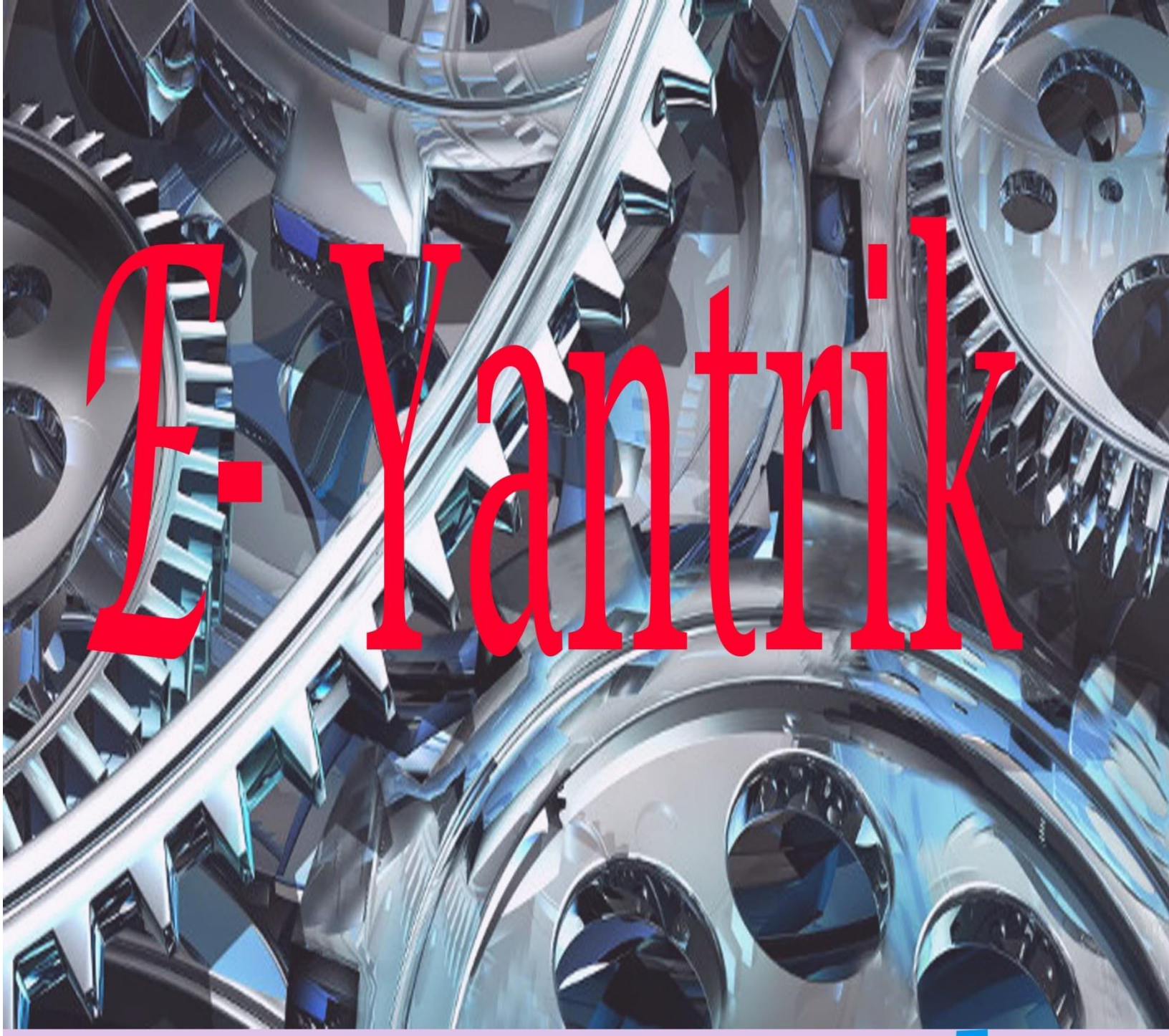

E-Yantrik

Volume: 7

1st :Issue

GIFT

Student Editors: **Anmol Das**

Sandeep Guin

Faculty Editor: **Dr. Alok Mohapatra**

Vision of the Department:

To become a centre of excellence, acclaimed globally as a source of knowledge in the field of Mechanical Engineering by producing the professionals of highest grade to excel in the field of Industry and Research, bearing the ability to face the challenges posed by latest technology and competition.

Mission of the Department:

- To impart quality education to the students and enhance their knowledge and skills to make them globally competitive Mechanical Engineers.
- To become a leader in the field of Mechanical Engineering by acquiring and disseminating knowledge, using the best methods of teaching.
- To develop linkages with Industrial and Research organizations, enterprises in India for industry-oriented projects to apply theoretical knowledge to practical problems.
- To develop entrepreneurship skill of the students to make them ready for self-employment.

PEO's of the Department

Program educational objectives of Undergraduate Mechanical Engineering Department are

- PEO-1 : Our graduates will succeed as a mechanical engineer or obtain an advance degree by applying basic principles of engineering and skills to solve complex engineering problems.
- PEO-2 : Our students will be able to carry out Multidisciplinary research using modern tools and adapt to current changes by inculcating habit of lifelong learning.
- PEO-3 : Our Students will be able to work in the field of clean energy for the welfare of the society as responsible citizens with good ethics.

From the HOD'S Pen

Dear Readers,

Greetings from Department of Mechanical Engineering!

I am pleased to know that our students are successful in bringing their first issue of magazine E-YANTRIK for this academic year 2017-18. E-YANRIK, the departmental magazine has the prime objective of providing aspiring engineers a wide platform to showcase their technical knowledge and to pen down innovative ideas. This magazine is intended to bring out the hidden literary talents in the students and teachers to inculcate strong technical skills among them. As a half yearly magazine of GIFT, it helps the students to interact and share their ideas with the industry leaders and their peers studying in the college.I congratulate and thank all the students and faculty coordinator who have made untiring efforts to bring out this magazine.

I thank everyone for their valuable contributions to the magazine and hope to receive similar enthusiasm through your precious insight in the fourth coming issues of E-YANTRIK.

Thanks & Regards,

Prof. Alok kumar Mohapatra

H. O. D, Mechanical

Gandhi Institute For

Technology, Bhubaneswar

From the Editor's Pen

Dear Readers,

Greetings from Department of Mechanical & Engineering!

I am delighted to learn that our college is bringing out a magazine for this academic year. It is a nice platform for both the faculty and the students to exhibit their talents. I strongly believe that it would be an excellent medium through which the world can learn about the potential and achievements . I hope that this would be an ongoing process and the magazine would bring out the latent talent of everyone. I join others in appreciating and recognizing the hard work of the magazine committee in bringing out the magazine and in wishing them success in their endeavour.

Thanks & Regards,

Dr. Alok Mohaptra

Dept. of Mechanical

Editor, E-Yantrik

- **Article**

1. *Characteristics of mixed convective Flowover fins for automobile application*
2. *A study on implementation of simulation at Operational level in manufacturing system*
3. *A novel discount mechanism for bu Online pick up in store (bops)*
4. *Makespan optimization in open shop scheduling*
5. *Assessment of manufacturing process through Lean manufacturing and sustainability Indicators: case studies in indian perspective*

- **Some Intresting Facts**
- **Technical quiz**
- **Mechanical Poem**
- **Grate Quotes**

CHARACTERISTICS OF MIXED CONVECTIVE FLOWOVER FINS FOR AUTOMOBILE APPLICATION

Prof. Rajeswari Chaini

Heat transfer is a phenomenon that plays a major role in the world of thermodynamics. In automobiles, heat transfer from the engine is a very vital phenomenon. There is the challenge of removing excess of heat with the help the fins from the engine to increase engine's efficiency. This paper attempts to properly design and optimize a fin using Finite volume analysis to increase heat transfer rate. The most common type of mode of heat transfer in fluids is convection. Convection takes place due to the movement of molecules. When the movement of these molecules takes place without any external source, it is called natural convection.

And when it happens with the aid of external source, it is called forced convection. When both these mechanisms act together to transfer heat i.e., when there is an interaction between buoyant and pressure forces, it is called mixed convection. To achieve mixed convection, a lid driven cavity is used where natural convection is obtained by maintaining the temperatures of walls of the cavity at different temperatures and forced convection is obtained with the help of the top wall of the cavity which moves with a certain velocity. In case of constant wall temperature (CWT), the surface wall has the same temperature throughout, but the flow of heat per unit area through the walls is different. And in case of constant heat flux (CHF), the wall temperature may not be uniform throughout but the rate of flow of heat per unit area through the wall surface remains same. Grashof's number is the ratio of buoyancy to viscous forces acting on the fluid. With the help of Grashof's number, one can predict if natural convection or forced convection is dominant. Prandtl number is the ratio of momentum diffusivity to thermal diffusivity. It can be used to determine the thermal conductivity of gases at high temperature. It also provides information about thermal and hydrodynamic boundary layer. Reynold's number is the ratio of inertial forces to viscous forces in a fluid flow. It helps us to predict the patterns in fluid's behavior. For Gr = 0, it becomes purely forced convection and for Gr = 105, natural convection is predominant It has been observed that, when flow advances towards purely natural or purely forced convection, heat transfer rate increases. Also, an obstacle in the cavity helps in offering resistance to flow which increases heat transfer.

A square cavity of side 1 m in length containing fluid with top wall moving is considered for the numerical analysis. The length of the lid is considered as the reference length. Since in this study the non-

dimensional analysis was carried out from an application point of view, the driving velocity of lid is not specified. the fluid moves along the direction of top plate since Reynolds number is very low, because of which the convective zone stays above the blockage. But once the Reynolds number increases the convective zone moves to the right a little and then starts moving towards the blockage. With increase in Reynolds number the convection changes from natural to forced convection. But for triangular blockage we can observe more forced convection than in that of other two blockages. With increase in Reynolds number the fluid circulates properly around the blockage taking away more heat. With increase in Prandtl number the heat capacity of water increases and because of which convection occurs at a faster rate. The difference between the square and triangular blockage is only with the presence of inclined edge for the triangular the blockage. Sharper the edge more is the convection rate because the fluid interacts with the surface for a considerable time as it comes to rest at that edge and it enhances heat transfer

A STUDY ON IMPLEMENTATION OF SIMULATION AT OPERATIONAL LEVEL IN MANUFACTURING SYSTEM

Bikash Choudhury

Manufacturing simulation has a greater role to play in this era of smart manufacturing. Global competency can be achieved when industries are able to execute planned strategies at an operational level. Over the years simulation has been extensively used at strategic levels, where decisions concerning productivity, design, process reengineering, alternative model selection to bemade, have long term effects. Many research experts have pointed at the need to use simulation at an operational level in manufacturing system.

Rapid growth of expertise and constant change in the customer requirement have decreased product life cycle. Nowadays industries are driven by customers unlike old traditional hierarchy rules, wherein flow of control was from top to bottom. “Lean manufacturing” is what industries people refer to. Thus, the processes that are carried at an operational level play a significant role in the path of moving toward lean manufacturing. At the operational level, industries require to collect, merge, and analyze various data set generated on the floor from unit production to equipment operations data. The effective execution of real-time analytics and monitoring is possible through better-informed decision making. We known that physical implementation of

change can be difficult task. But through simulation, designer can actually test and verify several design alternatives as they would be having detail analysis of existing system's behavior over a period of time. Given that over the years simulation has been used mostly for decision support in situations that are several months and maybe years ahead. Simeonov and Simeonovova in their paper have considered a case study on coffee production describing potential uses of simulation for increasing productivity and profit. Minegishi and Thiel explained simulation study on industrial management behavior in food industries. But there has been too little concern toward implementing simulation in plans and schedules on a weekly or even daily basis from industry people. In order to explore the effects of implementation of simulation at the factory floor, we conducted a simulation study at a tin container production line. The objective of the study was to maximize production rate through minimizing serious bottlenecks identified at various stages by proposing several scenarios without altering existing facility.

Simulation study is carried out through several orientation visits to the plant and getting familiar with the system components. Among available simulation software's such as Arena 10.0, ProModel, Process model, etc., Arena 10.0 was used to run real-time simulation and build the system model. With the simulation run results, congestions in different stages on the production line were determined. Through simulation experiments, several scenarios were developed to identify feasible solution to increase production rate. Introduction of change into existing system always has a cost attached to it. Therefore, payback period of capital investment was also calculated To accomplish the objective of the study detail analysis of requirements of simulation was carried out. All the stages, their processes, inter-arrival times, and resources are identified and reported. Then, a simulation model is built using modules of simulation software and it has to be verified and validated so that it represents true behavior of the existing system. Once we arrive at a validated model, it is used to conduct the simulation experiment to look for feasible solution which maximizes the productivity of the plant.Operational level management of many small scale industries run without proper guidance and perhaps less technologically supported. This particular study was successful in implementing simulation tool at an operational level, wherein the main objective of increasing the production rate was increased by almost 22% and reducing average waiting times and average number of queue at each stage of the production line.The biggest challenge in implementation of simulation at an operational level is convincing the plant management that using simulation in this way, along with improvised computer tool support, has large impacts on plant itself.

A NOVEL DISCOUNT MECHANISM FOR BUY ONLINE PICK UP IN STORE (BOPS)

Mr. Suraj Biswas, 3rd Year mechanical

Buy online pickup in store (BOPS) is one of the omnichannel fulfillment strategies which is gaining lots of popularity among omnichannel stakeholders. For this purpose, few large retailers have adopted BOPS strategy while many more are in queue to adopt for BOPS's benefits to expand their business. To attract the customer to use BOPS environment, retailers often offer various discounts on products and services. In this paper, a novel discount strategy is proposed under BOPS environment to benefit both consumers and retailers. In this mechanism, the customer would be delighted through different discount categories which are based on travel distance to pick their order. To get depth insight into this strategy, a numerical illustration is enumerated. This strategy would be useful to the new market entrant in this area for expanding their business through leveraging such BOPS schemes.

The emergence of omnichannel has redefined the retail industry to a great extent. Consumers have transformed themselves into omnichannel consumers who believe to enjoy seamless experience. This demand to have frictionless service is making life difficult for retailer. Since this is an era of digital information, even a slight mistake by retailer in expectation fulfillment of consumer can cause a loss of many valuable customers. Thus, retailers are forced to restructure and reconfigure their strategy in order to match omnichannel expectation. Few of important ones are changed in structure of distribution network, information system, application programmable interface, channel collaboration, etc. These changes have brought many interesting intervention in today's retail industry. Few of them are buy online pickup in store (BOPS), reserve online pickup and pay in store (ROPS), ship to store (STS), ship from store (SFS), etc. Out of these, BOPS is most popular due win-win situation for both retailer as well as customer. These could be seen in terms of large retailer, i.e., 42% of them provide options of BOPS.. This strategy has been very effective in terms of its sales and providing better customer satisfaction. For example, BOPS accounted for almost a third (30.2%) of Sam's Club e-commerce sales in 2015 while in case of Kmart it was 22.6%. Adoption of BOPS could be seen in the Nielsen report of2015 on the future of grocery. BOPS has many benefits such as it reduces congestion at store and thus saves the time of consumer. It is also cost effective due to reduced cost of lastmile fulfillment which accounts for 28% of total delivery cost. As due to pickup by consumer in case of BOPS, this major cost could be saved and in return some discount may be offered to consumer to motivate for BOPS. BOPS also offer quality check of the

product at the time of pickup at store. BOPS is also very useful in increasing in-store sales through cross-selling at the time of pickup. Also, it overcomes the major disadvantage of online shopping issues like late delivery and returns management through its structure of collecting and returning product at the store. BOPS being a very recent and novice phenomenon in today's retail industry, it possesses few shortcomings in its operations. JDA and Centrio (2016) reported that about 16% of online consumer finds it difficult to locate their appropriate order picking store because of distance issues. This drawback in the form of "unreasonable store recommendation" is a serious issue which keeps 62% of consumer away, and these issues have not been reported much in the literature. Jin et al. tried to answer this query by deciding optimal strategy by trade-off between retailer costs and BOPS service area. We answer this gap by designing a distribution network for deciding optimal BOPS service area based on a discount mechanism keeping both consumer and retailer interest in mind. To the best of our knowledge, such discount mechanism keeping both retailer and consumer has not been reported in the literature yet. This section dealt with the introduction to omnichannel and its interesting invention in today's retailing world. Next section deals with the literature review regarding related work in the field of omnichannel and BOPS. Section three is concerned with formulation of proposed mathematical model while section four deals with a numerical illustration for the same. Finally, section five puts forward a concluding remark of the proposed study.

BOPS is so popular that most of the global giant had started to adopt the philosophy of BOPS to reap its benefits. About 42% of the larger retailers are seen with providing the option of BOPS to the customers. Gallino and Moreno carried an empirical investigation and reported that BOPS increases store sales while reduces online sales. Gao and Su reported the limitation of BOPS that it is not profitable in case of implementation for those products which sells well in stores and in case where store fulfillment is cost effective. However, to motivate customer for using BOPS, there is a need to provide some forms of incentive to the customer. The incentive mechanism could be in terms of discounts, coupons, etc., so that the customer agrees to travel a certain distance to pick their order. In this work, a distribution network is designed for deciding optimal BOPS service area based on a discount mechanism keeping both consumer and retailer interest in mind.BOPS requires capital investment initially in form of investments in information and labor but still it is profitable due to many advantages like reduced cost of last mile fulfillment which is one of the major cost in delivery, increased in-store sales through cross-selling at the time of pickup, reduced congestion at store, time saving of both consumer and retailers, availability of quality checks at the time of pick from store and easy returns. It also

overcomes the major disadvantage of online shopping issues like late delivery and returns management through its structure of collecting and returning product at store. But to motivate customers to migrate to BOPS, motivation is need in the form of discounts and seamless services. In this work, a novel discount mechanism for BOPS environment is proposed where BOPS user gets the discount based on their travel distance. Such kind of mechanism is very effective and fair as both BOPS retailers and customers through sharing BOPS benefits among them. This makes a win-win situation for both parties. Here, the discount mechanism is based on the average travel distance of BOPS customer from nearest DC. However, the model is illustrated through a hypothetical example which is one of the limitations of this work. In case of bigger and complex problems since exact solver may not be suitable, heuristic or metaheuristic is suggested in future work. Also, web or phone-based application could be made in near future for real-time suggestive discount mechanism for future purchase in BOPS environment.

MAKESPAN OPTIMIZATION IN OPEN SHOP SCHEDULING

Mr.Inayat Quadri 2nd Year mechanical

In today's rapid production scenario, scheduling plays a dynamic role in planning. In this work, open shop scheduling problem related to a copper flexible braids manufacturing company is considered. In a scheduling problem, the purpose is to find the orders of jobs on specific machines with an objective to optimize the make span. Scheduling can be either manual or automatic. Manual scheduling of operations is a difficult task. Hence, computational methods are used to automate and simplify the process. In this work, integer programming and constraint programming based mathematical models are developed to tackle this problem. The branch-and bound (B&B) algorithm is applied for integer programming model, and branch and- cut (B&C) algorithm is applied for constraint programming model in order to get optimized make span. A comparison of results obtained from both mathematical models is done for selection of optimized make span and identification of model.

Scheduling deals with the allocation of the resources or the arrangement of resources. It is a wider term used in number of industrial problems. For example, scheduling of jobs in industry for obtaining the optimum make span time. Figure represents the classification of scheduling. To perform the scheduling, the very first thing is to get the information about the availability of resources. When the scheduler gets all the information on

available resources, the second step is to allocate the available resources for performing specified tasks. For this, the scheduler first constructs a tentative schedule chart and then evaluates it. After the completion of evaluation, scheduler conveys the plan to user. User may or may not be satisfied by the results obtained by the tentative scheduling plan and can alter some resources to get the more efficient and accurate output. Widely, scheduling is classified as α/β/γ types; where α represents job environment, β indicates job characteristics and γ signifies the optimality criterion.

Some authors have considered the objective of open shop scheduling problem as minimizing the makes pan. They established a model using constraint programming to solve the problem and tested the results with the existing literature. For solution of open shop scheduling problem, many metaheuristic algorithms have been introduced in last few years. Some of the current and successful metaheuristic algorithms are ant colony optimization, genetic algorithm, and particle swarm optimization. From the literature, it can be concluded that most of the heuristic techniques rapidly give good results. Most of them are constructive techniques and belong to three major groups: matching algorithms, priority dispatching rules, and insertion and appending actions joint with beam search. Open shop scheduling was explored with dynamic shortest processing time (DSPT), which considered the scheduling of n jobs and m machines. A heuristic for minimizing the make span was proposed and a new lower bound presented for schedule. It was verified with the experiments.

In the present work, a mathematical model is proposed for n job, m machine for open shop scheduling. This model used the criterion of minimization of make span time. This model is further programmed in two optimization tools, which computationally help to solve the problem. A similar model can also be used for other objective functions such as minimum tardiness, minimization of mean flow time with slight modification in the mathematical model. The future work may be conducted to develop new meta heuristics techniques and mixed integer linear programming (MILP) for solving open shop scheduling problem.

ASSESSMENT OF MANUFACTURING PROCESS THROUGH LEAN MANUFACTURING AND SUSTAINABILITY INDICATORS: CASE STUDIES IN INDIAN PERSPECTIVE

Subham Das , 4th year, Mechanical

Due to the government pressure and public awareness, industries are bound to incorporate sustainability in their manufacturing process. In this context, the concept of lean manufacturing and value stream mapping (VSM) process has been used widely in various manufacturing industries to minimize the waste in their production process. The objective of this study is to propose a conceptual model for the integration of VSM tool integrated with various sustainability indicators. The proposed model is capable to assess the manufacturing process into three sustainability dimensions such as economic, social, and environmental. This methodology was applied to two different manufacturing industries such as automotive component manufacturing organization and PVC pipe manufacturing organization, situated in India. The result demonstrated that the proposed methodology identified the areas of improvement after applying these integrated methodologies and clearly enabled the opportunities for improvements in both manufacturing organizations.

The operation management frameworks have been developed to adopt the new changes in the market with certain changes in customer demands. During the twentieth century, the increase in demands for quality of products thus various management frameworks have come into the competitive market to fulfill the customer needs. This framework was developed based on the analysis of standard time, methods, and operations. In the end of the twentieth century, the demand of the quality product was in hike due to globalization, and resulted various manufacturing processes had been managed according to quality, delivery time, cost of the product, flexibility, reliability, and speed indicators. Lean manufacturing approach is wieldy applied for the management of manufacturing process. The objective of lean manufacturing is to eliminate waste from the production process and enhance the operational improvement of the organization. The various improvements can be found after the successful implementation of the LM concept such as reduction in cycle time, waiting time, inventory level, number of employees; this can directly help in the improvement of quality, cost, and delivery time of the product. Ultimately, these improve customer satisfaction level of industry in the competitive market.

This study introduces a new group of sustainability indicators integrated with three dimensions such as economic, social, and environmental key performance index (KPI), and these indicators are integrated with lean manufacturing tools VSM (lean KPIs) to develop a conceptual method for assessing sustainability of the manufacturing process.

Lean manufacturing (LM) is defined as a methodology which eliminates waste from manufacturing process through reduction in non-value-added activities and improves bottom-line results. Eatock et al. defined that the lean manufacturing is a set of principles, procedures, methods which helps to reduce waste and improve the production process. The study highlighted the value stream mapping tool is a most powerful tool among the other lean tools and also stated that this tool provides a holistic view and is highly used in several organizations. Chen et al. presented an implementation process of lean manufacturing in a factory with the help of a case study. Kuhlang et al. proposed the concept of extended value stream mapping (EVSM). The EVSM consisted of transport indicators and allowed this for the development of future scenario for the improvement in manufacturing process. Dües et al. analyzed the relation between green and lean manufacturing practices in the area of supply chain management (SCM).

The concept of integrating lean manufacturing tool, value stream mapping (VSM), with sustainability indicators to assess the manufacturing process has been recently discussed in the literature by various authors. However, development of a conceptual model for the integration of VSM tools with various sustainability indicators in the assessment of the manufacturing process that efficiently contributing the increased level of sustainability in any manufacturing process is in the initial stage. Thus, the main objective of this study is to discuss the obtained result and improvements identified in the two industrial case studies related to the assessment of manufacturing process through integration of VSM and sustainability indicators. The case studies are presented for assisting the new direction for improvement and future research in the field of lean manufacturing (LM) and sustainability. This methodology brings the new group of sustainability indicators under the three dimensions that are economic; social; and environmental. Two sustainability indicators have been considered under each dimension through developed assessment mode and the reviewed literature on sustainability indicators.

SOME INTRESTING FACTS

Mr. Aswini Kumar, 2nd Year mechanical

- ***The first alarm clock was designed for one person and could only go off at 4am – when they had to get up and get ready for work. An adjustable alarm clock was not created for another 60 years.***
- ***The only state that can be typed on the same line of a QWERTY keyboard is Alaska. You just checked didn't you?***
- ***80% of YouTube's videos are viewed from outside the United States.***
- ***The 2015 most popular mobile app was Facebook.***
- ***People who are using a computer blink 66% less than those who aren't.***
- ***The first ever domain to be registered, symbolics.com, is still in existence today 31 years and 275 million domain names later.***
- ***China has banned YouTube, Facebook, Gmail, Twitter, Instagram, Dropbox and Skype from public use.***
- ***The computers used in the Apollo 11 trip to the moon had less processing power than a modern day cell phone.***
- ***An ecofriendly car that can act as a backup power generator for your house in the event of a blackout? That's the futuristic Toyota FCV.***
- ***Around the year 1500, Leonardo da Vinci sketched plans for a robot.***

Technical Quiz

Mr. Sandeep Mohanty, 3rd Year MECHANICAL

1. Cooling and dehumidification of air is done in summer air conditioning.

a) true b) false

2. Heating and humidification is done in

a) summer air conditioning b) winter air conditioning

c) both of the mentioned d) none of the mentioned

3. What is dehumidification?

a) The process of increasing the moisture of the air is called as humidification.

b) The hot air when cooled with contact in water.

c) The warm air taken out when brought in contact with water

d) The air-water cooling done to cool down the warm water.

4. By differencing the temperature, heat added or removed is

a) Sensible heat b) Latent heat c) Heat of vaporization d) None of the mentioned

5. For summer air conditioning, the relative humidity should not be less than....

A.40% B.60% C.75% C.90%

6.The moisture content lines in psychrometric chart are also called as

a. relative humidity lines b. specific humidity lines c. both a. and b. d. none of the above

7. In psychrometric chart, specific humidity lines are:

(A) vertical (B) horizontal (C) inclined (D) curved lines

8. An air washer can work as:

(A) Humidifier (B) Dehumidifier (C) Filter (D) All of the above

9.Sensible heat factor is:

(A) Sensible heat/Latent heat (B) Total heat/Sensible heat

(C) Latent heat/Sensible heat (D) Sensible heat/Total heat

10. The function of duct in air conditioning unit is:

(A) air cooling (B) air cleaning (C) air drying (D) air distribution

Answers

1. A
2. B
3. D
4. C
5. B
6. C
7. B
8. C
9. C
10. B

Mechanical Poem

Biswaranjan Tarai ,3rd yr ,Mechanical

Mechanical Heart

What I have is a mechanical heart made up of gears;
it pumps up oil and artificial heartbeats

It was you who gave it life—
It was you who made me alive—

Even though it's already yours,
I just want you to know,
You're the only one it's beating for.

GREAT QUOTES

Kirankumar pakal 3rd yr mech

- ***"Anyone and everyone taking a writing class knows that the secret of good writing is to cut it back, pare it down, winnow, chop, hack, prune, and trim, remove every superfluous word, compress, compress, compress...***
  - ***Nick Hornby***

- ***"When you write a book, you spend day after day scanning and identifying the trees. When you're done, you have to step back and look at the forest."***
  - ***Stephen King***

- ***"There's no such thing as writer's block. That was invented by people in California who couldn't write."***
  - ***Terry Pratchett***

- ***"Outside of a dog, a book is man's best friend. Inside of a dog, it's too dark to read."***
  - ***Groucho Marx***

- ***"I love deadlines. I like the whooshing sound they make as they fly by."***
  - ***Douglas Adams***

- ***"If my doctor told me I had only six minutes to live, I wouldn't brood. I'd type a little faster."***
  - ***Isaac Asimov***