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Methods to improvement utilizing Non-Traditional Optimization techniques

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ABSTRACT

Chat creates an unfortunate surface completion and high device wear and could in fact harm machine devices because of the regenerative impact, the deficiency of the contact impact and the mode coupling impact. The early and most recent investigates are to stifle babble by one or the other aloof or dynamic techniques by applying safeguard, damping, changed speed and choices. In this paper, it very well may be seen that the streamlining centers around shaft configuration, apparatus way, cutting cycle and variable pitch for babble concealment. There are different calculations which can be applied in improvement of machining issues; notwithstanding, Differential Evolution (DE) is the fitting competitor that can tackle tedious, nearby ideal and more hearty when contrasted with Genetic Algorithm (GA), despite the fact that it has broadly applications, and Sequential Quadratic Programming (SQP) as a popular regular calculation can be utilized for prattle concealment..

Keywords: Chatter, optimization, artificial intelligence, suppression

INTRODUCTION

Almost 100 years ago, Taylor described machine tool chatter as the “most obscure and delicate of all problems facing the machinist”(Stephenson et al., 2006). Its history started when chatter has been recognised as a challenging practical problem from as early as 1906. Merchant (1945) presented the kinematics of mechanics of the metal cutting process in orthogonal cutting as represented by Figure 1. The relationships between the forces and the cutting parameters φ, rake angle α, the coefficient of friction F_s between the tool, the chip and the shear strength of the materialψ are derived. However, the relationship is not valid in the steady state cutting process due to metal cutting’s being a totally dynamic process and chatter needs to be taken into account as it causes serious problems in machining stability.

Such industries of aerospace, automotive, mold/die and general manufacturing, the pressure faced to ensure lower cost, greater productivity and improved quality in order to encourage the economic growth of the machine tool industry. However, machining productivity using a high material removal rate is inhibited by the dynamic deflection of tool and workpiece systems, which generates an unstable cutting force. This cause sudden large vibration amplitude when energy input exceeds the energy

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Coordinated in FMS utilizing Non-Traditional enhancement procedures

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Abstract

The Ladder layout design (LLD) problem generally crop ups when a manufacturing cluster intended to enlarge their making capacity and/or decrease the transportation cost or material flow through a predefined sequence of machines for manufacturing a product. The problem is known to be Non-deterministic Polynomial (NP) hard, which is usually solved by metaheuristics. In this paper, multi-objective optimization is considered related to FMS scheduling which acts as a constraint in configuring the ladder layout in optimum manner by various algorithms such as Metaheuristics like PSM, SA etc. The various Ladder layout problems are tested for performance of objective function with respect to computational time and number of iterations involved in SA and PSM. A necessary code is generated in C++ and the code is run by the IDE tool. The results of the different optimization algorithms such as simulated annealing (SA), Particle swarm method (PSM) are compared. Finally, it is observed that most of solutions obtained from SA are marginally better than PSM except in some exceptional cases but the computational time taken by SA were almost same as PSM.

Keywords: Flexible Manufacturing systems; ladder layout;, job scheduling; Particle swarm method; Simulated annealing;; IDE tool;

"Analysis of Process Parameters During DEBURRING Process

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Abstract: In this paper, an experimental investigation into electrochemical deburring (ECD) of die steel is carried out. The Taguchi method is used to formulate the experimental plan to analyse the effect of each electrochemical deburring process parameters on change in burr height and to predict the optimal setting for each ECD process parameter. Taguchi's L_{16} orthogonal array design is chosen for the experiments. Maximization of change in burr height is selected as the required surface quality at lower machining time. The signal-to-noise ratio and the analysis of variance are used to find the optimum levels within the window of parameters selected and to identify the order of importance of the process parameters. Finally, a confirmation test is conducted, which verifies that optimal ECD parameters can be determined effectively so as improve the rate of change in burr height.

Key words: ECD; Taguchi method; Orthogonal array; Burr height; Optimization

1. INTRODUCTION

Deburring is a finishing method used in industrial setting and manufacturing environments. There is no standard procedure to remove burrs having different shape and dimensions. For removing burrs of different sizes, shapes and properties, a number of conventional processes are available. Conventional deburring processes necessitate time, labour and other associated costs. Electrochemical deburring has been found to offer a potential solution to these problems (Choi and Kim, 1998a; Jain, 2002; Sarkar et al., 2004). ECD is one of the most promising machining techniques in accuracy manufacturing and high quality machining. In ECD process any type of conducting materials can be used as the workpiece material apart from of its hardness. Due to electrochemical dissolution between tool and burr tip, the material removed from burr tip.

Many researchers have studied the ECD methods. Choi and Kim (1998b) explain the mechanism of ECD by using electroplated Cubic Boron Nitride (CBN) wheels that examined the deburring efficiency and the deburring performance through various electrolytic currents and other electrochemical conditions for an internal cross hole. Pramanik et al. (1982) has presented an investigation on the ECD process with graphite balls using turned aluminium specimens for three different electrolytes. Ghabrial and Ebeid (1981) pointed out that stationary machining is suitable for deburring, embossing, finishing of dies with intricate profiles for forging, pressure-casting and extrusion processes. Shome et al. (2008) presented an investigation on the ECD of stainless steel. Xu et al. (2010) developed a mathematical model that can predict the deburring time for different burr heights. Ning et al. (2011) analyzed pulse electrochemical deburring through a developed mathematical model.

However, it is necessary to find an optimal process condition capable of higher removal of burr.

Taguchi's philosophy for the robust design is an important and powerful tool for the purpose of designing and improving product quality (Phadke, 1989). The original Taguchi method is designed to optimize a single quality characteristic. Taguchi method has been successfully applied in different advanced manufacturing processes to optimize the control parameters (Amini et al., 2011; Acherjee et al., 2011).

In present research, experimental investigation on electrochemical deburring process of die steel is performed. Effort is also made to optimize the ECD process parameters with consideration of deburring characteristic like change in burr height using Taguchi method. Additional experiment has been carried out to verify predicted result at optimum level and an effective improvement is observed in selected deburring characteristics. In addition to that the effect of process parameters on deburring characteristics is also reported.

2. TAGUCHI METHOD

Taguchi (1991) method is a widely used approach for robust design, which utilizes an orthogonal array (OA) to obtain dependable information about the design parameter with minimum time and resources, and adopts signal-to-noise (S/N) ratio to interpret experimental data and optimize performance. Usually, there are three categories of quality

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Execution Flow of Variable Viscosity Fluids in Peristaltic Pump

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The problem of peristaltic transport of a fluid with variable viscosity through the gap between concentric uniform tubes, such that the inner tube is rigid and outer tube with sinusoidal wave travelling down its wall, has been investigated under zero Reynolds number, and long wavelength approximations. The velocity field in the gap, relations between the pressure gradient and flow rate and that between the friction forces on the inner and outer tubes and the flow rate are obtained in terms of viscosity parameter,radius ratio and the degree of occlusion. The peristaltic pumping and augmented pumping are discussed with the physical parameters of interest.

KEYWORDS: peristaltsis, Newtonain fluid

1. Introduction

The purpose of this paper is an attempt to understand the fluid mechanics in a physiological situation with the presence of an endoscope is placed concentrically. We discussed the pressure rise, peristaltic pumping, augmented pumping and friction force on the inner tube (endoscope) and outer tube as discussed by Srivastava *et al.* (1983), and Siddiqui and Schwarz (1994). In (1966) Latham investigated the fluid mechanics of peristaltic pump and since then, other papers on the same subject have followed by Burns and Parkes (1967). Barton and Raynor (1968) have been studied the case of a vanishingly small Reynolds number. Lykoudis and Roos (1970) studied the fluid mechanics of the ureter from a lubrication theory point of view. Zien and Ostrach (1970) have investigated a long wave approximation to peristaltic motion, and the analysis is aimed at the possible application to urine flow in human ureters. Roos and Lykoudis (1971) studied the effect of the presence of a catheter upon the pressure distribution inside the ureter. Ramachandra and Usha (1995) studied the influence of an eccentrically inserted catheter on the peristaltic pumping in a tube under long wavelength and low Reynolds numbers approximations. Abd El Naby and El Misery (2001) studied the effects of an endoscope and generalised Newtonian fluid on peristaltic motion. Gupta and Seshadri (1976) studied peristaltic transport of a Newtonian fluid in non-uniform geometries. Srivastava and Srivastava (1985) have investigated the effects of power law fluid in uniform and non-uniform tube and channel under zero Reynolds number and long wavelength approximation. Provost and Schwarz (1994) have investigated a theoretical study of viscous effects in peristaltic pumping and assumed that the flow is free of inertial effects and that non-Newtonion normal stresses are negligible. Bohme and Friedrich (1983) have investigated peristaltic flow of viscoelastic liquids and assumed that the relevant Reynolds number is small enough to neglect inertia forces, and that the ratio of the wavelength and the channel height is large, which implies that the pressure is constant over the cross-section. El-Misery *et al.* (1996) have investigated the effects of a Carreau fluid in peristaltic transport for uniform channel. Elshehaway *et al.* (1998) studied peristaltic motion of generalized Newtonian fluid in a non-uniform channel under zero Reynolds number

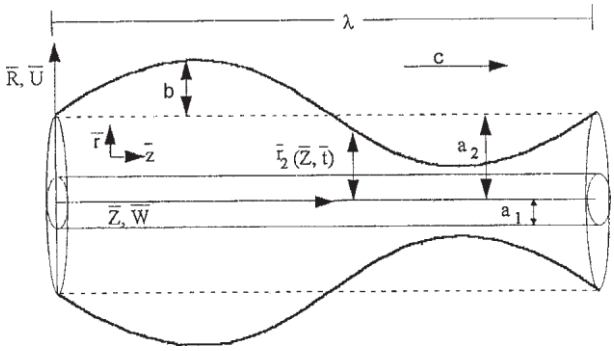

Fig. 1. Effects of endoscope on peristaltic motion.

with long wavelength approximation. Most of studies on peristaltic motion, that assume physiological fluids behave like a Newtonian fluid with constant viscosity fail to give a better understanding when peristaltic mechanism involved in small blood vessel, lymphatic vessel, intestine, ducts efferentes of the male reproductive tracts, and in transport of spermatozoa in the cervical canal. According to Haynes (1960), Bugliarllo and Sevilla (1970) and Goldsmith and Skalak (1975) it is clear that in pre mentioned body organs, viscosity of the fluid varies across the thickness of the duct. Furthermore inserted endoscope does not have any effect on viscosity of physiological fluids. Our results agree with those of Shapiro *et al.* (1969) and Shukla *et al.* (1980) when radius ratio (") asymptotes to zero and parameter viscosity (α) equals zero.

2. Formulation and Analysis

Consider the two-dimensional flow of an incompressible Newtonian fluid with variable viscosity through the gap between inner and outer tubes where the inner tube is an endoscope and the outer tube has a sinusoidal wave travelling down its wall. The geometry of the two wall surfaces are given by the equations:

$$\bar{r}_1 = a_1; \qquad (2.1)$$

$$\bar{r}_2 = a_2 + b\sin\frac{2\pi}{\lambda}(\bar{z} - c\bar{t}); \qquad (2.2)$$

where a_1 is the radius of endscope, a_2 is the radius of the small intestine at inlet, b is the amplitude of the wave, λ is the wavelength, $\bar{t}$ is the time and c is the wave speed.

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Performance Analysis of a Passive Suspension System For Constant And Variable Loads

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Abstract

Passive shock absorbers are designed for standard load condition. These give better vibration isolation performance only for the standard load condition. However, if the sprung mass is lesser than the standard mass, comfort and road holding ability is affected. It is demonstrated that sprung mass acceleration increases by 50%, when the vehicle mass varies by 100 kg. In order to obtain consistent damping performance from the shock absorber, it is essential to vary its stiffnessand damping properties. In this article, a variable stiffness system is presented, which comprises of two helical springs and a variable fluid damper. Fluid damper intensity is changed in four discrete levels to achieve variable stiffness of the prototype. Numerical simulations have been performed with MATLAB Simscape and Simulink which have been with experimentation on a prototype. Furthermore, the numerical model of the prototype is used in design of real size shock absorber with variable stiffness and damping. Numerical simulation results on the real size model indicate that the peak acceleration will improve by 15% in comparison to the conventional passive solution, without significant deterioration of road holding ability. Arrangement of sensors and actuators for incorporating the system in a vehicle suspension has also been discussed.

Keywords

Tire deflection, fluid damping, sprung mass, sprung mass acceleration, Simulink

Introduction

Passive fluid shock absorber provides simple and effective solution for comfort and handling of the vehicle. These convert vibration energy into heat by throttling viscous fluid through restricted orifice and are widely used in vehicle suspensions. Furthermore, the fluid damper can be tuned by changing the fluid flow area to vary the vibration isolation performance.

Two-degree-of-freedom quarter car model for analysis of a passive suspension is shown in Figure 1. Sprung mass (m_1) represents chassis and vehicle body, whereas un-sprung mass (m_2) includes suspension and tire. Quarter car model has been used for numerical simulations to evaluate vibration isolation performance of the presented system.

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Investigation on Boiler Performance

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Abstract - *There are many reasons for the heat loss in the boiler, such as Hot flue gas is discharged into the atmosphere through the chimney, the discharge of hot waste water and the heat transfer from the hot surface. In this research work, the chimney was originally designed for a 15-ton/hour, 16-bar boiler. The problem with the chimney is that the largest number of carbon particles are formed in this chimney structure. To overcome the problem, the chimney is redesigned to reduce the accumulation of scale that affects the efficiency of the boiler. It is specially developed for boiler chimneys. At the end of the design, a hatch was provided in the chimney. The purpose of this project is to reduce the cross-sectional area of this special section to increase the flue gas flow.*

Key Words*: Boiler, Chimney, Redesign*

1. INTRODUCTION

A chimney is a structure that allows hot flue gas or smoke from a boiler, stove, oven, or chimney to be discharged into the atmosphere. The joint is usually vertical or, if possible, in order to ensure a smooth gas flow by drawing air into the combustion in the so-called chimney or chimney effect. The height of the chimney affects its ability to discharge flue gas outdoors. In addition, the diffusion of pollutants in high altitude areas can reduce their impact on the environment.

Fouling is the accumulation of unwanted materials on hard surfaces at the expense of functionality. Inanimate matter (inorganic or organic). Fouling is usually distinguished from other surface-growth phenomena, in that it occurs on a surface of a component, system or plant performing a defined useful function, and that the fouling process impedes or interferes with this function shown in fig. 1.

Fig -1: Fouling in chimney

The boilers used in industry works on very high temperature & pressure. Some flue gases form in the boiler which required exhausting in atmosphere through chimney. During this process some fouling are formed on the boiler chimney surface. After some period, fouling will become considerable which affects life of chimney.

Mostafa M. Awad (2011) studied the various aspects related to fouling of heat exchanger including various aspects such as types of fouling, fouling processes and mechanisms, time dependency of fouling, cost of fouling beard by various organization which leads to corrosion and reduction in economy, Parameters affecting fouling, fouling measurements and monitoring, Performance data analysis, fouling mathematical models, its design and various cleaning and controlling methodologies.Moni Kuntal Bora and S. kafle (2014) has focused on collaborative study of boilers fouling. Boiler efficiency may play an important role in the coming years. Industries all over the world are experience increasingly fierce competition and automated production. The cost of running such a system is expected to be very high. This document explains more clearly how to deal with this issue. Rahul Dev Gupta *et at.* (2011) point out that the resulting ideas have been submitted to a boiler house efficiency study conducted in a large boiler house in a pulp and paper mill. The low efficiency of the boiler is due to various heat losses, such as the loss of unburned coal in the waste, the loss of dry flue gas, the loss of moisture in the fuel, the loss of radiation, the loss of sewage, and the loss of hydrogen combustion. Various heat losses were analyzed, and some implementation suggestions were

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Refrigerant in Vapor Absorption Refrigeration Cycle For Sustainable Environment

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Abstract

All industrial process uses a lot of thermal energy by burning fossil fuel to produce steam or heat for the purpose. After the processes, heat is rejected to the surrounding as waste. This waste heat can be converted to useful refrigeration by using a heat operated refrigeration system, such as vapour absorption refrigeration system In this work, a thermodynamic analysis of ammonia lithium-nitrate water solution and ammonia water sodium hydroxide solution absorption refrigeration cycle has been studied at low generator temperature heat source 60 to 80^{o}C and the range of evaporator temperature -4 to 0^{o}C. The influences of operating temperature on the thermal load of components, coefficient of performance are investigated. The COP of the absorption system increases with increase in evaporator temperature and generator temperature.

Keywords: Vapour absorption, heat operated, generator, evaporator, absorber

INTRODUCTION

Most of industrial processes use thermal energy by burning fossil fuel to produce steam or heat for the purpose. After any of these processes, heat is rejected to the surrounding as waste. This waste heat can be utilized for cooling by using a heat operated refrigeration system, such as an absorption refrigeration cycle. Thus, electricity purchased from utility companies for conventional vapour compression refrigerators can be reduced. The use of heat operated refrigeration systems helps to reduce problems related to environmental issues such as the so called greenhouse effect from CO_2 emission from the combustion of fossil fuels in utility power plants.

Another difference between absorption systems and conventional vapour compression systems is the working fluid used. Most vapour compression systems commonly use chlorofluorocarbon refrigerants (CFCs), because of their favourable thermo physical properties. It is through the restricted use of CFCs, due to depletion of the ozone layer that will make absorption systems more prominent. However, although absorption systems seem to provide many advantages, vapour compression systems still dominate all market sectors. In order to promote the use of absorption systems, further development is required to improve their performance and reduce cost.

The early development of an absorption cycle dates back to the 1700's. It was known that ice could be produced by an evaporation of pure water from a vessel contained within an evacuated container in the presence of sulphuric acid. In 1810, ice could be made from water in a vessel, which was connected to another vessel containing sulphuric acid. As the acid absorbed water vapour, causing a reduction of temperature, layers of ice were formed on the water surface. The major problems of this system were corrosion and leakage of air into the vacuum vessel. In 1859, Ferdinand introduced a novel machine using water/ammonia as the working fluid. This machine took out a US patent in 1860. Machines based on this patent were used to make ice and store food. It was used as a basic design in the early age of refrigeration development.

In the 1950's, a system using lithium bromide/water as the working fluid was introduced for industrial applications. A few years later, a double-effect absorption system was introduced and has been used as an industrial standard for a high performance heat-operated refrigeration cycle. The aim of this paper is to provide basic background and review existing literatures on absorption refrigeration technologies. A number of absorption refrigeration systems and research options are provided and discussed. It is hoped that, this paper should be useful for any newcomer in this field of refrigeration technology.

COMPARISON OF VAPOUR COMPRESSION AND ABSORPTION SYSTEM

Absorption refrigeration system is a system that uses a heat source (e.g., solar energy, a fossil-fuelled flame, waste heat from factories, or district heating systems) which provides the energy needed to drive the cooling process. This system operates based on absorption process rather than compression process.

Similar to vapour compression system, the cooling effect is produced through evaporation process of the refrigerant in the evaporator and the heat absorbed in the evaporator is released to the atmosphere via the condenser. The vapour absorption refrigeration system also comprises of all the processes taking

International Journal of Mechanical Stuides

Scheduling of Loop Layout design in flexible Manufacturing System using Population Heuristies

Abstract

To design any manufacturing setup we need to focus on design of facility layout and it has a huge impact on the performance of the manufacturing system. so the Optimum arrangement of layout is important in order to achieve high productivity in flexible manufacturing system (FMS). The objective of the loop layout problem is the determination of the ordering of machines around a loop, to minimize the total number of loop traversals for a family of parts. The problem we address is to design the layout of the system so that the number of machines that the part types cross in their manufacturing process is minimized. We formulate the problem mathematically and solve it by a meta-heuristics that obtains consistently better results than an earlier popular method. Since, optimum arrangements of layout is a combinatorial problem so finding the best combination out of millions of combinations is a challenging task and can't be solve using conventional techniques. Therefore, this paper details the design, development and testing of particle swarm optimization (PSO) technique to solve the loop layout problem. The proposed method is validated with bench mark problems. Here PSO algorithm is proposed for obtaining the optimal solution of unidirectional loop layout design problem of various FMS models.

Keywords: Flexible manufacturing system; Loop layout; Particle swarm optimization; Loop layout design problem

Introduction

Flexible manufacturing systems (FMS) play a crucial role in modern complex production lines. Such systems generally consist of a group of machines capable of performing a number of different operations, interconnected through an automated parts-transportation and handling mechanism all operating under the hierarchical control of a common computer system. An important factor in designing a FMS is the determination of an effective layout of the machines, i.e., an optimum arrangement of the machines in the shop floor so that to provide efficient operation. The layout of the machines has a significant impact to the material-handling cost, the time of processing, the throughput of the production system, and therefore affects the overall productivity of the FMS. The layout of machines in a FMS is typically determined by the type of material-handling device used such as material-handling robots, automated guided vehicles (AGVs), gantry robots, etc. In practice, the most commonly used types of machine layouts are the following (Figure 1): the linear single-row layout (Figure 1a), the linear double-row (Figure 1b), the cluster layout based on gantry robot (Figure 1c), the semi-circular layout with a single robot, (Figure 1d), and the closed-loop layout (Figure 1e). In the first two layouts (Figures 1a and 1b) an AGV transports parts between the machines moving in both directions in a straight line. The third machines layout (Figure 1c) based on a gantry robot is used when the space in the shop floor is limited. In the fourth layout (Figure 1d) a material-handling industrial robot carries parts between the machines traversing with its end-effector a semi-circular (pre-specified) trajectory. While, in the closed-loop layout, a conveyor moves in a closed-loop rail in only one direction transporting parts among the machines. This work addresses the unidirectional loop layout design problem (LLDP), i.e., the problem of designing loop-layout-manufacturing systems of the form shown in Figure 1e.

Literature Survey

Afentakis [1] has developed an interchange heuristic to solve the loop layout problem and modelled the layout of an FMS by a graph, whose nodes represent process components and whose edges denotes the interconnection links of the material handling system. Kaku and Rachamadugu [2] have presented quadratic assignment problem (QAP)

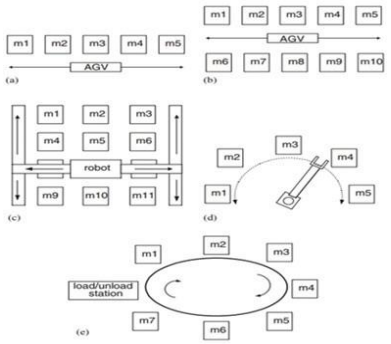

Figure 1: Forms of machines layouts in a FMS with respect to the various types of the material-handling devices: (a) single-row layout, (b) double-row layout, (c) cluster layout, (d) semi-circular layout, and (e) closed unidirectional loop layout.

formulation approach to unravel loop and linear layout problems in FMS. Kouvelis and Kim [3] developed a heuristic and branch and bound (BB) procedure to unravel unidirectional loop network downside and conjointly planned a decomposition principle to deal giant work flow matrices. Leung [4] has developed a heuristic supported graph theory that constructs a layout from an answer to the linear programming relaxation of the matter.

They introduced integer programming (IP) formulation to unravel unidirectional loop layout downside that thought-about each the MIN_SUM and MIN_MAX objectives. Cheng et al. [5] have developed

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A NTOT for Optimum Design of Line Layout in FMS with Integrated Job shop format

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Abstract

The paper presents a comparison and application of metaheuristic population-based optimization algorithms to a flexible manufacturing automation scenario in a metacasting foundry. It presents a novel application and comparison of Bee Colony Algorithm (BCA) with variations of Particle Swarm Optimization (PSO) and Ant Colony Optimization (ACO) for object recognition problem in a robot material handling system. To enable robust pick and place activity of metalcasted parts by a six axis industrial robot manipulator, it is important that the correct orientation of the parts is input to the manipulator, via the digital image captured by the vision system. This information is then used for orienting the robot gripper to grip the part from a moving conveyor belt. The objective is to find the reference templates on the manufactured parts from the target landscape picture which may contain noise. The Normalized cross-correlation (NCC) function is used as an objection function in the optimization procedure. The ultimate goal is to test improved algorithms that could prove useful in practical manufacturing automation scenarios.

Keywords: *Bee Colony Algorithm, Particle Swarm Optimization, Ant Colony Optimization, Foundry Automation*

1. Introduction

In the 21st century, under the influences of globalization, manufacturing companies are required to meet continuously changing customer demands. Flexible manufacturing systems (FMS) has emerged as a science and industrial practice to bring about solutions for unpredictable and frequently changing market conditions [21]. Existing FMS implementations in manufacturing companies have demonstrated a number of benefits by helping lower production costs, increased factory floor utilization, reduced work-in-process, etc. However, there are a number of problems faced during the life cycle of an FMS, which could be classified into work flow design, production leveling, and control problems [21]. In particular, the production leveling is important owing to the dynamic nature of FMS such as flexible machines, tools and workflow. This work is primarily concerned with production leveling problem. Over the last decade, most research in FMS has been focused on scheduling of FMSs for single or multi objective problems. The present work, however, compares three evolutionary computation techniques Particle Swarm Optimization (PSO), Bee Colony Algorithm (BCA) and Ant Colony Optimization (ACO). The goal of the paper is not to declare one of the techniques as better than the other, but to test their applications after modification to suit the manufacturing scenario discussed, as well as their limitations. The case study is a small-to-medium batch manufacturing foundry and we intend to test the suitability of the algorithms for the purpose of lean workflow and reducing machine starvation in the manufacturing facility.

Earlier Research

Flexible Manufacturing Systems

During the last two decades much research has been done in this area. The heuristic algorithms developed include enumerative procedures, mathematical programming and approximation techniques, i.e., linear programming, integer programming, goal programming, dynamic programming, network analysis, branch and bound, genetic algorithm (GA), etc.

Shankar and Tzen [39] considered scheduling problems in a random FMS as composite independent tasks. Lee [25] presented a goal-programming model for multiple conflicting objectives in manufacturing. Toker et al. [45] proposed an approximation algorithm for ‘n’ job ‘m’ machine problem. Steeke and Soldverg [43] investigated various operating strategies on a caterpillar FMS by means of deterministic simulation with the number of completed assemblies on a performance criterion manufacturing problem associated with parallel identical machines throughout simulation. Chan and Pak [3] proposed two heuristic algorithms for solving the scheduling problem with the goal of minimizing total cost in a statictically loaded FMS. Shaw and Winston [40] addressed an artificial intelligence approach to the scheduling of FMS. Schultz and Merkens [38] compared the performance of an ES, a GA and priority rules for production systems.

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Optimum Design of Line Layout In FMS In Job shop Scheduling

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Abstract: ***Analysis and modeling of flexible manufacturing system (FMS) consists of scheduling of the system and optimization of FMS objectives. Flexible manufacturing system (FMS) scheduling problems become extremely complex when it comes to accommodate frequent variations in the part designs of incoming jobs. This research focuses on scheduling of variety of incoming jobs into the system efficiently and maximizing system utilization and throughput of system where machines are equipped with different tools and tool magazines but multiple machines can be assigned to single operation. Jobs have been scheduled according to shortest processing time (SPT) rule. Shortest processing time (SPT) scheduling rule is simple, fast, and generally a superior rule in terms of minimizing completion time through the system, minimizing the average number of jobs in the system, usually lower in-process inventories (less shop congestion) and downstream idle time (higher resource utilization). Simulation is better than experiment with the real world system because the system as yet does not exist and experimentation with the system is expensive, too time consuming, too dangerous. In this research, Taguchi philosophy and genetic algorithm have been used for optimization. Genetic algorithm (GA) approach is one of the most efficient algorithms that aim at converging and giving optimal solution in a shorter time. Therefore, in this work, a suitable fitness function is designed to generate optimum values of factors affecting FMS objectives (maximization of system utilization and maximization of throughput of system by Genetic Algorithm (GA) approach.***

Keywords: Taguchi philosophy and genetic algorithm have been used for optimization. Genetic algorithm (GA) approach

1. Introduction

In today's competitive global market, manufacturers have to modify their operations to ensure a better and faster response to needs of customers. The primary goal of any manufacturing industry is to achieve a high level of productivity and flexibility which can only be done in a computer integrated manufacturing environment. A flexible manufacturing system (FMS) is an integrated computer-controlled configuration in which there is some amount of flexibility that allows the system to react in the case of changes, whether predicted or unpredicted. FMS consists of three main systems. The work machines which are often automated CNC machines are connected by a material handling system(MHS) to optimize parts flow and the central control computer which controls material movements and machine flow. An FMS is modeled as a collection of workstations and automated guided vehicles (AGV). It is designed to increase system utilization and throughput of system and for reducing average work in process inventories and many factors affects both system utilization and throughput of system in this research system utilization and throughput of system has been optimized considering factors, which is discussed in next sections.

Flexible manufacturing system

A system that consists of numerous programmable machine tools connected by an automated material handling system and can produce an enormous variety of items. A FMS is large, complex, and expensive manufacturing in which Computers run all the machines that complete the process so that many industries cannot afford traditional FMS hence the trend is towards smaller versions call flexible manufacturing cells. Today two or more CNC machines are considered a Flexible Manufacturing Cell (FMC), and two or more cells are considered a Flexible Manufacturing System (FMS)

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Design and analysis of engine cylinder with extended fins through design modification using CATIA v5 & ANSYS

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ABSTRACT - *The cooling mechanism of the air cooled engine is mostly dependent on the fin design of the cylinder head and block. Cooling fins are used to increase the heat transfer rate of specified surface. Engine life and effectiveness can be improved with effective cooling. The main aim of the project isto study and comparing with 100 cc Hero Honda Motorcycle fins and analyze the thermal properties by varying geometry, material and thickness. Parametric models of cylinder with fins have been developed to predict the transient thermal behavior. Presently Material used for manufacturing the models is aluminum alloy 6063 which has thermal conductivity of 200W/mk. We are analyzing the designed models by taking the thermal temperature of 1000 C The energy transfers from the combustion chamber of an internal combustion engines are dissipate in three different ways.Transient thermal analyses were performed for actual and proposed design of engine cylinder in order to optimize geometrical parameters and enhanced heat transfer from theIC engine. Result revel that the proposed design of IC engine*
has better performance and heat transfer rate from the heating zone in the IC engine that is why the result of present work is more concentrate on it and also proposed replacement of new design by Using ANSYS 17.0 software.

Key words: Internal Combustion engine, transient thermal analysis, CATIA, ANSYS, Heat Transfer, Aluminium

I. INTRODUCTION

Most combustion engines or internal combustion engines are fluid cooled using either air (a aeriform fluid) or a liquid agent like water run through a device (radiator) cooled by air. In air cooling system, heat is carried out or driven away by the air flowing over and round the cylinder. Here fins are sew the plate and cylinder barrel which offer extra heat conductive and heat radiating surface. In water cooling system of cooling engines, the cylinder walls and heads ar given jacket Cooling fins facilitate keep Chevrolet potential unit battery at ideal temperature we all know that just in case of internal combustion (IC) engines, combustion of air and fuel takes place within the engine

Fig.1

COOLING SYSTEM:

Types of Cooling System

There are primarily Two types of cooling systems:

1. Air cooled system, and

2. Water cooled system.

II. METHODOLOGY

Step 1: Aggregation data and information associated with cooling fins of IC engines.

Step 2: A completely parametric model of the cylinder block with fin is formed in CATIA ver 5.0 software package.

Step 3: Model obtained in Step a pair of is analyzed using ANSYS17.0 (Workbench), to get the warmth or heat rate , thermal gradient and nodal temperatures.

Step 4: Manual calculations are done.

Step 5: Finally, we tend to compare the results obtained from ANSYS and manual calculations for completely different material, shapes and thickness.

Layout in Flexible Manufacturing System with Scheduling as constraints – In algorithm and Trajectory based method

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Abstract: The scheduling problem for flexible manufacturing systems (FMSs) has been attempted in this paper using the ant colony optimization (ACO) technique. Since the operation of a job in FMSs can be performed on more than one machine, the scheduling of the FMS is considered as a computationally hard problem. Ant algorithms are based on the foraging behaviour of real ants. The article deals with the ant algorithm with certain modi®cations that make it suitable for application to the required problem. The proposed solution procedure applies a graph-based representation technique with nodes and arcs representing operation and transfer from one stage of processing to the other. Individual ants move from the initial node to the ®nal node through all nodes desired to be visited. The solution of the algorithm is a collective outcome of the solution found by all the ants. The pheromone trail is updated after all the ants have found out their respective solutions. Various features like stagnation avoidance and prevention from quick convergence have been incorporated in the proposed algorithm so that the near-optimal solution is obtained for the FMS scheduling problem, which is considered as a non-polynomial (NP)-hard problem. The algorithm stabilizes to the solution in considerably lesser computational effort. Extensive computational experiments have been carried out to study the influence of various parameters on the system performance.

Keywords: flexible manufacturing systems, ant colony optimization, scheduling

NOTATION

c	small positive constant
G	set of arcs connecting all possible combinations of nodes
G_k	set of all nodes still to be visited by ant k
j	a job
j^0	maximum number of jobs available from time 0 onwards
J	set of jobs
k	an ant
m	a machine
m^0	maximum number of machines
M	set of machines
n	a node
N	total number of operations
NC	counter for number of iterations
N_max	maximum number of iterations
o	an operation
o_j	an operation of job j
$o^0{}_j$	maximum number of operations for job j
O_j	operation set of job j
O^0	set of all operations
p	randomly generated quantity
$p^{\mp}_{best}$	best makespan
$p^{\mp}_{iter}$	optimal makespan for an iteration iter
$p_{j,o,m}$	processing time of operation o of job j on machine m
p_0	parameter used to attain quick convergence of the algorithm
P_k	makespan by the kth ant
$P^k_{ij}{}_{\cdots}t\dagger$	transition probability of moving from node i to node l for ant k
q	random number
Q	positive constant
S_k	set of nodes allowed at the next step by ant k
t	time
$tabu^k$	list of nodes travelled by ant k
T_k	tabu list of ant k
¬	factor that controls the importance of the trail
β	factor that controls the importance of visibility
y_{kl}	visibility from node k to node l

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Tensile and impact test on Glass fiber reinforced epoxy Fiber

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Abstract **- This paper reports the characterization of tensile and impact properities of polymer based composites filled with polyester fabrics. Polymers are well suited as matrix materials due to their low density and their low processing temperatures. The polymer matrix composites are light weight, high strength to weight ratio and stiffness properties have come a long way in replacing the conventional materials such as metals and wood.The hybridization of specimens is done by maintaining the volume fractions for the different tests as per the ASTM . The composite material is made with glass fabrics, polyester and epoxy resin.**

Key words:-Glass fabric, polyester fabric, Hybridization, Digital UTM, curing, mechanical properties.

INTRODUCTION

Polymer matrix composites find various applications in our daily life. The most matured and widely used composite systems are polymer matrix composites (PMCs), also known as Fiber Reinforced Polymers (Plastics) which provides the major focus for this work. Polymers are well suited as matrix materials due to their low density and their low processing temperatures. The polymer matrix composites are light weight, high strength to weight ratio and stiffness properties have come a long way in replacing the conventional materials such as metals and wood. The applications of polymer matrix composites are decking Boat, Civil, Aerospace, Sports, Domestic, Transport, Marine Applications. The hybridization of specimens is done by maintaining the volume fractions for the different tests as per the ASTM standards. The growing interest in natural fibers is mainly due to their economical production with few requirements for equipment and low specific weight, which results in a higher specific strength and stiffness when compared to synthetic fibers composites. Also, they offer safer handling and working conditions compared to synthetic fibers. Natural fibers from renewable natural resources offer the potential to acts biodegradable reinforcing materials alternative for the use of synthetic fibers or stiffness to weight ratio.

The experimental work is by the E- glass reinforcement with the natural fabrics .the applications of this are, tent poles, sound absorption, heat and corrosion-resistant fabrics, high-strength fabrics, pole vault poles, arrows, bows and crossbows, translucent roofing panels, automobile bodies, hockey sticks, surfboards, boat hulls, and paper honeycomb. The experimental work is gone through the glass/polyester fabrics.

MATERIAL DETAILS AND SPECIMEN PREPARATION

Material used to prepare the specimen are glass fiber and polyester fiber as reinforced material and L-12 lepoxy ,K-6 hardener as matrix material.

Glass fabric provides excellent strength and moisture resistance. Glass fibers are most common reinforcing fiber. The principal advantages of glass fibers are the low cost and high strength. Glass fiber has high mechanical strength, impact resistance, stiffness and dimensional stability of a resin. Polyester is a strong and durable synthetic fabric. Polyester dries quickly and can be washable or dry clean only, so check your tags.Epoxy is a copolymer. It is formed from two different chemicals. These are referred to as the resin and the hardener. In this experiment we are using L-12 lepoxy as the matrix material. In the experimental work the hardener K-6 is added for the easily drying agent to the epoxy.

EXPERIMENTAL PROCEDURE

The Characterization of this hybrid composite can be done on these tests .The tests are conducted according to ASTM standards. The following are the tests can be done on the hybrid composites areTensile test, Inplane shear test, Open hole tensile test, Inplane open hole tensile test, Impact test.

The hybrid composites are susceptible to mechanical damages when they are subjected to effects of tension and impact, which can lead to interlayer delamination. In any cases, the increase of the external load favors the propagation of delamination through the interlayer leading to the

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Job Shop of Open Field Layout design in flexible Manufacturing System using Trajectory Methods

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Abstract— In current scenario, many production companies are badly in need of advanced manufacturing systems like FMS which is very gifted technology due to its litheness. The main theme is focused on optimization concern to FMS allocation of parts as a restraint in designing the open field arrangement of machines in feasible mode by an evolutionary algorithm such as GA etc and trajectory method like SA etc. In this article the initiators of this paper put an endeavor to allocate machine allocation pattern in an optimum order with flexible batch scheduling as limitation in an FMS, based on precedence rule. The various open field layout problems are inspected to endorse the goal function in respect to problem solving time and number of engendering involved in evolutionary algorithm and Trajectory based method. The necessary programme is developed in C++ and the cipher is operate through simulation tool. Eventually in perceive of authors, the outcome of the non traditional optimization algorithms (Genetic Algorithm and simulated annealing method) are assimmilated and inferences are delineated.

Keywords— Flexible Manufacturing systems, open field layout, Genetic Algorithm, Simulated Annealing, IDE Tool.

I. INTRODUCTION

Owing to advancement in automation of industrial sectors, the merchandise for manufacturing products is enhancing globally. In order to face the challenges in the highly competitive world, the industries are to focus on available resources and energies to withstand and gain advantage of competitive market. To attain this, manufacturers has to choose the best method as an alternative such as FMS to reduce and eliminate the problems occurred in industry.

FMS is always ahead for industrial solutions; it is more lithe in solving the industrial problems to obtain best profits by decreasing the processing time and stock level in order to improve the productivity by prediction and control. To attain maximum productivity FMS has a solution through various layouts which involves supplying unlike resources. The design of these layouts leads to optimum making time and cost [1] must be determine in the inception of FMS[2].In general the various types of FMS layouts [3] are

1) Open field layout.
2) Line or single row layout.
3) Ladder layout.
4) Loop layout.

Authors have choosen open field layout out of the above layouts which is more convenient than other. This article speaks about integrated scheduling of open field layout design

II. LITERATURE SURVEY

In view of hypothetical and real world , eminence of FMS has been highly emphasized due to its integrated scheduling in configuring optimum design of layout. In the past, researchers mainly concentrated on finding out the problem solution in mathematical model like dynamic programming and integer programming [4] which can be useful for solving the simple problem. Search methods are more suitable to resolve the simplel and also complex issues. The heuristic methods are commonly known for its efficiency, but quickly identify the neighbour finest solution and less assertion about obtaining global solutions. of late, metaheuristic been applied as alternative for heuristics, such as, Sheep flock and cuckoo search technique.]

Buzacott and Yao [5] presented a complete review of the analytical modes developed for the design and scheduling of FMS. Kimemla and Gershwin [6]focused on optimizing the routing of part in an FMS with the objective an optimization problem which maximizing the flow by maintaining the average in-process inventory below a fixed pointl. Chan and Pak [7] introduced two heuristic algorithm in a statically loaded FMS for solving the scheduling problem with the goal for minimizing the total cost of tardiness. Solimanpur M, Prem and Ravi Shankar [8] have used to solve single row layout problems by considering a non –linear 0-1 programming model in which the distance between

ORIGINAL ARTICLE

Optimization of wrung order Layout in Flexible Manufacturing System with Scheduling as constraints – An Approach of evolutionary algorithm and Trajectory based method

N GOVINDA RAO [1] Dr K. MALLIKARJUNA [2]

Abstract Layout arrangement is important to achieve high productivity in flexible manufacturing system (FMS). This paper discusses the design of loop layout in FMS. The objective of the loop layout problem is the determination of the ordering of machines around a loop, to minimize the total number of loop traversals for a family of parts. This paper details the design, development and testing of particle swarm optimization (PSO) technique to solve the loop layout problem. The proposed method is validated with bench mark problems. The clearance between the machines is also considered in the design of loop layout. This aspect aids in selecting the best layout.

Keywords Flexible manufacturing system · Loop layout · Particle swarm · Machine clearance

1 Introduction

The layout of a flexible manufacturing system (FMS) involves distributing different resources for achieving maximum efficiency. It was estimated that 15–70% of the manufacturing costs are due to material handling [1]. With a good arrangement of the devices, it is possible to reduce the manufacturing costs by at least 10–30% [2]. The layout has an impact on the production time and cost [3]. Optimal design of the physical layout is one of the most important issues that must be resolved in the early stage of the FMS. Good solutions to layout problems provide a necessary foundation for effective utilization of the system and leads to drastic reduction of material handling expenses [4].

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The layout of machines in a FMS is typically determined by the type of material handling devices used such as material handling robots, automated guided vehicles, gantry robots etc., In practice the most commonly used types of machine layouts are the following. 1. Linear single row layout 2. Linear double row layout. 3. Cluster layout based on gantry robot. 4. Semi-circular layout with a single robot. 5. Closed loop layout [5]. Among the above layouts, the loop layout was found to be more attractive due to their relatively low initial costs and high flexibility in material handling [6]. The loop layout is shown in Fig. 1.

2 Literature survey

Afentakis [6] has developed an interchange heuristic to solve the loop layout problem and modeled the layout of an FMS by a graph, whose nodes represent processing elements and whose edges denotes the interconnection links of the material handling system. Kaku and Rachamadugu [7] have presented quadratic assignment problem (QAP) formulation approach to solve loop and linear layout problems in FMS. Kouvelis and Kim [8] developed a heuristic and branch and bound (BB) procedure to solve unidirectional loop network problem and also proposed a decomposition principle to deal large workflow matrices.

Leung [9, 10] has developed a heuristic based on graph theory, which constructs a layout from a solution to the linear programming relaxation of the problem. They introduced integer programming (IP) formulation to solve unidirectional loop layout problem which considered both the MIN_SUM and MIN_MAX objectives. Cheng et al. [11, 12] have developed hybrid genetic algorithm and neighbourhood search to solve the loop layout problem. Tansel and Bilen [13] have proposed two heuristics called MOVE and MOVE/INTERCHANGE to solve the unidirectional loop network layout problem. The first heuristic was based

R300a Refrigerant in VAR Cycle for Eco-Friendly Environment

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Keywords:
refrigeration, R134a, R600a, hydrocarbons, subcooling, drop-in, cooling systems, GWP

ABSTRACT

In this paper the attention is focused on introducing the initial experimental results of a comparative experimental investigation on the energy performances of R600a tested as drop-in of R134a in a test-bench refrigeration system developed at the School of Mechanical Engineering of VIT University located in Vellore (India). Moreover, a comparison of the energy performances was pursued also with the system working with and without sub-cooling. The initial experimental investigation is performed respecting the requirement that the two fluids occupy the same volume. The initial energy performances are carried out in terms of evaporator temperature, coefficient of performance and refrigeration effect. The effect of drop-in with R600 a system previously working with R134a, carries an enhancement of the energy performances in terms of COP and refrigeration effect. Moreover, subcooling carries to an additional benefit on the refrigeration effect. The introduced initial experimental results constitute just the first step of a bigger investigation to be conducted in India, focused on analyzing the impact of the drop-in of HFC with new eco-friendly refrigerants.

1. INTRODUCTION

Nowadays, global warming is a shared worldwide problem: the human end contributed significantly in the last half century to its intensification, since the energy consumption is considered among the main reasons to temperature increment in our world. The warning signals launched by our planet are already worrying and all the world is called to responsibility to avoid the catastrophic consequences that could occur. All the most critical sectors for energy consumption are called to adopt countermeasures to counteract the progress of global warming. Among them, more than 20% of the worldwide energy consumption originates from the sector identified by refrigeration, air conditioning and heat pumping. Almost the totality of the cooling systems is based on Vapor Compression (VC) and therefore on fluid refrigerants. Since the beginning of the utilization of VC-based systems and up to a couple of decades ago, the benchmark refrigerants were ChloroFluoroCarbons (CFCs) and HydroChloroFluoro-Carbons (HCFCs) due of high Ozone Depletion Potential (ODP) and Global Warming Potential (GWP) [1]. They were the cause of the CFCs and HCFCs banning by the Montreal Protocol [2] that took place in 1987 to the purpose of protecting the stratospheric ozone layer. Over the years subsequent measures were taken in 1997 with Kyoto Protocol [3], an international agreement linked to the United Nations Framework Convention on Climate Change. Because of their significant Ozone Depletion Potential (ODP), the usage of HCFC has been forbidden since 2000 and the only fluorinated class of allowed refrigerant was the HydroFluoroCarbons (HFCs), characterized by no ODP but consistent GWP [4-7].

Since then, periodical meetings among the Parties agreeing to the Montreal Protocol have been succeeding over the year modifying and adapting the measures approved to counteract the global warming and, more generally, preserve the ecosystem. From 2009, a progressive phasing out of HFCs has been established, in order to reduce greenhouse gases emissions. The 28th Meeting of the Parties (MOP28) [8] to the Montreal Protocol which was held in Kigali, Rwanda, from October 10 to 14, 2016, led to an international agreement on the phase-down of the production and consumption of HFCs. Specifically, the Kigali amendment identifies the countries composing the Article 5 as the 136 primarily developing countries as specified by Montreal Protocol, except for ten countries: Bahrain, India, Iran, Kuwait, Oman, Pakistan, Qatar, Saudi Arabia and the United Arab Emirates. These ten countries constitute a separate group of Article 5 countries (group II), because they are characterized by elevate ambient air temperature and therefore, they are particularly dependent by air conditioning. All the other countries (the “developed” countries) are classified are non-Article 5 parties [9]. The Kigali amendment represents a milestone agreement that prescribes a gradual 80% to 85% phase-out of HFC at the end of 2040s with a staggered execution of consumption freezers from: 2019 for non-Article 5 countries (the “developed” countries); 2024 for most of the “developing” countries (Article-5 group I); 2028 for the other ten “developing” countries (Article-5 group II). Basing on above prescriptions,