An Experimental Studies on the Polymer Hybrid Composites—Effect of Fibers on Characterization

M. Ashok Kumar, K. Mallikarjuna, P. V. Sanjeev Kumar and P. Hari Sankar

Abstract The present research focused on the polymer hybrid composite fabrication and its characterization. Kevlar fibers (also called Aramid fibers, KF) are mixed with Sansevieria trifasciata fiber (snake plant leaf fibers, STF) to improve the performance of the epoxy matrix. Former fiber is synthetic fiber and the later is natural fibers are combined proportionately by the rule of mixtures KF and STF treated fiber systems. Wet-hand layup was used to organize systems with weight ratios of KF/STF for treated, viz. 1:0; 0.5:0.5; 0.75:0.25; 0.25:0.75; 0:1 (typically named as A, B, C, D, and E systems from the left). It was found that tensile strength for system-D (treated) was found improvement due to the fact that dust-free, rough, and improved surface area. Impact strength was found significant for the system-D when compared with others. The interface and voids at the fracture surface were improved for the systems C and D which were observed from the SEM images. Chemical resistance found good all the samples except carbon tetrachloride due to the hit of carbon atoms which consequently imparted erosion of the fiber out of the matrix.

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Characterization of Mechanical Behavior of New Hybrid Fiber Reinforced Composite Sheets

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Abstract— **The aim of this research work is to perform an experimental analysis of mechanical behavior of new hybrid fiber composite sheets. In this article, sisal and bagasse fibres have been reinforced into epoxy resin in different fibre ratios keeping the composite resin and fibre ratio constant i.e. 60:40. In order to achieve the objectives, five different composites were prepared by reinforcing sisal and bagasse fibres in varying weight compositions in the composite. After preparation of samples different test were performed for testing of their mechanical performance (i.e. Tensile test, Impact test, Rockwell Hardness, Flexural test test) and water absorbing capacity of the fibres. The influence of alkali treatment (with 5 wt. % NaOH solution for 10 Hrs.) on mechanical properties of sisal and bagasse reinforced hybrid composites was also investigated.**

After detailed analysis of results obtained it was concluded that as the amount of sisal fibre increased in the sisal/bagasse hybrid composite increased its tensile strength, tensile modulus and hardness increased and upon introduction of bagasse fibre its flexural strength, flexural modulus and water absorbing capacity increased. Impact Strength is maximum for alkali treated composite having composition in the ratio of 60:20:20 and it increases by 73.17% compared to neat epoxy. Tensile and Flexural Modulus of composite (Untreated) with weight ratio as 60:20:20 increased by 18.79% and 54.89% respectively compared to neat epoxy. Tensile and Flexural Strength is maximum for neat epoxy composite and it also shows least water absorbing capacity due to absence of fibres.

Index Terms— **Sisal, Bagasse, Epoxy, Reinforcement.**

I. INTRODUCTION

A. INTRODUCTION TO COMPOSITES

A composite comprises of two major elements in which one of the elements, called as the reinforcing phase, in the shape of sheets, fibers or particles is embedded into the other element called the matrix phase. Composites normally have a fiber or particle phase that is stiffer and tough than the continuous matrix phase **[1]**. The properties of resultant material i.e. composite are better than the properties of the individual materials that make the composite.

The matrix works as a medium of load transfer between fibers whereas reinforcement provides strength and stiffness to the matrix. The matrix even protects the fibers from environmental damage during and after processing of composite. Composites are not only employed for their structural applications but also for their electrical, thermal, environmental and tribological applications.

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B. DEFINITION OF COMPOSITES

The following definition gives a encompassing view regarding composites:

Beghezan[2] defines as "Composites are the compound materials that are differentiated from alloys because their individual constituents retain their characteristics."

Van Suchetclan[3] defines composite as heterogeneous materials which consists of more than two solid phases, in close contact with each other on a microscopic scale.

Jartiz[4] said that "Composites are those multi utility material systems that provide attributes which are unobtainable from any other material. They are made physically by combining two or more than two compatible materials which are different in composition, characteristics and form".

Kelly[5] clearly stressed that composites must not only be regarded simply as a combination of two materials. Instead in broader perspective; the composite has its own separate properties.

C. COMPONENTS OF COMPOSITE

The composite material primarily comprises of two elements:

- Reinforcement
- Matrix

a) REINFORCEMENT- The reinforcement generally provides strength to the composite and appends its mechanical properties. It is generally found in fibrous or particle form and also provides stiffness to the composites. The purpose of the reinforcement in a composite is primarily of appending the mechanical properties of the neat resin system. For majority of applications, the fibers are organized into some form of sheet, identified as fabric, for proper handling. Different ways of assembling fibers into sheets and the diversity of fiber orientation helps the reinforcement to obtain different characteristics.

b) MATRIX- The matrix component generally comprises the major part of a composite. Materials in fibrous form resemble good mechanical properties and for achievement of these properties the fibres must be bonded by a matrix. Matrix can be of three material types - Polymer, metals or ceramics.

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Optimum Design of Single Line Layout with Scheduling as Restriction

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Abstract

Job shop scheduling problem (JSSP) is one of the most famous scheduling problems, most of which are categorised into Non-deterministic Polynomial (NP) hard problem. The objectives of this paper are to i) present the application of a recent developed metaheuristic called Firefly Algorithm (FA) for solving JSSP; ii) investigate the parameter setting of the proposed algorithm; and iii) compare the FA performance using various parameter settings. The computational experiment was designed and conducted using five benchmarking JSSP datasets from a classical OR-Library. The analysis of the experimental results on the FA performance comparison between with and without using optimised parameter settings was carried out. The FA with appropriate parameters setting that got from the experiment analysis produced the best-so-far schedule better than the FA without adopting parameter settings.

Keywords: Scheduling, Job shop, Metaheuristics, Firefly Algorithm, Experimental design, Parameter

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Multi stage stochastic Dynamic Programming Optimization for Queing ofsales counter in super stores

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Abstract

Research in operations management has traditionally focused on models for understanding, mostly at a strategic level, how firms should operate. Spurred by the growing availability of data and recent advances in machine learning and optimization methodologies, there has been an increasing application of data analytics to problems in operations management. In this paper, we review recent applications of data analytics to operations management, in three major areas – supply chain management, revenue management and healthcare operations – and highlight some exciting directions for the future.

1 Introduction

Historically, research in operations management has focused on models. These models, based on microeconomic theory, game theory, optimization and stochastic models, have been mostly used to generate strategic insights about how firms should operate. One of the reasons for the prevalence of this model-based approach in the past has been the relative scarcity of data, coupled with limitations in computing power.

Today, there has been a shift in research in operations management. This shift has been primarily driven by the increasing availability of data. In various domains – such as retail, healthcare and many more– richer data is becoming available that is more voluminous and more granular than ever before. At the same time, the increasing abundance of data has been accompanied by methodological advances in a number of fields. The field of machine learning, which exists at the intersection of computer science and statistics, has created methods that allow one to obtain high quality predictive models for high-dimensional data, such as L1 regularized regression (also known as LASSO regression; Tibshirani 1996) and random forests (Breiman 2001). The field of optimization has similarly advanced: numerous scientific innovations in optimization modeling, such as robust optimization (Bertsimas et al. 2011), inverse optimization (Ahuja and Orlin 2001) and improved integer optimization formulation techniques (Vielma 2015) have extended both the scope of what optimization can be applied to and the scale at which it can be applied. In both machine learning and optimization, researchers have benefited from the availability of high quality software for estimating machine learning models and for solving large-scale linear, conic and mixed-integer optimization problems.

These advances have led to the development of the burgeoning field of *data analytics* (or *analytics* for short). The field of analytics can most concisely be described as using *data* to create *models* leading to *decisions* that create *value*. In this paper, in honor of the 20th anniversary of *Manufacturing & Services Operations Management*, we highlight recent work that applies the analytics approach to problems in operations management. We divide our review along three major application areas: supply chain management (Section 2), where we cover location, omni-channel and inventory decisions; revenue management (Section 3), where we cover choice modeling and assortment optimization, pricing and promotion planning, and personalized revenue management; and healthcare (Section 4), where we cover applications at the policy, hospital and patient levels. We conclude in Section 5 with a discussion of some future directions – such as causal inference, interpretability and "small data" methods – that we believe will be increasingly important in the future of analytics in operations management.

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Solar Powered Autonomous mamal using fuzzy logic

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Abstract - *In this paper was presented a MATLAB Simulink model of the DC/DC boost converter controlled by the MPPT algorithm of the incremental conductance with the fuzzy logic controller. The model includes the following basic components: a) Photovoltaic system; b) Module that generates the variation of the solar radiation intensity and environmental temperature; c) DC/DCboost converter; d) MPPT algorithm of the incremental conductance with fuzzy logic controller. Following the analysis of the simulation results for the MATLAB Simulink model of the DC/DC boost converter controlled by the MPPT algorithm of the incremental conductance with fuzzy logic controller, it was found that the implementation of this algorithm ensures an optimal operation of the photovoltaic system for a large variation of the intensity of solar radiation and a maximum power transfer from photovoltaic panels to a resistive load.*

Key Words: fuzzy logic controller; dc/dc boost converter; MPPT algorithm

1. INTRODUCTION

The conversion of the solar energy into electricity is currently performed at high costs and low efficiency of the photovoltaic systems being used. The maximum power transfer from the solar panels made by the DC/DC boost converter to the load may be obtained through the maximum power point tracking (MPPT) algorithm. The study of the performances of DC/DC voltage converters (Buck-Boost type) with extended voltage has been presented in the paper [1], and of the bidirectional Boost converter in the paper [2]. The follow-up of the maximum power point (MPP) for a photovoltaic system in shading conditions was analyzed in the paper [3]. The implementation of the MPPT algorithm based on the methods: perturb and observe, fuzzy logic controller and adaptive neural fuzzy inference system (ANFIS) has been presented in the paper [4]. The implementation of fuzzy controllers for controlling DC/DC boost converter in the MATLAB-Simulink environment has been presented in the paper [5] for energy management produced by an autonomous Solar PV -Wind hybrid system. The implementation of the MPPT algorithm based on the incremental conductance method has been presented in paper [6] for a Cuck - type DC/DC converter. The enhancement of the performances of the photovoltaic systems has been obtained through the usage of the MPPT algorithm of the incremental conductance with fuzzy logic controller. The works [7] and [8] have presented the algorithm mentioned above for controlling a DC/DC buck converter. This article presents the implementation of the MPPT algorithm of the incremental conductance with fuzzy logic controller in MATLAB/Simulink for controlling a DC/DC boost converter.

2. DESIGN ELEMENTS OF THE DC/DC BOOST CONVERTER

The electric diagram of a voltage lifting converter supplied from a photovoltaic system is shown at Fig. 1. For designing this type of converter the following design data have been required: minimum input voltage $U_{int\_min} = 26$ V.c.c., output voltage $U_{ies} = 50$ V.c.c., intensity of the load current $I_{ies} = 8$ A, switching frequency $F_{SW} = 25000$ Hz, power $P = 400$ W, effectiveness $5 = 0{,}95$, the percentage from the output voltage for calculating the riple voltage is equal to 1. The design elements of the DC/DC Boost converter are: a) The filling factor D for the PWM control signal of the power transistor in the circuit of the voltage lifting converter is determined through the relation:

$$D = *1 - \frac{(U_{int\ min} * y)}{U_{ies}} \% \quad (1)$$

b) The output current is calculated with the relation:

$$I_{ies} = \frac{P}{U_{ies}} \quad (2)$$

c) The value of the input current I_{in} results from the relation: $P = I_{in}U_{in} = I_{ies}U_{ies}$

$$I_{in} = \frac{P}{U_{1n}} \quad (3)$$

d) The value of the input current I_{in} will be equal to the current rate in the coil. The ripple current of the inductance L will be equal to 20% of the input current.

$$\Delta I_L = 20\% * I_{in} \quad (4)$$

e) The inductance L is calculated through the relation:

OPTIMIZATION OF MACHINING PARAMETERS ON EPOXY AND GPRF FIBER REINFORCED POLYMER COMPOSITE USING FUZZY LOGIC

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Abstract— This paper presents a optimization of Machining parameters on epoxy and GPRF fiber reinforced polymer composite using fuzzy logic A **composite material** (also called a **composition material** or shortened to **composite** which is the common name) is a material made from two or more constituent materials with significantly different physical or chemical properties that, when combined, produce a material with characteristics different from the individual components. The individual components remain separate and distinct within the finished structure. The new material may be preferred for many reasons: common examples include materials which are stronger, lighter, or less expensive when compared to traditional materials. More recently, researchers have also begun to actively include sensing, actuation, computation and communication into composites,[1] which are known as Robotic Materials. As the composite materials possess great properties they are substituting various other conventional materials therefore, the research on composite materials must be developed further.

Index Terms— Fibrous Composites, Filament winding, History, Resin infusion processes.

I. INTRODUCTION

A typical composite material is a system of materials composing of two or more materials (mixed and bonded) on a macroscopic scale. For example, concrete is made up of cement, sand, stones, and water. If the composition occurs on a microscopic scale (molecular level), the new material is then called an alloy for metals or a polymer for plastics.
Generally, a composite material is composed of reinforcement (fibers, particles, flakes, and/or fillers) embedded in a matrix (polymers, metals, or ceramics). The matrix holds the reinforcement to form the desired shape while the reinforcement improves the overall mechanical properties of the matrix. When designed properly, the new combined material exhibits better strength than would each individual material.

II. HISTORY

The first uses of composites date back to the 1500s B.C. when early Egyptians and Mesopotamian settlers used a mixture of mud and straw to create strong and durable buildings. Straw continued to provide reinforcement to ancient composite products including pottery and boats.Later, in 1200 AD, the Mongols invented the first composite bow. Using a combination of wood, bone, and "animal glue," bows were pressed and wrapped with birch bark. These bows were extremely powerful and extremely accurate. Composite Mongolian bows provided Genghis Khan with military dominance, and because of the composite technology, this weapon was the most powerful weapon on earth until the invention of gunpowder. The modern era of composites did not begin until scientists developed plastics. Until then, natural resins derived from plants and animals were the only source of glues and binders.In the early 1900s, plastics such as vinyl, polystyrene, phenolic and polyester were developed. These new synthetic materials outperformed resins that were derived from nature.However, plastics alone could not provide enough strength for structural applications. Reinforcement was needed to provide the strength, and rigidity. In 1935, Owens Corning introduced the first glass fiber, fiberglass.Fiberglass, when combined with a plastic polymer creates an incredibly strong structure that is also lightweight. This is the beginning of the Fiber Reinforced Polymers (FRP) industry as we know it today.

WWII – Driving Early Composites Innovation
Many of the greatest advancements in composites were incubated by war. Just as the Mongols developed the composite bow, World War II brought the FRP industry from the laboratory into actual production. Alternative materials were needed for lightweight applications in military aircraft. Engineers soon realized other benefits of composites beyond being lightweight and strong. It was discovered that fiberglass composites were transparent to radio frequencies, and the material was soon adapted for use in sheltering electronic radar equipment (Radomes).

Adapting Composites: "Space Age" to "Everyday"
By the end of the WWII, a small niche composites industry was in full swing. With lower demand for military products, the few composites innovators were now ambitiously trying to introduce composites into other markets. Boats were an obvious fit for composites, and the first commercial boat hull was introduced in 1946.At this time Brandt Goldsworthy, often referred to as the "grandfather of composites," developed new manufacturing processes and

Experimental Investigation of Hybrid Composites using Alovera Fibre

N.Govinda Rao , G.Siva Prasad , S.Javeed

Abstract from the past few decades the world depends upon the glass fiber reinforced composites. These composite materials used in so many areas like aerospace, automotive, construction and household purposes also due to their high mechanical properties. But for these composites there are some drawbacks like high cost, high density, high weight. In addition to this it have large impact on environment while preparing these fibers and their related composites. These drawbacks have been overcome by the natural fibers. The advantages of Natural fibers over synthetic fibers are low density, less weight, biodegradable in nature, less cost, recyclable, easily available and nontoxic in nature. Many researchers show interest towards natural fibres due to its advantages. Due to less cost and ecofriendly nature the natural fibers have capability to replace the synthetic fibres. This paper discusses about the mechanical properties of composites reinforced by natural fibers and factors which influences the mechanical properties of natural fibre reinforced composites.

Index Terms: Natural fibers, Processing of fibers, Hybridization, Behavior of fibers, bonding materials

1 INTRODUCTION

Hecomposite material is a product formed by combining two different materials of different chemical and physical properties. This composites material having different and higher properties than the individual materials. Composite material consists of a matrix and a fiber that maybe a natural or synthetic. Thermoplastic polymers and thermosetting polymers are used as the matrix for composites. The thermoplastic materials used as matrix are polypropylene, polyethylene and polyvinyl chloride. The thermosetting polymers are epoxy and polyester resins. The role of matrix is that it is used to protect the fibers from environment and acts as a load transfer media between the fiber and the matrix[1]. Now fibers are hair like material which are continuous longitudinal filaments. These are similar in the form of threads. They can be spun into threads, ropes etc. They can also be mated into sheets. The fibers used for composite materials are maybe natural or synthetic fibers. Synthetic fibers used are carbon, glass and aramid etc. There are so many natural fibers used for composites. Initially the composites are prepared by using synthetic fibers mainly using glass fibers because of its cost is lower than the other synthetic fibers and it's mechanical properties. Due to the disadvantages of synthetic fibers like higher density, higher cost, non-biodegradable nature, higher consumption of energy and hazard to human health etc. But nowadays researches and industrial applications are shifted to natural fibers due to their attractive properties than the synthetic fibers. These natural fibers cheap, renewable, recyclable, biodegradable and easily Plants such as jute, hemp, pineapple, sisal, ramie, abaca, banana, kenaf, bamboo etc. are the most used natural fibers for composites.

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Due the advantages of natural fibres like renewability, low density, availability as well as price make them an alternative to synthetic fibers. The main drawback of natural fibers is moisture absorption and less adhesion to matrix. The bond between the fiber and the matrix is responsible for better mechanical properties. If the bond is strong the composite should have good mechanical properties. Surface treatment is one of the methods which improves the bond between fibre and matrix. By this treatment the impurities present on the surface should be removed and the properties of fibers and the composites is increased [1,2]. In some composites more than one fiber is used. Such composites are called hybrid composites. The mechanical properties of the composites also depend on the stacking sequence. Better stacking sequence of fibers and matrix produces better mechanical properties [3]. With increase in the fiber content up to certain limit less than the weight percentage of matrix the mechanical properties should be increased. The mechanical properties are improved by increase the fiber content in the composite[4,5]. The geometry of the fibre also influences the mechanical properties of composites. The composites reinforced with natural fibres are can't be used in outdoor applications because of moisture absorption behavior of natural fibres. The natural fibres have less mechanical properties than the synthetic fibres. Hybridization is one of the ways to increase the mechanical properties of composites reinforced with natural fibres[5,18,24,25]. One of the main disadvantages of natural fibers is moisture absorption. The capacity of moisture absorption increases with increase in natural fiber content. It can be reduced by chemical treatment with some chemicals like silane, NaOH and sometimes water also used. By the surface treatment the weight and diameter of fibers were decreased [6]. Natural fibers can be used industries also because of their mechanical properties and they are easily available. Hydrophilic nature is also one of the serious drawbacks of natural fibers and it reduces the bonding between the fiber and the matrix. Hydrophilic nature can be modified by the surface treatment of fibers [7]. Natural fibres and synthetic fibres are the two main categories of fibres. The fibres which are available naturally are called natural fibers. The fibers which are prepared artificially are called as synthetic fibers. Plant fibers are again classified as primary fibers and secondary fibers. The plants which are mainly grown for fibers such as jute, sisal, and hemp etc. are belongs to primary. In secondary the fibers are by products from the

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Design and analysis of Single slider ram for shaper machine

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ABSTRACT: This paper describes about **single side shaper machine using a scotch yoke mechanism** which can be used in industries for cutting process. A Shaper is a machine used for shaping (metal removal) operation on the work piece. A usual shaper machine operates by a principle of whitsworth quick return mechanism where materials are processed at one end and other end remains idle. But in a dual side shaper machine, materials are processed at both ends which become advantageous when compared to usual shaper. Nowadays, Industries try to achieve high production rate at a minimal amount of time, cost etc. Usage of dual side shaper machine eliminates most disadvantages faced by a single side shaper. The main advantage of dual side shaper is that it decreases time as well as production cost. Thereby it increases productivity. Another advantage is that number of moving parts is less when compared to usual machine. This model uses a single power source which can be connected to gears for increasing or decreasing the speed of cut.

KEYWORDS: Construction, Working, Detailed view, Shaper Calculations, Analysis.

I.INTRODUCTION

A **Shaper** is a type of machine tool that uses linear relative motion between the work piece and a single-point cutting tool to machine a linear tool path. Its cut is analogous to that of a lathe, except that it is linear instead of helical. The work piece mounts on a rigid, box-shaped table in front of the machine. The height of the table can be adjusted to suit the work piece, and the table can traverse sideways underneath the reciprocating tool, which is mounted on the ram. Table motion may be controlled manually, but is usually advanced by automatic feed mechanism acting on the feed screw. The ram slides back and forth above the work. At the front end of the ram is a vertical tool slide that may be adjusted to either side of the vertical plane along the stroke axis. This tool-slide holds the clapper box and tool post, from which the tool can be positioned to cut a straight, flat surface on the top of the work piece. The tool-slide permits feeding the tool downwards to deepen a cut. The tool-slide permits feeding the tool downwards to deepen a cut.When a load is placed on the input rod of the scotch yoke by an actuator, sideward thrust causes the input rod and yoke arm to bow and twist. This increases the friction on the sliding nut. At the extreme positions of travel of the sliding nut, the bowing and twisting become severe and the yoke arm tends to bind. Diagrammatic representation of tool feed direction is shown below:

Performance Analysis of DI Engne using artificial neural network

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Abstract **-** Optimization of Compression Ignition Engines through advanced artificial neural network is the modern process in mechanization and best utilization of modern technology for better economic scenarios in coming generation. This project deals with the feasibility of using artificial neural networks in combination with genetic algorithms to optimize the diesel engine settings. The engine is operated by using diesel and sunflower oil blends and the output parameters are calculated theoretically with the standard mechanical formulae and those manual experimental calculated values are used for training several neural networks with different various hidden layer [n x m] matrix combinations. The output values given by these trained networks are compared with experimental values and out of which the trained error values are taken for all networks.

Keywords : *Diesel engine, Sunflower oil, Artificial Neural Networks (ANNs), Back Propagation Algorithm, Matlab.*

I. INTRODUCTION

In this modern world of industries and technology the diesel engine plays a major role in various fields. It may be transportation (or) production e.t.c., with the increase of various applications to the diesel resources effects on the environment leading to effect like green house. Higher fuel efficiency in the diesel engine is achieved due to the high compression ratios along with relatively high oxygen concentration I the combustion chamber. However, these same factors results in high emission in diesel engine. The stringent emission norms have been an important driving force to develop the internal combustion engines more environment friendly. The main pollutants from diesel engines are Carbon Monoxide and Hydro Carbons

This recommends the intensive studies on the use of alternative fuels especially renewable ones like vegetable oils and alcohol's. The use of vegetable oils as an alternative fuel for diesel engine is not a new concept. Infact early engines were demonstrated with vegetable oil. In a developing country like India where mass transportation plays an important role, the suitability of alternate fuels for a diesel fuel engine application has to be thoroughly investigated. Vegetable oils plays a prominent role in substituting diesel, since they are renewable and are easily produced in rural areas.

The efficiency of the non optimized injection system can be compensated by hotter combustion chamber which assists (vegetable oils) spray atomization. Hence the vegetable oil operation of the conventional engines is more efficient with low emissions compared with vegetable oil operation of the conventional engines. Because of the oxygen content of the vegetable oils, CO emissions are similar to the diesel operation or even lower in some oils. The smoke and un-burned fuel emission levels depend on the fuel spray. Characteristics and hence the conventional engine configuration reduces them to a greater extent.

Ultimately the disadvantages of vegetable oils, which are the causes for poor performance and heavy smoke, can be overcome by the use of vegetable oils in the conventional engine since the gas temperatures are higher. Hence in the resent work SUNFLOWER OIL has been tested as fuel in the conventional engine.

III. ARTIFICIAL NEURAL NETWORKS

An artificial neural network (ANN), usually called neural network (NN), is a mathematical model or computational model that is inspired by the structure and/or functional aspects of biological neural networks. A neural network consists of an interconnected group of artificial neurons, and it processes information using a connectionist approach to computation. In most cases an ANN is an adaptive system that changes its structure based on external or internal information that flows through the network during the learning phase. Modern neural networks are non-linear statistical data modelling

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EXPERIMENTAL INVESTIGATION ON ROLLER BURNISHING PROCESS ON EN-8 SPECIMENS USING DESIGN OF EXPERIMENTS SERS

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Abstract – *Roller burnishing is cold working process used to improve surface structure it produces a fine surface finish by planetary rotation of hard rollers over bored or turned metal surface it compresses projection(peaks) into indentations(valleys) thus forming smooth mirror finished surface in the burnishing process at point of contact. The pressure generated by rollers exceed the yield point of material, the surface is plastically deformed by cold flowing of subsurface material the result is mirror like finish tough and hardened surface. The pressure required for roller pressure is applied and burnishing operation is performed in this research project. The burnishing process is used to analyze the effect on hardness and tensile test of mild steel material using lathe machine. The Taguchi method is used to obtain main effect plots of hardness and tensile strength of the specimen*

Key Words: Burnishing process, Roller burnishing, burnishing tool, Lathe Machine, hardness, tensile strength Universal testing machine, Brinell hardness testing machine, Taguchi method.

1. INTRODUCTION

Roller burnishing helps users to eliminate secondary operations for substantial time and cost savings, while at the same time improving the quality of their product. Roller burnishing is a method of producing an accurately sized, finely finished and densely compacted surface that resists wear. Hardened and highly polished steel rollers are brought into pressure contact with a softer work piece. As the pressure exceeds the yield point of the workpiece material, the surface is plastically deformed by cold flowing of subsurface material. A burnished surface is actually smoother than an abrasively finished surface of the same profilometer reading. Profilometers measure roughness height. Abrasive metal removal methods lower the roughness height. But, they leave sharp projections in the contact plane of the machined surface. Roller burnishing is a metal displacement process. Microscopic "peaks" on the machined surface are caused to cold flow into the "valleys", creating a plateau like contact plane. The burnished surface will therefore resist wear better than the abraded surface in metal to metal contact, as when a shaft is rotating in a bushing. Roller Burnishing is a Super-finishing process. It is a Cold Working process which produces a fine surface finish by the planetary rotation of hardened rollers over a bored or turned metal surface. Since all machined surfaces consist of a series of peaks and valleys of irregular height and spacing, the plastic deformation created by roller burnishing is a displacement of the material in the peaks which cold flows under pressure into the valleys. The result is a mirror-like finish with a tough, work hardened, wear and corrosion resistant surface. Lapping and Honing is eliminated. Roller burnishing is cold working the surface of the work piece to improve surface structure .it produces a fine surface finish by the planetary rotation of harden rollers over a bored or turned metal surface. The roller burnishing operation compresses the projection (peaks) into the indentations (valleys) thus forming a smooth mirror finished surface in the burnishing process at the point of contact, the pressure generated by the rollers exceeds the yield point of the piece-part materiel, the surface is plastically deformed by cold flowing of subsurface material the result is mirror like finish and tough, hardened surface. The pressure required for roller burnishing depends on various factors like tensile strength of the material, surface toughness before and after roller burnishing, ductility, shape of the rolls and diameters. Roller burnishing is used on cylindrical, conical, or disk shaped workpieces. The tool resembles a roller bearing, but the rollers are fixed so they slide against the workpiece surface instead of rolling. It is simultaneously rotated and pressed into the workpiece. Typical applications for roller burnishing include hydraulic system components, shaft fillets, and sealing surfaces. Burnishing Balls also occurs to some extent in machining processes. In turning, burnishing occurs if the cutting tool is not sharp, if a large negative rake angle is used, if a very small depth of cut is used, or if the workpiece material is gummy. As a cutting tool wears, it becomes blunter and the burnishing effect becomes more pronounced. In grinding, since the abrasive grains are randomly oriented and some are not sharp, there is always some amount of burnishing. This is one reason the grinding is less efficient and generates more heat than turning.

Taguchi methods are statistical methods developed by Genichi Taguchi to improve the quality of manufactured goods, and more recently also applied to engineering, biotechnology, marketing and advertising. Professional

Experimental investigation of B20 blend in the DI diesel engine with a modification of smaller orifice injection nozzle

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Abstract— The geometry of the diesel fuel injection nozzle and fuel flow characteristics in the nozzle significantly affects the processes of fuel atomisation, combustion and formation of pollutants emissions in a diesel engine. To describe the injector fuel flow, a three-dimensional Solidworks model is employed. The Solidworks package FlowXpress is used for 3-d flow analysis. The results represent the fuel flow characteristics for steady state flow conditions at different angular conical holes. For this purpose several three-dimensional models representing different conical angles are made in the nose region. The fuel injection pump is driven by an electric motor, the pressure control valve regulates the pressure at 100 bar and the calibration fluid is injected through the nozzle into the measuring Cylinder. For the analysis fuel is injected to the virtual conical jar made at the bottom of injector. The fuel flow profiles obtained from the Solidworks FlowXpress at steady flow conditions in the nozzle are validated with the results of the analytical calculations. The injection pressure is kept constant of 100bar and inside the cylinder the pressure is made to 20bar due to the compression ratio and then flow characteristics of all diesel fuel is simulated and observed that by increasing the angle of injection, the swirling of fuels increases and got an optimal angle beyond which it touches the cylinder which will result in more improper mixing and finally result in the Nox emissions.

Index Terms— Atomisation,Diesel,FlowXpress,Injection pump,Nox emissions,Solidworks,Swirling.

1 INTRODUCTION

Fuel injection is a Fuel system for admitting fuel into an internal combustion engine. In olden days carburetors are used to fulfil this action. A Carburetor is a device that blends air and fuel for an Internal Combustion Engine. Carburetor works on the Bernoulli's Principle. The lower its static pressure, and the higher its dynamic pressure. The throttle (accelerator) linkage does not directly control the flow of liquid fuel. Instead, it actuates Carburetor mechanisms which meter the flow of air being pulled into the engine. The speed of this flow, and therefore its pressure, determines the amount of fuel drawn into the airstream. From the past decade these carburetors have been replaced by fuel injectors. A variety of injection systems have existed since the earliest usage of the internal combustion engine. The primary difference between carburetors and fuel injection is that fuel injection atomizes the fuel by forcibly pumping it through a small nozzle under high pressure, while a carburetor relies on suction created by intake air accelerated through a Venturi tube to draw the fuel into the airstream. The evaluation of fuel injection system is from Throttle Body Injection to Multi Point Fuel Injection to Gasoline Direct Injection. In these Fuel Injection systems Fuel Injectors are used to inject fuel. These are either cam controlled or solenoid controlled. In Solenoid controlled fuel injectors there are three stages fuel metering, fuel filtering, and fuel injection. In Multi Point Gasoline Direct Injection system fuel injector is assigned to an individual cylinder and fuel metering is also done separately in each cylinder, whereas in Throttle Body Injection one fuel injector is used for the multi cylinder arrangement and fuel metering is uneven in all the cylinders. So from the discussion the fuel injector plays a crucial role in the fuel injection systems, and in this study we are using multi hole fuel injectors with different conical angles so as to study or examine the characteristics of fuel injected into the cylinder in the prescribed path through the injector nozzle in each case.

2 PROBLEM DEFINITION:

Since in the convectional fuel injectors the fuel is not mixed completely, we are making some changes in the design of fuel injectors so as to increase the fuel and air mixing. So, for this action to be done we are using multi hole fuel injector instead of single hole fuel injector because in single hole fuel injectors due to the high pressure change the flow of fuel from the fuel injector rushes to the combustion chamber following a hollow conic trace or shape as shown in the figure. Due to this shape in the hollow region of the cone trace the air and fuel are not mixed .So by using this multi hole fuel injector we can cover almost the whole area efficiently. Hence we can use these multi hole fuel injectors instead of single hole fuel injectors at different conical angle sections .

3 FUEL INJECTOR PARTS AND WORKING:

The Fuel injector consists of the following parts in order so as to complete the mechanism. .

Fuel injector body:

Fuel injector body is consisting of all the parts of the fuel injector arranged systematically inside it. The material used must be a non-conductor of electricity as the solenoid wiring is in touch with the body.

PerformanceEnhancement of a R-250 A by using vapour absorption refrigeration system

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Abstract

At the present time refrigeration plays a very important role in our daily as well as industrial life. But due to some problems for example, refrigerant the CFC is also affecting our ecosystem very rapidly. So there is need of working on these systems in order to avoid such harms. Vapour Absorption Refrigeration System acts as an alternative to existing systems as it requires low grade of energy for example; solar energy as it's renewable and present in enormous amount. So, in recent times a lot of research is going on to improve such systems that affects least to the environment and humanity but acts for same purpose in very efficient manner.

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1. INTRODUCTION

In our daily life whenever the term "refrigeration" comes in our mind; we simply think of refrigerator that works on the electrical supply and thus provides us chilled water, ice and preserves our beverages and eatables from getting exhausted. In these types of refrigerators the components that are used are "compressor, condenser, and evaporator and expansion valves". These different components plays different role but all of them are so very much needed in order to complete the refrigeration cycle. Fig-1describes schematic cycle description of vapour compression system. The compressor is utilized for the purpose of compressing low pressure and temperature vapour refrigerant to high pressure and temperature. In condenser the high pressure and temperature vapour refrigerant is cooled and condensed. In during this process, the refrigerant gives up its latent heat to the surrounding medium. Now in evaporator, liquid-vapour refrigerant is transformed into low pressure and temperature refrigerant at low pressure and temperature by absorbing the latent heat from the medium. At the end, comes role of expansion valves whose function is to allow to liquid refrigerant under high pressure and temperature to lower down its temperature and pressure so as to feed into the evaporator. Thus; in these steps the complete refrigeration cycle is completed and hence the net refrigeration effect is achieved [1]. There is also a term used "refrigerant" used which is circulated among these four components and which is the most essential need of the complete system. In common usage CFC is used as a refrigerant in the above described refrigeration system. The limitation related to it is that when it leaks into the atmosphere it depletes our ozone layer, which is keeping us safe and secured from the ultraviolet rays of the sun.

Here; COP is given by the relation;

$$COP\ (VCRS) = \frac{Refrigeration\ \ Effect}{Work\ Done} \qquad (1)$$

So now, in order to avoid this harm which is happening in our environment researchers are working on another type of refrigerating system known as "VARS i.e. VAPOUR ABSORPTION REFRIGERATION SYSTEM" and is system is somewhat different from the used one"s. The difference among the two systems are:- Firstly; in first system there isa compressor where as in VARS systemthere is no compressor and it"s role is played bycombination of "absorber, generator and expansion valve". Secondly; in VCRS system there is high grade of energy" is needed for performance of the system whereas in VARS system "low grade of energy" is utilized for example: solar energy, geothermal energy, wind energy and etc. Now in this paper we are going to take into account "solar energy" as it is renewable and available in large amount.

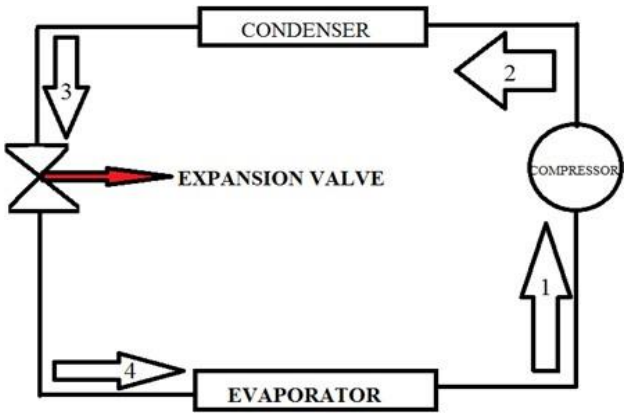

Fig-1: Simple Vapour Compression System

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Characterization of Mechanical Behavior of Metal matrix composite

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ABSTRACT: Aluminium metal matrix composites are significantly important in the various demanding fields of medicine and engineering like aerospace, defense, automobiles, dental and consumer goods. The industrial need of good materials with light weight, excellent properties and low cost demanded the scientists to research on composite materials. Among the MMCs, aluminium matrix composites (AMMCs) sought over other conventional materials because of their high strength to weight ratio, high wear resistance and low economic. These AMMCs offer a large variety of mechanical properties depending on the chemical composition of the Al-matrix. The reinforcement in AMMCs could be in the form of continuous/discontinuous fibers, whisker and particulate as second phase depending on their applications and property requirements. Addition of various reinforcements such as fly ash, TiC, SiC, Al2O3, TiO2, B4C etc., to aluminum matrix will enhance the mechanical and tribological properties. This paper attempts to review the different combinations of the usage of reinforced materials as a reinforcing agent in different Aluminium matrix alloys in the processing of aluminium metal matrix composites along with its properties.

Key words: AMMC, reinforcement, stir casting, Mechanical and Wear properties.

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INTRODUCTION

Over the past few decades, researchers have emphasized on production of light and strong materials. This caused the scientists to shift their research from monolithic to composite materials. A composite material is a combination of two or more chemically distinct materials to form a stronger material. The term “composite” broadly refers to a material system which is composed of a discrete constituent (the reinforcement) distributed in a continuous phase (the matrix), and which derives its distinguishing characteristics from the properties of its constituents, from the geometry and architecture of the constituents, and from the properties of the boundaries (interfaces) between different constituents. Composite materials are usually classified on the basis of the physical or chemical nature of the matrix phase, e.g., polymer matrix, metal-matrix and ceramic composites [1-2]. MMC (Metal matrix composites) are metals reinforced with other metal, ceramic or organic compounds. They are made by dispersing the reinforcements in the metal matrix. Reinforcements are usually done to improve the properties of the base metal like strength, stiffness, conductivity, wear and corrosive resistance etc... Aluminum, Silicon, Copper, Titanium, Magnesium, and Nickel metals are widely used for preparation of metal matrix in composites materials [3]. In Metal Matrix Composites (MMCs), aluminum and its alloys have attracted most attention as base metal in metal matrix composites because of its low density, low weight, high strength, superior malleability, easy machining, excellent corrosion resistance and good thermal and electrical conductivity, etc. In AMMCs one of the constituent is aluminium, which forms percolating network and is termed as matrix phase. Aluminium alloys, such as the 2000, 5000, 6000 and 7000 alloy series are the most commonly utilised materials in composite fabrication the other constituent is embedded in this aluminium and serves as reinforcement. Mono filaments, whiskers, fibres or particulate types are widely used as reinforcement phases. In recent years, Al based composite materials have gained significance in aerospace, automotive and structural applications due to their enhanced mechanical properties and good stability at high temperature [4].

Design And Analysis propeller shaft for rear wheel drive

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Abstract: The Roadway vehicles like cars, buses, trucks and land movers having many mechanical parts in common like Engine parts, Propeller shafts, Gearbox, Brakes, Clutches, Wheels, etc., To make the vehicle fuel efficient which in result make the transportation economical, the weight of that vehicle should be reduced. Since the composite materials are light weight with more strength & stiffness, inclusion of composite materials to conventional steel materials used in auto parts will reduce the weight and improve the mechanical properties of those components. This paper deals with propeller shaft of heavy vehicle to design the shaft for its minimum dimensions to satisfy current problem specification and then replace conventional steel material with composite material. The design of the propeller shaft is first theoretically designed for steel, Carbon/Epoxy and Glass/Epoxy composite material for its safe dimensions. Then they can be created as a part model for respective dimensions in CREO software. After modeling, Torsional buckling analysis can be carried out in the propeller shafts using ABAQUS software to check whether theoretical calculations and analytical results are similar. Then obtained results are compared among those three materials and Carbon/Epoxy composite material is selected as suitable replacement material for conventional steel material in terms of several mechanical properties.

Keywords: Propeller Shafts, Abaqus,Solidworks, Analysis, Composite Material, Conventional Steel, Mechanical Properties

1. Introduction

The propeller shaft is an important component in the power transmission of any vehicle. Conventional steel drive shafts have weight and low critical speed limits. If the maximum efficiency of the power transmission is to be achieved, it is most important to reduce the weight of the drive shaft. The shaft in the front engine rear-drive vehicle will reduce the power according to the length of the vehicle. Natural bends occur when long shafts are used, to avoid this they are split using universal joints. When the number of universal joints increases its power transmitting capability decreases. The overall objective of this work is to control the power loss using composite material. Composite materials have high strength and stiffness and they can also withstand high temperature. When the analysis is done by ABACUS & SOLIDWORK software's, properties like Strain energy, Equivalent elastic strain, Total deformation, Von-misses stress are analysed.

2. Related Work

Virendra V. Maheta et. al (2015) presented study involves the design, analysis and development of a driveshaft for automobiles Application. This involves calculating the dimensions of the drive shaft based on the required engine power. Accordingly, shaft couplings e.g. universal joints, transmission gears for axle and axle design will be performed considering all static and dynamic loads acting upon it. All design process will be performed with aid of FE analysis using ANSYS software. Optimization will be followed after performing design which includes weight reduction of drive shaft and material selection. It has been observed from results of study that by using composite material in place of steel material, weight reduction of up to about 80% is obtained. When study is carried out for different epoxy materials of composites, it has been observed that Kevlar/Epoxy composite has proved maximum strength compared to the others. When study has been carried out for different fiber angles for composite layers, it has been observed that 90o angle of fibers is providing better fundamental frequency compared to other angles.

Kiran A, Jagtap et. al. (2015) presented the design the driveshaft for heavy duty trucks based on their ability to transmit maximum torque, maximum stress has been produced and perfect component analysis software has been used to evaluate the product by virtual simulation as per the required speed requirements. The power from Transmission shaft should be transmitted to the Rear axle of the vehicle. The axis of the Transmission and the connecting member of Rear axle are at an angle, which changes with the variation in load or the road condition. To facilitate the power transmission at a variable angle a Propeller shaft is used. With respect to the geometrical construction the Propeller shafts are categorized into single piece two-piece and three-piece propeller shafts. In case of two or multi stage propeller shaft length of the rear propeller shaft is subjected to variation while the remaining propeller shafts are rigid members i.e., do not change in length. The variation in the length of rear propeller shaft is allowed using a splined shaft. Generally, length of the propeller shaft is decided after freezing the remaining aggregates.

V. Jose Ananth Vino et. al. (2015) suggested the concept to reduce the weight of automotive drive shaft with the utilization of composite material. Composite materials have been used in automotive components because of their properties such as low weight, high specific stiffness, corrosion free, ability to produce complex shapes, high specific strength and high impact energy absorption etc. As the automotive drive shaft is a very important component of vehicle. The modeling of the drive shaft assembly was done

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Multi-objective optimization for design of dual row layout in flexible manufacturing system with scheduling constraint

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***Abstract*— The goal of today's production strategy is to maximize the advantages of flexibility. Only when a manufacturing system is completely controlled by FMS technology is this possible. With the Process-Product Matrix in mind, it's feasible to see how an industry might achieve high flexibility via creative technological and organizational initiatives. A flexible cell is now defined as two or more CNC machines, while a flexible manufacturing system is defined as two or more cells. In computer science, system engineering, and many other areas, Petri nets are a strong modeling framework. Petri nets are a graphical description of the dynamic behavior of systems that combines a well-defined mathematical theory with a graphical representation of the dynamic behavior of systems. Because each of its aspects may be implemented in a number of ways and with varying degrees of complexity, the scatter search process is very adaptable. To handle scheduling challenges, the Petri Net idea is introduced and compared to the Scatter Search method. When the results of two case studies (9 machines X 2 jobs) are examined, it is shown that Petri Net outperforms Scatter Search in terms of machine usage.**

Keywords*— *Flexible Manufacturing System, Scatter Search approach, Petri Net, Machine utilization

I. INTRODUCTION

A flexible management system (FMS) is an automated production environment in which numerous processes may run at the same time. Different items may be made at the same time, and shared resources are often used to save costs. The system consists of machines that can perform a variety of tasks on a set of components. The machines are unreliable, and the control system's main difficulty is to satisfy production needs while the machines break down and need to be serviced at irregular intervals. Kimemia and Gershwin (1983). The Flexible Manufacturing System of a manufacturing business (FMS). An consistent framework is offered to make decision-making easy throughout the design and planning processes. The suggested framework includes an Analytic Hierarchy Process (AHP), a simulation module, and an accounting system. By applying weight flexibility limitation and cross efficiency ways to remedy the impediment, this study finally picks the most efficient FMS system Shang and Sueyoshi (1995). Among the operational strategies investigated are policies for loading (assigning processes and tooling to machines) and real-time flow control. A detailed simulation was utilized to analyze the different choices. Stecke and Solberg (1981) results differ from those of standard job shop scheduling studies, illustrating the influence of loading and control strategies on system performance in this flexible manufacturing system. Due to its flexibility, a flexible manufacturing system (FMS) is concerned with the automated fabrication of numerous components in the medium range. It's a completely automated manufacturing system in a nutshell. This article gives a review of previous work in the field of FMS modeling, as well as research and development for a better knowledge of the subject. It is used to examine work done in FMS utilizing a variety of modeling methodologies, including mathematics, artificial intelligence, hierarchical, multi-criteria decision-making, Petri Nets, and simulation Yadav and Jayswal (2018).

A scheduling problem in a flexible manufacturing system (FMS) is made up of two interdependent tasks: loading and sequencing. The loading problem formulations are offered with two purposes:

(i) Minimizing system unbalance and the number of late tasks;

(ii) Decreasing workload imbalance in the system;

Consider constraints such as the number of tool slots with duplications, unique job routing, non-splitting of tasks, and machine capacity. For both aims, heuristic approaches are devised, and the results are compared to Shanker and Tzen's (1985) accurate mixed integer programming solutions. A Flexible Manufacturing System (FMS) is a computer-controlled network of automated material handling equipment and numerically controlled (NC) machine tools capable of simultaneously processing medium-sized quantities of a range of component types. This innovative manufacturing method combines the efficiency of well-balanced, machine-paced

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Performance of Heat exchanger with L Bent tube Using CFD Analysis Software

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ABSTRACT: The Heat exchanger is a device which used to transfer heat from one fluid to another through a solid medium or interface. There is various type of heat exchanger available. In this paper shell and tube type heat exchanger is selected. Our objective was to change the cross section of tube to improve the efficiency of the heat exchanger. Square, Square with fillet and a hexagonal cross section of tubes is selected for the study. Design of new shell and tube heat exchanger is done using standard designing procedure and 3D modeling is done in Solidworks 2018. Finite Element Analysis software ANSYS Workbench 18.0 is used to perform CFD analysis under a standard working condition to find performance parameter. We found that the hexagonal cross-section provides more effective heat exchange due to increase in the convective surface.

KEYWORDS: Heat Exchanger, Shell and Tube Type, CFD, Tube cross-section, Design, and Analysis

I. INTRODUCTION

Due to the high consumption and the reducing availability of fossil fuel resource, high thermal performance heat exchanger is subject to great interest over decades. Typically, two fluids with different temperature circulate through the heat exchanger in natural or forced convection manners and the thermal energy is exchanged via surfaces during the process. The performance of heat exchanger is dependent on various factors such as mass flow rate of the fluids, length of fluid travel, number and arrangement of baffle plates etc. To improve the efficiency of the heat exchanger, maximizing the surface area of the wall between two fluids and minimizing resistance flow passing across the exchanger are two most concerned focuses. The increase of area is the most direct way to exchange more thermal energy. Performance enhancement of heat exchangers has been a hot topic for researchers all around to obtain the optimal output from a heat exchanger for the same amount of work done on it in order to conserve energy and money.

II. LITERATURE REVIEW

In this paper, Study is conducted on CFD analysis of heat exchanger with helically coiled tube. Due to comparatively more surface area than standard heat exchanger, it is proved to be more effective and efficient. [1]
In this paper, a heat transfer characteristic of different cross section has been conducted. They have also incorporated waviness on channel by varying the Reynolds number and the amplitude of waviness. It was found that this different cross section with wavy channel provide high heat transfer coefficient (HTC) and would be effective in thermal applications. .[2]
In this paper, an attempt has been made to investigate the complex flow and temperature pattern in such a short shell and tube type heat exchanger, with and without baffles in the shell side Heat exchangers are analysed using CFD code OpenFOAM-2.2.0 for different mass flow rates. The effect of flow field on shell side heat transfer coefficient and a comparison with analytical methods are presented.[3]

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Optimization of milling machine parameters on biwooven fiber using minitab software

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ABSTRACT:

The present research was carried out in order to predict the deformation at varied speeds, which was caused by high frequency vibration, as well as the milling cutter's full deformation. Tool vibration was studied in order to estimate tool life and instrument wear. This project highlights a cutter model with instrument inserts for static and dynamic cutting system components. To boost the deformation technique, a new generation of computers was created in collaboration with Ansys. To determine the cutting tool reaction, many designs utilise finite element analysis. The goal of this study is to look at the design and modelling of a face milling cutter with inserts using SolidWorks and FEA using Ansys 14.0. When comparing the two models, it was discovered that tungsten carbide is superior owing to reduced deformation and high strength.

Keywords: Multi Point Cutting Tool, Solidwork, Ansys 14.0, Solid Modelling and Finite Element Analysis.

1. Introduction

Material removal may occur through direct shearing, as in machining, or via abrasion, erosion, or chemical action, as in non-conventional machining techniques. Cutting tools play an important role in machining manufacturing. Two wide heading instruments, a one-point cutting tool, and a multi-point cutting tool may all be investigated. To achieve enhanced surface finishes, multi-point cutting instruments are utilised. Using a one-point cutting tool is one of the most versatile and frequently utilised metal extraction techniques in the industrial industry. Intensive research in the cutting tooling equipment industry has resulted in recent breakthroughs in engineering materials and pressing demands for increased efficiency in global manufacturing. Metal cutting or machining is the process of creating a product by removing undesirable material chips from a metal frame. This is critical since metal extraction directly or indirectly finishes almost all goods in shape and size. The loss of chip content is the method's most significant drawback.

A large amount of heat is generated during machining as well as other operations that cause material deformation. When the carrying device comes into contact with the workpiece, the temperature generated at the bottom of the instrument is referred to as the tool-cutting temperature. Heat is a factor that has a significant impact on the tool's operating efficiency. We realise that a significant portion of the energy received by metal cutting is converted to heat. Elevated cutting temperatures have a significant impact on tool wear, tool life, the integrity of workpiece surfaces, and the chip forming mechanism, all of which contribute to heat deformation of the cutting tool, the most severe source of errors in the machining technique. Cutting is the separation of two portions of a physical item or part of a physical object by the application of actual force.

Figure 1: Milling Cutting Tool

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Research Paper

MACHINABILITY PERFORMANCE OF AL2205 ON CNC USING REGRESSION ANALYSIS

A.V.Krishna Chaitanya[1] , A.Srinivas[2]

By optimization of various parameters of CNC milling process like spindle speed, feed rate and depth of cut, Improvement can be achieved in surface finishing. Various methods are used for predict surface roughness in CNC milling machine. Here Artificial Neural Network has been implemented for better and nearest result. By using this paper, mathematical model can be developed easily for milling process. Number of experiments have been done by using Hy-tech CNC milling machine. Conclusion from Taguchi method, Surface roughness is most influenced by Feed rate followed by spindle speed and lastly depends on depth of cut. Predicted surface roughness has been obtained, average percentage error is calculated by ANN method. The mathematical model is developed by using Artificial Neural Network (ANN) technique shows the higher accuracy is achieved which is feasible and more efficient in prediction of surface roughness in CNC milling. The result from this paper is useful to be implemented in manufacturing industry to reduce time and cost in surface roughness prediction.

Keywords: CNC milling, ANN, Surface roughness

INTRODUCTION

Higher quality is mainly goal of modern machining industries. CNC milling is a very commonly used machining process now in industry. High production rate with good surface finish and low machining time is the main criteria for industries today. To achievement for higher surface finishing, machining parameters like spindle speed, feed rate and depth of cut should be properly controlled. The ability to control the process for better surface finishing of the final product is most importance. The mechanism for the generation of surface roughness in CNC milling process is very complicated, and process parameters dependent. In CNC milling machining process, some of the parameters can be controlled like Spindle speed, Feed,

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A Study on Improvement in Computational Efficiency for Diesel Engine Using Fluent Software

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Abstract- Internal combustion engines in now a days is the best available reliable source of power for all domestic, large scale industrial and transportation applications. The major issue arises at the efficiency of these engines. Every attempt made to improve these engines tends to attain the maximum efficiency. The performances of the diesel engines are enhanced by proper design of inlet manifold, exhaust manifold, combustion chamber, piston etc. The study is about the effect of piston configurations on in- cylinder flow. Here a single cylinder direct injection diesel engine is used for study. For obtaining swirl intensity helical-spiral combination inlet manifold is used. Increase in swirl intensity results in better mixing of fuel and air. Swirl Velocities in the charge can be substantially increased during compression by suitable design of the piston. In the present work, a study on the effect of different piston configuration on air motion and turbulence inside the cylinder of a Direct Injection (DI) diesel is carried out using Computational Fluid Dynamics (CFD) code Fluent 13. Three dimensional models of the manifolds, pistons and the cylinder is created in CATIA V5 and meshed using the pre-processor Hypermesh 10.0.

Index Terms- CFD, inlet manifold, piston configurations, swirl ratio, tumble ratio, volumetric efficiency.

I. INTRODUCTION

As engines have evolved over the years, pistons have evolved with them. They're getting shorter and lighter, and use smaller skirts — the cylindrical "body" of the piston. Newer pistons are often made of aluminum alloys comprised of more silicon than in the past. This improves resistance to heat and reduces thermal expansion.

One of the biggest advancements in piston technology is the use of different piston "tops" or "crowns," the part that enters the combustion chamber and is subjected to combustion. While older piston tops were mostly flat, many now feature bowls on top that have different effects on the combustion process. The piston bowl is primarily used in diesel engines. Diesels don't have an ignition phase, so the piston crown itself may form the combustion chamber. These engines often use pistons with differently shaped crowns, although with direct injection becoming increasingly popular, gasoline engines are starting to use them as well.

The shape of the piston bowl controls the movement of air and fuel as the piston comes up for the compression stroke (before the mix is ignited and the piston is pushed downward.) The air and fuel swirl into a vortex inside the piston bowl before combustion (or compression) takes place, creating a better mixture.

By affecting the air/fuel mixture, you can achieve better and more efficient combustion, which leads to more power. The bowls have a variety of different shapes; some are also designed to optimize fuel economy. With direct injection becoming the hottest new technology for gasoline engines, expect uniquely-bowled pistons to become more and more popular. In high-speed direct-injection Diesel engines, the flow conditions inside the cylinder at the end of the compression stroke, near top dead center (TDC), are critical. for the combustion process

These are determined by the air flowing into the cylinder through the intake valves during the induction process and by its evolution during the compression stroke.

Many researchers had been studied on piston geometry effecting the flow distribution of diesel engine. This chapter reviews the previous published literatures, which lays the foundation and basis for further work in this project. This helps to give a better understanding about the topic and also acts as a guideline for this thesis.

Benajes and Margot *et al.* [6], studied the flow characteristics inside the engine cylinder equipped with different piston configurations were compared. For this, complete calculations of the intake and compression strokes were performed under realistic operating conditions and the ensemble-averaged velocity and turbulence flow fields obtained in each combustion chamber analyzed in detail. The results confirmed that the piston geometry had little influence on the in-cylinder flow during the intake stroke and the first part of the compression stroke. However, the bowl shape plays a significant role near TDC and in the early stage of the expansion stroke by controlling both the ensemble-averaged mean and the turbulence velocity fields.

Aita *et al.*[1] studied the swirl motion in the cylinder during the intake and compression strokes on a real geometry with one intake valve, but presented little validation of their calculations. Chen *et al.* [4] performed calculations of the full intake and compression processes and presented some comparisons with experimental data. Their results showed that calculations significantly under predicted the turbulence velocity. They explained the differences by errors in the experimental data and the limitations of the standard k–ε model. Dillies *et al.* [5] also presented similar calculations of a Diesel engine with one intake valve for one combustion chamber, and in this case results compared reasonably well with the experiments. Celik *et al.* [3] made a review of computations based on large eddy simulation