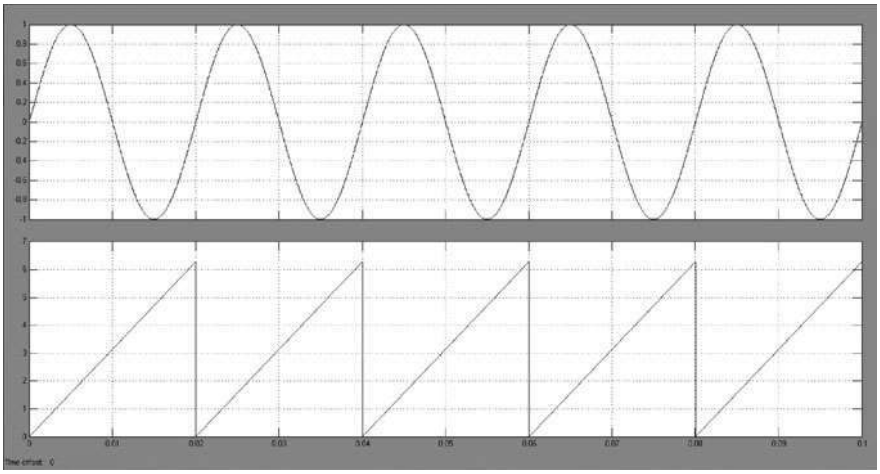

Fig. 22.5 Phase locked loop output

22.2.4.1 Simulation Results for Ideal Grid Condition

In this section the Simulation results are shown for the ideal grid condition. In ideal grid condition no variation in the grid voltage amplitude and frequency are done.

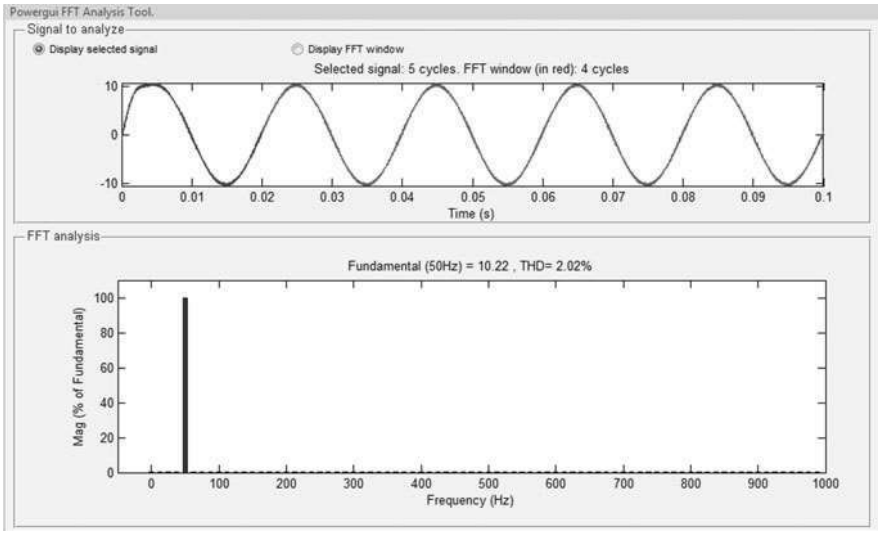

Fig. 22.6 FFT analysis of filter input current

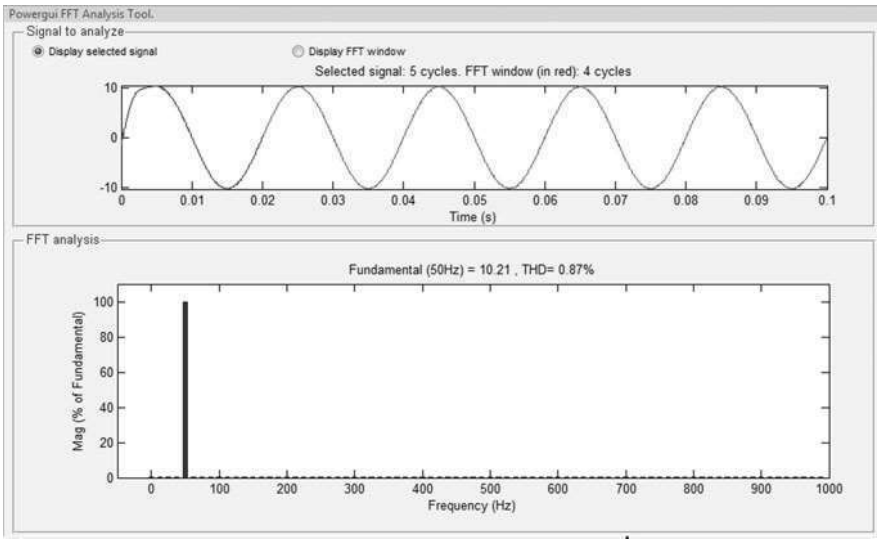

Fig. 22.7 FFT analysis of filter output current

22.2.4.2 Simulation Results for Non Ideal Grid Conditions

In this section the simulation results for non ideal grid condition are shown. 10% variation is done in the voltage amplitude and 5% variation in frequency is done.

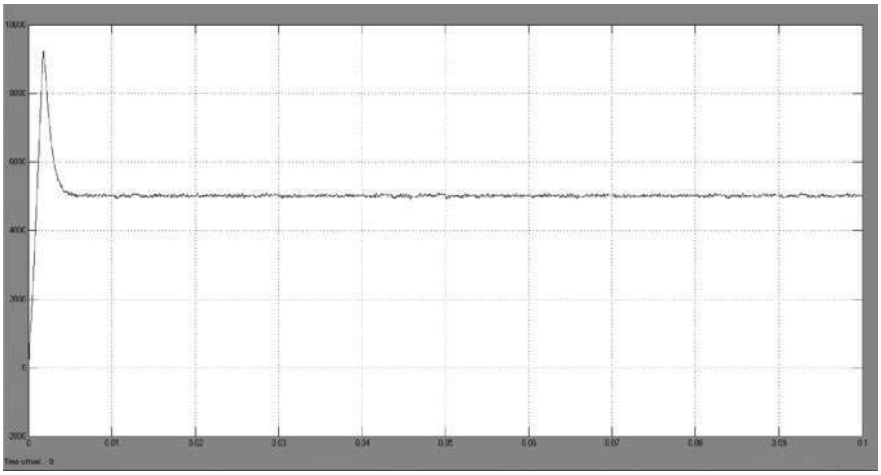

Fig. 22.8 Active power fed from inverter to the grid

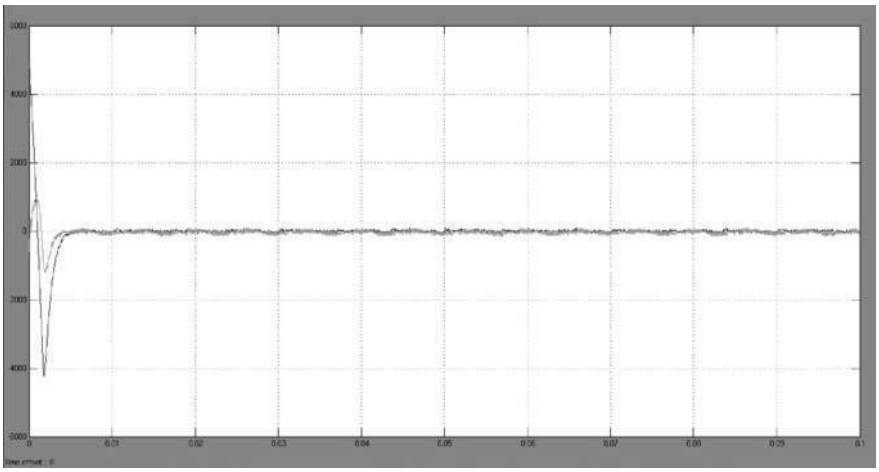

Fig. 22.9 Power sharing between load and grid

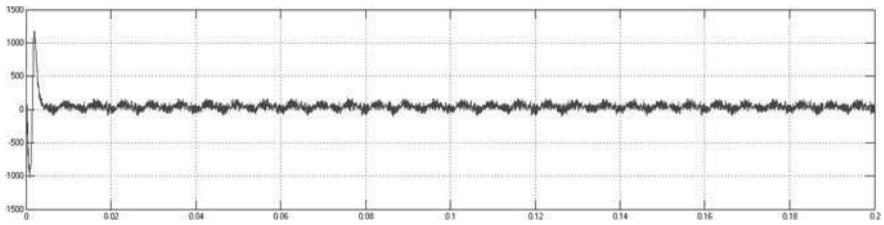

Fig. 22.10 Reactive power fed into the grid

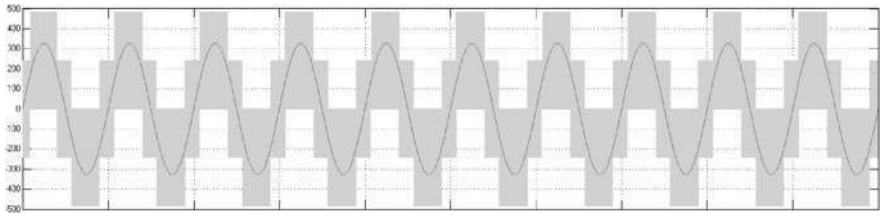

Fig. 22.11 Phase to phase inverter output voltage (*Yellow*) and grid voltage (*Red*) is synchronized

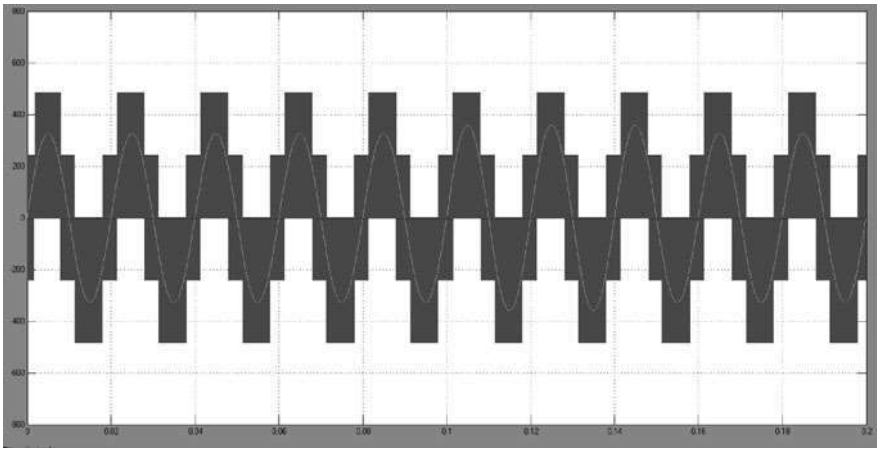

Fig. 22.12 Showing grid synchronization of inverter with 10% of voltage amplitude variation in grid

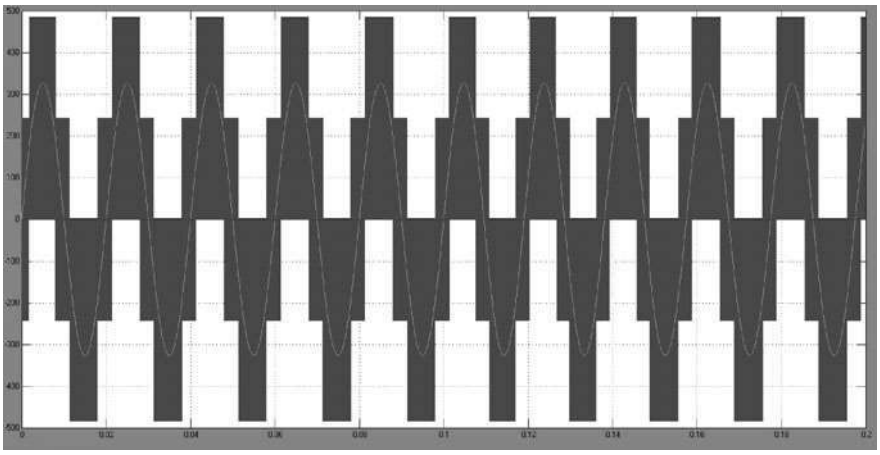

Fig. 22.13 Showing grid synchronization of inverter with 5% variation in grid frequency

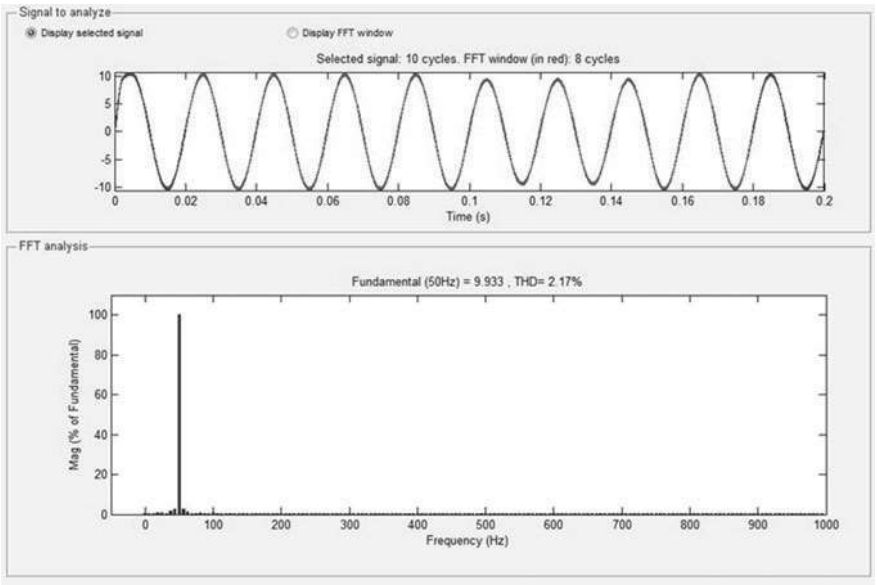

Fig. 22.14 FFT analysis of filter input current showing THD of 2.17% with 10% variation in grid voltage amplitude

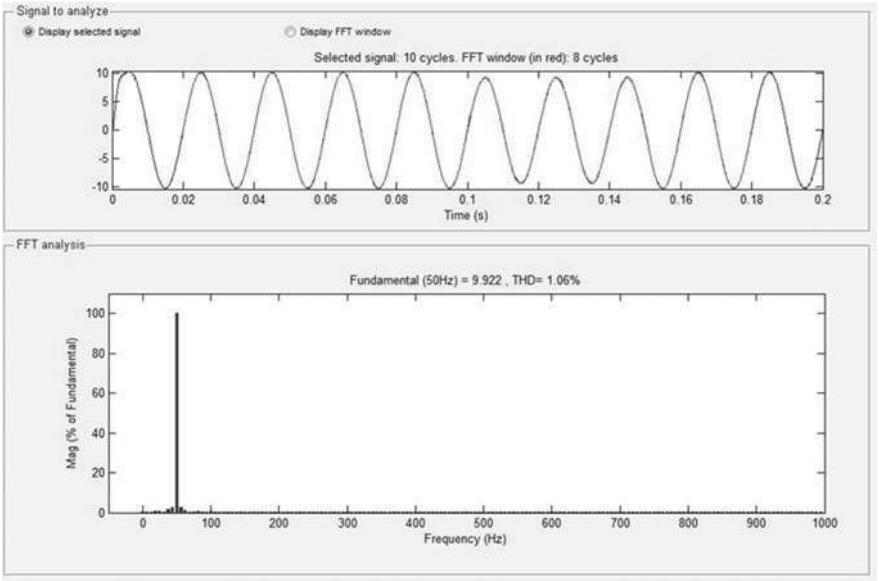

Fig. 22.15 FFT analysis of current injected into the grid showing THD of 1.06% with 10% variation in grid voltage amplitude

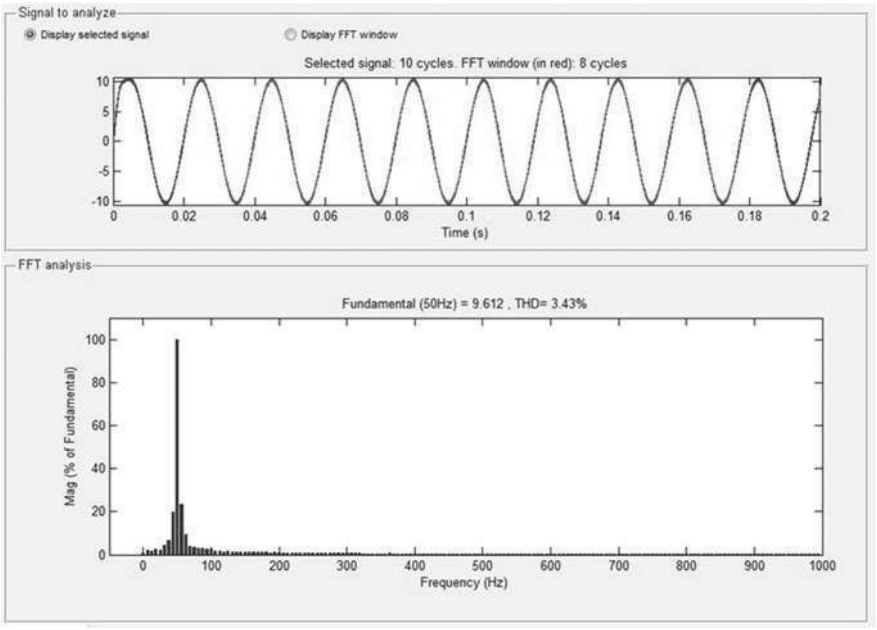

Fig. 22.16 FFT analysis of filter input current showing THD 3.43% with 5% variation in grid frequency

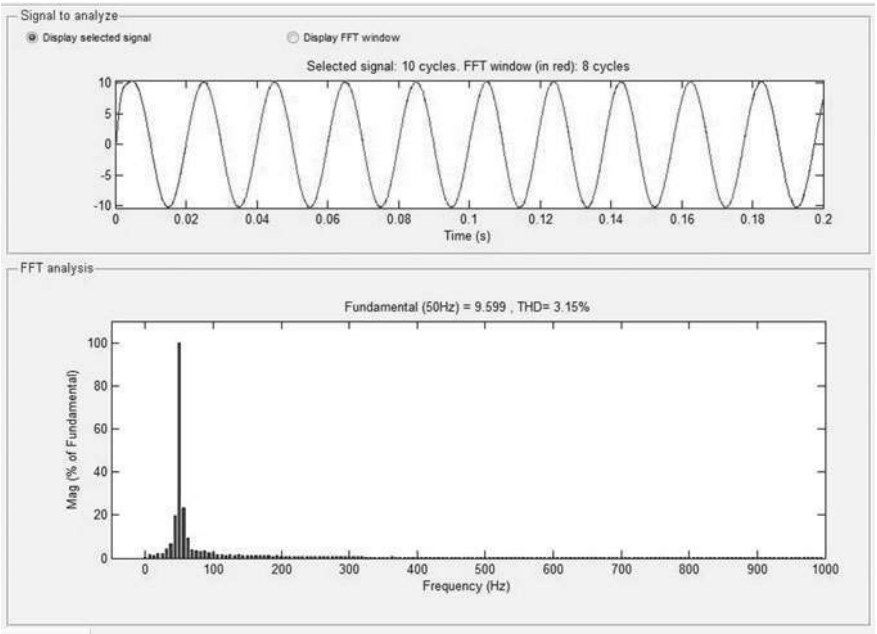

Fig. 22.17 FFT analysis of current injected into the Grid showing THD 3.15% with 5% variation in grid frequency

The variation is done for the time interval between 0.1 and 0.15 s (Figs. 22.12, 22.13, 22.14, 22.15, 22.16 and 22.17).

22.2.5 Conclusion

The Synchronization of renewable energy generation has been achieved using Synchronous rotating frame phase locked loop and Proportional integral current control method. The control over output voltage has been achieved by applying SVPWM technique. The harmonics contents are limited by using the LCL filter with series damping. The result of Simulation of proposed scheme are qualifying the standards specified by IEEE.

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Reconfiguration of Photo Voltaic Arrays under Partial Shading Conditions

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***Abstract*—Photovoltaic (PV) array are prone to huge amounts of power deficit due to partial shading on the array. The shading pattern of a solar panel if examined helps to improve the efficiency of a Solar panel. The output of the module declines when shaded by nearby buildings, tree branches or module dust. The output declines proportionally to the amount of shading. Shading on a single module causes the current in the string to fall. Due to partial shading the arrays characteristics exhibits multiple peaks. This paper analyzes the various configurations under partial shading conditions. The performance of Series Parallel (SP), Honey Comb (HC), Bridge link (BL), Total Cross Tie (TCT) with and without bypass diode are compared for 6x6 photovoltaic array using MATLAB/Simulink.**

This paper also propounds a method to configure the modules to enhance the power output of the PV system. The PV array is positioned by "Number Place" Method. This method minimize the effect of shading and also lessen the peaks occurs in different configuration with bypass diodes connected.

***Index Terms*—Partial shading, Photo voltaic (PV), Series Parallel (SP), Honey Comb (HC), Bridge link (BL), Total Cross Tie (TCT), Number Place Method.**

I. INTRODUCTION

The infinite, renewable, clean and noiseless nature of the solar energy makes it of the most preferred sources of renewable energies which is increasingly finding application areas in today's human life. However, despite of the mentioned advantages, this clean energy source has some disadvantages which should be overcome for an efficient use [1]. High production costs of Photo Voltaic panels, less availability of efficient energy storage devices and dependency of energy production on the environmental conditions is some of the main issues which comes while production of solar energy. The amount of energy produced by solar panels totally depends on the incident solar irradiance on the panel surface. Energy production is subjected to variations as the received solar irradiance is not constant at any time instance, variation may be caused by the variations of the position of the sun in the sky during a day or shading effects caused by passing clouds, neighboring buildings etc [1][6]. Partial or full shading/full dark conditions of solar modules caused by any reason have a direct effect on their power output. When it is comes to large-scale photo voltaic plants, these effects may cause large amounts of economic losses and effectively reduce the overall efficiency of the PV systems[5]. Therefore, estimation of the power yield under different environmental conditions and finding methods to overcome the negative effects of the mentioned conditions and finally improving the efficiency of the PV generation systems has been considered by many researchers during the recent years [1].

Solar photo voltaic is important energy source since it is renewable and produces clean energy. Many researchers have been conducted in this field over so many years. Solar Photo Voltaic panel is a non linear power source that needs correct identification of optimal operating point. The panel output power changes with temperature and insulation. It is desired to operate Solar Photo Voltaic panel at its maximum power output to improve efficiency for economic reasons [2].

The model is developing using basic circuit equations of the photovoltaic (PV) module including the effects of temperature changes and solar irradiation. It is

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very important to understand characteristics of solar photovoltaic array under partial shading condition to maximize its output and to effectively use solar photovoltaic installations under all conditions. This paper presents different configuration techniques of photo voltaic array to reduce the losses faced in photovoltaic system due to partial shading. It is difficult to make analysis on physical PV module as field testing is costly, time consuming and dependent on weather conditions. Use of bypass diode in anti parallel will increase power output in different partial shading condition but causes multiple peak voltage-power characteristics [3].The losses occurred due to partial shading are not proportional to the shaded area but depend on the pattern of shading, array configuration and the location of shaded module in the array. Different array configurations have been proposed in literature to reduce the mismatch losses in the photo voltaic array. Four interconnection schemes viz., Series-Parallel (SP), Total Cross Tied (TCT), Honey Comb (HC) and Bridge Linked (BL) are compared for their losses fill factor, reliability, maximum power and energy yield due to mismatch caused by the manufacturer's tolerances in module characteristics and by partial shading [4].

This paper also presents a method to configure, in which the physical placement of the modules in a Series-Parallel (SP), Total Cross Tied (TCT), Honey Comb (HC) and Bridge Linked (BL) connected PV array is done to enhance the photo voltaic power output generation under partial shaded conditions. The modules are arranged based on the Number Place Method, without changing their electrical connection within the PV array. This structure helps to distribute the effect of shading over the whole array area thereby reducing the effect of shading of modules in the same row. The performance of the system is investigated for different shading patterns and the results shows that the Number Place Method exhibits better performance under partially shaded conditions. Equivalent circuit and single diode model of solar cell is shown in Figure 1.

II. SYSTEM DESCRIPTION

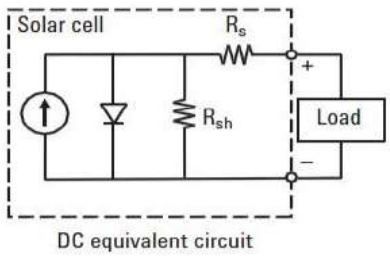

Figure1: Single Diode model of Photovoltaic Cell

Module consists of a number of photo voltaic cells in source shunted with a diode and represented by an equivalent circuit [4] shown in Figure 1.The equation relate the output current and the voltage of a photo voltaic module at an insolation G can be written as[7]-

$$I = I_{pv} - I_o\left[\exp\left(\frac{V+R_s}{V_{t,a}}\right)-1\right]-\frac{V+R_s}{R_s} \quad (1)$$

The light generated current of the photovoltaic cell depends linearly on the solar irradiation and is highly influenced by the temperature according to the following equation [7]

$$I_{pv} = (\mathrm{I}_{pv,n}+\mathrm{K}_1\Delta\mathrm{T})\frac{G}{G_n} \quad (2)$$

The diode saturation current I_o and its dependence on the temperature may be expressed by [7]

$$I_o = I_{o,n}\left(\frac{T_n}{T}\right)^3\exp\left[\frac{qE_g}{ak}\left(\frac{1}{T_n}-\frac{1}{T}\right)\right] \quad (3)$$

TABLE 1

Parameters of KC200GT PV array at 25° C, AM 1.5, 1000W/m^2

I_{mp}	7.6A
V_{mp}	26.3V
$P_{max,e}$	200.14W
I_{sc}	8.2A
V_{oc}	32.9V
K_v	-0.1230V/K
K_I	0.0032A/K
N_s	54

Where:-

Ipv=Photocurrent (A)
Isc= Diode Saturation current (A)
Ki= Current Coefficient
Kv= Voltage Coefficient
Rs=Cell Series Resistance (Ω)
Rp= Cell Shunt Resistance (Ω)
T=Temperature of P-N junction (K)
G=Irradiation (W/m^2)
G_n=Nominal irradiation

The structures of the simulation models for various configurations are presented in this paper. The simulated P-V and I-V curves, under standard conditions for various configurations are illustrated in this paper in section II

III. DIFFERENT CONFIGURATION SCHEMES OF PV ARRAY UNDER PARTIAL SHADING CONDITIONS

Different techniques are available for the configuration of PV array. These configurations are investigated in this paper. Series Parallel (SP), Bridge linked (BL), Honey Comb (HC) and Total Cross Tied (TCT) configurations of Photovoltaic array are compared in this paper under partial shading condition with and without bypass also a new configuration named Number Place is proposed.

(i) SERIES PARALLEL (SP)

Series and Parallel connections of PV array are low current and voltage values which is the main disadvantage. The Photovoltaic modules are arranged in series to increase the voltage level and in parallel to increase the current level of photo voltaic array, this configuration is known as Series Parallel configuration, SP configuration is shown in Figure 2(a). The simulink model of SP configuration is shown in Figure 2(b)and simulink model of SP configuration with Bypass diode is shown in Figure 2(c). Figure 2(d) shows the P-V characteristics.

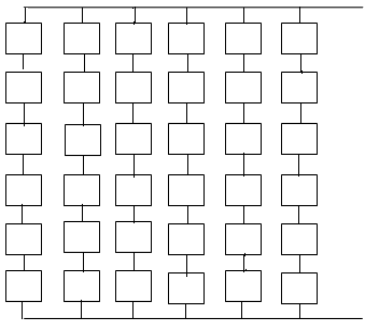

Figure 2 (a): Photovoltaic Array Configuration for Series–Parallel connection

This paper also presents a method to configure, in which the physical placement of the modules in a Total Cross Tied (TCT) connected PV array is done to enhance the photo voltaic power output generation under partial shaded conditions. The modules are arranged based on the Number Place Method, without changing their electrical

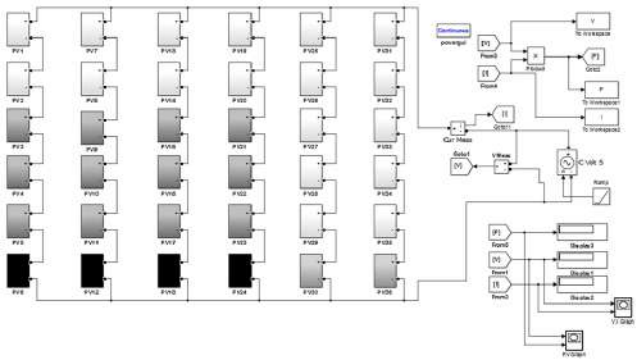

Figure 2(b): Simulink Model of Series–Parallel connection without Bypass Diode

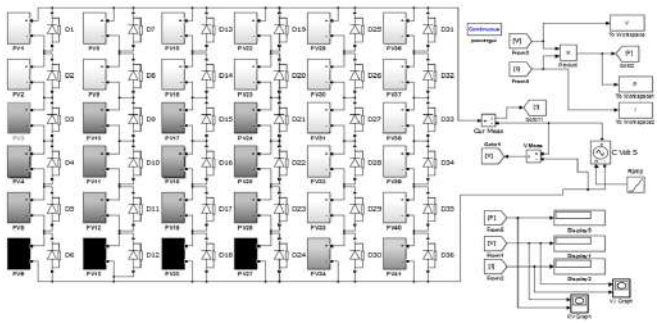

Figure 2(c): Simulink Model of Series-Parallel Connection with Bypass Diode

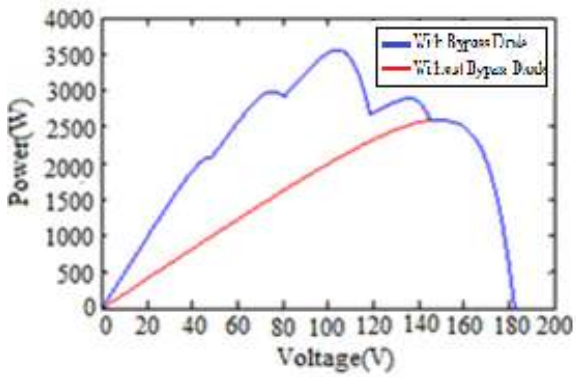

Figure 2(d): P-V Characteristic of Series-Parallel Connection

(ii) HONEY COMB CONNECTION (HC)

Series Parallel connection is modified by connecting ties across junctions which creates HC configuration as shown in Figure 3(a), it consist of two parallel string having three series connected modules. The ties in the strings improve the voltage and current values. The simulink model of honey comb configuration is shown in Figure 3(b) and simulink model of honey comb configuration with Bypass

diode and P-V characteristics is shown in Figure 3(c) and Figure 3(d) respectively.

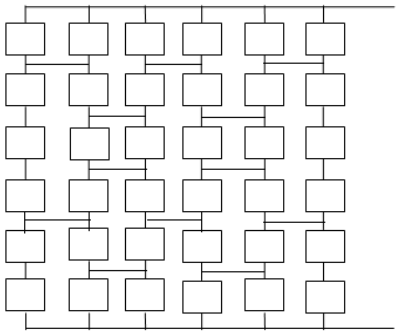

Figure 3(a): Photovoltaic Array Configuration for Honey Comb connection

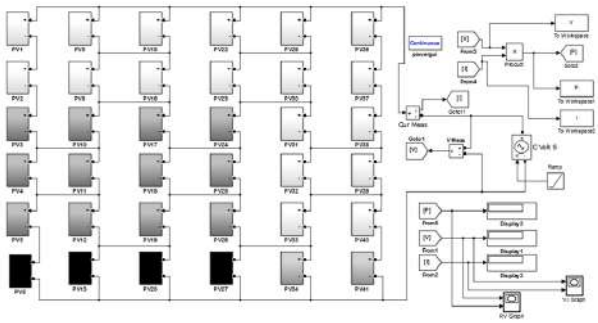

Figure 3(b): Simulink Model of Honey Comb connection without Bypass Diode

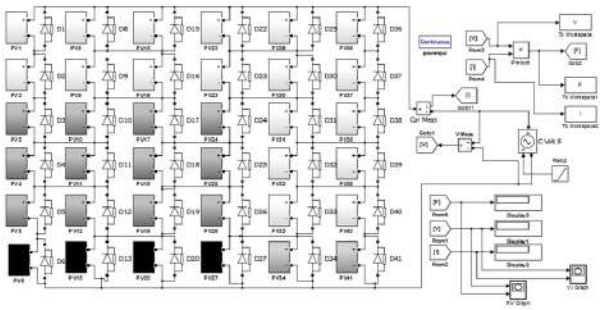

Figure 3(c): Simulink Model of Honey Comb Connection with Bypass Diode

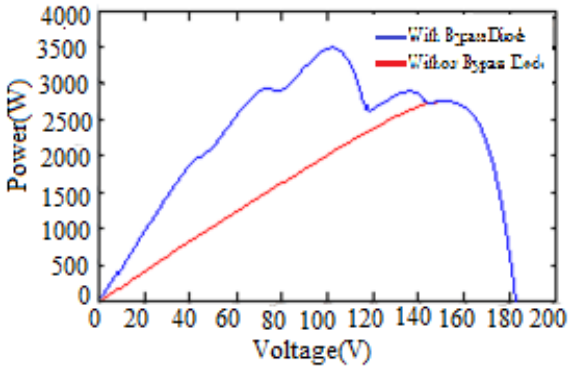

Figure 3(d): P-V Characteristic of Honey Comb Connection

(iii) BRIDGE LINK CONNECTION (BL)

In Bridge Link configuration modules are connected in a bridge rectifier manner as shown Figure 4(a) it consist of two parallel string having two series connected modules, there exists tie between the bridges. The simulink model of bridge link configuration is shown in Figure 4(b) and simulink model of bridge link configuration with Bypass diode and P-V characteristics is shown in Figure 4(d) respectively.

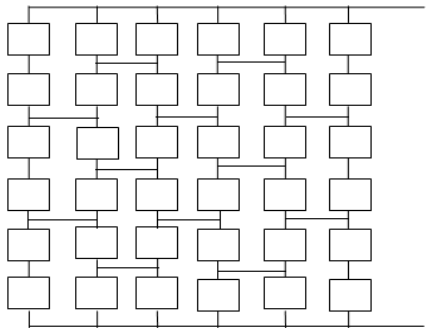

Figure 4(a): Photovoltaic Array Configuration for Bridge Link connection

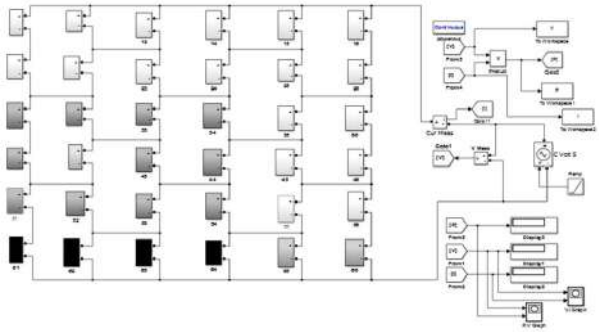

Figure4(b): Simulink Model of Bridge Link connection Without Bypass Diode

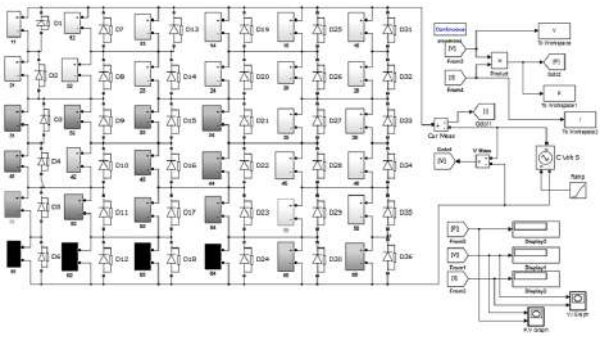

Figure4(c): Simulink Model of Bridge Link connection With Bypass Diode

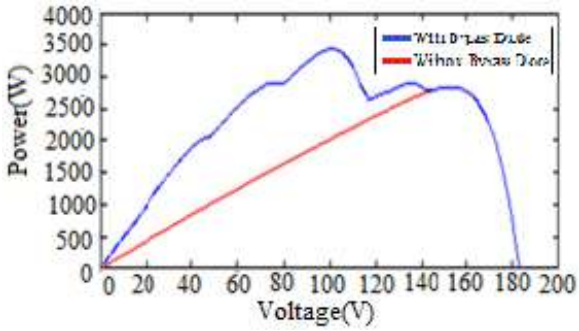

Figure 4(d): P-V Characteristic of Bridge Link Connection

(iv) TOTAL CROSS TIED CONNECTION (TCT)

Total Cross Tie configuration is obtained from Series Parallel configuration by connecting cross ties across each row Figure 5(a). The columns are connected in series and rows are connected in parallel. The simulink model of Total Cross Tie is shown in Figure 5(b) and simulink model of Total Cross Tie configuration with Bypass diode and P-V characteristics is shown in Figure 5(c) and Figure 5(d) respectively.

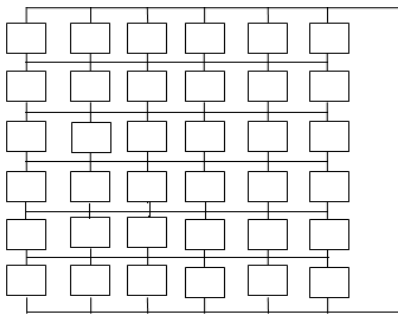

Figure 5(a): Photovoltaic Array Configuration for Total Cross Tie connection

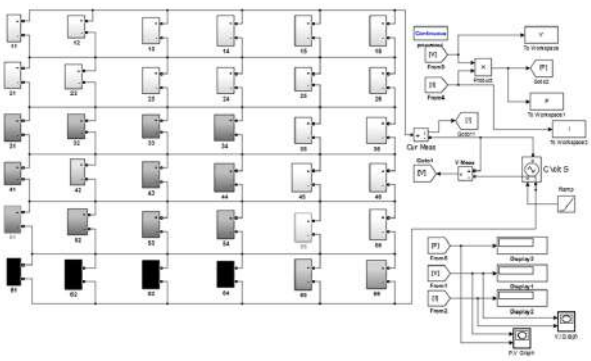

Figure 5(b): Simulink Model of Total Cross Tie connection with Bypass Diode

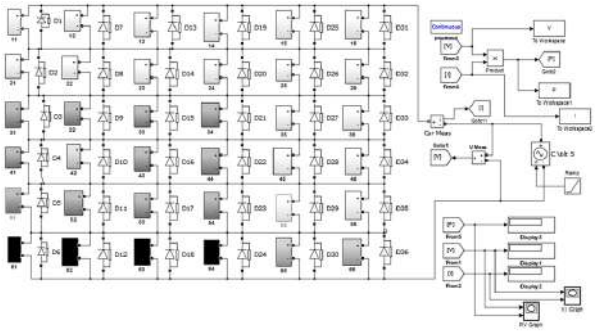

Figure 5(c): Photovoltaic Array Configuration for Total Cross Tie connection

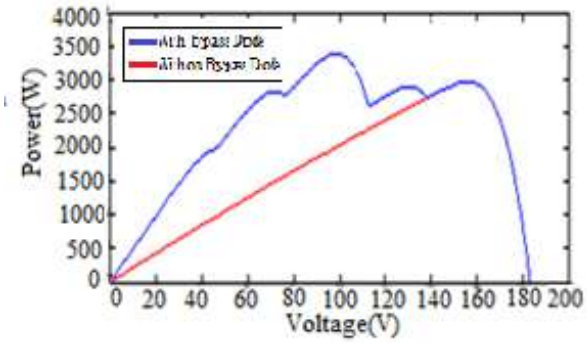

Figure 5(d): P-V characteristic of Total Cross Tie connection

(vi) NUMBER PLACE METHOD (NP)

It is logic based number place method. The main objective is to fill 6x6 grids with digits so that no digit repeats in any row or column. The Number Place Method involves six 2X6 matrices and every row, column, and matrix accommodates the digits 1 to 6 without repeating any number. A Number Place pattern is shown in Figure 6(c) is chosen for the study. The first digit in each box represents the number and the second digit denotes column of the 6X6 array. It can be seen that in each sub matrix, each row and each column of the array accommodates all the digits from 1 to 6. Here the electrical connection of the module remains same as shown in Figure 6(a). However, the physical location of the modules gets changed. The panel 32 (third row, second column) is moved from its location to the first row second column but the panel connection remains the same, in the fourth row. In this way, the locations of the panels are changed without changing the electrical connections in the array.

To evaluate and compare the Number Place Method with other configuration methods simulation studies using MATLAB/Simulink environment will be done. The modules are rearranged according to the chosen puzzle pattern as shown in Figure 6 (b). The PV characteristics are obtained for SP, BL, HC and TCT.

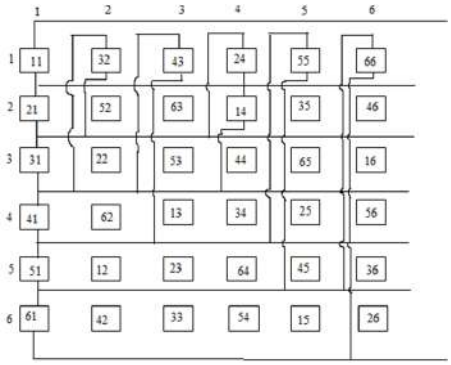

Figure 6(a): General Photovoltaic Array Configuration for Proposed Number Place Method

1000W/m^2

11	12	13	14	15	16
21	22	23	24	25	26
31	32	33	34	35	36
41	42	43	44	45	46
51	52	53	54	55	56
61	62	63	64	65	66

800W/m^2 600W/m^2 100W/m^2

Figure 6(b): Shading pattern for different configurations

11	32	43	24	55	66
21	52	63	14	35	46
31	22	53	44	65	16
41	62	13	34	25	56
51	12	23	64	45	36
61	42	33	54	15	26

Figure 6(c): Chosen pattern for Number Place Method

11	12	13	14	15	16
21	22	23	24	25	26
31	32	33	34	35	36
41	42	43	44	45	46
51	52	53	54	55	56
61	62	63	64	65	66

Figure 6(d): Shading dispersion with Number place method

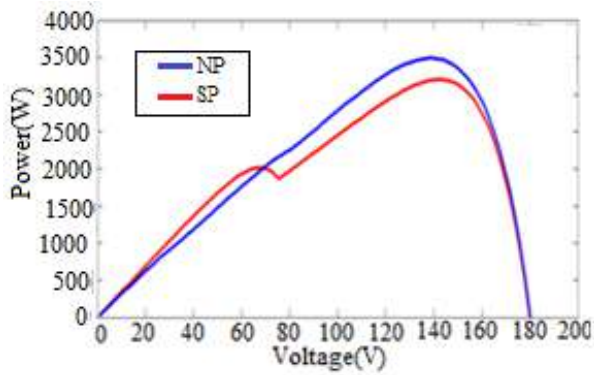

Figure 6(e): P-V characteristic of SP and NP method

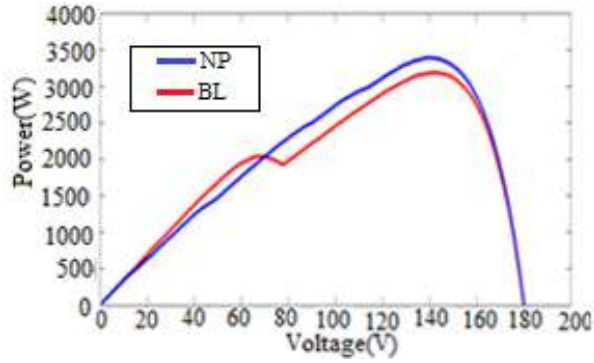

Figure 6(f): P-V characteristic of BL and NP method

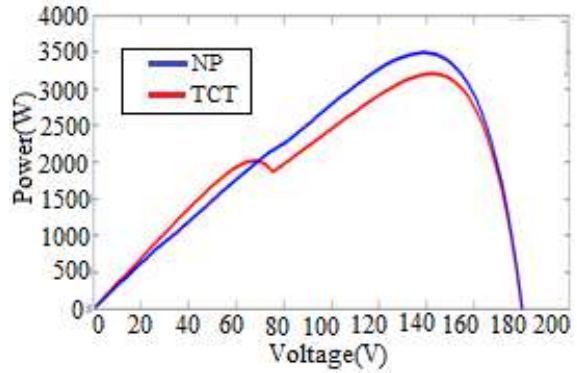

Figure 6(h): P-V characteristic of TCT and NP method

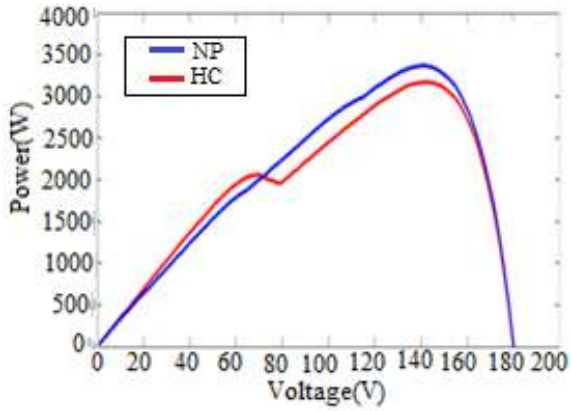

Figure 6(g): P-V characteristic of HC and NP method

IV. RESULT & CONCLUSION

TABLE 2

Configuration	Without diode			Peaks	With diode			Peaks
	Voltage(V)	Current(A)	Power(W)		Voltage(V)	Current(A)	Power(W)	
SP	150	17.5	2625	1	105	33.75	3543	5
HC	148.1	18.6	2754	1	103	33.5	3450	5
BL	151	18.7	2823	1	102.5	33.8	3470	5
TCT	158	18.75	2954	1	106	34.1	3615	5

TABLE 3

Configuration	Power(W) With Diode	Number Of Peaks	Power(W) with NP Method	Number Of Peaks	Power Improvement %
SP	3125	2	3350	1	6.7
HC	3175	2	3375	1	5.9
BL	3200	2	3400	1	5.8
TCT	3280	2	3500	1	6.2

Different system configurations are utilized in photo voltaic generation plant to improve the overall system efficiency. Series-Parallel, Bridge Link, Honey Comb and Total Cross Tie are the configurations which are widely used in order to reduce the effects of partial shading.

This paper proposed a new technique Number Place Method to improve the output power of the photo voltaic system and to reduce the multiple peaks under partial shading conditions. In this method the physical location of the modules gets interchanged according to the chosen method but the electrical connection remains exactly same. This configuration is a single time arrangement for the photo voltaic modules in an array and demonstrates the improvement in photo voltaic power generation under partial shaded conditions. Table 2 & Table 3 represent the comparative analysis of SP, BL, HC and TCT configurations with and without bypass diodes connected and with Number Place method respectively. The result reveals that this reconfiguration method offers a greater output power than the photo voltaic systems with classic configurations. The mentioned method has been able to increase the array's output power value up to 6.7%. It is also observed that number of peaks also reduces to one, in all configurations with NP method.

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Real time performance evaluation of modified PMDC motor, BLDC motor and dual commutator PMDC machine

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Rahat Ullah Khan **All Authors**

Abstract

Document Sections

I. Introduction

II. Machine Structure

III. Overview of the Conventional PMDC Motor, BLDC Motor and First Generation Modified PMDC Motor

IV. Dual Commutator Based PMDC Motor

V. Conclusion

Authors

Abstract: This paper present a novel technology for PMDC motor by adding second commutator at the same shaft for Solar PV/T Pumps. This idea opens the new methodology to run a mach... **View more**

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Abstract:

This paper present a novel technology for PMDC motor by adding second commutator at the same shaft for Solar PV/T Pumps. This idea opens the new methodology to run a machine i.e. generate energy while running for the torque. This machine is designed and fabricated and tested in real time conditions for various applications. A comparison amongst conventional PMDC Motor, first generation Modified PMDC Motor and Dual Commutator PMDC Motor including second generation BLDC motor has been discussed. Several combinations of modes of operations are explained for various applications.

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Contents

I. Introduction

Energy saving is considered as energy generation. The proposed work is to enhance the efficiency of the PMDC motor initially by introducing additional commutator which is provided to supply the additional power during sudden demand for additional load condition and to extract the electrical power during under load running condition. To understand it, design of a new technique for PMDC motor for Solar PV Pumps by adding second commutator at the same shaft. This machine is designed and fabricated and tested in real time conditions for various applications especially for solar based PV pump systems. With the help of auxiliary commutator on the same shaft electrical power is obtained while the PMDC Machine is running as a Motor, simultaneously the by other commutator we are extracting the electrical power when running at under load condition. In another case we may provide Electrical Power to the auxiliary commutator if we are required more torque.

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Series Fed Patch Antenna Array with CSRR Inspired Ground Plane

Authors | Authors and affiliations

Chirag Arora, Shyam S. Pattnaik, R. N. Baral

Conference paper
First Online: 29 October 2017

Part of the Smart Innovation, Systems and Technologies book series (SIST, volume 78)

Abstract

In this paper, a series fed, Complementary Split Ring Resonator (CSRR) loaded, microstrip patch antenna array has been presented for 5.5 GHz Wi-Fi applications. The traditional unloaded antenna array resonates at 6 GHz with gain of 7.15 dBi and bandwidth of about 480 MHz. Whereas, when the ground plane under each patch of the same antenna array is

Diagnosis of Pulmonary Tuberculosis using fuzzy Inference System

Publisher: IEEE

Ekata ; Praveen Kumar Tyagi ; Neeraj Kumar Gupta ; Shivam Gupta **All Authors**

Abstract

Document Sections

I. Introduction

II. Neuro Fuzzy Diagonistic Intelligence System for Pulomonary Tuberculosis

III. Simulation Based Results and Discussion

IV. Conclusion

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Abstract:
Artificial intelligence is a set of real time computational methodologies to address complex real-world problems. In this paper, Neurofuzzy Inference System for analysis of pulmonary tuberculosis (TB)disease is discussed. For effective result, simulation is being done by using the realistic causes of pulmonary TB. The Neurofuzzy system is used for decision making based on a predefined rule based upon the symptoms of the patient are taken as inputs and the corresponding TB risk quotient is evaluated as the output. This crisp result obtained allows us to diagnose the low or high risk of the disease in the patient. Hybrid learning algorithm is applied for minimization of error in the output.

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Contents

I. Introduction

As concern about rural areas or villages, some time patients hardly get any medical assistance. Online diagnosis of some chronic diseases is increasingly becoming popular day by day. The paper thus proposes intelligence based virtual doctor that uses the service of online diagnostic system [1] for the people to get an easy check up and analysis report based on the individual medical condition. According to the report patient may consult the specialist doctor. The spine of this system is the “knowledge base” which is indeed a well-organized collection of conventional data base with simple if-then rules and practices prevalent in that perspective. Diagnosis and treatment of Tuberculosis, a painful communicable disease, will be focused using artificial intelligence approach.

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Opinion mining to strengthen teaching learning process

Publisher: IEEE

Sartaj Ahmad ; Ashutosh Gupta ; Neeraj Kumar Gupta **All Authors**

Abstract

Document Sections

I. Introduction

II. Classification of Web Mining

III. Data on Web Page & its Extraction

IV. Opinion Mining as an Application of Unstructured Data Mining

V. Future Perspectives

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Abstract: Online exchange of information is very common now a day. It offers opportunity & challenges to extract knowledge for individual use. There are different techniques to ach... **View more**

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Abstract:
Online exchange of information is very common now a day. It offers opportunity & challenges to extract knowledge for individual use. There are different techniques to achieve this purpose. Therefore in this paper details about web mining especially about web content mining is presented. A comprehensive review about web mining techniques and their use in getting structured, semi structured and unstructured data from the ocean of information (World Wide Web) is also presented. Further opinion mining is explored as an application of web content mining for academic data to reinforce existing academic teaching learning process.

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I. Introduction

Size of W3 (Information Space) is increasing very fast day by day because documents are connected through links. Reason of this is people awareness and dependency on the internet for the various purposes like business, shopping, education, banking, health, blogging, feedbacks etc. But this is also facts that major part of such information space is in unstructured in nature means in text form. Therefore major challenge is how to extract and use relevant information from such big information space.

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Investigation of renewable energy potential in union territory of Lakshadweep islands

Publisher: IEEE

M. Shariz Ansari ; Manaullah ; Mohd. Faisal Jalil **All Authors**

Abstract

Document Sections

I. Introduction

II. Renewabl Energy Potential in UTL

III. Comparative Analysis

IV. Result and Discussion

V. Conclusion

Authors

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Abstract: The Energy Supply of most islands depends mainly on expensive oil derivative importation; the others are linked by usually a week electricity grid connection to the main ... **View more**

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Abstract:

The Energy Supply of most islands depends mainly on expensive oil derivative importation; the others are linked by usually a week electricity grid connection to the main land. Due to high Energy Costs, the islands are proving to be excellent test beds for the introduction of new technologies, and some islands are trying to become so-called renewable Islands to satisfy their energy demand mainly or entirely from indigenous and renewable sources, thus increasing the security of supply, and employment opportunities, without increasing the cost significantly along with environmental pollution mitigation. A great deal of work has been carried out in this specific aspect of energy supply on different Islands in the world. Unfortunately due to Island specific energy use profile, resources and different kind of environmental

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conditions, study to One Island can't be applied to other islands. The main source of electricity in Lakshadweep Island is Diesel Generators even though there is an abundance of renewable energy sources such as solar, wind and biomass. In this paper an investigation has been made to find out total available potential of solar, wind and biomass in five islands of union territory of Lakshadweep (UTL).

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I. Introduction

The Lakshadweep Island group lies in the Arabian sea and consists of 36 small size islands scattered about 200–400 Km from the western coast of South India between latitude 81°15' N and 11°45' N and longitude 72°00 E and 74°00' E, of these 11 Islands are inhabited [1]. Out of these 36 Islands only Kavaratti and Androth Islands have area greater than 4 Km^2 and population greater than 10,000 persons and Kavaratti is the Capital of UTL. Lakshadweep has a tropical climate with summer's temperature ranging from 35°C to 22°C and winter temperatures lies between 32° to 20°C. Humidity levels are high through the year and ranges from 70-80%. The Island experience moderately high rainfall of 1000 mm a year with the major share from the southwest monsoons [2]. The Lakshadweep islands are identical in structure and formation and their tops are built on coral reefs. The soil has been derived from coral limestone. It is essentially coral sandy soil underlined by limestone and gravel of different shapes and size. The land has 85 to 98 percent calcium carbonate, which is totally unfavorable for any type of cultivation[3]. Thus the natural eco-structure of these islands is not conducive to agricultural development. However, it is suited for coconut plantation, which is done here to a great extent. The feudal character of land tenure that existed in the islands earlier was abolished in 1965 and ownership was transferred to the tenants of the land. The majority of land holdings (almost 90%) at present are thus less than 1.0 Ha in size. Limited land and the ownership of these small holdings, which mostly belongs to the local population, is a major constraint for the Administration for utilizing the land for other purposes[4].

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Reconfiguration of photo voltaic arrays under partial shading conditions

Publisher: IEEE

Cite This PDF

Mohd Faisal Jalil ; Ritu Saxena ; Mohd Shariz Ansari ; Noman Ali **All Authors**

Abstract

Document Sections

I. Introduction

II. System Description

III. Different Configuration Schemes of PV Array Under Partial Shading Conditions

IV. Result & Conclusion

Authors

Figures

Abstract: Photovoltaic (PV) array are prone to huge amounts of power deficit due to partial shading on the array. The shading pattern of a solar panel if examined helps to improve ... **View more**

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Abstract:
Photovoltaic (PV) array are prone to huge amounts of power deficit due to partial shading on the array. The shading pattern of a solar panel if examined helps to improve the efficiency of a Solar panel. The output of the module declines when shaded by nearby buildings, tree branches or module dust. The output declines proportionally to the amount of shading. Shading on a single module causes the current in the string to fall. Due to partial shading the arrays characteristics exhibits multiple peaks. This paper analyzes the various configurations under partial shading conditions. The performance of Series Parallel (SP), Honey Comb (HC), Bridge link (BL), Total Cross Tie (TCT) with and without bypass diode are compared for 6×6 photovoltaic array using MATLAB/Simulink. This paper also propounds a method to configure the modules to

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enhance the power output of the PV system. The PV array is positioned by “Number Place” Method. This method minimize the effect of shading and also lessen the peaks occurs in different configuration with bypass diodes connected.

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Contents

I. Introduction

The infinite, renewable, clean and noiseless nature of the solar energy makes it of the most preferred sources of renewable energies which is increasingly finding application areas in today's human life. However, despite of the mentioned advantages, this clean energy source has some disadvantages which should be overcome for an efficient use [1]. High production costs of Photo Voltaic panels, less availability of efficient energy storage devices and dependency of energy production on the environmental conditions is some of the main issues which comes while production of solar energy. The amount of energy produced by solar panels totally depends on the incident solar irradiance on the panel surface. Energy production is subjected to variations as the received solar irradiance is not constant at any time instance, variation may be caused by the variations of the position of the sun in the sky during a day or shading effects caused by passing clouds, neighboring buildings etc [1] [6]. Partial or full shading/full dark conditions of solar modules caused by any reason have a direct effect on their power output. When it is comes to large-scale photo voltaic plants, these effects may cause large amounts of economic losses and effectively reduce the overall efficiency of the PV systems[5]. Therefore, estimation of the power yield under different environmental conditions and finding methods to overcome the negative effects of the mentioned conditions and finally

improving the efficiency of the PV generation systems has been considered by many researchers during the recent years [1].

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Chapter 22
SVPWM Based Inverter Design for Synchronization of Renewable Energy with Grid

Shivam Saway, Shivani Sachan and Ankit Singhal

Abstract This paper aims to Synchronize the three phase Space vector pulse width modulated inverter with the AC grid. Phase, frequency and amplitude of the AC grid is tracked using the synchronous rotating frame phase locked loop while of inverter are controlled using PI controller. The primary application of the proposed synchronization method is for the distributive generation with renewable energy resources in which power converter plays an integral role.

Keywords SVPWM · Synchronous rotating frame phase locked loop · Proportional integral current controller · LCL filter with series damping resistance

22.1 Introduction

In the last few years renewable energy have experienced one of the largest growth areas in percentage of over 30% per year, compared with the growth of coal and lignite energy. The goal of European community is to reach 20% in 2020, but EU-27 energy is only 17% of the world energy. In fact countries like China and India requires continuously more energy (china energy share has increased 1 point every year from 2000). Even India has uplifted its goal to 175GW of energy form renewable energy resources by 2022. This paper presents a method to interconnect the renewable energy sources generation with our conventional AC grid. Synchronous rotating frame phase locked loop are used to track the phases angle of the AC grid [1, 2] and proportional integral current controller is used to and sync the renewable energy resource generation with AC Grid [3]. SVPWM is used to

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control the output voltage [4] of the inverter of renewable energy generation. A LCL filter with series damping is used to limit the harmonics content of current injected into the AC Grid [5, 6].

22.2 Two-Dimensional Model

The block diagram of the proposed model is shown in Fig. 22.1. The grid voltage angles have been tracked by using the Synchronous rotating frame Phase locked loop. The control strategy is in the Synchronous Reference Frame. The Synchronous reference control can also be called as the dq control. The three phase AC variables are converted to DC variables to work in dq Frame. This is done to achieve the control of variables easily. The active and Reactive power are obtained to set the reference for the active and reactive current controller. The current controller here used are the Proportional Intergral current controller because of its satisfactory performance while working with the DC variables. Proportional integral current controller is used for the current error compensation. Synchronous rotating frame Phase locked loop is used to Synchronize the system with the phase angle of the grid. It is also used to observe the grid conditions to comply with the grid codes.

22.2.1 Power Block

The power block in the proposed model uses the active and reactive power from the grid and generates the reference active and reactive current for obtaining the

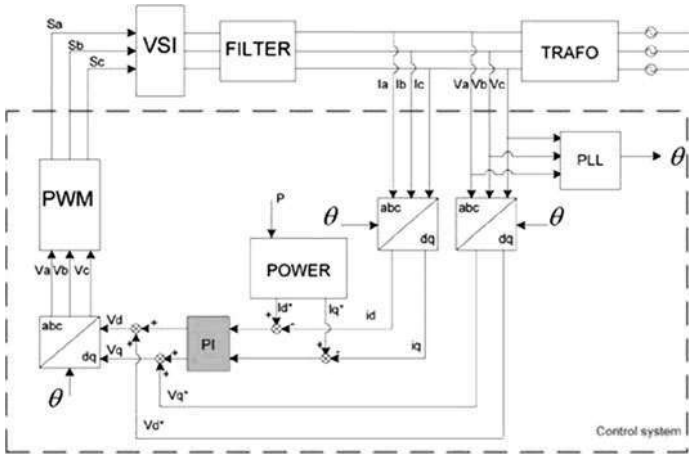

Fig. 22.1 Block diagram of proposed model

required reference signal for the Pulse Width modulation. The concept of power invariance has been employed to generate reference active and reactive current.

22.2.2 PWM Block

The PWM block uses the reference signals as the input and Generates the gate pulses for the six switches of the voltage source Inverter. The gate pulses in this model has been generated by employing the Space Vector Pulse Width Modulation Technique.

22.2.2.1 Space Vector Pulse Width Modulation

The conceptual scheme behind Space Vector Pulse Width Modulation Technique is that if the reference voltage space vector is rotated in space at a very high frequency then the periphery obtained will be close to circle. Hence, the wavefrom obtained from it will be close to sinusoidal waveform. In space vector pulse width modulation there are eight states of voltage space vector out of which six are the active states and the other two are the zero states. The vector corresponding to the active states and zero states are called active vector and zero vector respectively [4]. The voltage space vectors are shown in Fig. 22.2. The average voltage variation in the Space Vector Pulse Width Modulation Technique is shown below in Fig. 22.3.

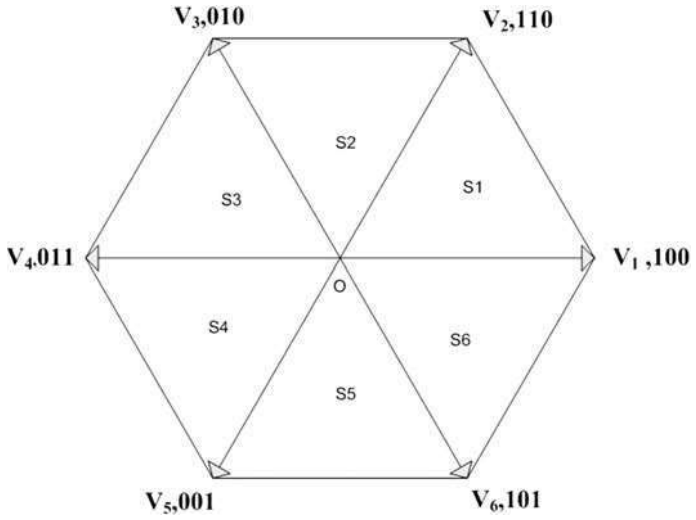

Fig. 22.2 Voltage space vector diagram

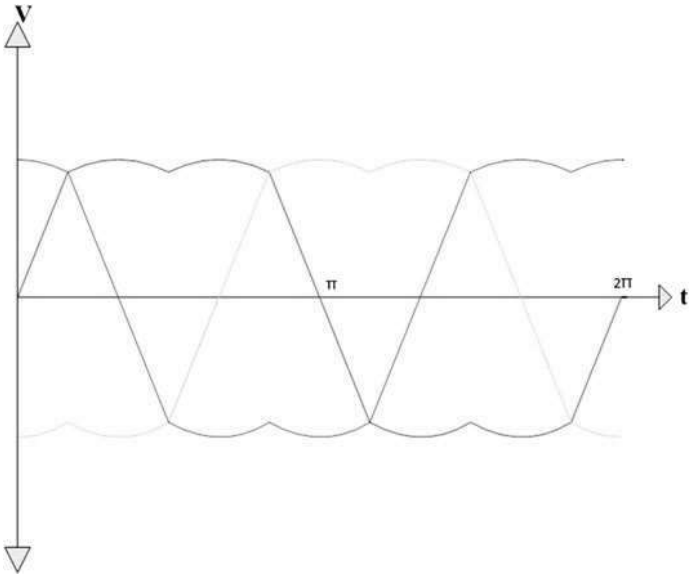

Fig. 22.3 Average voltage variation

22.2.3 Simulation

The simulation of the proposed model is done using matlab Simulink 2009b. The DC link voltage is 725 V and the load is of 5 kW with resistive nature. The grid has been represented by three phase sinosuidal voltage source at 50 Hz of frequency of amplitude of phase to phase voltage equal to 400 V.

22.2.4 Simulation Results

The simulation results are presented in this section. Figure 22.4 shows the simulink model of the proposed design and Fig. 22.5 shows the Synchronous rotating frame Phase locked loop output. Figure 22.6 shows the FFT analysis of the inverter output current with total harmonic distortion of 2.02%. Figure 22.7 FFT analysis of filter output current with total harmonic distortion of 0.87%. Figures 22.6, 22.8 and 22.9 shows the Power generated from renewable energy and sharing of Power between load and Grid respectively. The results are shown for both ideal and non ideal grid condition. To show the non ideal grid condition results the variation in grid voltage amplitude and frequency are done. Figures 22.10 and 22.11 shows the non ideal grid condition results.

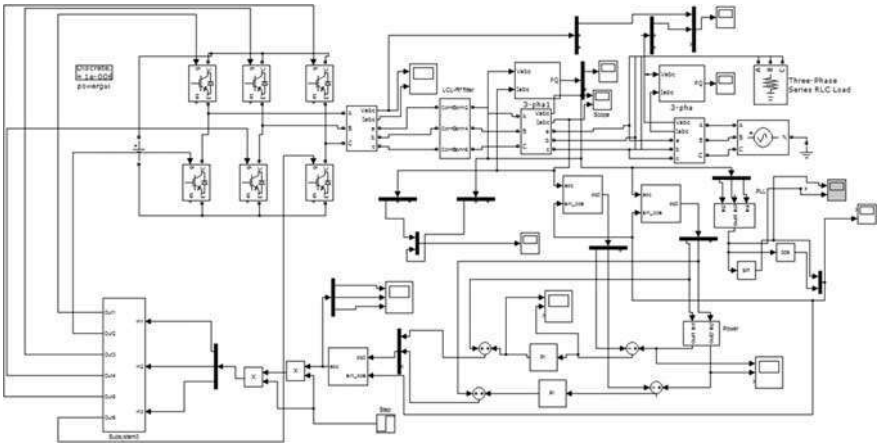

Fig. 22.4 Matlab simulink model of proposed design

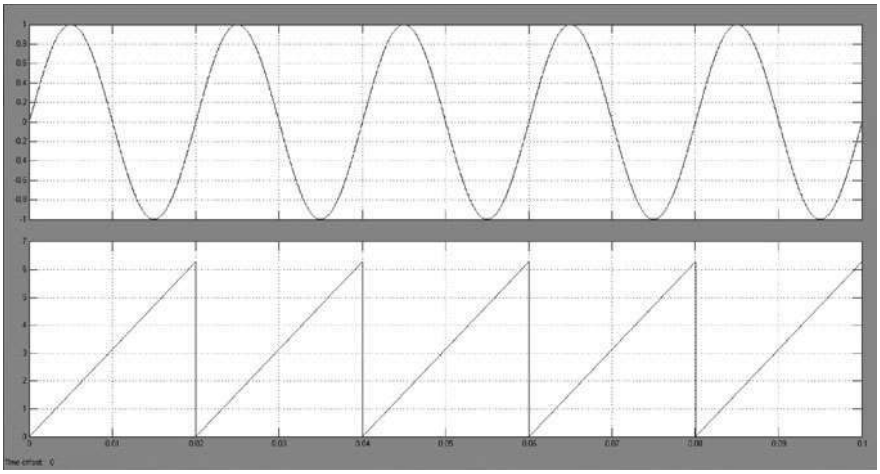

Fig. 22.5 Phase locked loop output

22.2.4.1 Simulation Results for Ideal Grid Condition

In this section the Simulation results are shown for the ideal grid condition. In ideal grid condition no variation in the grid voltage amplitude and frequency are done.

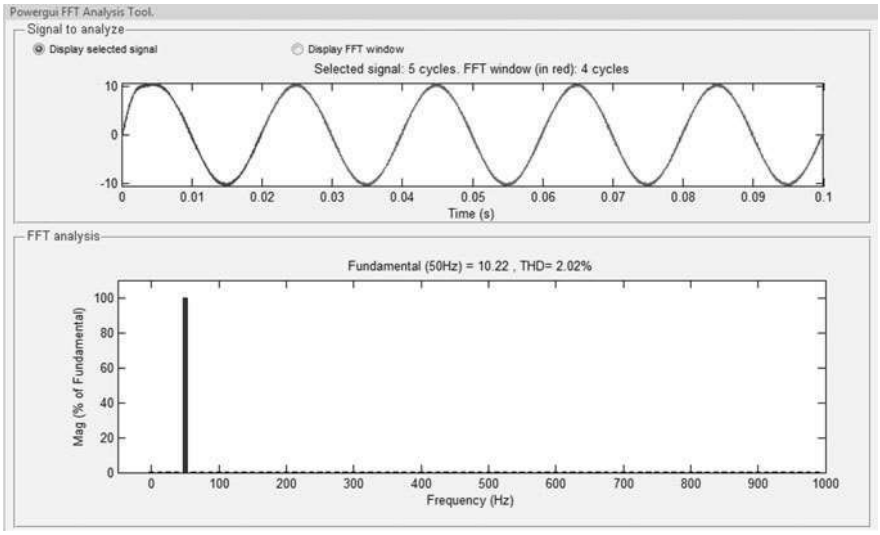

Fig. 22.6 FFT analysis of filter input current

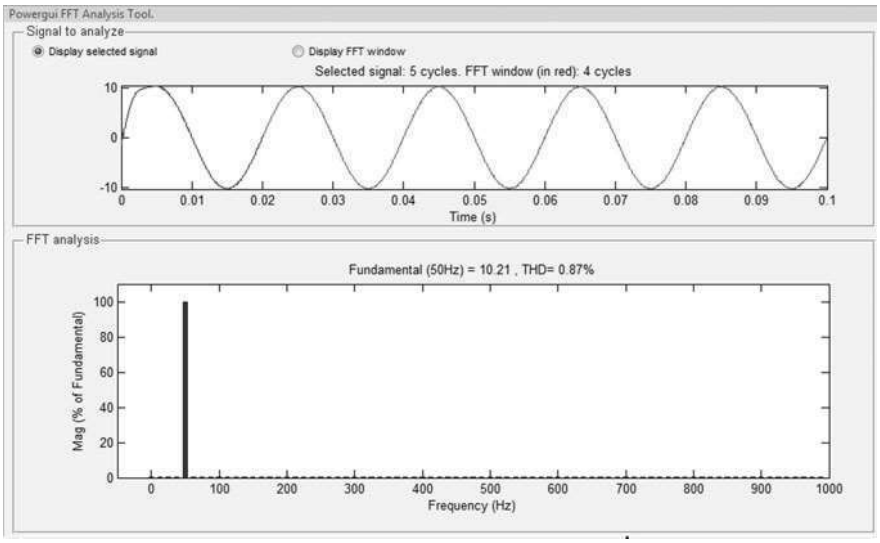

Fig. 22.7 FFT analysis of filter output current

22.2.4.2 Simulation Results for Non Ideal Grid Conditions

In this section the simulation results for non ideal grid condition are shown. 10% variation is done in the voltage amplitude and 5% variation in frequency is done.

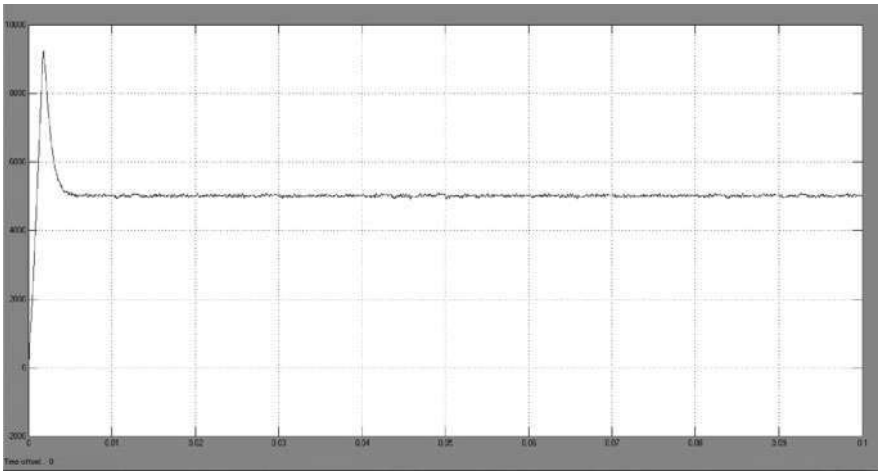

Fig. 22.8 Active power fed from inverter to the grid

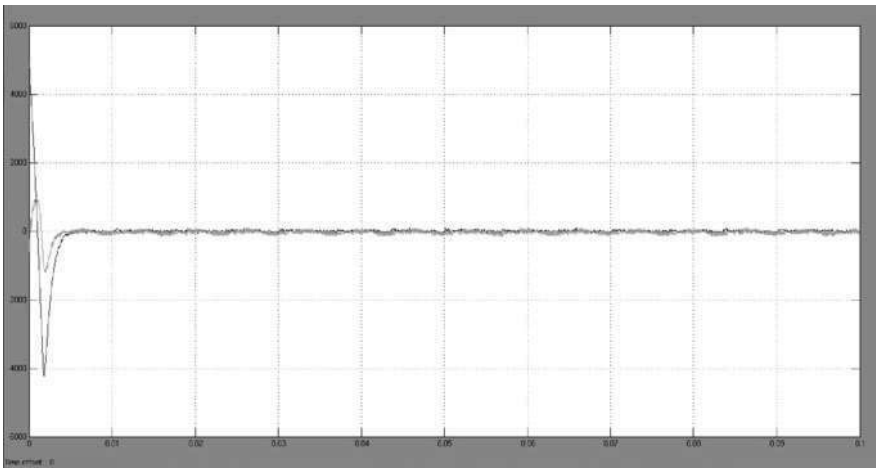

Fig. 22.9 Power sharing between load and grid

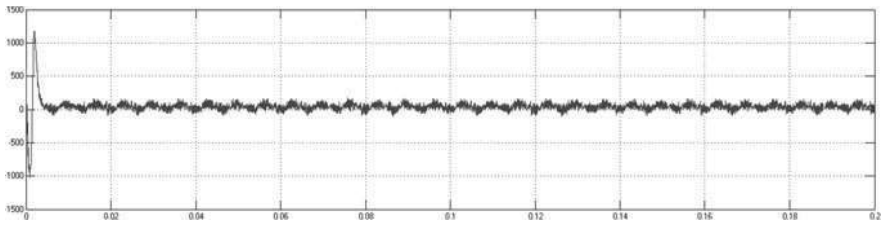

Fig. 22.10 Reactive power fed into the grid

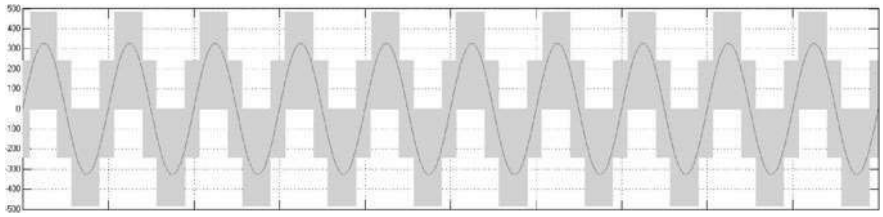

Fig. 22.11 Phase to phase inverter output voltage (*Yellow*) and grid voltage (*Red*) is synchronized

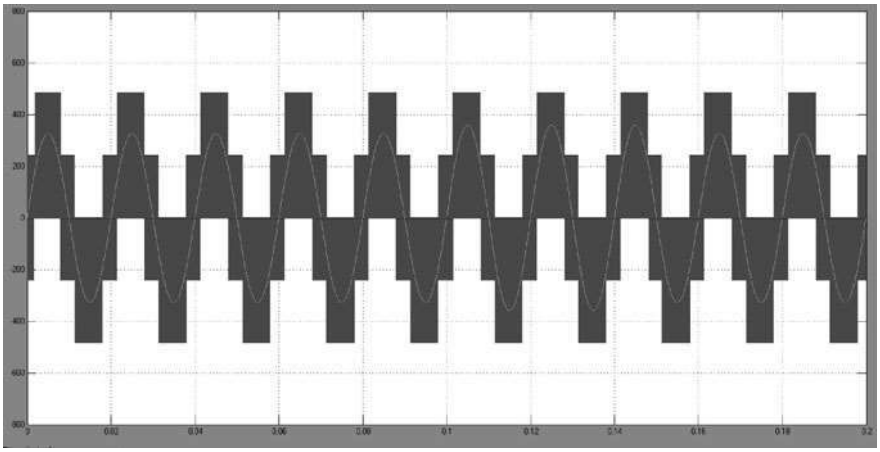

Fig. 22.12 Showing grid synchronization of inverter with 10% of voltage amplitude variation in grid

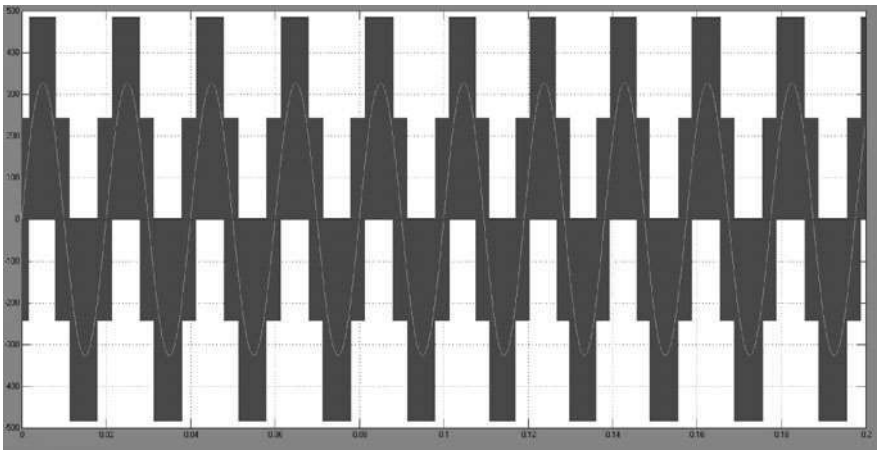

Fig. 22.13 Showing grid synchronization of inverter with 5% variation in grid frequency

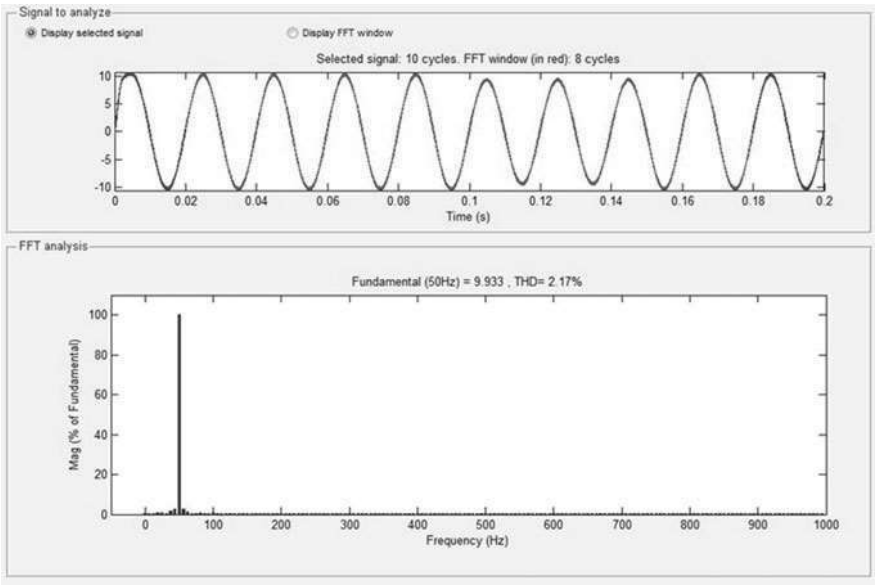

Fig. 22.14 FFT analysis of filter input current showing THD of 2.17% with 10% variation in grid voltage amplitude

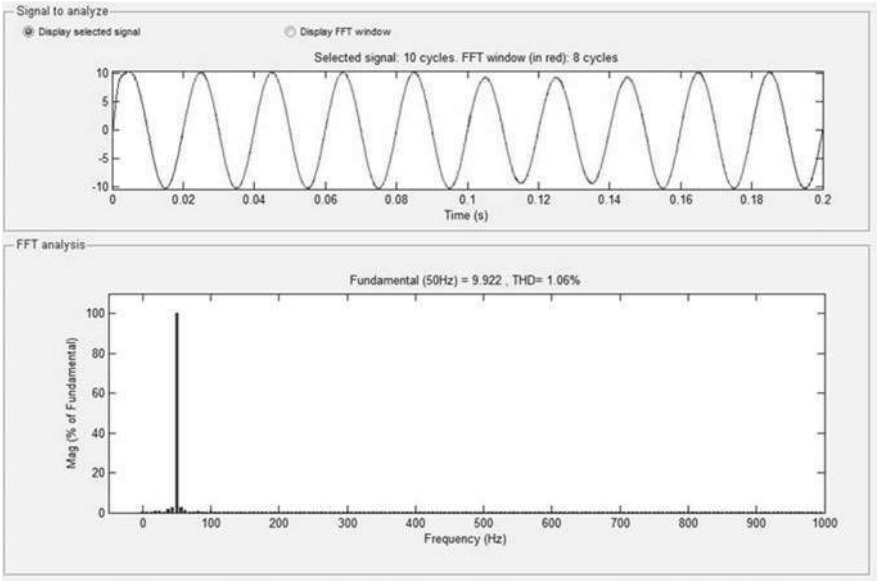

Fig. 22.15 FFT analysis of current injected into the grid showing THD of 1.06% with 10% variation in grid voltage amplitude

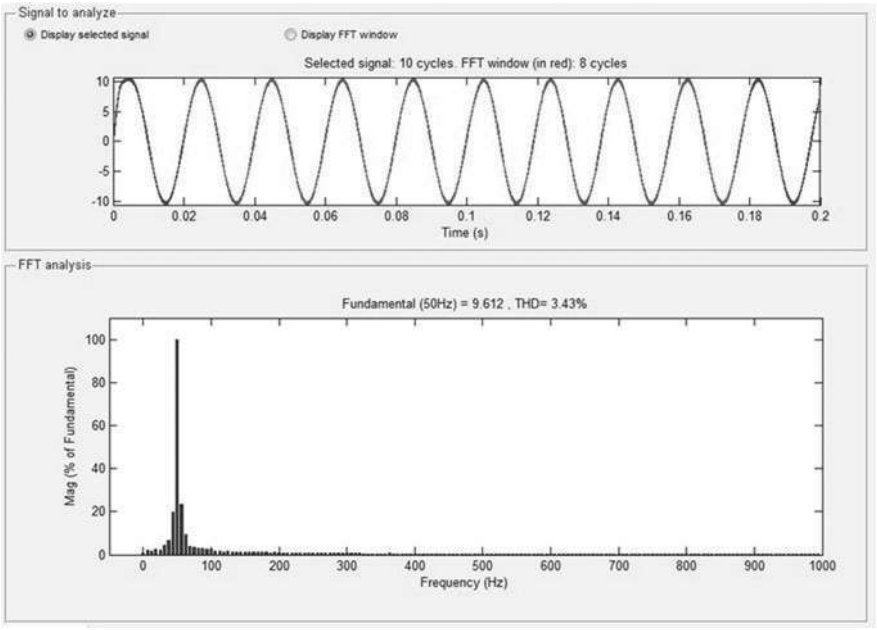

Fig. 22.16 FFT analysis of filter input current showing THD 3.43% with 5% variation in grid frequency

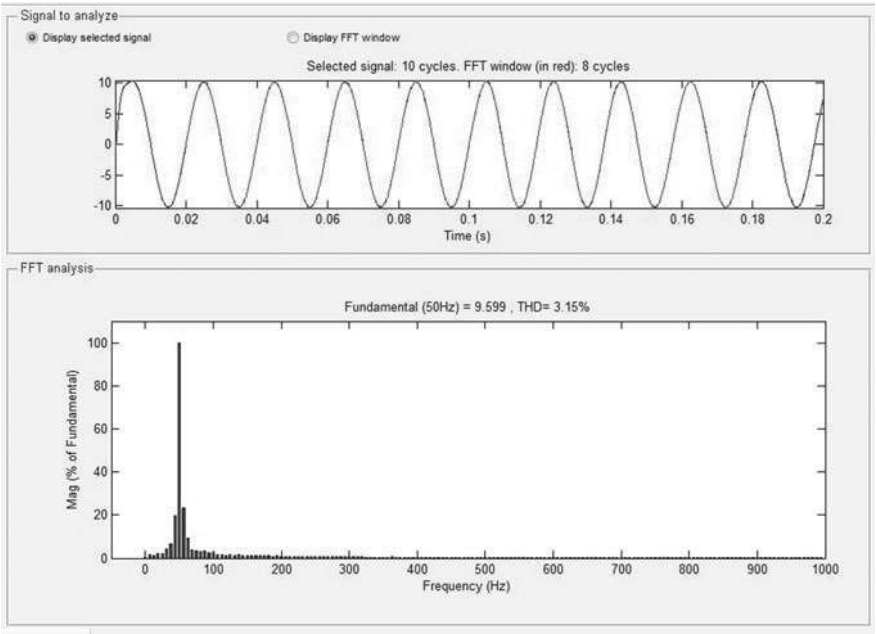

Fig. 22.17 FFT analysis of current injected into the Grid showing THD 3.15% with 5% variation in grid frequency

The variation is done for the time interval between 0.1 and 0.15 s (Figs. 22.12, 22.13, 22.14, 22.15, 22.16 and 22.17).

22.2.5 Conclusion

The Synchronization of renewable energy generation has been achieved using Synchronous rotating frame phase locked loop and Proportional integral current control method. The control over output voltage has been achieved by applying SVPWM technique. The harmonics contents are limited by using the LCL filter with series damping. The result of Simulation of proposed scheme are qualifying the standards specified by IEEE.

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Reconfiguration of Photo Voltaic Arrays under Partial Shading Conditions

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***Abstract*—Photovoltaic (PV) array are prone to huge amounts of power deficit due to partial shading on the array. The shading pattern of a solar panel if examined helps to improve the efficiency of a Solar panel. The output of the module declines when shaded by nearby buildings, tree branches or module dust. The output declines proportionally to the amount of shading. Shading on a single module causes the current in the string to fall. Due to partial shading the arrays characteristics exhibits multiple peaks. This paper analyzes the various configurations under partial shading conditions. The performance of Series Parallel (SP), Honey Comb (HC), Bridge link (BL), Total Cross Tie (TCT) with and without bypass diode are compared for 6x6 photovoltaic array using MATLAB/Simulink.**

This paper also propounds a method to configure the modules to enhance the power output of the PV system. The PV array is positioned by "Number Place" Method. This method minimize the effect of shading and also lessen the peaks occurs in different configuration with bypass diodes connected.

***Index Terms*—Partial shading, Photo voltaic (PV), Series Parallel (SP), Honey Comb (HC), Bridge link (BL), Total Cross Tie (TCT), Number Place Method.**

I. INTRODUCTION

The infinite, renewable, clean and noiseless nature of the solar energy makes it of the most preferred sources of renewable energies which is increasingly finding application areas in today's human life. However, despite of the mentioned advantages, this clean energy source has some disadvantages which should be overcome for an efficient use [1]. High production costs of Photo Voltaic panels, less availability of efficient energy storage devices and dependency of energy production on the environmental conditions is some of the main issues which comes while production of solar energy. The amount of energy produced by solar panels totally depends on the incident solar irradiance on the panel surface. Energy production is subjected to variations as the received solar irradiance is not constant at any time instance, variation may be caused by the variations of the position of the sun in the sky during a day or shading effects caused by passing clouds, neighboring buildings etc [1][6]. Partial or full shading/full dark conditions of solar modules caused by any reason have a direct effect on their power output. When it is comes to large-scale photo voltaic plants, these effects may cause large amounts of economic losses and effectively reduce the overall efficiency of the PV systems[5]. Therefore, estimation of the power yield under different environmental conditions and finding methods to overcome the negative effects of the mentioned conditions and finally improving the efficiency of the PV generation systems has been considered by many researchers during the recent years [1].

Solar photo voltaic is important energy source since it is renewable and produces clean energy. Many researchers have been conducted in this field over so many years. Solar Photo Voltaic panel is a non linear power source that needs correct identification of optimal operating point. The panel output power changes with temperature and insulation. It is desired to operate Solar Photo Voltaic panel at its maximum power output to improve efficiency for economic reasons [2].

The model is developing using basic circuit equations of the photovoltaic (PV) module including the effects of temperature changes and solar irradiation. It is

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very important to understand characteristics of solar photovoltaic array under partial shading condition to maximize its output and to effectively use solar photovoltaic installations under all conditions. This paper presents different configuration techniques of photo voltaic array to reduce the losses faced in photovoltaic system due to partial shading. It is difficult to make analysis on physical PV module as field testing is costly, time consuming and dependent on weather conditions. Use of bypass diode in anti parallel will increase power output in different partial shading condition but causes multiple peak voltage-power characteristics [3].The losses occurred due to partial shading are not proportional to the shaded area but depend on the pattern of shading, array configuration and the location of shaded module in the array. Different array configurations have been proposed in literature to reduce the mismatch losses in the photo voltaic array. Four interconnection schemes viz., Series-Parallel (SP), Total Cross Tied (TCT), Honey Comb (HC) and Bridge Linked (BL) are compared for their losses fill factor, reliability, maximum power and energy yield due to mismatch caused by the manufacturer's tolerances in module characteristics and by partial shading [4].

This paper also presents a method to configure, in which the physical placement of the modules in a Series-Parallel (SP), Total Cross Tied (TCT), Honey Comb (HC) and Bridge Linked (BL) connected PV array is done to enhance the photo voltaic power output generation under partial shaded conditions. The modules are arranged based on the Number Place Method, without changing their electrical connection within the PV array. This structure helps to distribute the effect of shading over the whole array area thereby reducing the effect of shading of modules in the same row. The performance of the system is investigated for different shading patterns and the results shows that the Number Place Method exhibits better performance under partially shaded conditions. Equivalent circuit and single diode model of solar cell is shown in Figure 1.

II. SYSTEM DESCRIPTION

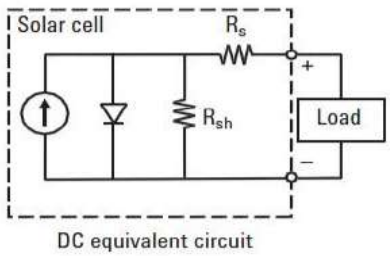

Figure1: Single Diode model of Photovoltaic Cell

Module consists of a number of photo voltaic cells in source shunted with a diode and represented by an equivalent circuit [4] shown in Figure 1.The equation relate the output current and the voltage of a photo voltaic module at an insolation G can be written as[7]-

$$I = I_{pv} - I_o\left[\exp\left(\frac{V+R_s}{V_{t,a}}\right)-1\right]-\frac{V+R_s}{R_s} \quad (1)$$

The light generated current of the photovoltaic cell depends linearly on the solar irradiation and is highly influenced by the temperature according to the following equation [7]

$$I_{pv} = (\mathrm{I}_{pv,n}+\mathrm{K}_1\Delta\mathrm{T})\frac{G}{G_n} \quad (2)$$

The diode saturation current I_o and its dependence on the temperature may be expressed by [7]

$$I_o = I_{o,n}\left(\frac{T_n}{T}\right)^3\exp\left[\frac{qE_g}{ak}\left(\frac{1}{T_n}-\frac{1}{T}\right)\right] \quad (3)$$

TABLE 1

Parameters of KC200GT PV array at 25° C, AM 1.5, 1000W/m^2

I_{mp}	7.6A
V_{mp}	26.3V
$P_{max,e}$	200.14W
I_{sc}	8.2A
V_{oc}	32.9V
K_v	-0.1230V/K
K_I	0.0032A/K
N_s	54

Where:-

Ipv=Photocurrent (A)
Isc= Diode Saturation current (A)
Ki= Current Coefficient
Kv= Voltage Coefficient
Rs=Cell Series Resistance (Ω)
Rp= Cell Shunt Resistance (Ω)
T=Temperature of P-N junction (K)
G=Irradiation (W/m^2)
G_n=Nominal irradiation

The structures of the simulation models for various configurations are presented in this paper. The simulated P-V and I-V curves, under standard conditions for various configurations are illustrated in this paper in section II

III. DIFFERENT CONFIGURATION SCHEMES OF PV ARRAY UNDER PARTIAL SHADING CONDITIONS

Different techniques are available for the configuration of PV array. These configurations are investigated in this paper. Series Parallel (SP), Bridge linked (BL), Honey Comb (HC) and Total Cross Tied (TCT) configurations of Photovoltaic array are compared in this paper under partial shading condition with and without bypass also a new configuration named Number Place is proposed.

(i) SERIES PARALLEL (SP)

Series and Parallel connections of PV array are low current and voltage values which is the main disadvantage. The Photovoltaic modules are arranged in series to increase the voltage level and in parallel to increase the current level of photo voltaic array, this configuration is known as Series Parallel configuration, SP configuration is shown in Figure 2(a). The simulink model of SP configuration is shown in Figure 2(b)and simulink model of SP configuration with Bypass diode is shown in Figure 2(c). Figure 2(d) shows the P-V characteristics.

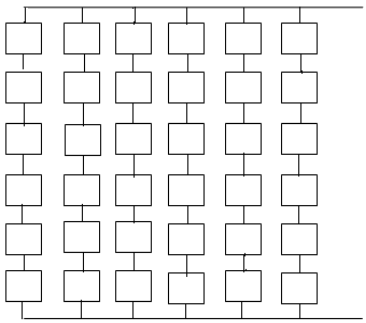

Figure 2 (a): Photovoltaic Array Configuration for Series–Parallel connection

This paper also presents a method to configure, in which the physical placement of the modules in a Total Cross Tied (TCT) connected PV array is done to enhance the photo voltaic power output generation under partial shaded conditions. The modules are arranged based on the Number Place Method, without changing their electrical

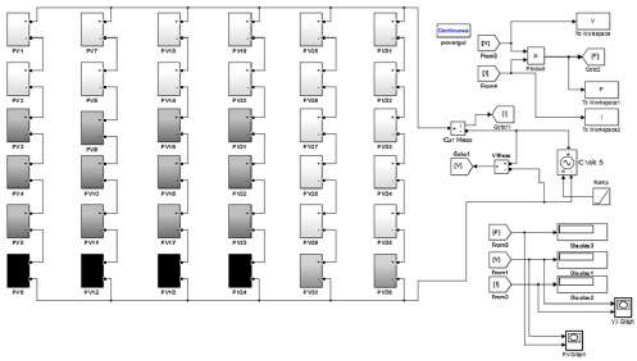

Figure 2(b): Simulink Model of Series–Parallel connection without Bypass Diode

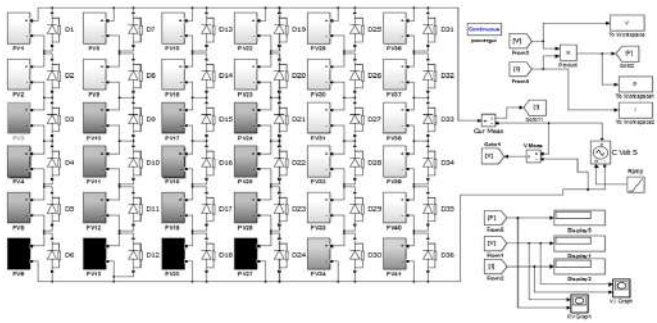

Figure 2(c): Simulink Model of Series-Parallel Connection with Bypass Diode

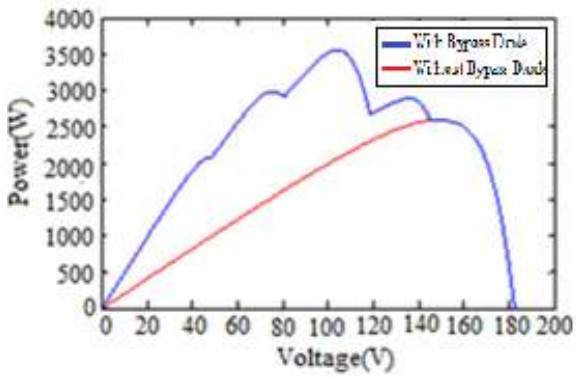

Figure 2(d): P-V Characteristic of Series-Parallel Connection

(ii) HONEY COMB CONNECTION (HC)

Series Parallel connection is modified by connecting ties across junctions which creates HC configuration as shown in Figure 3(a), it consist of two parallel string having three series connected modules. The ties in the strings improve the voltage and current values. The simulink model of honey comb configuration is shown in Figure 3(b) and simulink model of honey comb configuration with Bypass

diode and P-V characteristics is shown in Figure 3(c) and Figure 3(d) respectively.

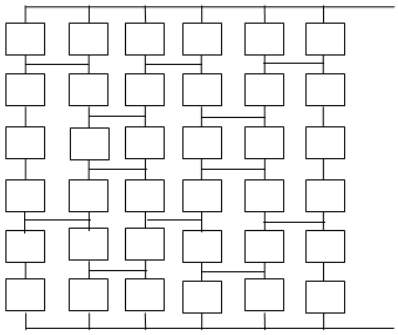

Figure 3(a): Photovoltaic Array Configuration for Honey Comb connection

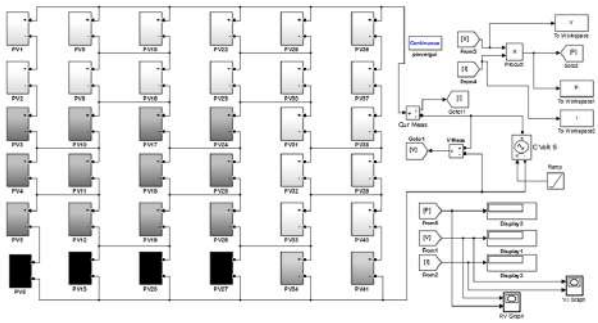

Figure 3(b): Simulink Model of Honey Comb connection without Bypass Diode

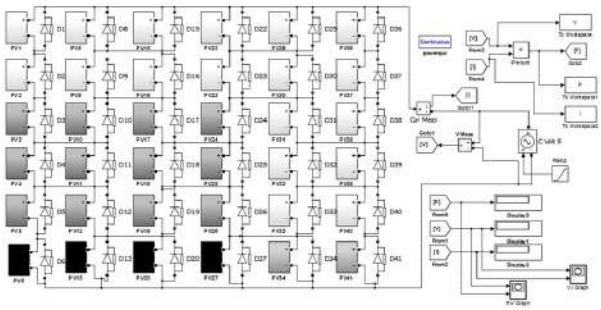

Figure 3(c): Simulink Model of Honey Comb Connection with Bypass Diode

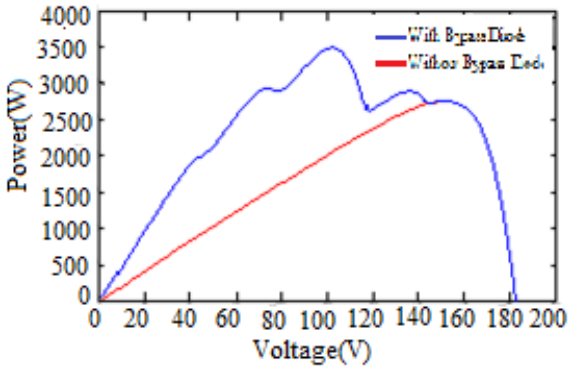

Figure 3(d): P-V Characteristic of Honey Comb Connection

(iii) BRIDGE LINK CONNECTION (BL)

In Bridge Link configuration modules are connected in a bridge rectifier manner as shown Figure 4(a) it consist of two parallel string having two series connected modules, there exists tie between the bridges. The simulink model of bridge link configuration is shown in Figure 4(b) and simulink model of bridge link configuration with Bypass diode and P-V characteristics is shown in Figure 4(d) respectively.

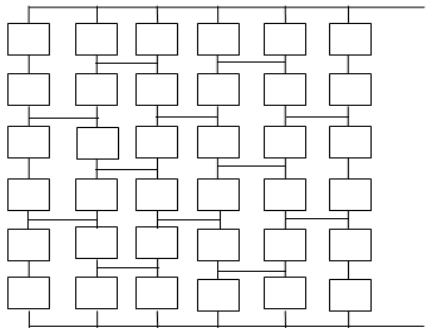

Figure 4(a): Photovoltaic Array Configuration for Bridge Link connection

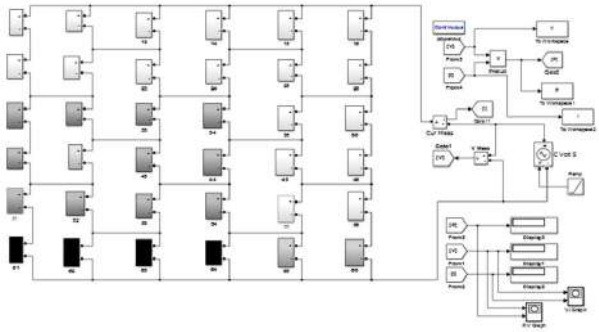

Figure4(b): Simulink Model of Bridge Link connection Without Bypass Diode

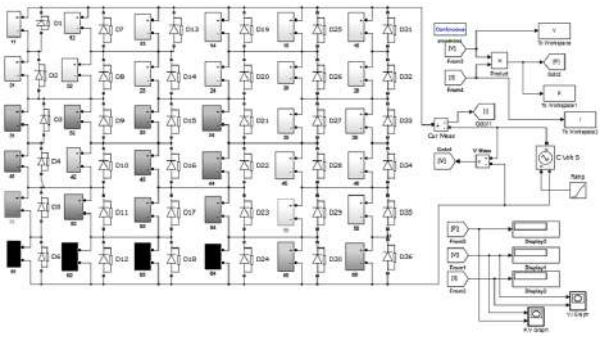

Figure4(c): Simulink Model of Bridge Link connection With Bypass Diode

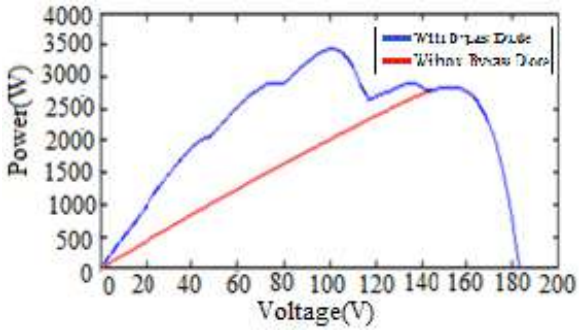

Figure 4(d): P-V Characteristic of Bridge Link Connection

(iv) TOTAL CROSS TIED CONNECTION (TCT)

Total Cross Tie configuration is obtained from Series Parallel configuration by connecting cross ties across each row Figure 5(a). The columns are connected in series and rows are connected in parallel. The simulink model of Total Cross Tie is shown in Figure 5(b) and simulink model of Total Cross Tie configuration with Bypass diode and P-V characteristics is shown in Figure 5(c) and Figure 5(d) respectively.

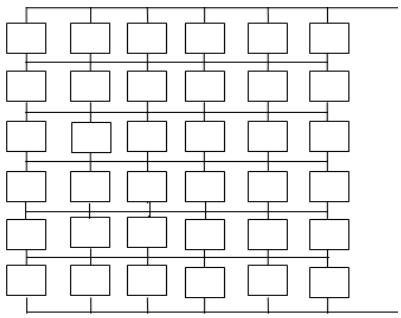

Figure 5(a): Photovoltaic Array Configuration for Total Cross Tie connection

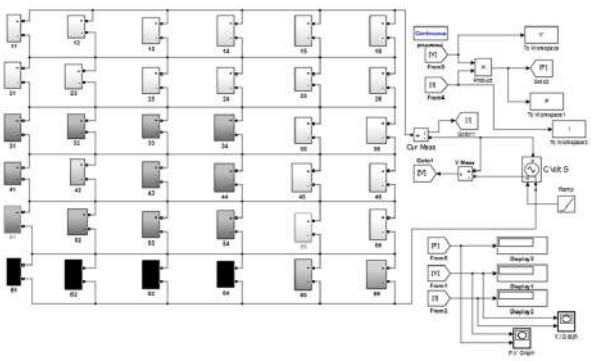

Figure 5(b): Simulink Model of Total Cross Tie connection with Bypass Diode

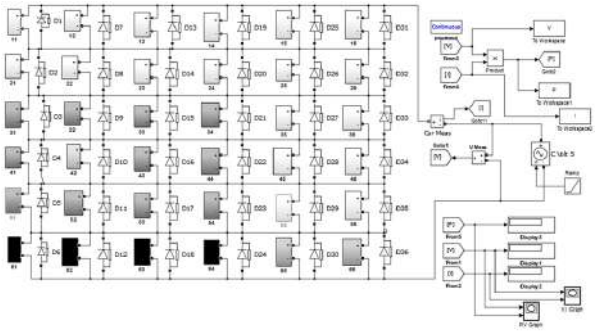

Figure 5(c): Photovoltaic Array Configuration for Total Cross Tie connection

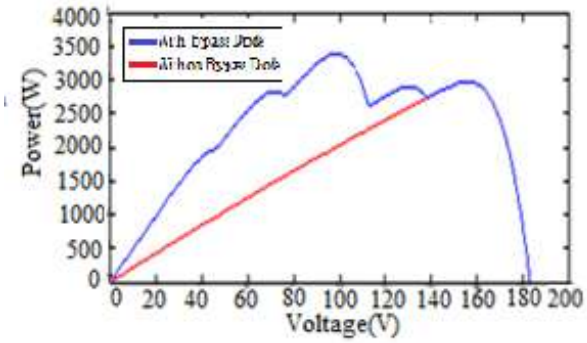

Figure 5(d): P-V characteristic of Total Cross Tie connection

(vi) NUMBER PLACE METHOD (NP)

It is logic based number place method. The main objective is to fill 6x6 grids with digits so that no digit repeats in any row or column. The Number Place Method involves six 2X6 matrices and every row, column, and matrix accommodates the digits 1 to 6 without repeating any number. A Number Place pattern is shown in Figure 6(c) is chosen for the study. The first digit in each box represents the number and the second digit denotes column of the 6X6 array. It can be seen that in each sub matrix, each row and each column of the array accommodates all the digits from 1 to 6. Here the electrical connection of the module remains same as shown in Figure 6(a). However, the physical location of the modules gets changed. The panel 32 (third row, second column) is moved from its location to the first row second column but the panel connection remains the same, in the fourth row. In this way, the locations of the panels are changed without changing the electrical connections in the array.

To evaluate and compare the Number Place Method with other configuration methods simulation studies using MATLAB/Simulink environment will be done. The modules are rearranged according to the chosen puzzle pattern as shown in Figure 6 (b). The PV characteristics are obtained for SP, BL, HC and TCT.

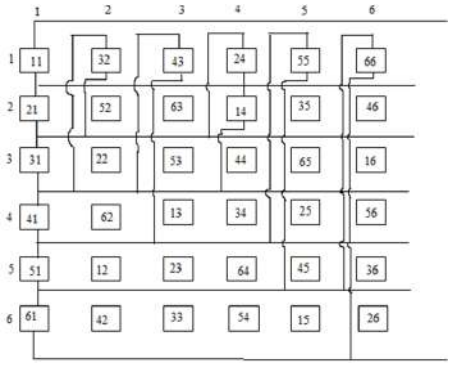

Figure 6(a): General Photovoltaic Array Configuration for Proposed Number Place Method

1000W/m^2

11	12	13	14	15	16
21	22	23	24	25	26
31	32	33	34	35	36
41	42	43	44	45	46
51	52	53	54	55	56
61	62	63	64	65	66

800W/m^2 600W/m^2 100W/m^2

Figure 6(b): Shading pattern for different configurations

11	32	43	24	55	66
21	52	63	14	35	46
31	22	53	44	65	16
41	62	13	34	25	56
51	12	23	64	45	36
61	42	33	54	15	26

Figure 6(c): Chosen pattern for Number Place Method

11	12	13	14	15	16
21	22	23	24	25	26
31	32	33	34	35	36
41	42	43	44	45	46
51	52	53	54	55	56
61	62	63	64	65	66

Figure 6(d): Shading dispersion with Number place method

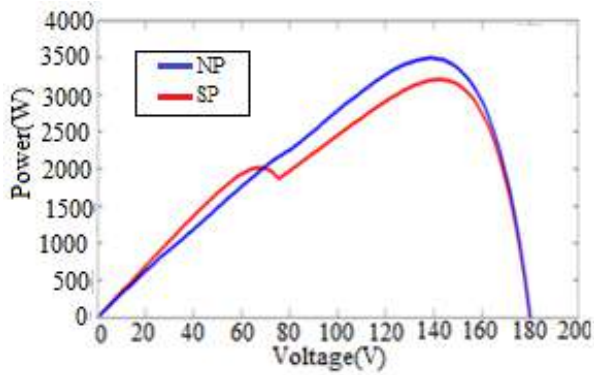

Figure 6(e): P-V characteristic of SP and NP method

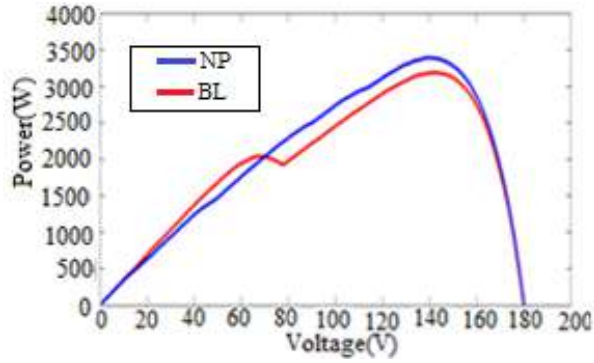

Figure 6(f): P-V characteristic of BL and NP method

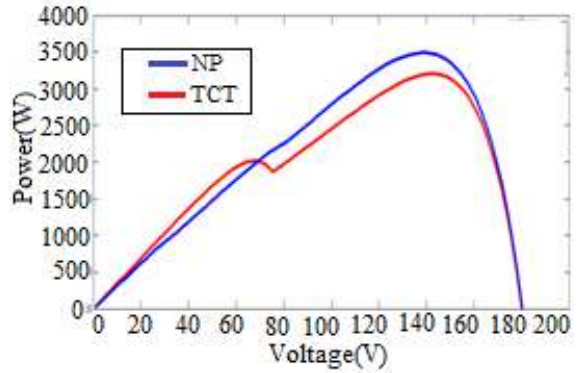

Figure 6(h): P-V characteristic of TCT and NP method

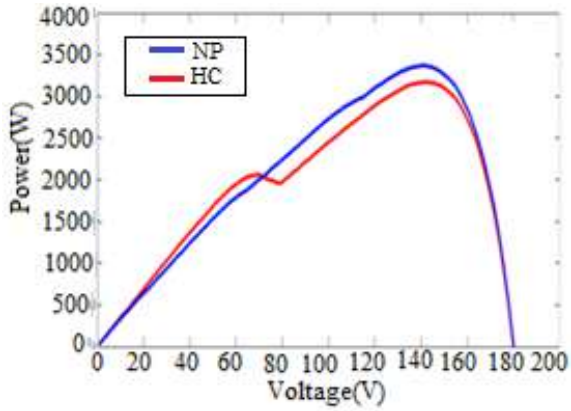

Figure 6(g): P-V characteristic of HC and NP method

IV. RESULT & CONCLUSION

TABLE 2

Configuration	Without diode			Peaks	With diode			Peaks
	Voltage(V)	Current(A)	Power(W)		Voltage(V)	Current(A)	Power(W)	
SP	150	17.5	2625	1	105	33.75	3543	5
HC	148.1	18.6	2754	1	103	33.5	3450	5
BL	151	18.7	2823	1	102.5	33.8	3470	5
TCT	158	18.75	2954	1	106	34.1	3615	5

TABLE 3

Configuration	Power(W) With Diode	Number Of Peaks	Power(W) with NP Method	Number Of Peaks	Power Improvement %
SP	3125	2	3350	1	6.7
HC	3175	2	3375	1	5.9
BL	3200	2	3400	1	5.8
TCT	3280	2	3500	1	6.2

Different system configurations are utilized in photo voltaic generation plant to improve the overall system efficiency. Series-Parallel, Bridge Link, Honey Comb and Total Cross Tie are the configurations which are widely used in order to reduce the effects of partial shading.

This paper proposed a new technique Number Place Method to improve the output power of the photo voltaic system and to reduce the multiple peaks under partial shading conditions. In this method the physical location of the modules gets interchanged according to the chosen method but the electrical connection remains exactly same. This configuration is a single time arrangement for the photo voltaic modules in an array and demonstrates the improvement in photo voltaic power generation under partial shaded conditions. Table 2 & Table 3 represent the comparative analysis of SP, BL, HC and TCT configurations with and without bypass diodes connected and with Number Place method respectively. The result reveals that this reconfiguration method offers a greater output power than the photo voltaic systems with classic configurations. The mentioned method has been able to increase the array's output power value up to 6.7%. It is also observed that number of peaks also reduces to one, in all configurations with NP method.

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Real time performance evaluation of modified PMDC motor, BLDC motor and dual commutator PMDC machine

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Abstract

Document Sections

I. Introduction

II. Machine Structure

III. Overview of the Conventional PMDC Motor, BLDC Motor and First Generation Modified PMDC Motor

IV. Dual Commutator Based PMDC Motor

V. Conclusion

Authors

Abstract: This paper present a novel technology for PMDC motor by adding second commutator at the same shaft for Solar PV/T Pumps. This idea opens the new methodology to run a mach... **View more**

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Abstract:

This paper present a novel technology for PMDC motor by adding second commutator at the same shaft for Solar PV/T Pumps. This idea opens the new methodology to run a machine i.e. generate energy while running for the torque. This machine is designed and fabricated and tested in real time conditions for various applications. A comparison amongst conventional PMDC Motor, first generation Modified PMDC Motor and Dual Commutator PMDC Motor including second generation BLDC motor has been discussed. Several combinations of modes of operations are explained for various applications.

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Rahat Ullah Khan
Department of Electrical Engineering, Indian Institute of Technology(ISM), Dhanbad, India

Contents

I. Introduction

Energy saving is considered as energy generation. The proposed work is to enhance the efficiency of the PMDC motor initially by introducing additional commutator which is provided to supply the additional power during sudden demand for additional load condition and to extract the electrical power during under load running condition. To understand it, design of a new technique for PMDC motor for Solar PV Pumps by adding second commutator at the same shaft. This machine is designed and fabricated and tested in real time conditions for various applications especially for solar based PV pump systems. With the help of auxiliary commutator on the same shaft electrical power is obtained while the PMDC Machine is running as a Motor, simultaneously the by other commutator we are extracting the electrical power when running at under load condition. In another case we may provide Electrical Power to the auxiliary commutator if we are required more torque.

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A hadoop based weather prediction model for classification of weather data

Publisher: IEEE

A. K. Pandey ; C. P. Agrawal ; Meena Agrawal **All Authors**

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Abstract:
Big Data is spreading vastly in the industry. Most of the industries want to have the records of not only the work they do but also are eager to know the taste of the consumer. Big Data is becoming relative to almost all aspects of human activity from just recording events to research, design, production and digital services or products delivery

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Contents

1. Introduction

In the present era, weather forecasting is an essential process that can affect several areas such as agriculture, farming, sea selling etc. and also for saving the life of living beings from climate hazard, earthquake and many more. Weather forecasting can be understood as interpretation of atmospheric data which includes temperature, rainfall, wind speed, wind direction and humidity. These conditions can be changed dynamically. Large numbers of tools are available to forecast the weather data, but the amount of data generate for weather forecasting is of high volume and unstructured. Hence, to predict the weather on the behalf of the weather data is not an easy task and it involves large number of parameters that can rapidly change as per atmospheric conditions. To prevent the climatic hazard in future due to weather, numbers of meteorological departments are working in this direction through sharing of information. Weather forecasting can be viewed as significantly challenging problem and can be required the latest technology equipment and technology for accurate prediction of future prediction. It consists of two factors i.e. human activities and technological advances [1]. For accurate prediction, the various researchers have identified meteorological characteristics by applying different methods. It is observed that new methodology predict the weather more accurate in comparison to others [2]. The weather forecasting basically measures the change occurred in present state of atmosphere. The present condition of weather is obtained from the observation like ground observation, from sea observation and the observation of air data through radars. Numbers of device are used to collect this information such as ship, radar, aircraft, satellites and radio sounds. After collecting the desired information, it can be processed and analyze to find the different patterns. In this work, large numbers of high end computers are used to process the data and tried to find the significant and effective piece of information. Present time, computers are widely used to for weather forecasting, called numerical weather prediction. In this process,

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Human Activity Recognition Using Local Motion Histogram

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The matrix is segmented into horizontal and vertical strips and binned histograms of each strip serve as feature descriptors. We have used these descriptors in a random forest based classification scheme and evaluated the performance on JHMDB, a publicly available human action RGB dataset.

Keywords

Human activity Histogram Motion projection matrix Random forest

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Dr. Ashu Mittal received his B.Pharm degree from University of Rajasthan, M.Pharm from Government college of Pharmacy, Karad, MS. and Ph.D from Uttar Pradesh Technical University.He has supervised over 45 post graduate students. Dr Mittal has over forty publications to his credit in foreign/international journals of high scientific impact.

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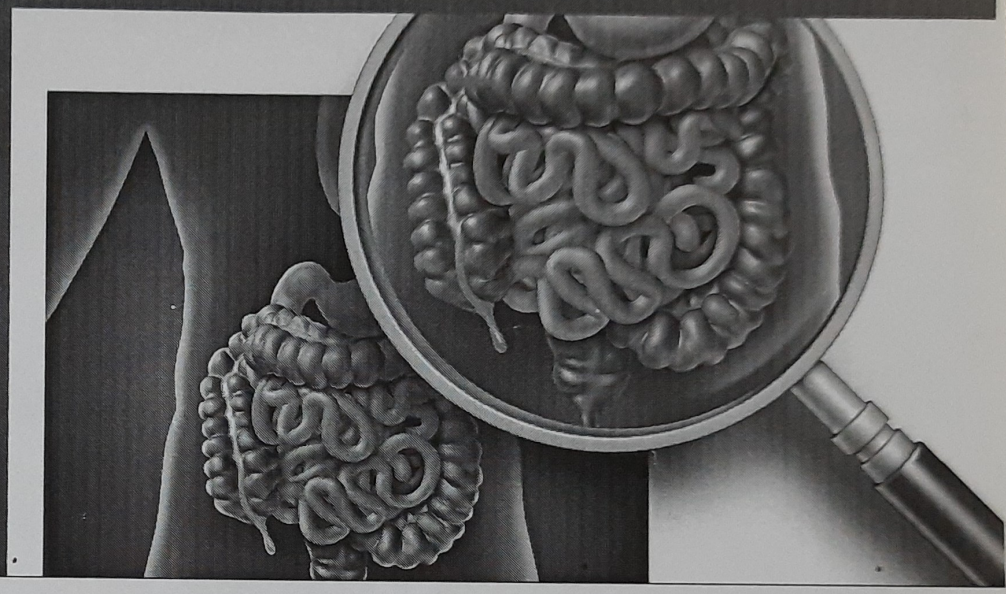

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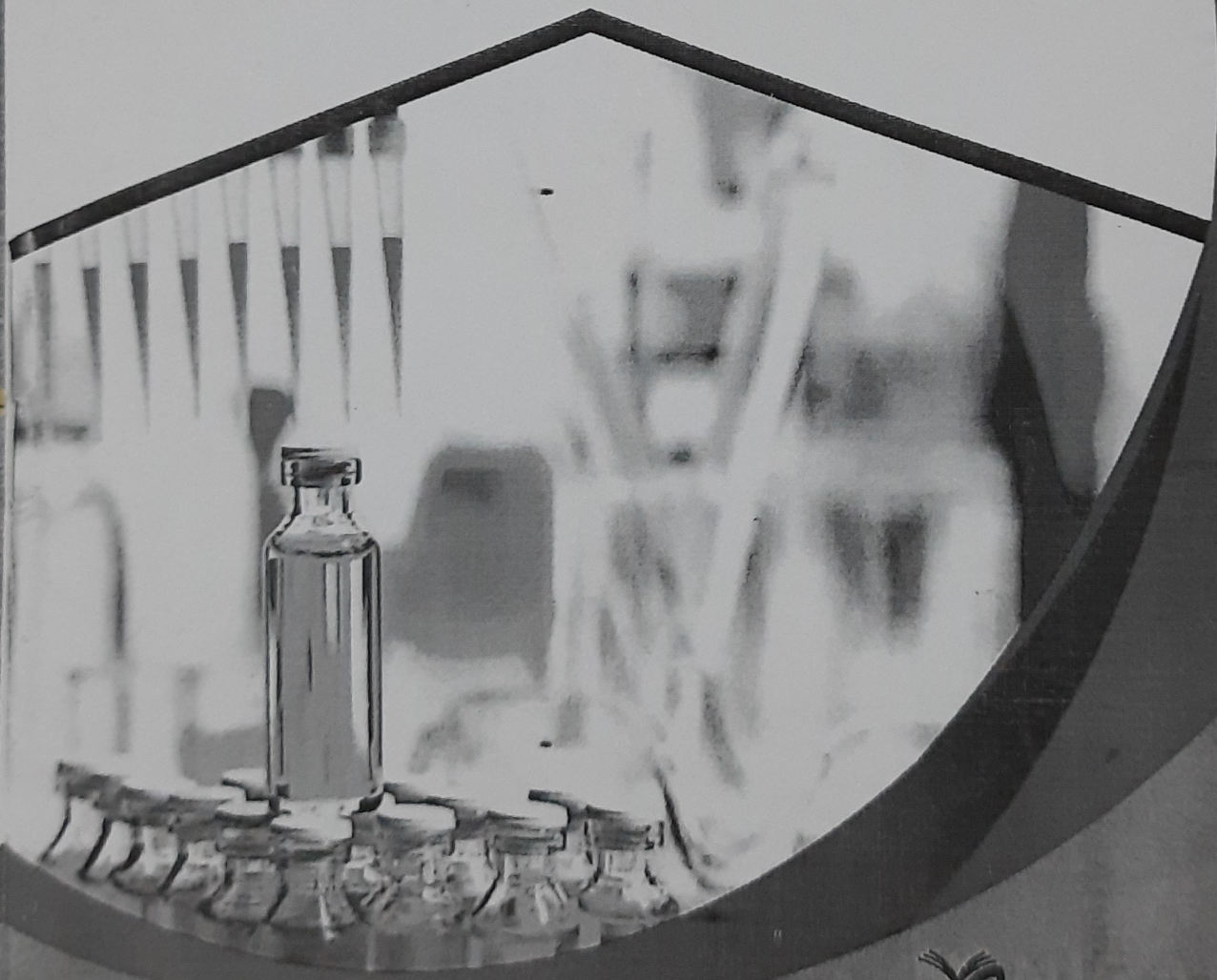

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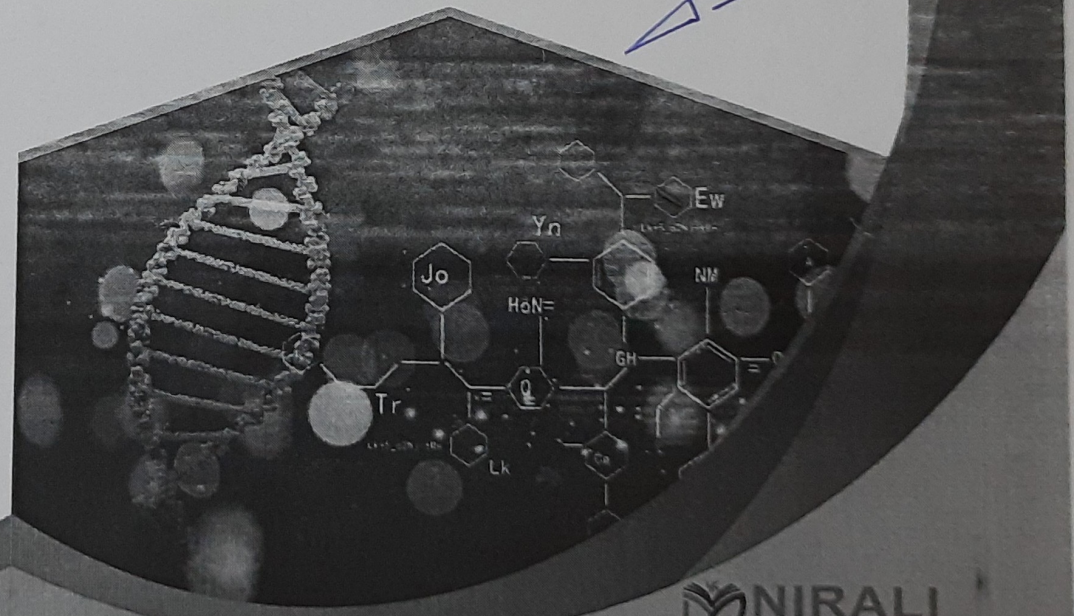

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The aim of this edited volume is to provide a platform for researchers, practitioners, academicians and professionals from diverse domains of finance to share innovative research achievements & practical experiences to stimulate scholarly debate in the development of finance and its major areas. The aim of this book is also to disseminate research results within the financial industry so that related parties can handle situations such as a financial crisis, environmental catastrophes, mass poverty, inequality, economic and political conflicts and help them to do their responsibilities effectively.

4

Foreign Direct Investment and Growth in Developing Nation: A Case Study of India

Deepa & Prateek Gupta

Abstract

The growth of a nation is directly depends on the flow of Investment in that country. The direct form of the Investment made by nation is called as Foreign Direct Investment. India is a nation where nearly 130 crore people are living and natural resources are available in abundance. Therefore, it is one of the favored investment destinations for the foreign companies. After liberalization in 1992 the amount and size of the investment was increasing in India until the year 2008 and then it declined towards the end of 2014, but due to lower exposure of the Indian economy, the impact of the recession on India was less. Due to all these factors together, the FDI in India has started rising again since then. This research paper emphasizes over finding out the relationship between these economic indicators with FDI and assumes a conceptual model where these economic variables are considered independent and FDI is considered dependent variable. This paper also finds out the strength of the relation between the FDI and other economic indicators, so that early proactive measures can be taken to avoid the bad impact when FDI flow decreases in the economy and thereby amount of FDI can be increased.

Ergonomic Risk Assessment and Postural Analysis of Indian Agricultural Workers

Arunesh Chandra, Sachin Rathore, and Z. Mallick

Abstract Agriculture is the main source of income for Indian population and it is a sector which contributes maximum Indian economy. In spite of that, agriculture is also known as the nation's most unsafe with high rates of musculoskeletal disorders (MSDs) and hazardous industry. The agricultural workers are using various types of tools and machinery daily for different activities to be performed in the agricultural fields. But still there is a little of human aspects and ergonomics involved in the design of tools/implements in which farmers are working in the present scenario. Workers aged between 24 and 50 years, who were using the traditional tool (hoe) for weeding operations were selected for the present study. Rapid upper limb assessment (RULA) was used for the analysis of working postures of the agricultural workers in a virtual environment with one of widely used hand tool (hoe). The assessment results obtained from RULA suggests that the postures of the agricultural workers while using existing hoe is extremely harmful and there is an urgent need to be addressed in detail about these postures and tool. Further, the existing hoe is redesigned taking into considerations of anthropometric dimensions and analysed through RULA results of which indicates a reduction in MSDs.

Keywords Agricultural workers · MSDs · Working posture · Hoe

1 Introduction

Agriculture is the main source of income for Indian population and it is a sector which contributes maximum Indian economy. In spite of that, agriculture is also known for the nation's most unsafe occupation with high rates of musculoskeletal disorders (MSDs) and hazardous industry. Musculoskeletal disorders related to work

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Fuzzy Expert System to Optimizing of Machining Parameters on Wire Cut EDMfor Aluminium - 7075 Alloy

Sachin Rathore[1], K.L.A.Khan[1], Saumya Sharma[2], Rishabh Taheria[2], Jasmeet Singh[2]

1. Department of Mechanical Engineering, KIET group of Institutions, Ghaziabad
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E-mail- saumya.1540143@kiet.edu, sachin.rathore@kiet.edu

Abstract –

Present investigation applied the designs of experiments and fuzzy logic approach to optimize and modelling the machining parameters for wire cut electrical discharge machining process of Al-7075. Uncoated brass wire of diameter 0.25 mm has been used as tool for cutting purpose for this WEDM. Fuzzy logic tool box @ MATLAB 2013a has been used to predict, optimize & modelling of input machining parameter such as pulse on time, pulse off time, wire feed and wire tension and the output parameters such as surface roughness (Ra), wire consumption rate and material removal rate. The input data rules & output actions or consequences are generally fuzzy sets, expressed by means of appropriate membership functions defined on an approximate reasoning or interpolative reasoning and is commonly represented by the composition of the fuzzy relations that are formed by the IF-THEN rules. This yields a total number of rules (4 X 3 X 3 X 3 X 3) equal to 324 for fuzzy model (mamdami).

I. INTRODUCTION

A. Wire Electrical Discharge Machining (WEDM)*:*

WEDM is a non-conventional, thermo electrical process which is used to machine electrically conductive material. In this process material is eroded from the work piece in the form of small chips, when a series of spark takes place between the tool and work piece [1]. Tool used in this process is a thin wire which acts as an electrode which follows a particular path, which can be controlled easily by a computer numeric control (CNC). Metal is melted and vaporized when spark takes place [2]. Chips are flushed away from the workspace by a dielectric medium such as water. Water jets are operated from both top and bottom. Water also prevents heat built up in the work piece. Without this cooling, thermal expansion of the part would affect both positional accuracy and surface roughness. Wire EDM is used to achieve higher productivity and complex shapes in tool and die industry, aerospace and automotive industry. Conductive material such as steel, copper, aluminium, alloys, titanium, tungsten carbide can be easily machined by this process using a wire having diameter of 0.2 to 0.3 mm [3].

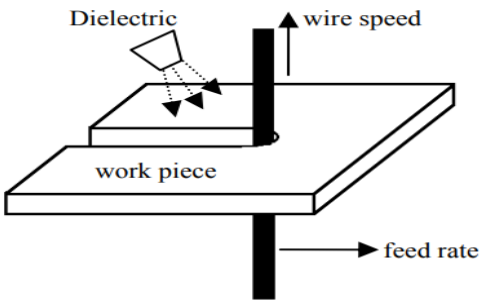

Fig. 1: Schematic of the Wire EDM process

B. *Material*

Al 7075 is an aluminium alloy with zinc as the primary alloying element.It has very high strength material used for highly stressed structural parts. This alloy having magnesium (2.1 % to 2.9%), Chromium (0.18% to 0.28%), Silicon (maximum 0.4%), Copper (1.2% to 2%) and rest some basic alloying elements. Al 7075 widely used in Aircraft fittings, gears and shafts, fuse parts, meter shafts and gears, missile parts, regulating valve parts, worm gears, keys, aircraft, aerospace and defence applications; bike frames, all-terrain vehicle (ATV) sprockets. Al 7075 having high ultimate tensile strength upto572 MP with tensile yield Strength of 503 MPa, modulus of elasticity 71.7 GPa, Poisson's Ratio 0.33 and fatigue strength 159 MPa.

c) Fuzzy Expert System:

It is known that the description of most of the world's problem is inaccurate and uncertain due to lack of information and imprecise knowledge. Hence to cope up with such inevitable problem some approach has to be developed. Fuzzy expert system is one such approach to handle these situations. Fuzzy expert system is based on fuzzy sets. This system works on certain algorithms which are derived from some logics. These algorithms are called fuzzy algorithms and are governed by some encoded knowledge called rule base. Rules establish a relationship between the inputs and outputs of a system. So, basically fuzzy logic is a superset of conventional (Boolean) logic that has been extended to handle the concept of partial truth–the truth values between completely true and completely false[7].

In the fuzzy theory, fuzzy set A of universe X is defined by function μA(X) called the membership function of set A.

μA(x): X → [0, 1], where μA(x) = 1 if x is totally in A;

μA(x) = 0 if x is not in A;

μA(x) < 1 if x in partly in A.

Fuzzifier and a defuzzifier are two main blocks of fuzzy rule based system. Fuzzifier: It converts the crisp input to a linguistic variable using the membership function stored in fuzzy knowledge base.

Defuzzifier: It converts the fuzzy output of the inference engine to crisp using membership functions analogous to the ones used by fuzzifier[8].

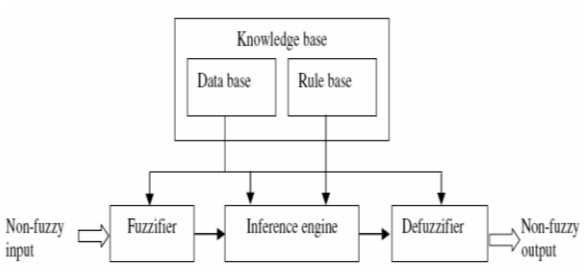

Fig.2The structure of fuzzy expert systems

II. METHODOLOGY

The relationships between various machining parameters such as surface roughness, material removal rate, wire weight consumption and input parameters like pulse on time, pulse off time, wire feed rate and wire tension can in general be represented by multi-inputs multi-outputs (MIMO) system.

Algorithm

(i) Selection of the input and output variables.

(ii) Determination of the ranges of input and output variables.

(iii) Determination of the membership functions for Various input and output variables.

(iv)Formation of the set of linguistic rules that represent the relationships between the systems variables.

(v) Selection of the appropriate reasoning mechanism for the formalization of the fuzzy model.
(vi)Evaluation of the model adequacy; if the model does results, modify the rules in step 4.

STEP 1: INPUT AND OUTPUT VARIABLES (SYSTEM'S VARIABLES)

The first and most important step in modelling is the identification of system input and output variables. The relationship between them will specify the objective of the model. As shown in Figure 3, the input variables are pulse on time, pulse off time, wire tension, wire feed rate. The output variables are surface roughness, material removal rate, wire weight consumption. In order to reduce the complexity of the system, other factors such as servo voltage, peak current, spark gap voltage etc. have been ignored as the inclusion of more inputs adds to the number of rules manifold.

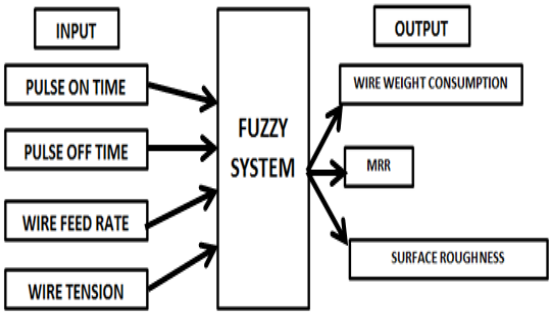

Fig.3- Inputs and output of the system

STEP 2: RANGES OF THE INPUT AND OUTPUT VARIABLES

The second step is to determine the ranges of the input and output variables. The concept of a linguistic variable plays an important role in the applications of fuzzy logic. These variables in fuzzy modelling are defined as linguistic variables whose linguistic values are words or sentences in a natural or synthetic language. A linguistic variable is a variable whose values are words or sentences in a natural or synthetic language. Input and output variables are defined in terms oflinguistic values. Each linguistic term is defined by its interval or range. **Table 1** shows the linguistic variables, their linguistic values, and associated fuzzy intervals.

Table 1: The linguistic variables, their linguistic values, and associated fuzzy intervals.

S. No.	System's Variables	Linguistic Variables	Linguistic Values	Fuzzy interval
1	Inputs	Pulse On Time	Low	0.6 - 0.85 µsec.
			Medium	0.8 - 1.1 µsec.
			High	0.9 - 1.2 µsec.
		Pulse Off Time	Low	6 - 8.5 µsec.
			Medium	8 - 11.0 µsec.
			High	9 - 12.0 µsec.
		Wire Feed	Low	6 - 7.5 m/min
			Medium	7 - 8.5 m/min
			High	8 - 9.5 m/min
		Wire Tension	Low	1600 - 1900 gm
			Medium	1700 - 2000 gm
			High	1800 - 2100 gm
2	Outputs	Surface Roughness	Low	2 - 4.0 µm
			Medium	3 - 5.0 µm
			High	4 - 6.0 µm
		Material Removal Rate	Low	52 - 77 mm^3/min
			Medium	70 - 95 mm^3/min
			High	85 - 110 mm^3/min
		Wire Weight Consumption	Low	$7.45*10^{-4}$ - $2*10^{-3}$ gm/min
			Medium	$1.5*10^{-3}$ - $2.75*10^{-3}$ gm/min
			High	$2.45*10^{-3}$ - $3.5*10^{-3}$ gm/min

STEP 3: MEMBERSHIP FUNCTIONS OF THE VARIABLES

The next step is to express linguistic values in the form of fuzzy sets, which are represented by its membership functions. The appropriate choice of the membership functions for each input and output variable is a crucial step in the proper design of the fuzzy model because (1) it determines the complexity of the model, i.e. the number of rules and (2) the performance of the model, i.e. the accuracy of the

model results. The membership functions are constructed from several basic functions such as piecewise linear functions, the Gaussian distribution function, the sigmoid curve, quadratic and cubic polynomial curves. The triangular membership function is the simplest one and is commonly used due to its computational efficiency. The membership functions for all inputs and output are shown in the figure 4.

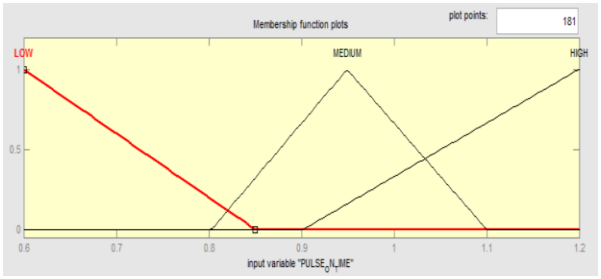

Fig.4(a) - Membership Function for Pulse on Time

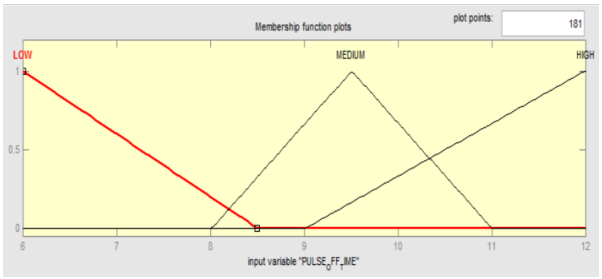

Fig.4 (b) - Membership Function for Pulse off Time

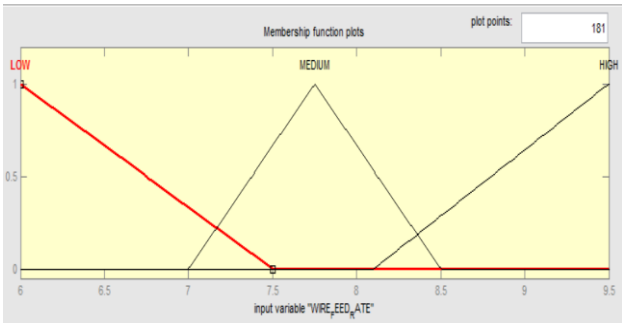

Fig.4 (c) - Membership Function for Wire Feed Rate

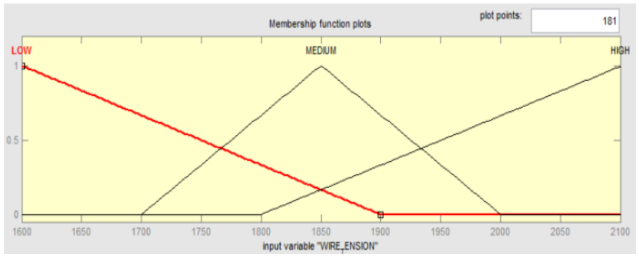

Fig.4 (d)- Membership Function for Wire Tension

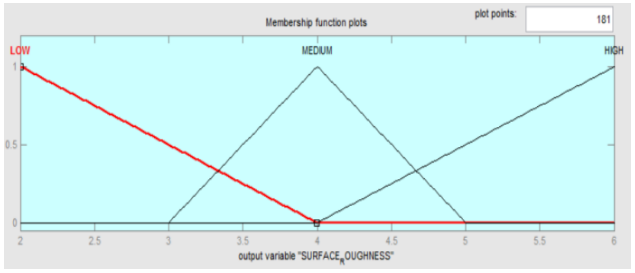

Fig. 4 (e): Membership Function for Surface Roughness

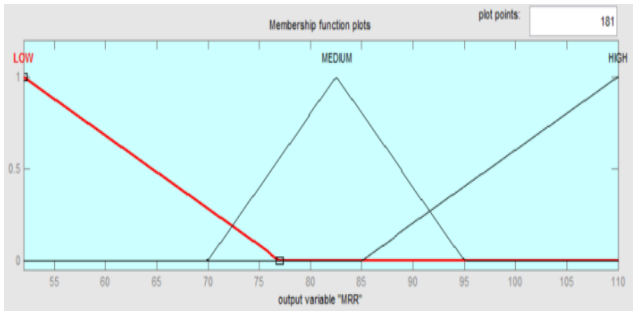

Fig.4(f)- Membership Function for Material Removal Rate

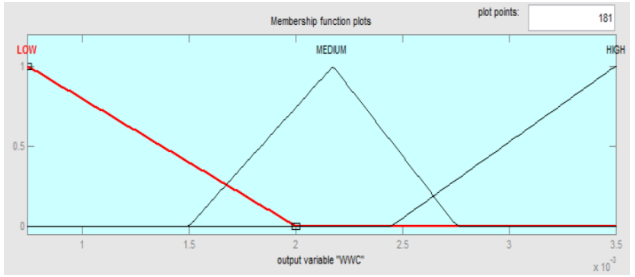

Fig.4(g)- Membership Function for Wire Weight Consumption

STEP 4: LINGUISTIC RULES

The relationships between inputs and output are represented in the form of IF-THEN rules. The knowledge base comprises a database and a rule

base. Membership functions of the fuzzy sets are contained in the database. The rule base is a set of linguistic statements with antecedents and consequents respectively connected by AND operator.

In general, a fuzzy rule-based system with multi-inputs single-output (MISO) can be represented in the following manner

IF P1 is B11 AND P2 is B12 AND . . . AND Pr is B1r THEN Y1 is D1

ALSO……

……..……ALSO

IF P1 is Bi1 AND P2 is Bi2 AND . . . AND Pr is Bir THEN Ys is Ds, Where P1, P2,…….Pr are the input variables and Y1, Y2, ……Ys are the output variables, Bij (i = 1,….., m, j = 1,……, r) and Di (i = 1,….., s) are fuzzy subsets of the universes of discourse U1, U2,…., Ur, and V1, V2,…….., Vs of P1, P2,……., Pr and Y1, Y2,. . ., Ys, respectively. The number of input variables and their associated membership functions determine the number of rules. For example in the present study, there are four inputs. The input data rules & output actions or consequences are generally fuzzy sets, expressed by means of appropriate membership functions defined on an approximate reasoning or interpolative reasoning and is commonly represented by the composition of the fuzzy relations that are formed by the IF-THEN rules. The number of membership functions associated with the first, second, third and fourth inputs are three, three, three and three, respectively. This yields a total number of rules (4 X 3 X 3 X 3 X 3) equal to 324 for fuzzy model (mamdami)[10].

STEP 5: INFERENCE MECHANISM

The model employs both Mamdani fuzzy inference methods. In Mamdani inference method, the membership functions of both the input and output variables are assumed to be fuzzy sets. After the aggregation process, there is a fuzzy set for each output variable that needs defuzzification. As an illustration, some rules for this approach along-with their graphic representations have been given in figure 4.

STEP 6: EVALUATION OF THE MODEL ADEQUACY

Finally, the model for speech interference expressed in the form of simple IF-THEN rules was implemented on Fuzzy Logic Toolbox of MATLAB (Logic Toolbox for use with MATLAB, 2013a). In the initial phases, the developed model generally does not produce the desired results. Hence we have to modify the if-then rules in step 4. In turn, we modify theranges of the related membership functions. This process is repeated till the desired results are obtained.

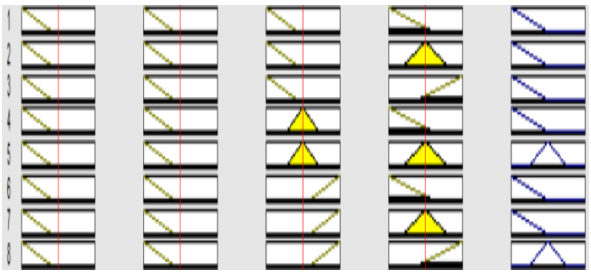

Fig.5(a)- Typical rules and their graphical representations for Surface Roughness in Mamdani approach

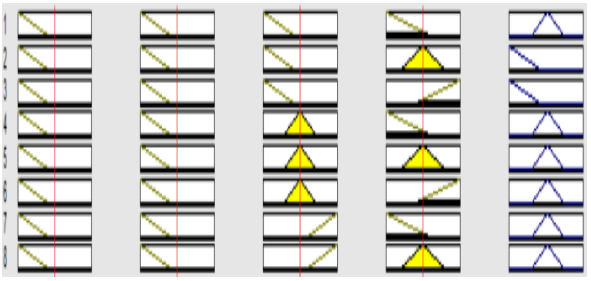

Fig.5(b)- Typical rules and their graphical representations for Material Removal Rate in Mamdani approach

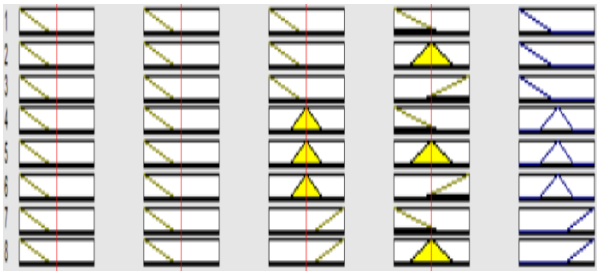

Fig.5(c)- Typical rules and their graphical representations for Wire Weight Consumption in Mamdani approach

IV. Result & Discussion

The model designed using the IF-THEN rule has been implemented on the Fuzzy Logic Toolbox of MATLAB using both the Mamdani technique. The model can be represented in two ways, either a 3D model can be generated or it can be analysed with a 2D model. Although both 3D and 2D can be referred for the analysis but 3D model is much more complex and cumbersome to understand so, 2D model is used.

Figure 6(a) shows the 3D surface model of surface roughness with respect to varying wire tension and wire feed rate. figure 6(b) shows 3D model of material removal rate and its nature with changing wire tension and pulse off time. Similarly figure 6(c) shows model of wire weight consumption with varying wire feed rate and pulse on time. These surfaces are hard to understand so 2D model of surface roughness, material removal rate and wire weight consumption are studied.

Figure 7(a) shows that minimum value (Ra=2.35µm) of surface roughness is obtained at high (0.95 µs) pulse on time high (10µs) pulse off time, medium (7.474 m/min) wire feed rate and low (1600 gm) wire tension. Figure 7(b) shows that highest value (102mm²/min) of material removal rate is obtained at high (0.95 µs) pulse on time, low(6 µs) pulse off time, low(6 m/min) wire feed rate and low(1600 gm.) wire tension.

Figure 7(c) shows that lowest value (0.00111gm/min) of wire weight consumption is obtained at high (0.95 µs) pulse on time, low(6 µs) pulse off time, low(6 m/min) wire feed rate and medium (1800 gm) wire tension.

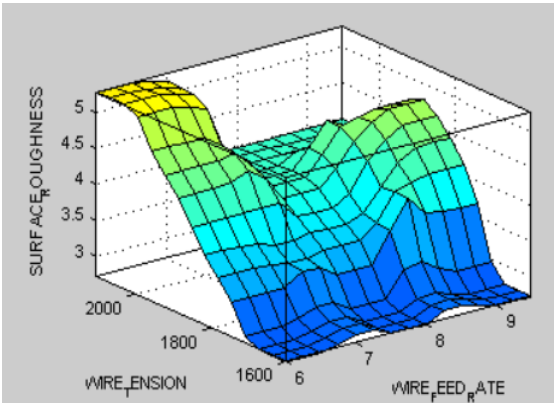

Fig.6 (a)- Output (Surface Roughness) in the form of 3-D representations with Wire Feed Rate & Wire Tension.

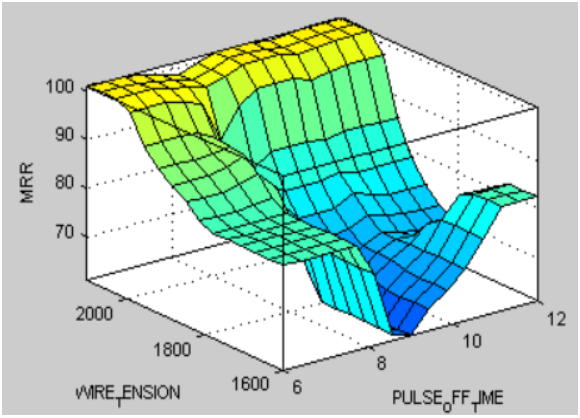

Fig.6 (b)- Output (Material Removal Rate) in the form of 3-D representations with Wire Tension & Pulse Off Time.

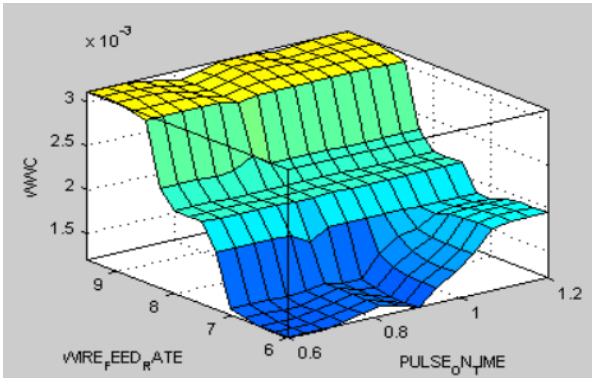

Fig.6(c)- Output (Wire Weight Consumption) in the form of 3-D representations with Wire Feed Rate & Pulse On Time.

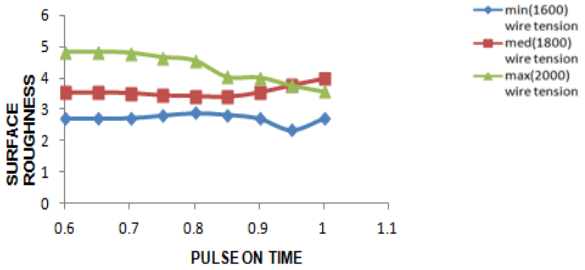

Figure 7(a)

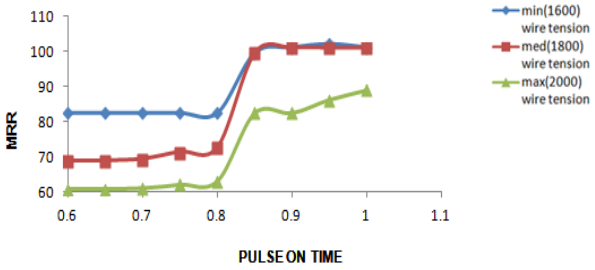

Figure 7(b)

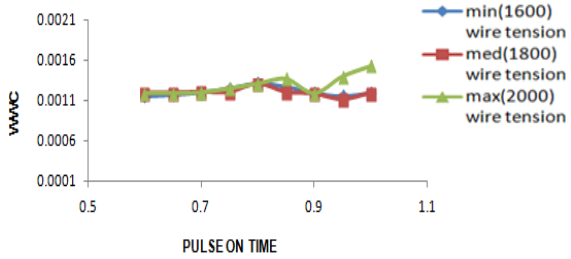

Figure 7(c)

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Industrial Defects Reduction Using Quality Control Tools

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Industrial Defects Reduction Using Quality Control Tools

Jafar Husain, Samar Khan, Obaidullah Khawar, Arunesh Chandra, and Abid Ali Khan

Abstract Human-machine interface is an important contributing factor in increasing the productivity of the organization. There are various parameters which are affecting this factor and quality is one of them. Quality is an important factor in the manufacturing industry in order to raise its profit. Quality tools are one of the methods used to control and improve productivity by many ways such as reducing the repetitive mistakes. This study is about to apply the quality tools in the processing line in order to identify where the major defects occurred and to give suggestions for reduction of the concerned major defects involved in the processing line. This research is done by participating in a project in the production unit of the Suzuki Power-Train India Limited. For this, analysis of production lines such as soft and hard line of transmission system is done and the major defects occurring in these processes are identified with the help of various quality tools, such as Check Sheet, Histograms, Pareto Charts, and Cause and Effect Diagram. After this suggestions are made to reduce these industrial defects. By successful implementation of these suggestions, the rejection rates reduced from 0.044 to 0.0087% in soft line and from 0.042 to 0.0038% in hard line.

Keywords Human-machine interface · Quality · Productivity · 7 QC Tools · Industrial Defects

1 Introduction

Quality is simply defined as the fitness for the purpose. In manufacturing industries, quality is defined in terms of the closeness of the product with respect to the defined product specifications. Higher quality products tend to achieve customer satisfaction and rise in product demand, less rejection, and less cost due to the better acceptance

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Design Science and Innovation, https://doi.org/10.1007/978-981-15-9054-2_92

rate. This ultimately yields in the form of better productivity of the organization and influence the better work environment for work force and resulting in the growth of the organization. In order to achieve greater quality, seven quality controls (7 QC) tools provide great helps in the quality improvement within an organization. The basic 7 QC tools are: Check Sheets, Pareto Diagrams, Cause and Effect Diagrams, Flowcharts, Histograms, Scatter Diagrams, and Control Charts (Figs. 1, 2, 3, 4 and 5).

There are number of research performed using these quality tools in the quality improvement of an organization. Rohani et al. applied the 7 QC tools in the plastic injection molding company. By improving quality management can able to decrease rejection rate from 13.49 to 7.4%. Rohani and Chan [1] Pareto chart can be very useful in separating vital few defects from trivial many defects. Then, these few defects can be analyzed using cause and effect diagram to identify the root causes of the defects. Craft and Leake [2] Paliska et al. used the 7 QC tools in the process industry. They showed the management that 7 QC tools can be implemented very easily in their organization. Paliska et al. [3] Chandra et al. studied the crankshaft

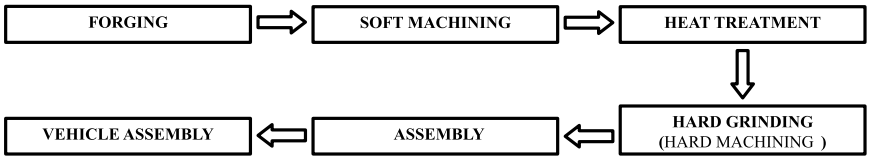


Fig. 1 Plant layout in transmission plant

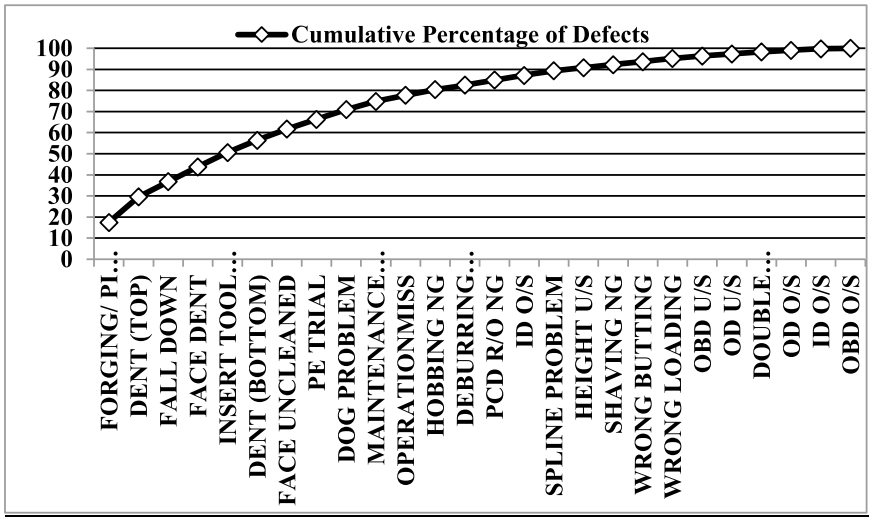


Fig. 2 Pareto diagram for soft line

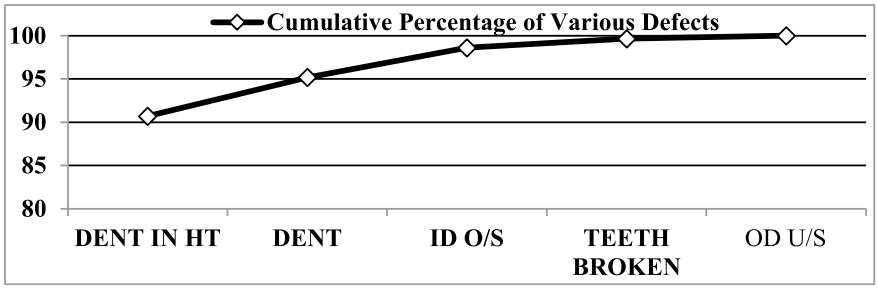


Fig. 3 Pareto diagram for hard line

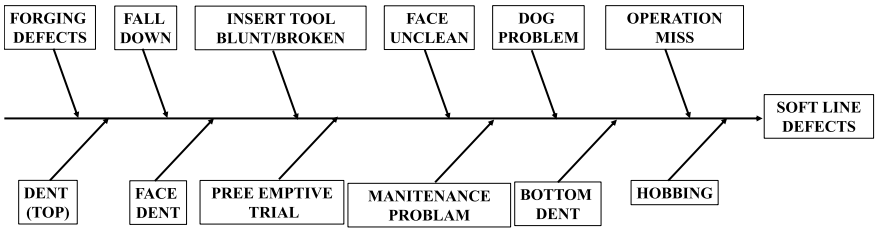
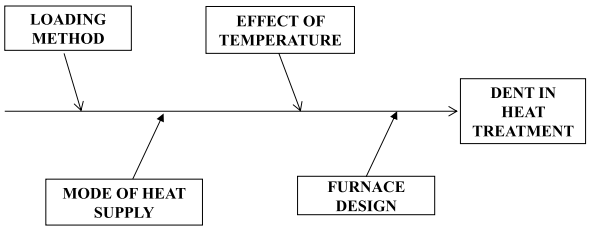


Fig. 4 Cause and effect diagram for defects in soft line

Fig. 5 Cause and effect diagram for defects in hard line



defects in the automobile industry. With the help of QC tools, they identified the major defects and give suggestions to reduce rejection rate. Kumar et al. [4] applied the QC tools in the improvement of grinding machine. They calculated the process capability of the machine and compare it with the standard. Then, the possible causes of variations of the product have been identified and suggestions are made to reduce variations [5] (Tables 1 and 2).

2 Company Background

This project is about to implement the quality tools in the selected large scale industry (LSI). The selected LSI is Suzuki Power-Train India Limited (SPIL) which located

Table 1 Suggestions for soft line defects

Defects	Suggestions
Forging defects	Volume flow rate should be automatically controlled., Scales should be remove during cooling immediately, separation should be done by density difference phenomena, alloy formation should be homogeneous and isentropic, give proper time for cooling, and use of pin hole that will prevent misalignment
Dent (Top)	During broaching proper cutting tool speed, during Hobbing operation, the clipping of gear should be done very carefully, gear shifting from one machine to other machine should be done carefully to prevent collision of top surface, helical angle should be limited at the time of disengagement of tool, and there should be no chattering and
Fall down	Proper operator attention, the hand glove should have lubricant absorbing capacity, and time period of production lot should be defined
Face dent	The sudden engagement and disengagement should be avoided, chip should be removed from the surface, use of proper lubricant, during forging prevent air trap, and tool should be properly angled
Insert toolBlunt /broken	Tool angle should be checked at regular interval of time, tool must be changed at optimum time, surface should be clean before machining operation, and gradually engagement of tool
Dent (bottom)	Undercutting of gear should be done carefully, the upsetting of the tool should be done carefully, and the machine tool feed depth should be well defined
Face uncleansed	Highly pressurized lubricant can be used, use of air pressure should be used carefully, low viscosity fluid should be used as lubricant, and preference for ductile material
PE trial	Selection of process should be decided according to machining effect, use of proper lubricant, tight holding clips, and process step should be followed
Maintenance problem	Blank should be free from open air, tool change time should be strictly followed, lubricant chamber should be filled properly, clearance test is done carefully, use of air pressure after each machining, and proper removal of chip from bed
Operation miss	Skilled worker and automated traveling system
Hobbing NG	High transmission ratio between the hob spindle and the index drive worm, use of diagonal Hobbing machine, axial and radial guide ways offer better weight control, and provide anti stick-slip properties

Table 2 Suggestions for hard line defects

Defect	Suggestions
Dent in heat treatment	Blank material proper selection, prevent surface to surface contact, gradual heating inside chamber, proper placement of gear in a heated chamber, single gear treated alone in the chamber, temperature range and time should be well defined to operator, and automatic enrollment during heat treatment of gear

at Manesar, Gurugram, and Haryana. It manufactures world class diesel engines and transmission system for cars. The company is producing 4-wheeler diesel engines, transmission unit for various vehicles. The diesel engine plant has a capacity to manufacture 300000 diesel engines a year. The company has following four plants: casting plant, engine plant, transmission plant, and 2-wheeler engine plant. The present study is performed in the processing line of transmission unit.

3 Methodology

The present study is carried out by active data collection and analysis to reduce the industrial defects. The study is focused in the processing line of transmission unit of the SPIL. There are different stages in the processing line which are including forging, machining, grinding, and assembly of the different parts. According to the observation, there are various defects occurs in these processes which cause the actual production less than the final target of the plant. Quality tools will be implementing in the processing line of this LSI in order to find where the highest defects occur at what process area, among all those processes. This proposal will give such a comprehensive ideas on how to reduce the waste by finding and analyzing the causes occurs in the processing line. In transmission plant of SPIL, there are assembly lines of four parts: input shaft, counter shaft, gear, and sleeve and final gear. In the present study, problems occurring in the production line of gears are analyzed for the reduction of industrial defects. In order to reduce these defects, in processing line of gear, major defects must be identified and counted at first. Then, the most significant causes of defects are required to be eliminated. To meet this objective, thorough investigation of the defects data of the gears production line of transmission plant is needed to be analyzed. There are two parts of entire gear production line in the transmission plant, soft line (The processes which are done before heat treatment of the part.) and hard line (The processes which are done after heat treatment of the part.).The plant layout in transmission plant is given below in Fig. 1:

First of all, major defects are identified with the help of the Pareto Diagram, present in the gear production line as shown in Figs. 1 and 2. The causes of these defects are determined using Cause and Effect Diagram. After investigation of these defects, suggestion is provided to remove these defects. Out of 7 quality tools, four quality tools are used for the analysis, which are Histogram, Check Sheet, Pareto Chart, and Cause and Effect Diagrams.

4 Results and Discussion

The defect data has been collected for month duration. After collection of data, for both soft line and hard line of gear production, the vital few defects which are responsible for 80% of rejections are identified with the help of Pareto Diagram.

On the basis of the Pareto Chat, following defects which are responsible for more than 80% of rejections are identified: Forging Problem, Dent (Top), Fall Down, Face Dent, Insert Tool Blunt /Broken, Dent (Bottom), Face Unsealed, Pre Emptive Trial, Dog Problem, Maintenance Problem, Operation Miss and Hobbing in the soft line, and Dent in heat treatment in the hard line as shown in Figs. 4 and 5 respectively. Therefore, these defects are analyzed for the further processing with the help of other quality tools. The analysis of basic causes of these defects has been carried out with the help of the Cause and Effect Diagrams.

After thorough investigation of production line of gear for the above-mentioned major defects, following suggestion are made for decreasing the rejection rate of gear as mentined in Tables 1 and 2.

5 Conclusions

In the present work, the analysis of production of gears for the transmission system of 4-wheeler automobile with the help of quality tools is being done. The analysis shows that more than 80% of rejection and rework are due to defects like Forging Problem, Dent (Top), Fall Down, Face Dent, Insert Tool Blunt /Broken, Dent (Bottom), Face Unsealed, Pre Emptive Trial, Dog Problem, Maintenance Problem, Operation Miss, Hobbing(for soft line), and dent in heat treatment (for hard line). Corrective measures are being suggested to overcome these defects of the gears. Finally, few remedial measures and suggestions have been provided for the existing production line. Controlling these vital few defects, in the production lines, will reduce present rejection rate from 0.044 to 0.0087% in soft line and 0.042 to 0.0038% in hard line. The reduced rejection rate is very beneficial in terms of quality cost and improved work environment to the work force as well as the management of the organization.

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Two zone model analysis of gasoline, methanol, ethanol as alternate fuel in SI engines

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Abstract—
Due to scarcity of petroleum deposits, an immediate need for alternate fuels has engulfed the minds of all present researchers. Methanol, ethanol, aromatic derivatives are fastly been tested for efficient pressure, work, power profiles all over the world. A paucity of a efficient model mars the usage of alternate fuels. The present work highlights usage of two zone models for investigating pressure profiles for using gasoline, methanol and ethanol as alternate fuel.

Keywords— alternate fuel,combustion,two zone model,methanol,ethanol,gasoline

Introduction

Nowadays , oil and petroleum extracts are becoming very scarce and costly. Day-by-day, engine fuel economy is improving and will continue to improve. Since vehicles has increased demand for fuel is also increasing. in future gasoline and diesel will become most costly. Due to high depletion and usage of fossil fuels, coming decades will see exhaustive use of alternate fuels. During recent years there have been quite a few internal combustion(IC) engines running on non-gasoline fuels. However, the numbers have relatively been very scarce. Some developing countries are using alternate fuel technology due to very high cost of petroleum products.

As an alternate fuel methanol is used either directly or in combination with other fuels. China and US are using methanol as fuel or combination fuel. Further , ethanol has less toxic effects, higher energy density, yet sustainable production of methanol is less expensive, and is a less expensivefor the carbon footprint reduction. However, when optimizing engine performance characteristics, availability of fuel , toxicity & political advantage, usage of a blend of ethanol, methanol and petroleum preferable to these individual substances alone. It may be made from fossil or renewable resources, (natural gas and biomass respectively).

The most interesting engine simulation tool, especially for spark ignition (SI) engines is two zone model. However, the accuracy of the heat transfer model is the deciding factor for pertinence of the simulation . In fact, transformation of an important part of fuel energy goes out of engine walls. Also, heat exchange is closely related to knock appearance. However, various choices are made for heat transfer evaluation and influence study has been carried out in the previous studies using two-zone models. These days political agenda include issues like climate change and energy supply. To deviate from the fossil fuel and petrolem energy supply of
present, a solution has to be found. There is high dependence of transportation sector in particular on fossil fuels. Therefore, alternative fuels are in constant attention of researchers for several years.

Muharrem et.al [3]. investigated the performance and combustion characteristics of a SI engine for ethanol–gasoline (E5, E10) and methanol–gasoline (M5, M10) fuel blends. A vehicle with a 4-cylinder, 4-stroke, MPFI system SI engine was used. On a chassis dynamometer tests were performed for running the vehicle for two speeds i.e 80 km/h and 100 km/h, and four different wheel powers (5, 10, 15, and 20 kW).

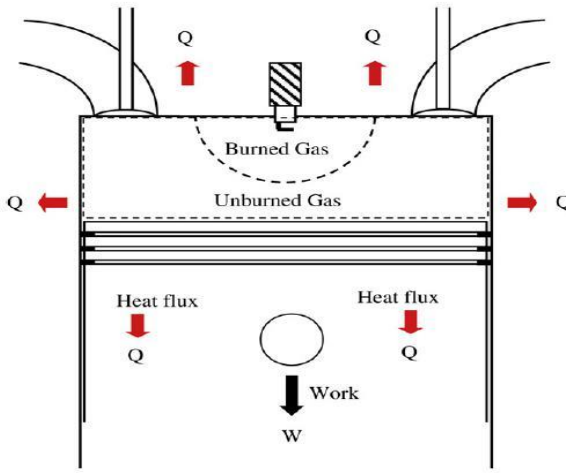
A comparison was made of the results obtained from the use of alcohol–gasoline fuel blends with those of gasoline fuel. The results showed that for alcohol–gasoline fuel blends , the brake specific fuel consumption(bsfc) increased; the rise of cylinder gas pressure started late than gasoline fuel. The lowest peak heat release rate was obtained from the gasoline fuel use in almost all the tests.

Mohand et.al [5]. investigated that in the case of SI engines using natural gas as fuel , the effect of the choice of the heat transfer correlation and burned zone heat transfer area calculation method and provide an optimized choice for a more efficient two-zone thermodynamic model. A computer simulation is developed for following purpose. For comparison and validation Experimental measurements are carried out. The effect of correlation choice has been first studied.The most known correlations have been tested and compared. The experimental pressure results, supported for more general and reliable conclusions, by a literature survey of many other studies, based on measured heat transfer rates for several SI engines, are used for correlation selection. Hohenberg's correlation was found to be the best choice. However, a negligible influence of the burned zone heat transfer area calculation method was found.

In this work, we will use two zone model for investigating preesure profiles for methanol as fuel and see if it matches with with that already in use.

TWO ZONE MODEL

For SI engines two-zone model is one of the most interesting engine simulation tools. Further, the accuracy of the heat transfer model depends on the pertinence of the simulation. In fact, combustion chamber wall loses an important part of the fuel energy is transformed to heat loss. Also, heat exchange is closely related to knock appearance.



Now, a two-zone model, used for formulating pressure of cylinder from IVC to EVO, is described. Fig. shows combustion chamber with the open system boundary for SI engine. Two zones are made for combustion gases namely burned and unburned portions. As flame front proceeds ,mass is entailed by the burned zone from unburned zone .

In the present work, the assumptions and approximations are as follows:

1. During intake, compression, expansion, and exhaust processes, the contents in the cylinder fully mix with each other and spacially homogeneous mixture in terms of composition & properties is made.
2. Two zones are used for the combustion process-burned & the unburned zones. An infinite small thin flame separates the two zones.
3. There are no pre-flame reactions and the model is a single zone until the start of combustion during thermodynamic cycle of engine all gases are considered to be ideal.
4. The cylinder pressure remains constant whether it is burned zone or unburned zone .Heat transfer to and from the two zones is negligible.
5. Uniform and constant cylinder walls temperature is assumed. Cylinder inner surface temperature donot vary much from the combustion gases temperature.
6. Infinite plenums containing gases at constant temperature and pressure at the intake and exhaust manifolds are assumed.
7. Zero blow-by losses and all crevice effects are ignored.
8. The engine works under steady state condition in such a way that state at the start (two crankshaft revolutions) is the same as that at end of thermodynamic cycle.

For a two-zone model the main governing equations are the conservation of energy equation applied on an open system , the ideal gases equation , the mass conservation , the volume evolution and different sub-models allowing the simulation of the thermodynamic cycle (combustion, heat transfer, mass transfer sub-models during the open phases of the combustion chamber and formation of pollutant).

Since valve leakage and blow-by are neglected the total mass is assumed to be constant.

$$m \quad m_u \quad m_b$$

The total cylinder volume depends on the geometry of cylinder as well as crank angle. It is equal to the volume of the two zones,.

$$11. \quad V_u \quad V_b$$

Assuming gases to be ideal and the each zone has same pressure, the ideal gas equation gives.

$$pV_u \quad mR_uT_u$$

$$pV_b \quad mR_bT_b$$

The energy equations were written for each zone as follows.

$$\frac{d\ (m_u u_u)}{d} \quad p \frac{dV}{d} \quad {}_i \frac{dQ}{d}$$

$$\frac{d\ (m_b u_b)}{} \quad p \frac{dV}{} \quad \frac{dQ}{} \qquad (3.5)$$

$$d \qquad d \qquad {}_i \quad d$$

Where $_i$ gives the total heat transfer through all engine parts in contact with cylinder gases

To determine the burning rate, the Wiebe function is often used. To describe the different configurations of application for SI engines, a simple function with four parameters is used

$$x_b \quad 1 \ \exp \ a \frac{\quad}{\quad}^{\ 0\ m\ 1}$$

Where is crank angle, $_0$ is crank angle at the start of combustion process, is total combustion duration (from x_b =0 to x_b=1), and a and m denote adjustable parameters for fixing the shape of curve.

Heat transferred inside IC engines are convective & radiative nature. However, the radiative transfers are negligible since they account for only 3e$_4$% of the total heat transfer for SI engines. For diesel engines this cannot be applied where the radiative transfers can go up to 10% of the heat exchanges due to soot formation during combustion.

The burned gas temperature increases significantly with maximum about 2800 K during combustion. It causes expansion of gases and an increase in their motion. Heat transfers are the most important during this period. Heat flux induced can reach several tens megawatts per square meter for some engines.

Being non uniform and unsteady heat transfer in between gases& cylinder walls is generally complicated to find Depending on what kind of results may be required many approaches can be used. However, to simplify the formulation Newton relation could be used:

$$Q_w \quad h_g A_w \ T_g \quad T_w$$

Where,. uniform supposition of T_g , h_g in different parts of the cylinder with same gas is there.

Accordingly, to evaluate the parietal losses during an engine cycle, the main parameter to determine, is the heat transfer coefficient hg .much has been written for years about heat transfer process from the gas-to-wall in Spark ignition and compression ignition engines and thus a large number of correlations were devised for formulating the heat transfer coefficient(instantaneous).

The above correlations suggest a heat transfer coefficient which represent a spacially-averaged value regarding cylinder. As such, commonly they are called global heat transfer models. The known ones belong to Borman, Trapy and Guibert, Nishiwaki, and Ollivier .

Two categories are classified for those correlations, as per the assumption used for the origin of heat transfer.

For the evaluation of heat transfer in engines, the first correlations established used the assumption of natural convection. In a dimensionless form the heat transfer coefficient, is then given by:

$$Nu \quad C \ \mathrm{Re} \ Gr^{\ n}$$

Nusselt established and used first correlation in 1923. spherical bomb was used for tests for establishing empirical correlation . Brilling , and Eichelberg followed and adjusted by using the experimental test results carried on internal combustion engines.

During their use , these models described the impact engine parameters such as gas pressure, temperature and engine speed. But limit of this approach quickly reached.

Even though categorized in this family Eichelberg's correlation still gives quiet accurate estimation for calculation of heat transfer.

Correlations using above assumption gives absurd results other engines because assumption the natural convection is inadequate . Thus, forced convection assumption was adopted by some experimenters (hohenberg, Annand, Woschni,) . This was more realistic as the movement of fluid in chamber is the result of mechanical efforts which are external. Generally these studies relie on dimension analysis for the turbulent flow which correlates the Prandtl, Nusselt no., Reynolds numbers. Employing engine experiments and assuming quasi-static conditions led to empirical correlations for heat transfer in Spark-Ignition and Compression ignition engine. The formulation of Nusselt number in such a case is written as:

$$Nu \quad a * \mathrm{Re}^{m} * \mathrm{Pr}^{n}$$

Substitute *Nu* and *Re* with physical properties, the global heat transfer coefficient is influenced by, transport properties, characteristic length, temperature, characteristic velocity and pressure. A new scaling factor is developed for coefficient tuning for matching geometry of engine. value for the exponent *m* is put forward by by various authors, for example, *m*= 0.5 for Oguri and elser , 0.8 for Woschni and Hohenberg , 0.7 for Annand and Sitkei, 0.75 for Taylor and Toong. Besides Woschni's correlation, other correlations forwarded time-averaged gas velocity which was proportional to mean piston speed. Yet , Woschni made two divisons of gas velocity : the unfired one that is proportional to the mean piston speed, and the time-dependent one which was combustion induced gas and thus function of the difference between the motoring and firing pressures.

Furthermore Woschni's & Hohenberg's correlations are the most prominent from this class. Woschni's Correlation:-

$$9. \quad 131C \quad B^{.2} * p^{.8} \quad T^{.53} w^{.8}$$

$c1$

w = characteristic speed given by:

$$w \quad 2.28\, U \quad p \quad 3.4*10 \quad {}^{3}C \quad 2 \quad * \frac{V_{disp}}{V_{ivc}} \quad \frac{p \quad p_{mot}}{p_{ivc}} \quad T \quad {}_{ivc}$$

C_1 ,C_2 = calibrating constants

All above equations can be used to form

$$\frac{dp}{d} \quad \frac{A \;\; B \;\; C}{D \;\; E}$$

7. RROBLEM FORMULATION AND SOLUTION METHDOLOGY

Different thermodynamic properties have been developed which would help in pressure formulation in terms of crank angle

For solution of various differential equations, value of specific heat at constant pressure is given as: $C_p /R=a_1 + a_2T + a_3T^2 + a_4T^3 + a_5T^4$

a_1, a_2 ,a_3 …can be calculated from JANAF tables

Similarly, for enthalpy:

$$\frac{h}{RT} \quad a_1 \quad a_2 T \quad \frac{a}{3} T^{2} \quad \frac{a}{4} T^{3} \quad \frac{a}{5} T^{4} \quad \frac{a}{T^{6}}$$

Now, for whole mixture the value of mole fraction of each constituent have to be calculated in order to multiply them with individual specific heat to get overall specific heat

Assumptions:

For <1 , CO and H_2 can be neglected

For >1 , O_2 can be neglected

For rich mixtures:

$$CO_2 \quad H_2 \quad CO \quad H_2O$$

$$K \quad \frac{n \quad n}{n \quad {}^{3} \quad {}_{2} \quad n \quad 10^{6} \quad .2803 \quad 10^{9}}$$

$$K \quad 2.743$$

$$T \qquad T^{2} \qquad T_3$$

K can be determined from a curve fit to JANAF table

For a fuel of molar composition CH_yO_z **,** the reactant mixture

$$CH\,O \quad \underline{1}\,1 \quad \frac{y}{4} \quad \frac{z}{2} \quad {}_{2} \quad ON_{2}$$

can be rearranged per mole of O_2 **,** reactant as

$$C \quad 2 \quad 1 \quad H_2 \quad O_2 \quad N_2$$

Where

$$\frac{4}{M} \quad 1 \quad 2 \quad * \; CH_y \quad O_2 \quad {}^{*} N_2$$

The unburned mixture, per mole O_2 in mixture, can be written as:

$$1 \quad x_b \frac{4}{M} \quad 1 \quad 2* \quad CH_y \quad O_2 \quad N_2$$

$$x_b \quad n_1 \quad n_2 \quad n_3 \quad n_4 \quad n_5 \quad n_6$$

Value of c can be known from:

$$K \;\; 1\, c_2 \quad c\, K\, 2 \quad 12 \qquad 12K1 \quad 0$$

The number of each species in unburned mixture is given by:

Table-2 Unburned mixture composition

Moles per mole of O_2 reactant

SPECIES	< 1	> 1
FUEL	$\frac{4\,1\;x_b \quad 1\;2}{M}$	$\frac{4\,1\;x_b \quad 1\;2}{M}$
O_2	$1\;x_b$	$1\;x_b$
N_2	Ψ	Ψ
CO_2	x_b	$x_b c$
H_2O	$2x \quad 1$ (b)	$x \quad 2\,1 \quad c$ (b)
CO	0	$x_b c$

H_2	0	x_b 2 1 c
SUM	n_u	n_u

$$\frac{2}{2z\ 1\ \frac{4}{4\ y}};$$

Now, let

$$*\ \ ,\ \ {}^{*1}\ \ \frac{z}{2}$$

The reactant expression becomes:

$$* C \quad 2 \quad * 1 \quad H_2 \quad O_2 \quad * N_2$$

And complete equation:

$$* C \quad 2 * 1 \quad H_2 \quad O_2 \quad * N_2$$

$$n_1 CO_2 \quad n_2 H_2O \quad n_3 CO \quad n_4 H_2 \quad n_5 O_2 \quad n_6 N_2$$

Per mole of O_2, molecular weight of the fuel, M depends on the number of moles of fuel , in the mixture . If the average molecular formula of the fuel is $(CH_y)_{\acute{\alpha}}$, then

M = ά (12+y)

Fresh fuel-air mixture then becomes:

Now,

$$C_{pu} \quad x_i C_{pi}$$

x is mole fraction of species

4.1.2 For burned zone

For burned gases, the combustion equation:

$$X_{12} C_n H_m O \quad n\ \frac{m}{4} \frac{1}{2} O_2\ 3.7274 N_2$$

P: $_1H\ X_2O\ X_3N\ X_4H_2\ X_5OH\ X_6CO\ X_7NO\ X_8O_2\ X_9H_2O\ X_{10}CO_2\ X_{11}N_2$

Q: -mole fraction of species

LHS of equation:

$$X_{12} \quad nC \quad mH \quad rO_2 \quad r' N_2$$

$$r \quad \frac{l}{2} \quad r_0$$

$$r' \quad 3.7274r$$

$$r'' \quad .0044r_0$$

Atom balance m of equation l gives:

$$r \quad n \quad \frac{4}{2}$$

From0 carbon balance:

$$X_6 \quad X_{10} \quad nX_{12}$$

From hydrogen balance:

$$X_1 \quad 2X_4 \quad X_5 \quad 2X_9 \quad mX_{12}$$

From oxygen balance:

$$\square \quad 2 \quad X_5 \quad X_6 \quad X_7 \quad 2X_8 \quad X_9 \quad 2X_{10} \quad 2rX_{12}$$

From nitrogen balance:

$$X_3 \quad X_7 \quad 2X_{11} \quad 2r' X_{12}$$

Also,

$$X \quad 1^{12}$$

1

$$\frac{1}{2} H_2 H \qquad K_1 \quad \frac{X_1 \sqrt{P}}{\sqrt{X_4}}$$

$$\frac{1}{2} O \quad O \qquad K_2 \quad \frac{X_2 \sqrt{P}}{\sqrt{X_8}}$$

2 2

$$\frac{1}{2} N_2 N \qquad K_3 \quad \frac{X_3 \sqrt{P}}{\sqrt{X_{11}}}$$

2

$$\frac{1}{2} H \quad \frac{1}{2} O \quad OH \qquad K_5 \quad \frac{X_5}{\sqrt{X_6}\sqrt{X_4}}$$

2 2 2 2

$$\frac{1}{2} N \quad \frac{1}{2} O \quad NO \qquad K_7 \quad \frac{X_7}{\sqrt{X_8}\sqrt{X_{11}}}$$

2 2 2

$$CO \quad \frac{1}{2} O \quad CO \qquad K_9 \quad \frac{X_9}{\sqrt{X_8}\sqrt{PX_4}}$$

III. 2 RESULTS AND 2

$$CO \quad \frac{1}{2} O_2 \quad CO_2 \qquad K_{10} \quad \frac{X_{10}}{\sqrt{X_8}\sqrt{PX_6}}$$

*A. Inputs*2

TABLE

VARIABLE	SUBSTITUTION	SYMBOL
X1	C1√Y1	C1=K1√P
X2	C2√Y3	C2=K2√P
X3	C3√Y4	C3=K3√P
X4	C4Y1	C4=1
X5	C5√Y1√Y2	C5=K5

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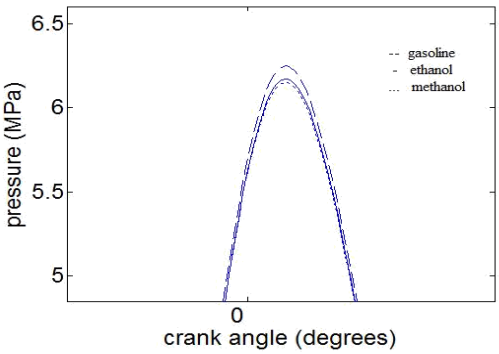
X6	C6Y2	C6=K5
X7	C7√Y3√Y4	C7=K7
X8	C8Y3	C8=1
X9	C9Y1√Y3	C9=K9√P
X10	C10Y2√Y3	C10=K10√P
X11	C11Y4	C11=1

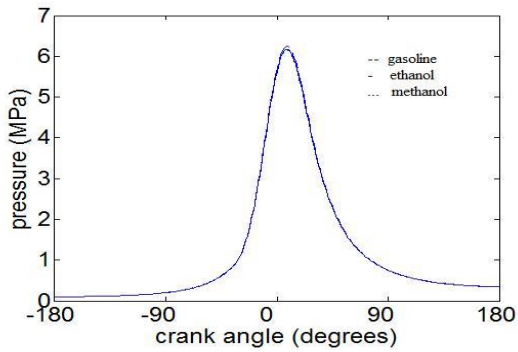
B. Output

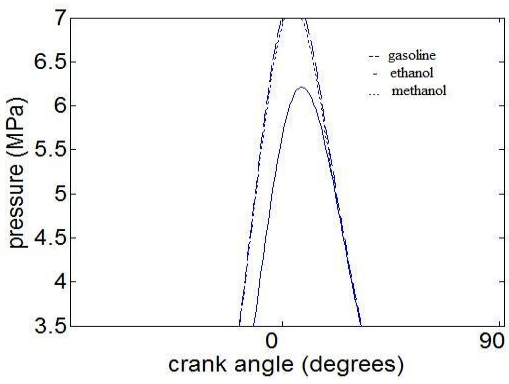
PRESSURE PLOT-I (RPM-2000, Equivalence ratio-0.8, spark advance-35)
Pressure plot and its exploded view are taken for following conditions:

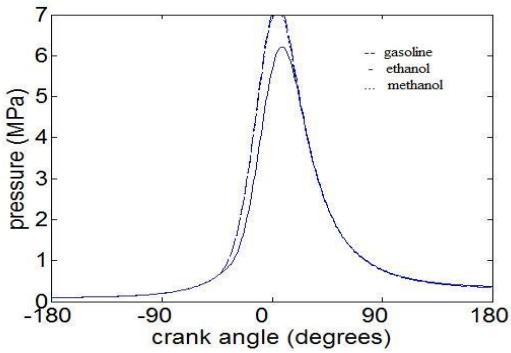
2. RPM-2000
3. Equivalence ratio-0.8
4. Spark advance- 35



PRESSURE PLOT-II (RPM-2000, Equivalence ratio-0.8, spark advance-45) Original plot and its exploded view are taken for following conditions-
RPM-2000
Equivalence ratio-0.8
Spark advance-45







CONCLUSION

6. In present work a two zone heat release model was presented which could predict performance of fuels like ethanol, methanol and gasoline. Then their comparison was done in entire domain of SI engine. Results showed that methanol and ethanol could be well used as fuels

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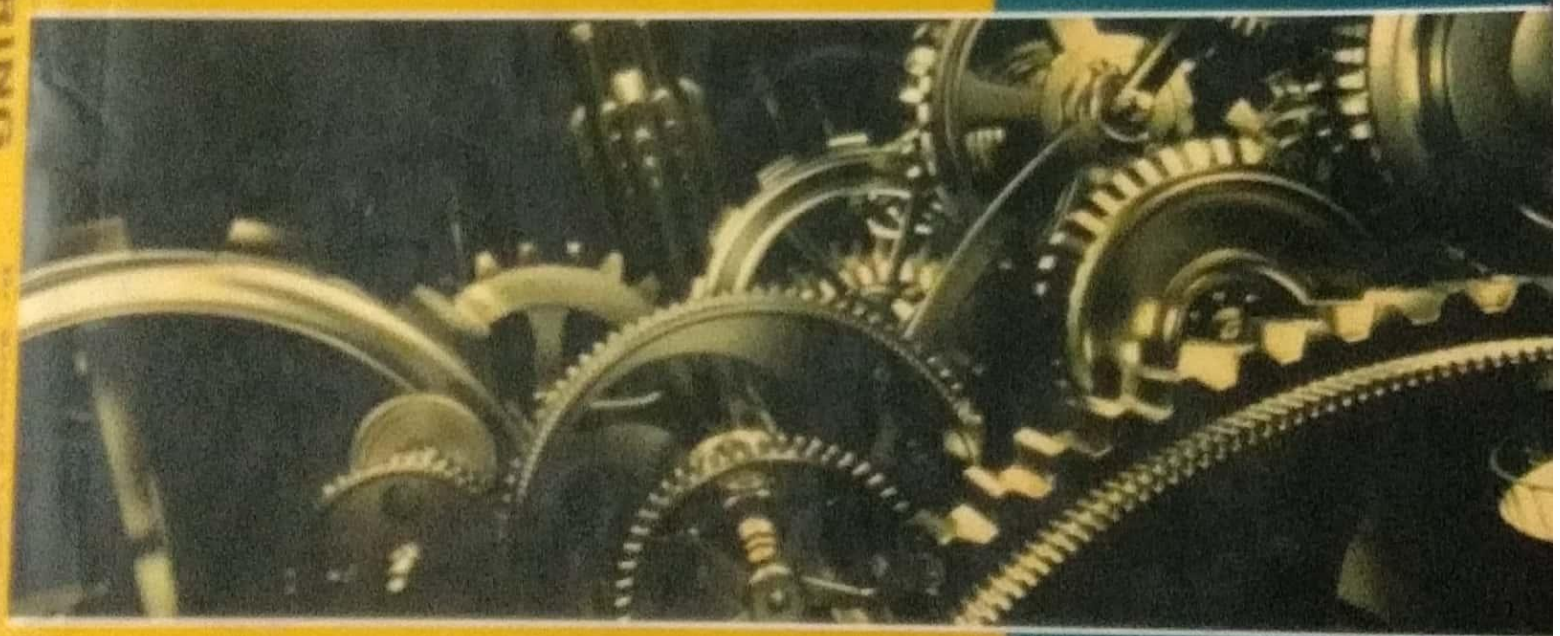
Dr. Arunesh Chandra



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Mechanical Engineering

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NEW DELHI

A review: Synthesis of aluminium based surface composites by friction stir processing

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Abstract **-** Friction Stir Processing (FSP) is an active solid state surface reformprocess used to improve the associated mechanical and physical properties including strength, ductility, fatigue, creep, formability and corrosion resistance. FSP canused to improve the surface properties of metals like aluminium, copper, brass and titanium.Aluminium alloys are widely employed in the applications demanding light weight and high strength. However all aluminium alloys exhibit poor tribological properties which restricts their applications involving as cylinder heads liners, pistons, brake rotor, sliding parts in automobile industries which need wear resistance. Thus, coating metallic substrates i.e. aluminium alloys with a ceramic or a ceramic metal matrix composite (MMC) layer is an effective solution in prolonging service life. This reviewed paper describes the different manufacturing process with reference of various process parameters' such as rotational speed, traverse speed, overlap percentage, filler material and its effects on microstructure analysis with respect of reinforcement types.

1. Introduction

Surface composites exhibit enhanced characteristics of composites on the surface while retaining properties of the base material. Friction stir processing (FSP) is one of the techniques for fabricating surface composites and modifying microstructural features. [1] The intrinsic nature of friction stir process has two basic components material flow and microstructural evolution. The progress of friction stir processing as metallurgical tool for microstructural modification and a broader manufacturing technology is connected to these. In friction stir processing super plasticity of material is important factor. Super plasticity is an ability of a material to exhibit >200 % elongation in tension. The most important microstructural features that govern the overall superplastic behaviour are:

(a) Fine grain size (<15 μm),
(b) Equiaxed grain shape,
(c) Presence of very fine second phase particles to inhibit grain growth, and
(d) Large fraction of high angle grain boundaries [2].

FSP in its simplest form consists of a non-consumable rotating tool, which is plunged into a work piece and then moved in the direction of interest. The schematic illustration of FSP is shown in **Fig. 1**. The tool serves two primary functions: (a) heating and (b) deformation ofwork-piece material. The heat is generated mainly by the friction of the rotating shoulder with the work-piece, while the rotating probe or pin stirs the heated material. The heated material softens and flows around the rotating pin. It then fills the cavity at the rear of the tool **[2]**. The material that flows around the tool is subjected to severe plastic deformation and thermal exposure, which leads to a significant refinement of microstructure in the processed zone. Stir zone **(**SZ) refers to the zone stirred by the tool probe **[3]**. The dynamic recrystallization (DRX) is the main mechanism for the generation of a fine and equiaxed grains in the SZ. However, in high stacking fault energy materials such as aluminum and its alloys, the dynamic recovery precedes DRX **[4]**.

Initially, FSP was employed for microstructural refinement of aluminum and magnesium alloys. FSP development has further led to the successful processing of alloys of copper [5], titanium **[6]** and steel **[7]**. FSP has also exhibited its

efficiency inhomogenizing powder metallurgy processed aluminum alloys **[8]**, microstructural modification of metal matrix composites **[9]**. FSP effectively eliminates casting defects, breaks up or dissolves second phase particles and lead to the considerable improvement in properties**.[10]**.

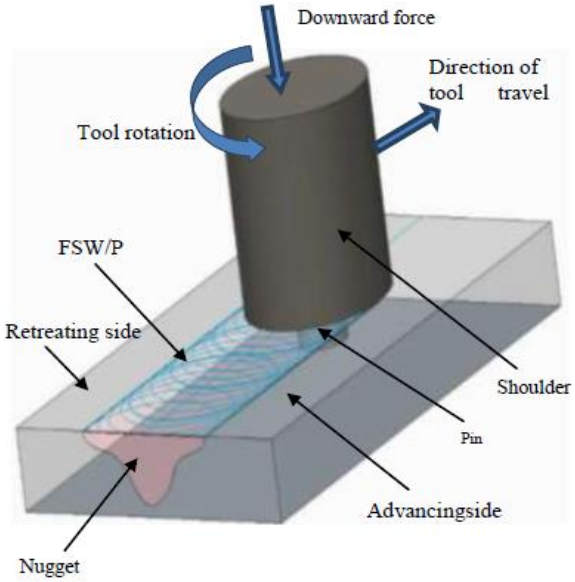

Fig.1: A schematic drawing of friction stir welding/processing [12]

In the last decade, **[11]** explored the potential of FSP technique in fabricating silicon carbide (SiC) reinforced surface composite layer on aluminum (Al) 5083 alloy. Sincethen, a variety of surface composites based on magnesium, copper, titanium and steel have been developed. However, comprehensive coverage of surface composites prepared by FSP is very limited. The present review paper is focused on nano, in-situ and hybrid surface composites fabricated by FSP. In this review, recent developments of FSP in fabricating surface composites are discussed. This is followed by discussion on the effect of process parameters of FSP such as tool rotational speed, tool traverse speed; number of FSP passes, FSP cooling, and tool geometry on microstructure and resultant mechanical properties. The challenges and future direction of FSP are summarized.

2. Literature Review:

2.1 Effect of process variables

These fall into three categories of machine variables, tool design variables and material properties (**Fig. 2**). The mechanical properties of base materials are decisive in selecting process variables. High heat input is required for high melting point materials like steel, titanium alloys, copper alloys etc. **[12]** stated that yield strength (YS), ductility and hardness of base material are important mechanical properties that control plastic deformation during FSW. In aluminium alloys with different mechanical properties, it was found that the material with lower YS, lower hardness and higher ductility can be processed easier than those with higher YS, higher hardness and lower ductility.

2.2 Major Machinevariables are tool rotating rate and tool traverse speed. Tool rotational and transverse speeds determine amount of heat generated in the work piece. Tool tilt angle and penetration depth also effect the formation of SZ, but generally these are kept constant. Interaction of rotating tool with work-piece generates heat due to friction and plastic deformation. The heat input in SZ influences material flow and microstructure evolution which directly affects mechanical and tribological properties. Tool rotational speed and traverse speed determine amount of heat input in the processed zone. The maximum temperature observed for various aluminum alloys has been reported to be in a range of 0.6-0.9 Tm. Sufficient amount of heat generation in SZ is necessary for the formation of defect-free processing zone.

Similarly, in FSP of other alloys like magnesium, copper and titanium alloys heat generation in the processed zone is dependent on rotational and traverse speeds.

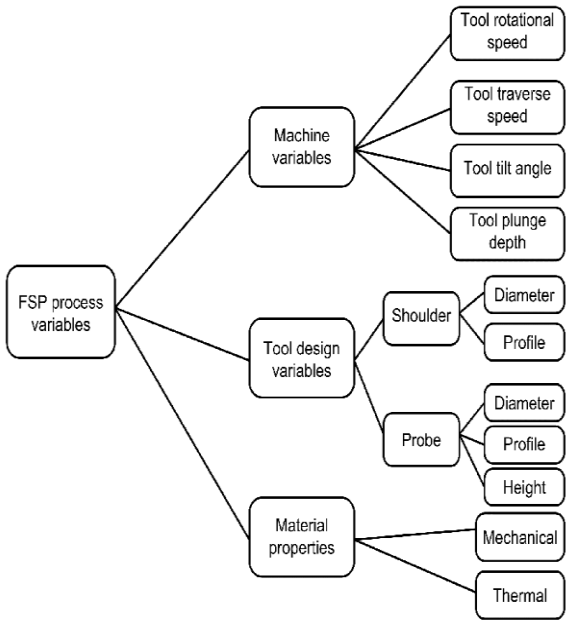

Fig 2: Classification of FSP process variables [5]

2.3 Effect of tool speeds:

Rotational speed and traverse speed (ω and ν) determine the amount of heat input in the SZ, which in turn affects the microstructure and resultant properties. Lower the heat input, more is the grain refinement and vice-versa, but there must be sufficient heat input to plasticize or soften the material **[12]**. In surface composite fabrication, higher rotational speed is required for distribution and breaking up of clusters of reinforcement particles. However, high rotational speed affects grain refinement due to high heat input **[13]**. Thus, rotational and traverse speed must be optimized to achieve a defect-free SZ and reduced grain size.

2.4 Tool material:

Selection of FSW and FSP tool material is a vital task which determines the quality of the weld formed. The tool material selection depends on the operational characteristics like operational temperature and axial force [13]. Soft materials are welded easily using tool steels while harder materials need harder tool material for instance carbide based material and polycrystalline cubic boron nitride (PCBN). In the FSW of aluminium alloys, as aluminium is soft material, the wear of the tool is not as much. Hence, tool materials such as tool steels can be used. But, in the FSW of high melting point materials (steel, titanium) and two phase materials, such as metal matrix composites (MMCs), tool wear is a serious issue. Therefore tool material selection is considered to be one of the important tasks in FSW of steel, titanium and composites.

2.5 Tool geometry:

There are basic three types of FSW and FSP tools which are fixed, adjustable and self-reacting. The fixed probe tool consists of a single piece comprising both the shoulder and probe. This tool can only weld a work piece with a constant thickness due to the fixed probe length [8]. The adjustable tool consists of two independent pieces, i.e. separate shoulder and probe, to permit adjustment of the probe length during FSW. In this tool design, the shoulder and probe can be manufactured using different materials and the probe can be simply replaced when worn or damaged. Flexible probe length can permitWelding of variable and multiple gauge thickness work pieces, and implementation of strategies for filling the exit hole, left at the end of the friction stir weld [11, 12]. The bobbin or self-reacting type tool is made up of three pieces: top shoulder, probe and bottom shoulder. This tool can weld multiple gauge thickness joints due to the variable probe length between the top and bottom Shoulders [13-16].

2.6 Shoulder Shapes:

Tool shoulders are basically designed to generate frictional heat in the surface regions of work piece and also produce the downward forging action which is essential to constrain the heated metal under the bottom shoulder surface. Three types of shoulder end surfaces are typically used, like flat shoulder, concave shoulder and convex shoulder. Of these, the flat shoulder end surface is the simplest design. The major disadvantage of this design is that the flat shoulder end surface is not effective for trapping the flowing metal material under the bottom shoulder [14].A concave shoulder end surface (6o-10μm) has become popular for restricting material extrusion coming out from the sides of the shoulder [15]. Convex shoulder is another type of shoulder shape. The main advantage of the convex shoulder profile is that it can achieve contact with the work piece at any location along the convex end surface, and hence,

accommodate the differences in flatness or thickness between the two adjacent work pieces. Its major disadvantage is the inability of the smooth end surface to avoid material displacement away from probe causes weld integrity issues [16].

The shoulder end surfaces can also include some features to increase material friction, shear and deformation for increased work piece mixing and higher weld quality [17, 18]. The typical shoulder end styles include knurling, flat scrolls, ridges, grooves and concentric circles, as revealed in Fig 3. These features can be applied to concave, flat or convex shoulder ends. Most used end feature is scrolls [13,19].

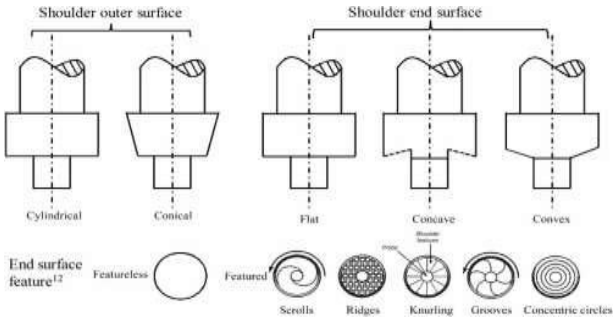

Fig 3: Shoulder Shapes and Features [17]

2.7 Probe shape:

The friction stirring probe is able to produce deformational and frictional heating. Ideally, it is designed to disruptthe contacting surfaces of the work-piece, shear the material in front of the tool and also move the material in the rear of the tool. The tool travel speed and depth of deformation are mainly governed by the probe. Fig. 4 shows the probe shapes and their main features. The end shape of the probe is either flat or it is domed. The major disadvantage ofthe flat probe is the high forge force during plunging. In contrast, a round or domed end shape can decrease the forge force and tool wear upon plunging, increase tool life by eliminating local stress concentration [18, 19].The FSW and FSP probes usually have a cylindrical outer surface but a tapered outer shape can also be used. In particular, cylindrical probes have been commonly used for joining plates. With the tapered probe, the higher frictional heat increases the plastic deformation due to the larger contact area of the probe with the work-piece. The probe outer surfaces can have various shapes and features including threads, flats or flutes. Thread less probes arechosen for highly abrasive alloys or high strength as the threaded features can be simply worn away [20]. Both Whorl and MXTriflute probes tools can weld at very high speeds, while achieving integral welds with good surface quality [21].

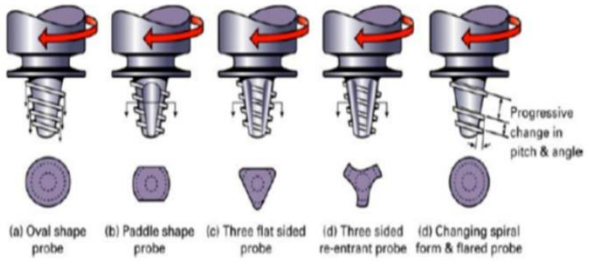

Fig 4: Probe Shapes[5]

Summary and future directions:

FSP is a versatile technique for fabricating surface composites. The grain refinement achieved by FSP and the solid state nature of processing are the unique advantages of thisprocess. Nano-crystalline grains have been reported in several surface composites fabricated by FSP. The surface composites exhibit high hardness as well as increased wear and corrosion resistance. FSP is a relatively new technique for fabrication of surface nano-composites and offers ease of particle dispersion. A number of reinforcements including ceramic and metallic particles and carbon nano-tubes have been successfully incorporated in metallic matrix by FSP. Elimination of clustering of nano-particles can be achieved. Surface nano-composites fabricated by FSP are defect free without voids and have a homogeneous particle distribution. In fabricating in-situ composites, FSP route is advantageous due to rapid removal of reaction products from interface which enhances further reaction. Moreover, the in-situ formed particles are in nano-meter regime. Hybrid composites comprising a hard and a soft reinforcement have been successfully produced with promising properties. To harnessthe full potential of nano-composites various methodologies to achieve uniform distributionhave been used in FSP. Initial studies pertaining to coating pointed out that application and stability of coating can be significantly improved by FSP. Micro alloying with low melting point metals like tin, lead etc. can be incorporated in the surface composite. FSP of polymers and polymeric composites was initiated

recently and the initial results are encouraging, but further investigation is required due to low melting point and polymeric chain structure arrangement. The tool wear is important issue in FSP especially in preparing high temperature melting point materials such as steel, titanium or ceramic particle reinforced composites. Tools of polycrystalline cubic boron nitride, tungsten based alloys etc. are recommended for FSP of hard materials. However, the high cost and low facture toughness of these tools limits their usage. These limitations restrict the use of FSP technique to prepare hard surface composites. Most of the surface composites fabricated so far is of aluminum based. Surface composites of harder alloys still await the development of cost effective and durable tools.

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An Assessment on Application Of Business Process Re Engineering In Gear Manufacturing Unit

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Abstract- *In the new world that is fact that is fast changing with rapid advances made in science and technology and shrinking borders, the academicians have to the discard the old theories of management and rewrite the rule all over again. Profit maximization and total quality management have been replace with new theories involving business process improvement, competitive collaboration and building profit streams on long term basic based on brand and business expansion. Business process reengineering and improvements change the way that the organization look at their man power, thus organizations have begun to train, groom and empower their employees along with the organization bringing together and marrying their individual goals with the organization goals. Business process reengineering is also known as business process redesign, business transformation or business process change management. By the use of bpr to reduce the bulked of returned materials in the manufacturing unit.BPR is different from other approaches to organization development (od), especially the continuous improvement or tqm movement by virtue of its aim for fundamental and radical change rather than iterative improvement. In order to dramatically improve customer service, cut operational costs, and become world class competitors BPR has been recommended.*

KEYWORDS: Business process reengineering, Organization development, Business process improvements

1. INTRODUCTION

Business process re-engineering (BPR) is a business management strategy, originally pioneered in early 1990s, focusing on the analysis and design of workflows and business process within an organization fundamentally rethink how they do their work in order to dramatically improve customer service, cut operational costs, and become world class competitors.BPR seeks to help companies radically restructure their organizations by focusing on ground-up design of their business processes..According to davenport (1990) a business process is a set of logically related tasks performed to achieve a defined business outcome , reengineering emphasized a holistic focus on business objectives and how processes related to them, encouraging full scale recreation of process rather than iterative optimization of sub processes.

Business Process Reengineering (Steps)-

How BPR applied to an organization -

- Who are customers?
- What values are we offering them?
- Is the current process delivering expected values?
- Does the process need to be redefined or redesigned?
- Are the processes in sync with our long term mission and goals?
- How would be we handle the existing process?

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Any Business Process can be characterized into three major elements

- Inputs (such as customer enquiries or customer inputs)
- Processing of the data (which usually go through several stages and may necessary steps that turn out to be time and money consuming)
- The outcome (the delivery results as expected by company (industry)).

Types of firms

BPR could be implemented to all firms (banks, manufacturing firms, retailers, BPO's etc) and public organizations that satisfy the following criteria

- minimum number of employees 20
- Management commitment to grow its company and finding new way of working and break free from its traditional style of work.

Business Process Reengineering could be applied to companies that confront problems

- High operational costs
- Low quality offered to customers
- Poor performance / mediocre performances from its employees.
- Inappropriate distribution of resources and jobs in order to achieve maximum performance.

Business process reengineering (BPR) is the practice of rethinking and redesigning the way work is done to better support an organization's mission and reduce costs. Reengineering starts with a high level assessment of the organization's mission, strategic goals and customer needs.

Such as "Does our mission need to be redefined?"

Are our strategic goals aligned with our mission?

Who are our customers?

As a structured ordering of work steps across times and place, a business process can be decomposed into specific activities, measured, modelled and improved.

Reengineering maintains that optimizing the performance of sub processes can result in some benefits, but can't yield dramatic improvements if the process itself is fundamentally inefficient and outmoded.

For that reason, reengineering focuses on redesigning the processes as a whole in order to achieve the greatest possible benefits to the organization and their customers. This drive for realizing dramatic improvements by fundamentally rethinking how the organization's work should be done distinguishes the reengineering from process improvement efforts that focus on functional or incremental improvement.

"The fundamental rethinking and radical redesign of business process to achieve dramatic improvements in critical contemporary modern measures of performances, such as cost, quality, service and speed".

A key stimulus for reengineering has been the continuing development and deployment of sophisticated information systems and networks. Leading organizations are becoming bolder in using this technology to support innovative business process rather than refining current ways of doing work.

COMPANY PROFILE-

Punjab Bevel Gears Ltd. Started operation in 1979.PBGL manufactures more than 2000 different type of gears. PBGL is the leading manufacturer, supplier and exporter of automotive and tractor parts.

PBGL competitiveness lies in the fact that we are

- Cost Competitive
- Quality Conscious
- Having track record of on time delivery

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- Having capability to develop new products in a comparatively shorter period

PBGL plants at Sahibabad and Sitarganj are ISO/TS 16949:2009 certified

PBGL forging plant at Ludhiana is ISO 9001:2008 certified

PBGL differential gear plant is ISO 9001, ISO 14000 & ISO 18000 certified

Best supplier award for new product development by TAFE in 2010

Best supplier award for consistent delivery performance through pull system-KANBAN by TAFE in 2013

There are 4 manufacturing unit.

PRODUCTS OF PBGL

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DATA ANALYSIS TABLE

S.NO.	ITEM	COMPLAINT	COUNTER MEASURE	IMPROVEMENT	PROCESS
1.	High/low speed Gear	DOP/MOT/ tooth width under/over size	Setting not done properly	Adjust mechanical/limit stopper	Gear Cutting
2	Constant mesh gear	PCD run out	Cutter out, fixture out , centre out	Redialing and true with in 10 microns	Gear Cutting
3	Pinion 3rd and reverse gear	Full depth/under/over size	Setting not done properly	Adjust slide and limit stopper	Gear Cutting
4	Sun rear gear axle shaft	Cutting/pitting marks	Cutter teeth broken	Slow the feed/cutter change	Gear Cutting
5	Shifting gear	Lead out	Setting not done properly	Redialing the cutter and true with in 10 microns adjust the cutter angle, realign the job	Gear Cutting
6	Hydraulic pump idle gear	Keyway upset	Setting not done properly	Align the job centre to centre	Gear Cutting
7	Intermediate gear	Surface hardness low	Charge tempered at high temperature in tempering furnace	Reprocessing the charge at modified process cycle	Heat Treatment
8	Gear forth counter shaft	Surface hardness high	Tempered at low temp in tempering furnace	Charge retempered in suitable temp soaking time	Heat Treatment
9	Clutch body	Core hardness low	Raw material not ok	Reprocessing the charge at modified process cycle	Heat Treatment
10	Drive shaft	Effective case depth	Carburizing time less	Reprocessing the charge at modified process cycle	Heat Treatment
11	Main shaft	Core hardness high	High hardening temp	May be corrected to some extent by hardening form low hardening temp	Heat Treatment
12	Gear main shaft low speed	Effective case depth high	Carburizing time less	NO remedies is possible inform to GM metallurgy	Heat treatment
13	Hub ground P.T.O.	Decarburization	Due to less content of carbon	Proper knowledge of increasing the carbon content should be given to intake	Hear Treatment
14	Helical gear	Poor surface finish or cracks	More wheel dressing frequency	To do less wheel dressing frequency	Grinding
15	Steel plate output flange	Cracks	Due to excessive cold working	By follow proper cooling process	Forging

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RESULTS AND CONCLUSION –

In today globe's economy it seems like many people find that the BPR is inevitable it have become an integral part of business to ensure that they get to learn and change based on different business needs in their environment, here are the top applications for using business process reengineering plan. The BPR aims at involving workers to work effectively in providing their services to business with reliance on internet and other business automation process. The BPR plan has the objectives of making sure that the business can now improve its production time.If the company taking a whole day to finish a product, the time should now be reduced to half a day or less. The company can now produce more products in less time .Taking the complaints into consideration and giving the remedy for the returned product for the particular process so that the customer will not repeat the same complaint for the particular process again and again. For example if we sell 100 tractors within six month if we receive the returned tractors about 10 to 12 due to manufacturing problem or due to customer dissatisfaction. The complaints are taken into consideration and for that complaint improvement is given. In now days many people do not love the idea of manual record keeping .It just likes a lot of time in terms of storing and retrieving it. The BPR plan aims at reducing all these burdens in business. If the burdens of record keeping is eliminated the workers can use the extra time on other work related objective.

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Analyses of Milling Process of an Aluminum Bar Using Response Surface Methodology

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ABSTRACT-Milling is a machining operation in which a work-part is fed past a rotating cylindrical tool with multiple cutting edges (in rare cases, a tool with one cutting edge, called a fly-cutter, is used). The axis of rotation of the cutting tool is perpendicular to the direction of feed. This orientation between the tool axis and the Feed direction is one of the features that distinguish milling from drilling. Important Factors in Determining Spindle SpeedType of work-piece material Cutting tool material Diameter of cutter Surface finish required Depth of cut taken Rigidity of machine and work setup. RSM is one of the most important tools in developing new processes and optimizing their performance. This procedure utilizes data gathered from process through statistically design of experiments method. Optimization provides a number of solutions which can be further judge for the best one depending upon the available resources and present constraints over the process system. Thus, employment of this optimization procedure over the manufacturing systems is simple and economically viable. In addition, the proposed procedure can be implemented easily by using ready-made standard statistical packages.

INTRODUCTION

Milling is a machining operation in which a work-part is fed past a rotating cylindrical tool with multiple cutting edges (in rare cases, a tool with one cutting edge, called a fly-cutter, is used). The axis of rotation of the cutting tool is perpendicular to the direction of feed. 'There are two basic types of milling operations (a) Peripheral milling and (b) Face milling. Yazdi et al. [1] describe the selection of optimal machining parameters (i.e., spindle speed, depth of cut and feed rate) for face milling operations was investigated in order to minimize the surface roughness and to maximize the material removal rate. Joshi et al. [2] carried CNC end milling is a unique adaption of the conventional milling process which uses an end mill tool for the machining process. Shah et al. [3] carried out an experiment for optimization of Cutting Tool Life on CNC Milling Machine through Design of Experiments. Hllmann [4] explain high-speed machining processes are of growing industrial interest, because this not only allow for larger material removal rates. Surasit et al. [5] describe shape the Aluminium alloys, milling is one of the most commonly used machining processes. Wang et al. [6] explain different parameter for Surface integrity of high speed milling of Al/SiC/65p Aluminium matrix composites. Kakati et al. [7] tested work an experimental investigation of end milling of Aluminium alloy with carbide tool is carried out and the effect of different cutting parameters on the response is studied with three dimensional surface plots. Ramanujam et al. [8] described a new methodology for the optimization of the machining parameters on turning Al-15%SiCp metal matrix composites. Mustafa & Ali [9] tested the effect of cutting parameters and work piece length on the geometric tolerances and surface roughness in turning operation. Narayana B. et al. [10] investigated to optimize machinability of commercial Al – 7050 (Aluminium) and also to obtain optimum process by using Taguchi's Method . Alauddin et al. [11] developed the mathematical model of surface roughness for the end milling of 190 BHN steel considering only the centre line average roughness parameter using response surface method. Ertekin et al. [12] considered three different materials, viz., 6061 Al, 7075 Al and ANSI 4140 steel, for roughness study in CNC milling. Yuvaraj P, et al. [13] were carried out experiments in turning gray cast iron to find a specific range and combinations of turning parameters like cutting speed ,feed rate and depth of cut . Moaz H. Ali et al. [14] work on lightweight, corrosion resistant and high-temperature Titanium alloy (Ti-6Al-4V materials to predict machining cutting parameters. Korkut et al. [15] studied the influence of feed rate and cutting speed on cutting forces, surface roughness and tool–chip contact length during face milling were investigated. M. Naga Phani Sastry et al. [16] investigated turning process by Response Surface Methodology on Aluminium alloy and resin with HSS cutting tool. Ghan et al. [17] studied the variations in input process parameters such as speed, feed and depth of cut affects seriously the surface roughness, material removal rate and machining time

of the Aluminium LM-26 alloy by ANOVA method Tomac et al. [18] developed a tool life relationship for carbide tool during the machining of SiC/Al composite at speeds lower than 100 m/min. Lu et al. [19] studied the optimization of cutting parameters for side milling of medium carbon steel with multiple roughness characteristics, viz., feeding direction roughness, axial direction roughness and waviness, using Taguchi approach. K et al. [20] studied the factors affecting surface roughness in the aluminum 7075-T6 face milling process by using completely randomized factorial designs with 5 repeated treatments for reducing the variation of sampling. Prajapati et al. [21] studied the influence of the process parameters like speed, feed, and depth of cut are different for different responses and found the error between experimental and predicted result was 8.69% and 8.49% in turning and facing process respectively. Rawangwong et al. [22] investigated the effect of main factors of the surface roughness in aluminum 7075-T6 face milling. Gopalakrishnan et al. [23] described the design and development of an analytical tool for the selection of machine parameters in turning. Prasad et al. [24] reported the development of an optimization module for determining process parameters for turning operations as part of a PC-based generative CAPP system. Gilbert et al. [25] studied the optimization of machining parameters in turning with respect to maximum production rate and minimum production cost as criteria. Armarego et al. [26] investigated unconstrained machine-parameter optimization using differential calculus. Brewer et al. [27] carried out simplified optimum analysis for non-ferrous materials. Bhattacharya et al. [28] optimized the unit cost for turning, subject to the constraints of surface roughness and cutting power by the use of Lagrange's method. Petropoulos et al. [29] observed that a constrained unit cost problem in turning was optimized by machining SAE1045 steel with a cemented carbide tool of ISO P-10 grade. Walvekar et al. [30] discussed the use of geometric programming to selection of machining variables by optimizing the cutting speed and feed rate to yield minimum production cost. Sundaram et al. [31] applied a goal-programming technique in metal cutting for selecting levels of machining parameters in a fine turning operation on AISI 4140 steel using cemented tungsten carbide tools. Hinduja et al. [32] described a procedure to calculate the optimum cutting conditions for turning operations with minimum cost or maximum production rate as the objective function. Agapiou et al. [33] formulated single-pass and multi-pass machining operations. Production cost and total time were taken as objectives and a weighting factor was assigned to prioritize the two objectives in the objective function.

RESPONSE SURFACE METHODOLOGY (RSM):

RSM is a collection of mathematical and statistical techniques that are useful for modeling and analysis in applications where a response of interest is influenced by several variables and the objective is to optimize the response.[6-8] Wilson as having proposed response surface methodology for the optimization of experiments. In many experimental situations, it is possible to represent independent factors in quantitative form. Then these factors can be thought of as having a functional relationship or response: $Y = \varphi(X_1, X_2, \ldots, X_k) \pm e_r$, between the response Y and $X_1, X_2, \ldots X_k$ of k quantitative factors. [9-12]The function φ is called response surface or response function. The residual e_r measures the experimental error. For a given set of independent variables, a characteristic surface responds. When the mathematical form of φ is not known, it can be approximated satisfactorily within the experimental region by a polynomial. The higher the degree of the polynomial the better is the correlation, though at the same time the costs of experimentation become higher [13-22].

In statistics, response surface methodology (RSM) explores the relationships between several explanatory variables and one or more response variables. Since there are a large number of variables controlling the process, some mathematical models are required to represent the process. However these models are to be developed using only the significant parameters influencing the process rather than including all he parameters. In order to achieve this, statistical analysis of the experimental results will have to be processed using the analysis of variance (ANOVA).[23-30] ANOVA is a computational technique that enables the estimation of the relative contributions of each of the control factors to the overall measured response. In the present work, only the significant parameters are used to develop mathematical models using response surface methodology (RSM).[30-32] These models are of great use during the optimization of the process variables. RSM methodology is practical, economical and relatively easy for use. The experimental results are used to build first-order and second order models by the multiple regression methods. The purpose of developing the mathematical models is to understand the combined effect of involved parameters and to facilitate the optimization of the machining process.[33-35] Response surface methodology or RSM is a collection of mathematical and statistical techniques that are useful for the modeling and

analysis of problems in which response of interest is influenced by several variables and the objective is to optimize the response.[36-42] Work-piece material used was 6061-T6 Aluminum. Aluminium alloys in the 6xxx series (6061, 6063) contain silicon and magnesium approximately in the proportions required for formation of magnesium silicide (Mg2Si), thus making them heat treatable. 6xxx series aluminium alloys have good formability, weldability, machinability, and relatively good corrosion resistance, with medium strength. Aluminium grades in this heat-treatable group may be formed in the T4 temper (solution heat treated but not precipitation heat treated) and strengthened after forming to full T6 properties by precipitation heat treatment. Tool: Φ 60 mm four-flute face-milling cutter with grade 1C28M40 inserts.

Constraints: The restrictions that must be satisfied to produce an acceptable design are collectively called design constraints. Constraints represent the limitations on the behavior or performance of the system is termed behavior or functional constraints.

The constraints or process parameters selected for the present work are:

Spindle speed – (A); **Feed** – (B); **Depth of cut** – (C)

Graph:

Following graphs are depicted by the software:

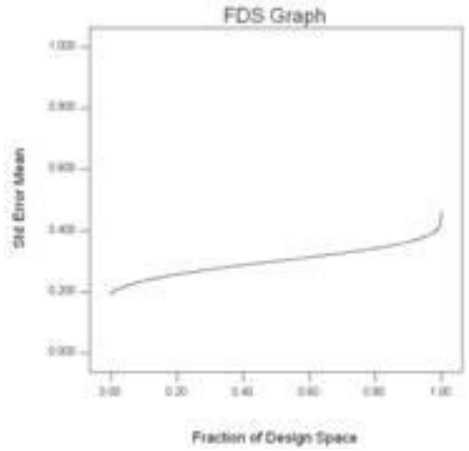

Fig: 1 FDS graph

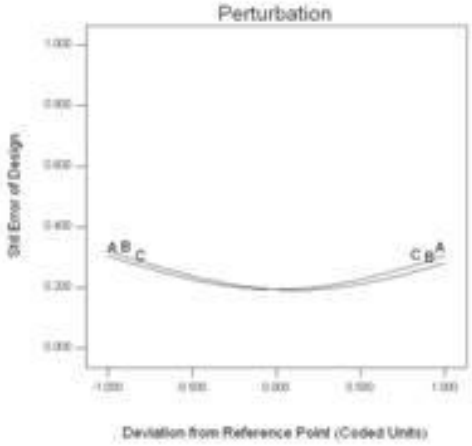

Fig: 2 Perturbation graph

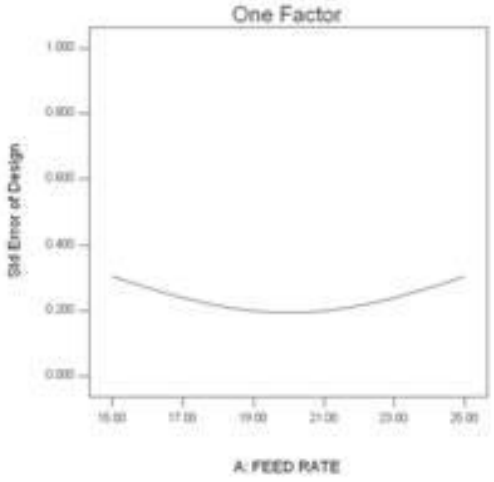

Fig: 3 One factor grap

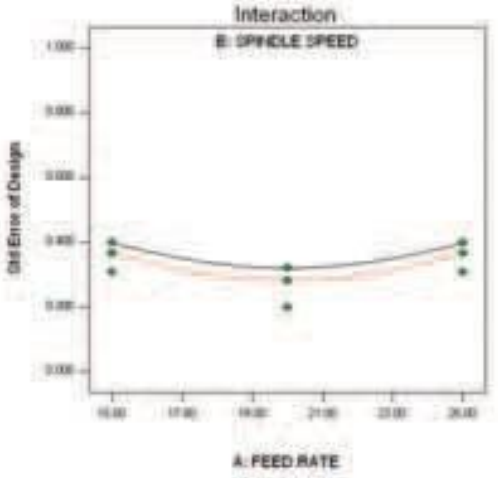

Fig: 4 Interaction graph

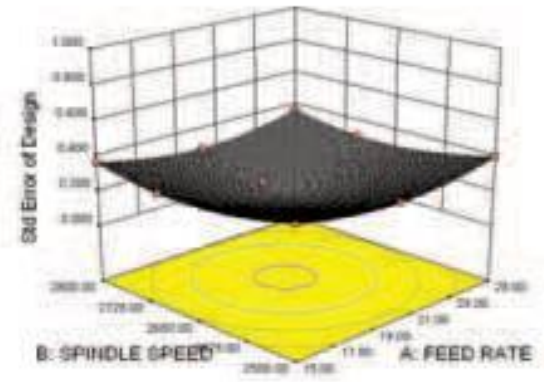

Fig: 5 Contour graph

RESULTS AND DISCUSSION

Based on the conducted experiments and accomplished analysis, the following conclusions can be made:

Effect of Spindle Speed - First it is increased from 2500 RPM to 2700 RPM and then 2800 RPM. Due to increase in Spindle the MRR is increased

Effect of Depth of Cut - With increase in depth of cut from 0.5mm to 0.75mm and finally 1mm by the MRR is increased.

Effect of Feed Rate (f) - With increase in feed rate from 15 mm/min to 20 mm/min and then 25 mm/min the MRR is increased.

CONCLUSIONS AND SCOPE FOR THE FUTURE WORK

The Material removal rate is affected by all the process parameters viz. spindle speed, depth of cut and feed rate.The MRR is increased by increasing any of the process parameters.RSM technique has the advantage of investigating the influence of each machining variable on the values of technological parameters. Model Adequacy checking ensures that predicted model is adequate. The maximum value of MRR is 0.0127632 gm/sec .The Optimum value of input factors for maximum MRR are:Feed Rate - 25 mm/min Spindle Speed - 2800 RPM Depth of Cut - 1 mm.The predicted equation for MRR is as follows:METAL REMOVAL RATE +0.017306 + (8.90733E-005) * FEED RATE +(6.76094E-006) * SPINDLE SPEED + (5.21369E-003) * DEPTH OF CUT. Response Surface Methodology is a very efficient tool to provide a good practical insight into developing new process and optimizing and could help engineers to raise a mathematical model to represent the behaviour of system as a convincing function of process parameters.

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Title : ANALYSES OF TEMPERATURE AND THERMAL STRESSES OF A CERAMIC-COATED DIESEL ENGINE VALVE

Dr.M.Kantha Babu
Organizing Secretary

Dr.S.Gowri
Chairman