Strategies For The Successful Lean Manufacturing Implementation: A Case Study In A Malaysian Automotive Parts Manufacturing

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Abstract

In recent global business environment, many manufacturing companies are attempting to implement lean manufacturing system. Malaysian manufacturing companies are no exception, and they consider lean manufacturing as an effective manufacturing strategy to survive in a highly competitive market. Given the lack of clear guidelines or step-by-step procedure in effectively implementing of lean manufacturing system among Malaysian manufacturing companies, this paper aims to present a case study of a manufacturing company pertaining to the automotive parts manufacturing company in Malaysia which has achieved significant improvement in productivity as a result of successful lean manufacturing implementation. The finding suggests that factors such as continuous management commitment, teamwork, and organization-wide involvement are crucial to lean success. The case study is expected to contribute important implications strategies for lean manufacturing system implementation in Malaysian manufacturing organization.

Keywords: Manufacturing Organization, Lean Manufacturing System, Productivity Improvement, Malaysian Automotive.

1. Introduction

Automotive industry in Malaysia currently faces a wide variety of challenges in order to be classified as a world class manufacturer as well as to sustain in the global competitiveness business. This has prompted many manufacturing companies to adopt or to change their current manufacturing system to more productive strategies that can improve their performance, increase efficiency and thus competitiveness. Lean manufacturing system is one of the proven strategy and has been regarded as a remedy to survive and be competitive in this global market [1]. The ultimate goal of lean manufacturing is to create a smooth and high quality organization that is consistently able of producing finished products that conforms to the customer's demand in the quality-looked while at the same time achieving minimal wastage of resources.

Lean Manufacturing strategy is being supported by the Malaysian government [2-4] towards creating world class manufacturing and that could face sustained high competitiveness in global market. The implementation of lean manufacturing system is considered to be very useful in the automotive industry in Malaysia, in order for the industry to improve their operational performances as well as to remain competitive [3]. Although many companies under this industry are interested in the lean manufacturing system and trying to implement lean tools, however, prior studies show that the level of implementation and adoption of lean manufacturing in Malaysia has yet to become comprehensive and is currently being applied only in certain stages and known areas [2, 3].

There are many documented instances in literature that describe the companies that have successfully implemented lean systems and had achieved significant improvements in terms of shorter lead times, lower inventory levels, better quality and higher profitability. However, despite intending to apply lean systems, there are companies that are struggling to change the work culture which is crucial towards successful implementation in their operational processes, thus having problems adapting and sustaining the lean principles. To the best of our knowledge, there are no

clear guidelines or step-by-step procedure in effectively implementing lean manufacturing system [5-7]. We therefore believe that Malaysian manufacturing organizations that have been able to implement lean manufacturing systems successfully and those having achieved excellent operational performance should be taken as showcase examples with their key success factors consolidated. Understanding these factors and having modified adoptions should provide a steady guideline to other organizations still searching for specific solutions regarding their own implementation of lean manufacturing.

Thus, this paper will discussed about the successful initiatives taken by a manufacturing company in implementing lean manufacturing system particularly in Malaysian automotive parts manufacturer organization.

2. Literature Reviews

The lean manufacturing system's implementation should be applied as a total system approach rather than a pick-and-choose adaptation when applying some of the lean tools and principles [8-11]. This is to ensure that sustainability and the ultimate goals of the lean manufacturing system could be achieved. An identified major barrier in implementing lean manufacturing system in the Malaysian automotive industry is the lack of lean understanding [12]. This includes understanding about the conceptual idea of leanness systems including its application and tools. In order to solve these problems and to ensure having its successful implementation, a set of guidelines is needed to be formed as a basis for guidance, comparison of performances over the time and settings factors for those desiring to implement and adhere to the lean manufacturing system.

The idea of manufacturing goods in a 'lean' manner was first introduced by a research group at MIT after analyzing the Japanese style of manufacturing, mainly the Toyota Production Systems [13]. The literature suggests that lean manufacturing is generally described from two different perspectives; (1) philosophical perspective related to guiding principles and overarching goals and (2) practical perspective related to management practices [14]. Accordingly, there are many definitions of lean manufacturing and underlying components. Our reviewer of literature revealed that concepts such as just-in-time (JIT), total quality management (TQM), total preventive maintenance (TPM), human resource management (HRM), and supplier relationship management (SRM) are among practices frequently implemented to achieve lean manufacturing [15, 16]. In the context of Malaysia, the literature reports that manufacturing companies in electrical and electronics industry have implemented various lean manufacturing tools to achieve higher performance improvements[1, 2].

It is well agreed that effective implementation of lean practices such as TQM and/or JIT is hard to achieve, and the foundation for gaining the successful result in implementing lean manufacturing system is to have a significance organizational and culture change [17]. This required a total supports and commitment from top management in ensuring the success and sustainability of the lean manufacturing system [5, 7, 17, 18].

Besides top management supports and commitment, employee involvement is another factor that need to be given special focus to ensure the lean systems achieves its intended impact and delivers positive results in enhancing the organization's overall performance. Employees who are motivated and empowered are essential since people are the key element in lean manufacturing. In addition, employee involvements as teamwork are critical throughout the implementation of lean manufacturing and it is the heart of lean manufacturing organization [19] 10, 20] as quoted from [1]. Besides forming a team-culture that shares the common goals and attitudes towards the implementation process, training would also be one of the main 'change agent' and needs to be address accordingly and given careful planning [21]. Trainings that are rolled out should not only be able to change the employee's perspective, but also give them a thorough understanding of lean manufacturing systems and the ability to appreciate the system's functionality and adherent benefits [20, 22]. In this regard, reference [2] reported that for Malaysian electronic manufacturers, employees' resistance to lean system is a more significant barrier compared to financial resource limitation and cultural issues.

The literature also suggests that resource availability is another crucial determinant of lean implementation success [7]. It is clear that implementation of lean activities require significant financial investments which is because of the need for hiring consultants, as well as aiding the actual implementation of lean tools

[2]. In some cases, lean implementation may require production of businesses to be ceased temporarily in order for the workforce and the existing system to embrace new lean tools. This loss of resources can be unaffordable for some companies, particularly smaller ones, thus, implementing companies need to have adequate financial resources to facilitate long-term success of lean system [7].

3. Case Study

3.1. Company's Background

B2 Sdn Bhd (name to be change for confidential purposes) was established on the 23rd April 1991. This company is listed as the second-tier of automotive parts supplier to the national car manufacturers in Malaysia. The company has an authorized capital of RM5 million with paid-up capital of RM2.5 million. With total of 73 personnel, the company produced Colorant, B-Compound and additives solution to the plastic industry. B2B Sdn Bhd was certified to ISO 9001:2008 and ISO/TS 16949:2009

3.2. Findings and Discussion

B2 Sdn Bhd has started their journey in implementing lean manufacturing system in 2011. The company is still in early stage of implementation. They've been supported by Malaysian Automotive Institute (MAI) as a government agencies that totally responsible in giving coaching and training to the automotive parts manufacturer that willingly to implement lean manufacturing system in their organization.

Top Management of the company is giving full commitment and support in making this system successfully implemented in their business organization. Their existing company policy with a focus on lean production systems proves their commitment. The policy focuses on 3 core areas, namely (1) lowering costs through the elimination of waste in every area of the organization, (2) improving responsiveness to customer demands and (3) reducing time throughout the entire business process. Besides that, the establishment of a lean production system department proves further that their top management are committed towards implementing the program. In addition, Kaizen groups are also formed and managed to help in realizing this lean manufacturing pursuit.

Through the top management's strategic direction and commitment, a few lean activities have been implemented in order to solve current problems. Material information flow chart (MIFC – refer figure 1) has been used to identify main problems that hinder a successful implementation. Some of the recognised issues are; poor 5S and safety –this can lead to mixing parts, longer time for machine changeover time (83 min for dark color and 112 min for light color), longer in-process quality control (IPQC) for dark colour (208 min), low productivity for machine L9 (4kg/min/man) and inventory management-where high stock for raw materials (approx. 31 days) and the finish goods stock is kept for 2 weeks, while also having a large production lot size (max up to 10mt). These problems have led to the longer delivery lead time which is currently at 7 days.

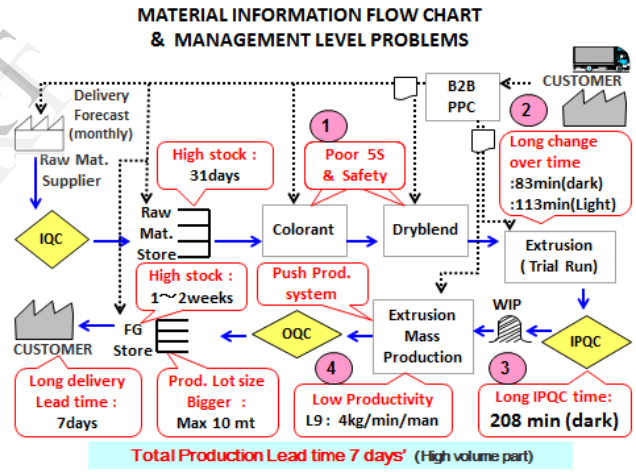

Figure 1: Material Information Flow Chart (*Simplified*)

In order to eliminate the obstacles identified through the MIFC, the first step taken by this company is to implement the 5S+1S (Safety) activity in their organization. This 6S training was given to all staff and the implementation activity was put into action once training was successfully completed. An internal audit for this activity was also carried out in order to measure the improvements level and effectiveness.

Extruder machine setup time was found to have contributed to longer machine changeover time which is 83 min for dark colour and 112 min for light colour.

Adjustments were made to reduce the time for both colour processes. The longer time problem factor was identified and to be rectified.

There are 3 main problems that occur; the extruder machine has a long heat-up time, a long start-up process and a long wash-up time. All of these processes are being done during the production time. To reduce this changeover time problems, a new standard of procedure (SOP) was introduced to ensure that the supervisor will operate the machine 45 minutes before the production activity, this starts on every first day of week (Monday) for the heating up process. In other words, all of the activities are done before the machine is use for production activity and it is re-labelled as pre-setup time. This improvement method has reduced 70% of the time needed as compared to the previous time needed for dark colour (25 min) and 47% of time for light colour (60 min). (Refer to Figure 2)

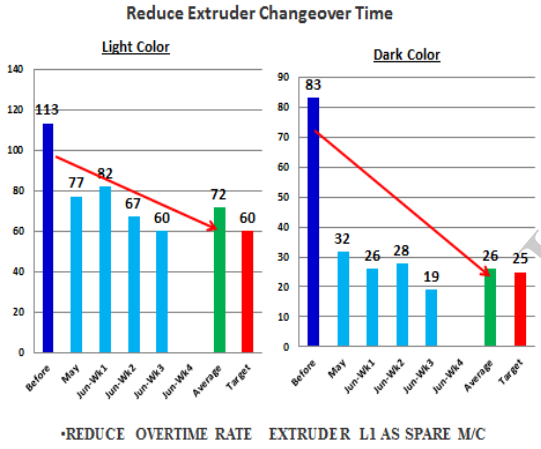

Figure 2: Before and After Improvement for Extruder Changeover Time Problems

Process quality control is important as it ensures the consistency in quality during all stages of the production processes. The company found having a long time in their IPQC activity will lead to other productivity problems. In order to rectify this situation, a pilot study was conducted in the area that had been identified (L9 extrusion process for dark colour). The findings of the study show that there are 5 major problems that contributed to the IPQC time which are
1. Colour matcher competency,
2. Colour consistency,
3. Long sample collection time,
4. Injection process set-up time and
5. Production processes.

Immediate action was taken in order to solve the problem effectively and eliminate all the possibilities pertaining to the quality of the product. A new SOP was introduced for a new colour checking /inspection process, while the production size has been reduced to batch sizes, so that the IPQC time can be reduced. The manpower skill chart also for IPQC activity was also established. This improvement activity has decreased the IPQC time from 208 min to only 59 min. (Refer to Figure 3)

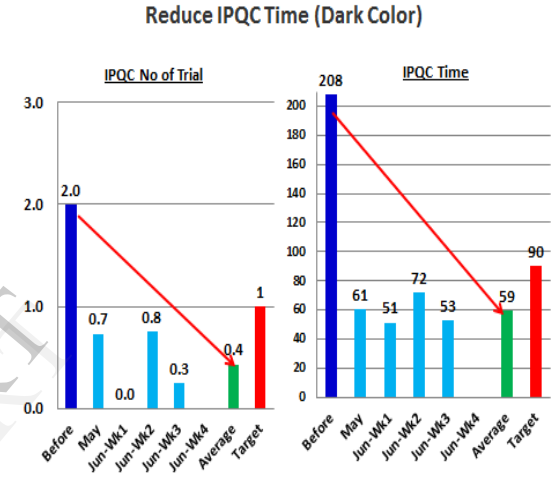

Figure 3: Before and After Improvement for IPQC Time Problems

Finally, to achieve a high throughput was the aim in solving an identified problem of lower productivity with machine L9. A root cause analysis was done in order to solve this matter. Through this analysis, 4 major problems were identified as obstacles in gaining a higher productivity rate. The problems started at the dry blend section, this section was found to be unable to cope with the large amount of compounds. This leads to insufficient cooling and so the drying system and the palletizer rubber roller is unable to withstand the constant high heat. It is also found that this will also lead to the insufficient spacing needed during the dry blend mixing process. From these identified problems, a set of solution was again implemented in order to increase the productivity rate. A tumble unit had been added to the dry blend mixing in order to increase the capacity of material production. The tumble supported this mixing action by improving the cooling and drying system, while it further enabled the mixer to process

the additional amount of material intended. The process improvement activity began by lengthening the drying belt system, while an air sucking system had been added to the silo.

All of these steps were successfully implemented, which shows that within 10 months of improvement activity implementations, the productivity rate had increased from 4kg/min/man to 7.0kg/min/man. (Refer to Figure 4)

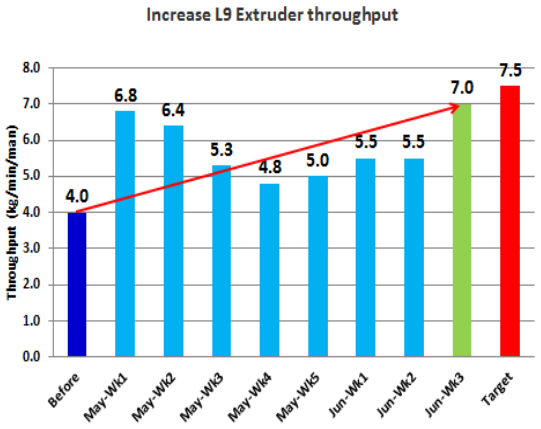

Figure 4: Before and After Improvement for Extruder Productivity Rate

4. Conclusion

Although the company has just started to embark its journey towards implementing a lean manufacturing system within their organization, the initial achievements recorded have been remarkable. Positive indicators shows there are improvements when making these 'change' initiatives. The commitment afforded by the top management was the key success factor in implementing the lean manufacturing systems adoption. Their strategic approach and policy direction towards a company-wide objective change mentality, enabled the process improvement to evolve albeit slowly but effectively. This observation further suggests that lean implementation is knowledge-intensive phenomenon, thus, top management in Malaysian manufacturing companies need to have clear vision and strategic initiatives, good level of education and the willingness to support productivity improvement. Without these top-down holistic approaches and the support of all the staffs involved, this might not have been possible. The training and sharing sessions pushed their agenda and brought the needed change in mentality for everyone, towards achieving a common goal.

Teamwork and understanding their individual roles within the system is the driving factor in-making the adoption of the lean manufacturing systems a success. The next goal for the studied company is to achieve a total company-wide implementation that should take the organization to a higher level of productivity, quality and achievement. This case study demonstrated that commitment to some lean activity to reduce variability related to only a specific source at a time can help a firm in eliminating some of the waste from the system.

However, Malaysian manufacturing companies should note that not all waste can be addressed unless firms can implement lean fully to attend to each type of variability concomitantly. Malaysian manufacturing companies need to know that lean implementation is a continuous process, thus long-term investment in lean activities should not be considered as an unnecessary loss of resources, and they should not anticipate immediate returns. In this case, we observed that after 10 month of continuous commitment to activity implementations, the studied case successfully achieved a remarkable performance improvement.

It is clear that this study has several limitations that the reader should take into account in interpreting the observation. The studied case, albeit successful, is in its early stages of lean manufacturing implementation, and has not committed to all the dimension of lean manufacturing. This means that our observation of lean success determinants is limited to this case, and care should be taken while generalizing the results of this case study to other Malaysian manufacturing organizations. The literature suggests that there are several critical success factors such as resource availability, organisational culture, and information technology proficiency which influence each dimension of lean manufacturing differently. Thus, future studies of multiple case studies can be conducted to capture the influence of a variety of success factors over different lean manufacturing tools. Consistently, in the future studies also a large-scale quantitative survey as cross-sectional data can be done in order to assess what are the most important determinants of lean manufacturing implementation.

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