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Key Performance Indices for Sugar Industry

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Abstract - ***This project mainly deals with the application of the key performance indices. As a support to the preventive maintenance in any of the industries, the main purpose is to study the performance of machine with respect to another machine, where in the human intelligence is considered. The process of preventive maintenance in any industry can be maintained using the software packages like MATLAB (Matrix Laboratory). The main purpose is to study implementation of the key performance indices for industries***

Key Words: *KPI, MATLAB, Sugar Industry, Breakage of Machine, Failure Mode and Effect Analysis .etc…*

1. INTRODUCTION

In order to run a manufacturing company, continuous development should be considered and must be applied in the regions of quality, safety and dependability. To accomplish the aim, one of the maximum significant processes which should be subjected for growth is maintenance process. Development of safety, reliability, quality and reliability in the plant is straight related to the maintenance scheme in the industry.

"KPI A set of quantifiable measures that a company or industry uses to gauge or compare performance in terms of meeting their strategic and operational goals. Key performance indices vary between companies and industries, depending on their priorities or performance criteria.[1]"

2. METHODOLOGY

2.1 Survey of Industries 1

Ugar Sugar Works Ltd. Ugar Khurd:

As there are various sugar industrial plants in our country at both medium and large scales & there is a good commercial effect to the nation. There are few difficulties that may cause effect in the performance of the sugar industry. This loss can be prevented by proper performance and maintenance procedures.

Our main aim is to solve the problems of the performance. As mentioned earlier of the failure mode and effect analysis (FMEA) method and it is consider as a tool for maintenance or performance and to imply this in the sugar industry the GUI of industry is predicted by using the MATLAB software. As consider some of the machine where the stoppages or breakages are taking place and it directly affect to the performance are mentioned:

2.2 MAT-LAB 2

MATLAB is a powerful language for technical calculation. Because its basic data element is a matrix (array). MATLAB should be used for simulations, modeling, math computations, processing, data analysis, conception, graphics & algorithm expansion.

MATLAB is broadly used in universities and colleges in preliminary & advanced courses in science, mathematics and especially in engineering. In industry the software is used in development, research and design. The standard MATLAB program has functions that can be used to solve common difficulties. In addition, MATLAB has elective toolboxes that are a gathering of specified programs designed to solve particular types of problems.

2.3 Frame work of project 3

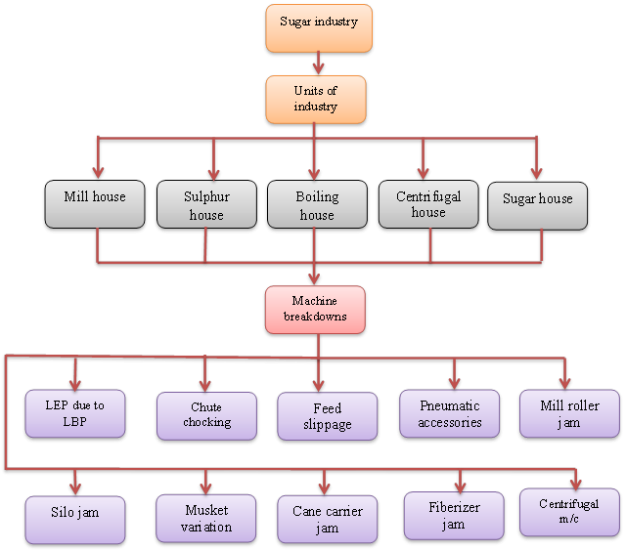

Fig no 4.12 framework of the project in sugar industry

2.4 Failure Mode & Effect Analysis (FMEA) 4

FMEA is an analytical paper test (technique) that associates the technology and knowledge of people in distinguishing predictable failure modes of a process or product and planning for its removal.

"It is a before-the-event action demanding a group effort to simply & cheaply alleviate changes in production & design".

The functions of FMEA

- Identify & evaluate the potential failure of a process or product & its result
- To minimize or remove the chance of potential failures and Recognize the actions
- Document the process.

There are many types of FMEA: process, design, environment, concept, equipment, system, service FMEA, and others. However, for all intents & purposes, all of the types can be broadly categorized under either process or design. For occurrence, service, ecological & equipment FMEA are just somewhat adapted forms of process & system is a grouping of design and process FMEA.

General FMEA Process description:

Process	Potential failure mode	Potential effect of failure	Potential cause of failure	KPI Avg	KPI
LEP due to LBP	Max moisture in fuel and fuel quantity	Process hamper and it effects to the turbine	Due to variations in turbine and boiling will be reduced	6.3	3
Mill roller jamming	Improper mixture of bagasse and water supply to roller	The jamming of bagasse has to be reduced	Due to overload supply of bagasse	6.4	5
Musket variation	Damage in rotating part or variation in speed	m/c stoppage and variation occurs in compressor	Due to variation in Continues supply of cooling water	6.2	2
Centrifugal m/c	Breakage of bearing	Stoppage of m/c	Breakage of ball due to Less lubrication supply	6.1	1
Cane carrier jam	Due to breakage of lifting blade	The over flow of moisture bagasse	Due to bridging action of cane in the carrier	6.3	4

Table2.1: FMEA table for the stoppage in process recognized

3. RESULT AND DISCUSSION

3.1 The stoppage or breakage priority analysis based on a process with respect to interlinked process.

NOTE: By taking in consideration, the maximum priority of KPI is set to 5 and the least priority is set to 1.

Process	LEP due to LBP	Mill roller jamming	Musket variation	Centrifugal m/c	Cane carrier jam	avg kpi	KPI
LEP due to LBP	5	4	3	3	3	3.6	5
Mill roller jamming	4	5	1	2	4	3.2	4
Musket variation	2	1	5	4	2	2.8	2
Centrifugal m/c	3	2	4	5	1	3	3
Cane carrier jam	1	3	2	1	5	2.4	1

Table no 3.1 KPI priority analysis table

3.2 A reason for FMEA depends on stoppage problems, with respect to their priority no.

FMEA reasons for LEP due to LBP

Process	LEP due to LBP	Mill roller jamming	Musket variation	Centrifugal m/c	Cane carrier jam	avg kpi	KPI
LEP due to LBP	5	4	2	3	1	3.6	5

i. LEP due to LBP with respect to mill roller jam the priority will be 4
Reason➔ Due to low boiling pressure it affects to the separation of raw juice and bagasse

ii. LEP due to LBP with respect to musket variation the priority will be 2
Reason ➔due to variation in boiling pressure the musket variation will be taking place

iii. LEP due to LBP with respect to centrifugal machine the priority will be 3
Reason➔ it directly affect to purification or filtration of a raw sugar

iv. LEP due to LBP with respect to cane carrier jam the priority will be 1
Reason➔reduce the supply of sugar cane

Conclusion: the average key performance index for LEP due to LBP in sugar industry was calculated to be 3.6 but the value of KPI was rounded out to be 10 by considering other machines for calculations

FMEA Reasons for mill roller jam

Process	LEP due to LBP	Mill roller jamming	Musket variation	Centrifugal m/c	Cane carrier jam	avg kpi	KPI
Mill roller jam	4	5	1	2	3	3.2	4

i. Mill roller jam with respect to LEP due to LBP the priority will be 4
Reason➔ because as the less supply of bagasse from mill roller tends to low boiling as well as low exhausts pressure

ii. Mill roller jam with respect to musket variation the priority will be 1
Reason➔ because due to shortage of sugar cane juice

iii. Mill roller jam with respect to centrifugal machine the priority will be 2
Reason➔ because due to shortage raw sugar to the m/c it will affect to the purification of sugar

iv. Mill roller jam with respect to cane carrier jam the priority will be 3

Reason➔ because the supply of sugar cane has to be stopped

Conclusion: the average key performance index for mill roller jam in sugar industry was calculated to be 3.2 but the value of KPI was rounded out to be 4 by considering other machines for calculations

FMEA Reasons for musket variation

Process	LEP due to LBP	Mill roller jamming	Musket variation	Centrifugal m/c	Cane carrier jam	avg kpi	KPI
Musket variation	3	1	5	4	2	2.8	2

i. Musket variation with respect to LEP due to LBP the priority will be 3
Reason➔ because due to low boiling pressure the variations are taking place

ii. Musket variation with respect to mill roller jam the priority will be 1
Reason ➔because the juice level reduces from mill roller

iii. Musket variation with respect to centrifugal machine the priority will be 4
Reason➔ because due to variation in musket the large amount of molasses obtained

iv. Musket variation with respect to cane carrier jam the priority will be 2
Reason➔ because due to over load supply of the sugar cane

Conclusion: the average key performance index for musket variation in sugar industry was calculated to be 6.1 but the value of KPI was rounded out to be 7 by considering other machines for calculations

FMEA Reasons for centrifugal machine

Process	LEP due to LBP	Mill roller jamming	Musket variation	Centrifugal m/c	Cane carrier jam	avg kpi	KPI
Centrifugal machine	3	2	4	5	1	3	3

i. Centrifugal machine with respect to LEP due to LBP the priority will be 3
Reason➔ because need to stop the supply of steam vapor

ii. Centrifugal machine with respect to mill roller jam the priority will be 2
Reason➔ because the reduction in removing juice from moisture bagasse

iii. Centrifugal machine with respect to musket variation the priority will be 4
Reason➔ because the large amount of molasses are obtained due to this musket variation is taking place

iv. Centrifugal machine with respect to cane carrier jam the priority will be 1
Reason➔ because the crushing of sugarcane has to be reduces

Conclusion: the average key performance index for centrifugal machine in sugar industry was calculated to be 3 but the value of KPI was rounded out to be 3 by considering other machines for calculations

FMEA Reasons for cane carrier jam

Process	LEP due to LBP	Mill roller jamming	Musket variation	Centrifugal m/c	Cane carrier jam	avg kpi	KPI
Cane carrier jam	3	4	2	1	5	2.4	1

i. Cane carrier jam with respect to LEP due to LBP the priority will be 3
Reason➔ because it reduces the supply of bagasse to the boiler

ii. Cane carrier jam with respect to mill roller jam the priority will be 4
Reason➔ because the reduction in removing juice from moisture bagasse

iii. Cane carrier jam with respect to musket variation the priority will be 2
Reason➔ because reduction in syrup level

iv. Cane carrier jam with respect to centrifugal machine the priority will be 1
Reason➔ because it reduce the purification of raw sugar

Conclusion: the average key performance index for cane carrier jam in sugar industry was calculated machines for calculations to be 2.4 but the value of KPI was rounded out to be 1 by considering other

3. CONCLUSION:

The Key Performance Index was given the individual machine and then were stimulated on MATLAB with quick references for maintenance management.

The Key Performance Index which are assigned to individual machine were validated with maintenance people of that sugar industry minor changes were made and Key Performance Index were recognized and hence it was validated with less modification.

Also it helps the maintenance department of the company to plan the maintenance schedule according to criticality of the machine which has been assignment with respective Key Performance Index.

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