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Design and Development of Fault Detection System in Production Line Monitoring at UJAS Electrical Private Limited - A Review

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Abstract: ***This review article focuses on the design and development of various processes, with an emphasis over the use of simulation abilities as a tool that helps the continuous improvement of manufacturing. The examination of common techniques to modelling production systems is the focus of such work. Simulation is a strong tool that allows businesses to save time and money. It enables user to evaluate various strategies and analyse the operation without even affecting actual system. This review paper investigates previous research to implement effective solution on production line in Ujas electrical pvt. Ltd. Many benefits may be gained by employing the simulation technique, which including reduced time spent changing the industrial layout, cost savings, increased profit, increased productivity, reduced idle time, reduced lead time, and so on.***
Keywords: Simulation, Petri Nets, production line, etc

I. INTRODUCTION

Manufacturing companies usually are the largest multipliers of economy, employment provider, and GDP contributor. Due to such a critical position in any country's economy, maintaining operational efficiency of a manufacturing concern is crucial. This also results in obtaining higher value products and gaining satisfaction and content of the consumers. Thus, in today's manufacturing environment, maintaining machines and production equipment plays an important role which directly affects the service life of equipment and its production efficiency. The organizational environment is also affected by how a company plans, utilizes and maintains its facilities and manufacturing process in order to enhance its market shares and consumer appreciation. Machine failures are undesirable to any manufacturing company as they result in low production rates and lead to inferior quality. In addition, failures make it difficult for manufacturers to accomplish their commitments to consumers.

The ratio of an output to the unit of all the resources needed to generate that output is known as productivity. Productivity is typically linked with departmental performance in industry, as compared to production. Production refers to production over a set period of time. Improving labour, capital, material, and machine productivity, among other things. Plant layout enhancement, on the other hand, might be one of the techniques used to respond to rising industrial productivity.

II. LITERATURE REVIEW

N.H. Saad et al (2005), presented paper on manufacturing plant performance analysis using simulation technique. [1] The management method of a discrete event simulation project is examined in this study. The goal integrates simulation approaches with the basic concept outlined in the PMBOK to improve project execution performance. To achieve this aim, we created a management plan for the project management model's phases, based on the PMBOK knowledge areas. Although the objective of this work is not to perform a simulation model including modelling, verification, and validation stages, it does take into account several characteristics of a simulation project. Jianliang Peng (2007), presented paper on Simulation and Optimization of Production Logistics System Layout based on Flexsim [2] The simulation of a modern logistics system seeks to comprehend different statistics and dynamic performance associated with material transit and storage dynamic processes. When simulation software is used, it may assist staff in efficiently optimising the layout design in the system designing and commissioning the system, saving time and resources. Mateusz Kikolski et al (2016) presented a study on using Plant Simulation software to identify production bottlenecks [3]. Improving the performance of workstations that cause production delays is a critical problem. It should be emphasised, however,

that before taking action to improve the performance of bottlenecked workstations, it is critical to pinpoint their exact position. Based on the current Theory of Constraints, the first step in controlling constraints is to find a bottleneck in the system. It entails pinpointing the system's flaws. Other steps of constraint management that may be utilised in the analysis of computer-assisted simulation models include as follows.

E.Tokgoz et al (2017), presented paper on Industrial Engineering and Simulation Experience Using Flexsim Software [4] In this paper, flexim software features are discussed. Industrial engineering is a field of engineering that focuses on the improvement of complex processes, systems, and organisations. Industrial engineers seek to minimise non-value-generating waste of time, money, materials, man-hours, machine time, energy, and other factors. Industrial simulation tools such as FlexSim, AnyLogic, and Simio are often utilised.

Vijay Bhaskar et al (2017), presented paper on Modelling and Analysis of a Manufacturing Plant Using Discrete Event Simulation [5]. Simulation is a model that is reflective of real-life events. It's a representation of reality that allows you to see what might happen in real-world scenarios. Simulation is a term that refers to a representation of reality that might take the shape of a physical object or a set of mathematical equations.

Akshay D. Wankhade et al (2017), presented paper on Productivity Improvement by Optimum Utilization of Plant Layout: A Case Study [6]. The purpose of this article is to investigate and comprehend the challenges and issues that this tiny sector faces, as well as to conduct a study on small plants to enhance their efficiency and dependability. This study seeks to enhance the plant structure of milk processing plants in order to remove material flow blockages and achieve optimum efficiency. Different optimal plant architecture models must be created, and their simulation utilising current software will result in an improvement in the plant's productivity. Because of numerous connected aspects such as workflow, machine locations, and the interaction between machines and work, optimization is quite difficult.

Zhao H. et al (2018) presented paper on Dynamic graph embedding for fault detection. [7] A fault detection problem for correlated process data. For this, they proposed a novel fault detection approach, referred to as dynamic graph embedding (DGE), to keep important characteristics of process variables and data such as structural information in process variables and serial (or temporal) correlation among process data. Then, they provided new similarity matrices based on a finite Markov chain to extract significant features of the process. To show the performance of the algorithm proposed, they applied it to the Tennessee Eastman benchmark process. Zhang and Li considered a non-linearity problem in semiconductor etching process for fault detection. For this, they presented a new fault detection approach based on multi way principal polynomial analysis. show the performance of the presented approach, they tested it on a numerical example and semiconductor etching process data.

Azhra, Fariza Halidatsani et al (2020) presented Designing the Simulation Model to Increase Production Using Flexsim Software. [8] After running the simulation, it becomes clear that XYZ has a serious problem in that it is unable to consistently meet consumer requests, resulting in missed opportunities. When the average demand is 70-100 dolls per day, XYZ can only manufacture 20-30 dolls per day. he sewing machine operation takes up the majority of the manufacturing time, resulting in a bottleneck between the cutting and sewing machines. As a result, the researcher tries to invest in a sewing machine so that no possibilities are missed. It was discovered that by adding two sewing machines, XYZ was able to manufacture an average of 80 dolls every day.

III.METHODOLOGY

FlexSim excels in 3D animation and is known for its user-friendly interface and simplicity. FlexSim only supports discrete event simulation, unlike AnyLogic, which enables multiparadigm simulation. Products are represented and managed as flow items in this sort of simulation. This imposes constraints on the implementation of product-based decision-making. The research conducted by several steps, include:

1) *Data Collection:* Statistics on the quantity of products, machinery, and operators, as well as the manufacturing process time, are collected.
2) *Observational data Distribution:* The processes of production line are observed. The data utilised is the routing sheet's production time data.
3) *Modelling:* The model is required to represent things on the manufacturing floor in order to conduct simulations.
4) *Simulation:* To get simulation results, the simulation is run using the flexsim software when all essential data and models have been finalised.
5) *Result Comparison:* The regular processing data will be simulated and optimized simulation data will be compared.

IV. CONCLUSIONS

From the analysis of various literature papers, it is observed that flexsim software is appropriate for our research. The simulation of processing features without affecting the actual manufacturing line is attractive factor of this software. Hence, the flexsim software will be used first to simulate the actual processing of production line in Ujas Electrical Private Limited. The idle conditions will be observed from the simulation and essentially practical solutions will be try to implement. This will help the organisation to increase the production by identifying and diagnose faults in system.

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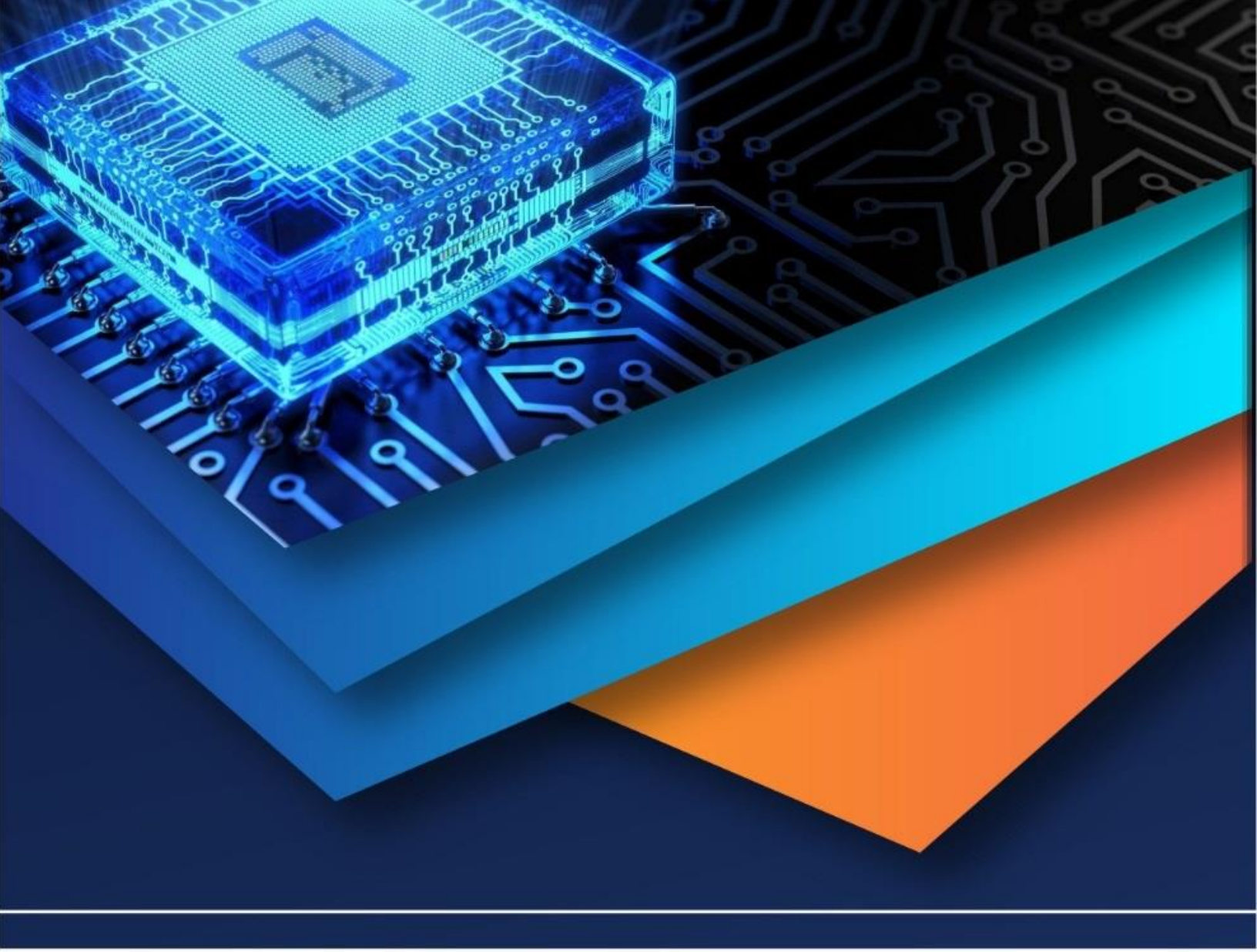

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