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IMPLEMENTING OVERALL EQUIPMENT EFFECTIVENESS (OEE) AND SUSTAINABLE COMPETITIVE ADVANTAGE: A CASE STUDY OF HICOM DIECASTINGS SDN. BHD. (HDSB)

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ABSTRACT

Overall equipment effectiveness (OEE) is a metrics to evaluate how successfully a manufacturing operation is managed. The affirmative of implementing OEE is most important in managing organization sustainability. The actual implementation (managerial perspective) must register on the perceptual radar of people (social perspective) for them to act, think and behave as expected. It affected the views and attitudes of managers in the organization on managing OEE. This process is aimed at creating a culture of excellence in the organization. Hence, managing OEE can be seen as a process of culture transformation through which the existing elements of the culture are modified, replaced or strengthened with better elements. These elements encompass values and attitudes, systems and procedures, operational practices organization structure and so forth. At this stage, OEE will be reflected in many ways in the organization such as effectiveness of management, ability of the employees, efficiency of the operational systems and the authority responsible for implementing it. Due to global competition, companies have to integrate effectiveness into all aspects of their products and services. This research focuses on employees' implementation on OEE in Hicom Diecastings Sdn Bhd. OEE has become increasingly popular as one of the managerial approaches across the world. The implementation of OEE in Hicom Diecastings Sdn Bhd is intended to be a cornerstone of competitiveness in order to fulfill customers' satisfaction as well as to achieve sustainable competitive advantage. Importantly, employees are regarded as the most important entity in ensuring that OEE can be carried out successfully in an organization. Since this research involves the staff (executive and non-executive employees) of Hicom Diecastings, the unit of analysis is the individual. Respondents were identified through convenient sampling. 300 questionnaires will be administered, examined and analyzed using the Statistical Package for Social Sciences version 12.0. Variables were adopted from works [1]. Prior to the survey, this paper is to provide a critical review with graphical or visualize information and understanding of the OEE implementation in the past, present and future undertaking. The design of this paper includes a brief introduction of OEE and its approaches, methods, survey, discussion and conclusion.

Keywords: OEE, approaches, methods.

1. INTRODUCTION

OEE is a term that carries important meaning to manufacturing plant. In the global marketplace today, many manufacturing organizations realized that their survival in the business world depend highly on obtaining competitive OEE. Due to the global competition, some manufacturing companies have indeed stressed that OEE indicators have to be put in place and integrated into all of its components in their production operation and management. In the late 1990s, OEE was bounded only as measurement tool for Total Productive Maintenance (TPM), but now it is viewed as a standalone tool for measuring true performance of the production in any department or organization [2].

OEE is a hierarchy of metrics developed by Seiichi Nakajima in the 1960s to evaluate how effectively a manufacturing operation is utilized. It is best used to identify the scope of performance improvement process [3].

OEE measurement is also commonly used as a key performance indicator (KPI) in conjunction with lean manufacturing efforts to provide an indicator of success [4].

Increasingly, the government of Malaysia is focusing on ways of hastening the growth within the individuals firms that make up the business sector, as a way of developing the economy as a whole. Further, organizations need to compete globally, sustaining their competitive advantage, increase yield or productivity. Thus, a range of strategies has been adopted, including emphasizing the importance of managing the OEE.

Managing OEE in the automobile industry is needed as a strategy for continuous improvement of on time delivery and service quality in order to meet customers' satisfaction and expectation. The meeting of customers' satisfaction depends significantly on the vendor's performance, reliability, responding to customers' needs and continuous improvement.

In order to efficiently deliver products and services to customers, companies need to reengineer their

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supply operations to meet the requirement of speed and flexibility. To improve the responsiveness of the supply operations, it is important to have the integration from last tier suppliers to the end customers. Such an integration or coordination will result in managing an extensive system which includes customers, customer's customers, suppliers, supplier's suppliers, segmentation, communication, information, productions, inventories, transportations, qualities, prices, partnerships, and interdependencies. All these elements are linked to the supply change management. Operational quality must pervade the entire supply chain management. The complexity of supply chains will then severely decrease within and between enterprises, otherwise it increase risk, cost, and time

In these days of outsourcing, the general issue on controlling quality, incoming and outgoing materials and supplier resources management, within a giant industrial group like DRB-Hicom, for instance will be able to be assimilated, simplified and made manageable.

To examine in depth and to avoid confounding inter-firm effect, one organization will be selected from DRB-Hicom Group namely as Hicom Diecastings Sdn Bhd. The factory is located at Section 27, Alam Megah Shah Alam and has ISO 9000/TS 16949 certification awarded by TUV. Currently, this organization is a supplier to the local automobile companies like Proton (involves in manufacturing of BLM's, Exora, Preve and newly Iriz's engine components) and Perodua (Viva's and Axia engine components). The forecasted sales turnover for fiscal year 2015/6 is RM 108 million, however the company faces a bunch of back logs and non on time delivery due to performance loss, high machine downtime and poor quality. It is good to extend this research to fine tune a strategy for improvement that possibly will benefit the top management of the company.

2. OBJECTIVES

The purpose of this study is to explore the implementation of OEE as sustainability indicator in Hicom Diecastings Sdn Bhd (HDSB) through measurement cited from operation management journal [1].

2.1 To analyze the perceived role of OEE among HDSB's staff.

2.2 To identify the relative influence of the possible factors against organization sustainability.

2.3 To ascertain the correlation between the OEE elements.

3. METHODS/APPROACHES/SCOPES OF OEE

This research is designed prior to cross-sectional sample survey. Through this survey, it will provide a good picture of the implementation of OEE function at different stages of the workforce. The cross-sectional sample survey is thus the most appropriate tool if information on the entire target population is to be obtained through one single survey. Since this study merely seeks the feedback of the people at a particular juncture and does not seek to prove causal effect, survey design is appropriate.

3.1 Subject/sample

Since this research involves the staffs (executive and non-executive employees) of Hicom Diecastings Sdn. Bhd. (HDSB), the unit of analysis is the individual. To obtain reliable results, the sample size should be at least 150, with results from sample sizes close to 300 being more stable [5] . As of today, there are more than 700 employees in the entire organization.

3.2 Procedures

The questionnaire will be distributed to the Head of Department during morning meeting to cater the day shift and night shift respondents. Each Head of Department have to return it to the researcher by a dateline that will be determined later. Respondents' particular will be also recorded to facilitate researcher to follow-up the feedback.

The conceptual framework based on perspectives will be as below [1].

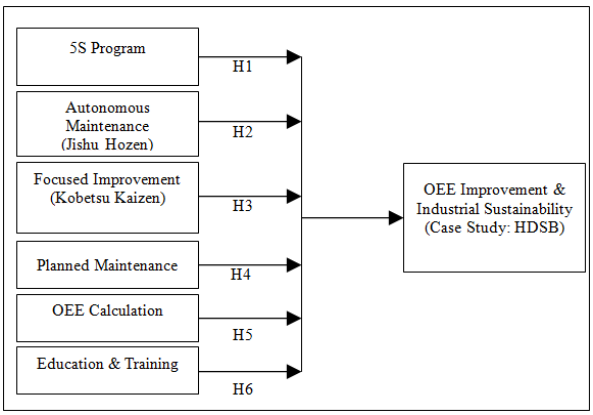

Figure-1. Conceptual framework.

The conceptual framework of the study links 6 TPM elements or variables to the industrial sustainability .6 hypotheses will be generated in this study to test the relationship between independent variables and dependent variable as depicted in the research.

In the literature review, it has been postulated that organizations, which extensively carried out OEE by managing all aspects of independent variables, would have better sustainability. Basically, when more efforts, such as commitment towards addressing 5S and Focused Improvement are carried out, it will definitely result in a higher achievement of better OEE. The more an organization implements this model (example: embark on addressing operational-related losses through these

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variables.); the deeper the commitment, the extent of better OEE will be enhanced.

4. OEE SURVEY RESULT

The importance of OEE in manufacturing cannot be underestimated. One of the reasons for this is that it provides a link between manufacturing and sustainability. The OEE area has been greatly developed in the last three decades. Based on the conceptual framework, the survey result is as follows;

4.1 Past survey

1983 until 1999 survey result. Most of the scholars emphasized on implementing planned maintenance in obtaining a better OEE.

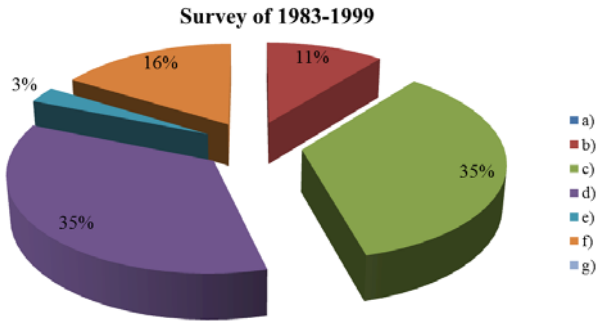

Figure-2. Graphical representation of 1983-1999 survey; a) 5S Program, b) Autonomous Maintenance, c) Focused Improvement, d) Planned Maintenance, e) OEE Calculation, f) Education and Training, g) OEE Improvement and Sustainability.

4.2 Present survey

In this section, the entire work is presented in two subsections, each subsection is composed of 7 years survey and 8 years survey respectively based on mentioned methods and presents the entire survey into graphical representation for easy understanding.

4.2.1 Survey 2000-2007

This subsection presents the survey of OEE work during 2000 - 2007 period based on stated methods, while the graphical representation of this survey is shown in Figure 3.0.

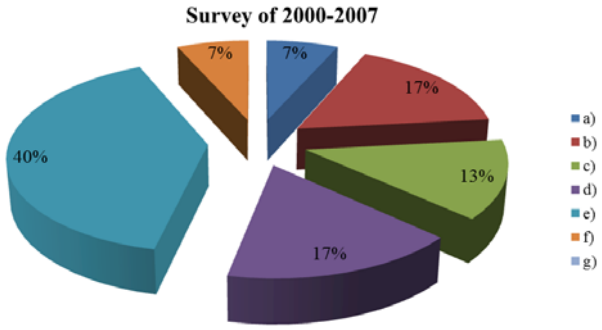

Figure-3. Graphical representation of 2000-2007 survey; a) 5S Program, b) Autonomous Maintenance, c) Focused Improvement, d) Planned Maintenance, e) OEE Calculation, f) Education and Training, g) OEE Improvement and Sustainability.

4.2.2 Survey 2008 – 2015

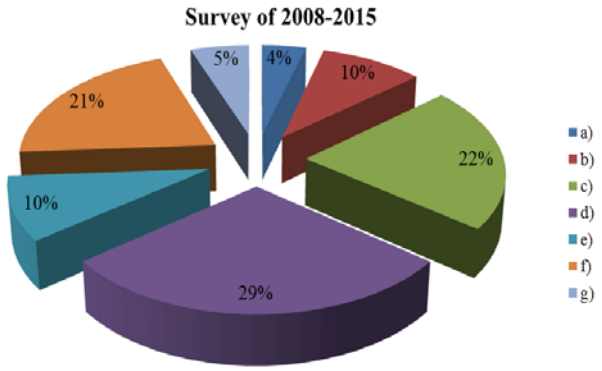

Figure-4. Graphical representation of 2008-2015 survey; a) 5S Program, b) Autonomous Maintenance, c) Focused Improvement, d) Planned Maintenance, e) OEE Calculation, f) Education and Training, g) OEE Improvement and Sustainability.

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Figure-5. Summarizes the survey result or findings based on the conceptual framework.

No.	Description	Year 1983 ~1999 (No of Citation)	Year 2000 ~2007 (No of Citation)	Year 2008 ~ 2015 (No of Citation)
1	5S Program	0	2	3
2	Autonomous Maintenance	4	5	7
3	Focused Improvement	13	4	16
4	Planned Maintenance	13	5	21
5	OEE Calculation	1	12	7
6	Education and Training	6	2	15
7	OEE Improvement & Industrial Sustainability	0	0	4
Total No. Citation (140)		37	30	73

Regardless in which occasion the survey is made, planned maintenance plays an important roles to OEE implementation. Based on the survey result, the major contributor towards improvement on OEE is basically by enhancing the planned maintenance activities.

However from the survey made in 1983 until 1999, 35% of the total literature emphasized on implementing both planned maintenance as well as focused improvement respectively.

Unlike, the result discovered from year 2000 until 2007, OEE calculation to be seen as an important factor. The definition of scheduled downtime for instance, shall not be used in OEE calculation [6].

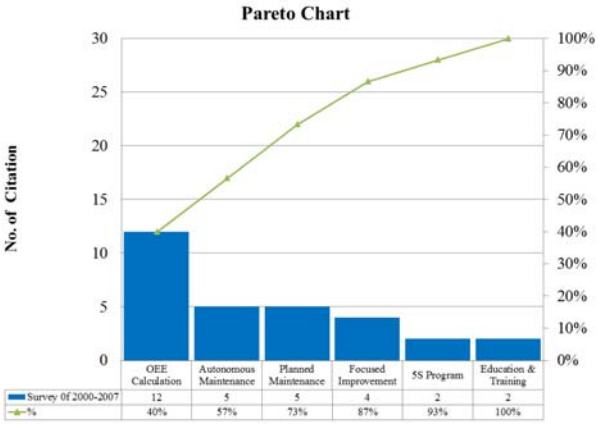
Present survey of 2008 until 2015. The findings was again highlighting the important of executing planned maintenance as a significant pillar towards obtaining a better result on OEE, followed by focus improvement and education or training provision.

5. CONCLUSIONS

6 independent variables (IV) against the 1 dependent variable (DV) will be tested out. Hypotheses between each IV to the DV will be made to conclude the significance of each correlation. Ultimately, several recommendations to address the company sustainability will be discussed and proposed to the management of Hicom Diecastings materializing their moving forward strategies, thus the OEE will be able to manage and directly improvise the company's bottom line whereby the profit and loss will be more manageable. Perhaps a proper management structure needs to be constructed prior to reinforcement strategy across the board. The situation is quite alarming, hence OEE direction or KPI has to be rolled up top down and bottom up.

Based on the literature review and pareto analysis for present survey of year;

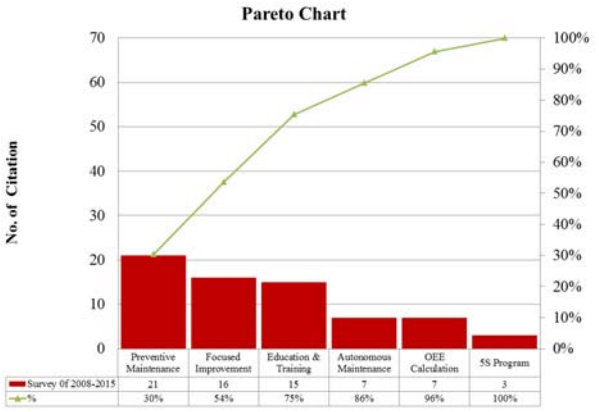
a) 2000~2007



In order to ensure the company sustainability the focus shall be made on firming the OEE calculation and at the same time institutionalizes autonomous maintenance as well as preventive maintenance simultaneously.

b) 2008 ~2015

Unlike the survey result of 2008 until 2015, the highlights were more on implementing preventive maintenance, followed by focused improvement and training provision.



However, the expectation of this research paper is to find out which of these variables has a significant correlation or unique to Hicom Diecastings OEE and ultimately the company sustainability. Through the inference made later, more initiatives will be reviewed and introduced to drive the OEE improvement company-wide.

There is a need for this organization to conform to the world class standards (OEE is 85% or more) in order to produce on time supply of good quality cars components. Managing the OEE is one of the approaches to ensure that the production operation are reliable, and able to satisfy the customers and/or end users at large and

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ultimately, being as a first tier supplier to Proton and Perodua, this will be the way to ensure Hicom Diecastings Sdn Bhd (HDSB) reliability is secured while supporting both entities competitiveness in the market, as well as, to comply with the world standards.

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