



Improvement of OEE by Measuring & Analysis of Machine Speed, Total Stoppages and Implementation of Visual Display Board

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Received 10 February, 2015; Accepted 10 March, 2015 © The author(s) 2015. Published with open access at www.questjournals.org

ABSTRACT: This paper covers monitoring & Analysis of Machine speed, total stoppages to database computer. The system is designed for keeping track of information in order to improve OEE of the plant. In this paper we also have discussed execution of Visual display board which will display various perimeters of the production line for implementation of visual factory concept.

Keywords: - OEE, Visual display, machine speed monitoring

I. INTRODUCTION

At the present time it has become significant to build up a cost effective monitoring system for any manufacturing facility which is capable of keeping up the track of machine speed actual vs. theoretical which can directly affect the throughput & also total number of stoppages along with their rationalities. This paper presents the design & accomplishment of a data gathering system & presentation of this data on production line, which is capable keeping track of data. To transmit medium, sensor can be positioned at filling line which are connected to PLC which is responsible to send figures to computer, moreover the computer will perform analysis and send these numbers to display boards which are LED marquee display board.

Overall Equipment Effectiveness (OEE) is a Lean tool which can truly ease complex production troubles into simple, intuitive presentation of information. It helps you systematically improve your process with easy-to-obtain measurements.

Overall Equipment Effectiveness (OEE) depends upon the following three factors:

$OEE = \text{Availability Ratio (A)} \times \text{Performance Ratio (P)} \times \text{Quality Ratio (Q)}$

Availability Ratio: Availability takes into account Down Time Loss, which includes any Events that stop planned production for an appreciable length of time.

Performance Ratio: Performance takes account into Speed Loss, which includes any factors that cause the process to operate at less than the maximum possible speed, when running.

In this study we will cover Availability Ratio & Performance Ratio in detail.

This system will furnish the thrust to the leading organizations worldwide to adopt effective and to design resourceful maintenance strategies such as Total Productive Maintenance (TPM), over the conventional firefighting reactive maintenance approaches.

II. DISCRIPTION

This is trouble-free independent system which can be installed at any filling line, without troubling the production line. The system is design for the measurement & analysis of two factors of OEE, these are performance ratio and availability ratio of any filling machines, to be precise bottles or tube filling.

The system is consist of following two segments,

- Measurement
- Analysis

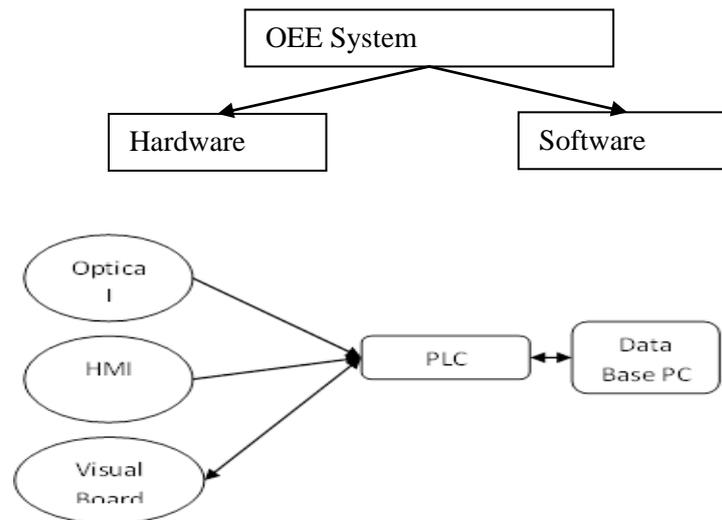
III. MEASUREMENT

In measurement segment we are using two or more optical sensors which can be placed at conveyor belt with various arrangements of the machine to measure performance ratio. As the sensor counts the number of bottles filled. The availability can be measure when the machine is stopped, the sensor will send signal to PLC and a message will appear on HMI to provide the reasons of the breakdown, as we have listed the reasons in our software section it will be discussed in analysis section.

IV. ANALYSIS

In analysis segment we have listed the various possible rational reasons for breakdown. As the reason is given as input and downtime will be calculated and recorded in the database. As we are keeping account of breakdown reasons, so it will be convenient for us to highlight major causes of downtime along with their contribution in production lose.

The system is mainly consist of two part



Overall Flowchart

- **Programmable Logic Controllers**
The role of PLC in the project is to control all operations of the three major components PLC is used in many industries and machines. Unlike general-purpose computers, the PLC is designed for multiple inputs and output arrangements. In our system PLC is used to take inputs from Optical sensor, HMI and provide out at LED Marquees for display.
- **Optical Sensors:**
Optical Sensors are designed for use in detecting the presence of an filled tube/bottle or motion detection in of the filling line. In this system we are using proximity sensor usage include detecting an object so that we can calculate the actual speed per minute.
- **Visual Management:**
On the factory floor, visual management can take shape in the form of key performance indicators that relate to production quantity, speed, as well as machine uptime and downtime.
LED Message Boards are ideal for situations where you need to get the message across, with words or symbols, simply and powerfully. LED scrolling message signs capture attention. Movement, light and color can be collectively used to draw concentration toward significant messages and put forward a continuous status update.
Our LED message boards and message signs are **appropriate** for both inside and **outside, daylight** readable, applications. It can be ranged from single, bi or multi line scrolling LED message boards and LED Marquee solutions to suit your budget and necessities in this system we will show few lines of message.
As we want to keep our board trouble-free and communicative to production floor team so that they can evaluate their performances.

Total BD time(Each)		
Material	Engineering	Misc
0	0	0
Total Downtime		
Operating Time		
Availability Ratio		
Performance Ratio		

- HMI:**
 HMI is used to give user a graphical interface allows individual and machines to interact with each other. Pictures, icons and messages allow for speedy recognition, easing the troubles of illiteracy.
- Database PC:**
 Database is designed to keep the factor effecting availability and performance ratio. The basic idea behind the design is to highlight the key effecting availability ratio by keep detail time for each listed causes of machine breakdown, below chart is showing the example for the measuring both quantities As well as the possible Downtime legends.

OEE(Performance & Availability)									
S.No	Time	Utilized time		Machine Speed		Performance Ratio	Availability ratio	Downtime	
		Theoretical	Actual	Theoretical	Actual			Minute	Reason
1	7:00 am - 8:00 am	45	30	75	65	0.963	0.925	15	
2	8:00 am - 9:00 am	60	60	75	70				
3	9:00 am - 10:00 am	60	60	75	75				
4	10:00 am - 11:00 am	45	45	75	75				
5	11:00 am - 12:00 pm	60	40	75	75			20	
6	12:00 pm - 1:00 pm	45	45	75	75				
7	1:00 pm - 2:00 pm	45	45	75	70				
8	2:00 pm - 3:00 pm	60	60	75	75				
9	3:00 pm - 4:00 pm	45	45	75	70				
Total		465	430	75	72.222			35	

Downtime Legend				
Material	Engineering		Misc	
	Electrical	Mechanical	Other(Specify)	ChangeOver
Tubes Shortage	Filling Nozzle	Filling Nozzle		
Skillet Shortage	Tube Loader	Tube Loader		
	Perforator	Perforator		
	Tube Sensor	Tube Sensor		
	Conveyor	Conveyor		

V. CONCLUSION

In this paper, we have highlighted the importance for the calculation of performance & availability ratio. The system will give new dimension for the measurement & analysis of OEE, as both of these factors has highly significance, of the availability & performance ratio of machinery has enlarged because of the harder competition in numerous industries across the globe to maintain higher OEE of the plants.

REFERENCES

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