

Efficiency In The Production Of Quality Crude Palm Oil

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Innovation in work processes or services to customers stands as a premier key in ensuring sustainability in businesses. Business leaders especially believe that innovation is a key to success as it comprises of competition in bringing new ideas. The philosophy in innovation is not only about coming up with new ideas but is also in the works of implementing them. In addition to this, utilisation of advanced and sophisticated technologies has always assisted businesses in being efficient and different in the market.

Establishing a culture that supports innovation usually helps businesses to maintain contemporary and increase competition. With this, Kulim (M) Berhad (KMB) has always been in the quest to be more progressive, efficient, profitable and a premier entity in the industry. This organisation was founded in 1975 and has a headquarter in Johor Bahru. KMB is one of the earliest founded corporations and has expanded its business extensively in Malaysia and Indonesia. The plantation by KMB deals with crude palm oil processing & plantation management as well as consultancy services. Not only that, it is indeed a fact that KMB has undergone rapid growth in achieving many milestones which include venturing into Oil & Gas (O&G) related business, sea transportation, sales of wood-based products and many potential areas.

This remarkable achievement rooted from the efficiency of their employees. Teamwork and sense of belonging stand as two main support in building a spirit towards these achievements. Not only that, their attitude towards work has resulted in vast improvement at workplace. All these are gained through a significant human capital investment for employees' development. This is crucial in enhancing employees' competencies that will provide a foundation for outstanding execution and quality service.



Getting The Best Of ICC In Problem Solving

Innovation and Creative Circle (ICC) stands as a problem solving platform used by a group of employees in implementing ideas for the betterment of an organisation. KMB embarked on this initiative since 1987. Many ideas are implemented for improvement through projects involving ICC. In 2014, twelve members were grouped together to form an ICC team known as Benih. The team had brainstormed among themselves in identifying the reason of increase in cost involving plant operations which brought to a loss to KMB. The team was well aware that the problem chosen has to be within the means of the team. Therefore, to identify and strengthen their findings, they had used the SMART (Specific, Measurable, Assignable, Realistic and Time-related), Critical versus Capability matrix and Cost analysis methods. It surfaced that the Sterilised Fresh Fruit Bunches (FFB) Conveyor (SFC) often broke down and affected the operations. This was listed as the most critical problem that required an immediate solution.

The production of crude palm oil involves distinctive processes and it all starts when the FFB is delivered to KMB factory. Firstly, FFB is transferred to the Vertical Steriliser (VS) from loading ramp. VS is a station known to boil FFB using steam at 140°C. This process will inhibit enzyme activities and break up fresh fruits easily. Following that, the sterilised FFB is transferred in an auto-feeder via SFC to proceed to the next process of separating the fruit and the bunch in a thresher. It was identified that the problem occurred as SFC often broke down. This eventually interrupted the next process of squeezing the sterilised FFB in the press machine involving the production of semi-final products of oil and press cake.

As mentioned, SFC is a conveyor that works to transfer the sterilised FFB into the thresher. This conveyor has a motor capacity of 40Hp with a moving speed of 0.35 meter/seconds and is 40 meters in length. It has a roller chain and scrapper and is able to uplift the sterilised FFB with a maximum weight of 85kg/meter at a time. It was further discovered that the heavy load of FFB has created a pressure to the SFC.

Due to this, the roller chain was derailed from the sprocket. Following these, four months of data collection stated that SFC broke down 15 times and required 28 hours for repair works. This entire issue led to the delay in the process of FFB at 1,064mt which is at 38mt/hr of FFB processed.

In addition to this, only 36mt/hour of FFB was uplifted via SFC at a time for the purpose of minimising the case of SFC damage which showed a significant reduction in efficiency involving the process. It was also deduced that, an extra 285 working hours were needed in fulfilling department's KPI. Another issue in this was an additional cost of operations which amounted to RM68,512 in overtime claim and diesel expenses in processing an amount of 195,000mt FFB annually.



In addition to this, the Free Fatty Acid (FFA) increased simultaneously as the backlog increased and affected the quality of crude palm oil. Based on these outcomes, the team had set targets through ICC project to reduce the frequency of conveyor damage and breakdown rate twice in 2 months and maintain at 2.5 percent respectively. Not only that, they also targeted to increase the amount of throughput above 38mt/hour. They had two months to experiment their ideas and come up with an outcome for their project.

The team had brainstormed to identify the root causes of SFC that led to an often break down during the process of transferring FFB to the auto-feeder. The

Fishbone diagrams were used to illustrate the possible root causes based on five factors of man, machine, material, method and environment. They further observed and collected required data for verification of possible root causes. The findings confirmed that there were three causes to the problem namely, excessive FFB during the process of transfer into SFC that with no speed control of FFB feeding. Secondly, it was discovered that the position of SFC gear box was not suitable and this actually led to a crack beneath the gearbox. The final concern was that the FFB was always entangled at the sprocket. The Tree diagram was drawn for each root causes in order to identify the most reliable solutions. The table below shows the root causes, proposed solution and actions taken for resolving the SFC problem.

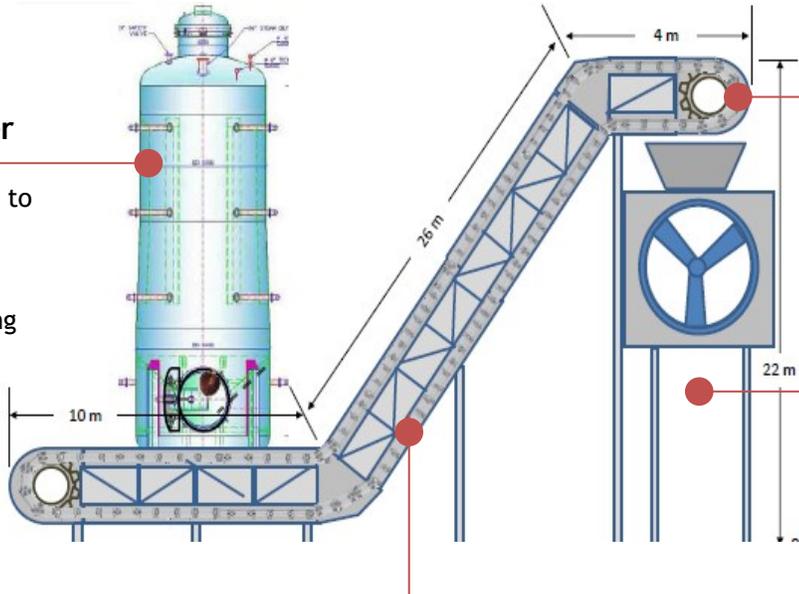
Root Cause	Proposed Solution	Action Taken
Excessive FFB during the process of transfer into SFC	Control feeding speed for minimising the amount of FFB that will be transferred to SFC	<ol style="list-style-type: none"> 1. Installed inverter at VS that can be accessed by the operators. The characteristics of chosen inverter are : <ul style="list-style-type: none"> • High protection and improved adaptation to the environment • High endurance • Wide range of application • Comply with global safety standards such as CE & UL • Suitable for motors with 0.75kW to 450kW capacity
The unsuitability of the gearbox position which led to a crack beneath the gearbox	To change the SFC gearbox position	<ol style="list-style-type: none"> 2. Changed the position of the motor gearbox to the top of SFC
FFB was always entangled at the sprocket	To reduce bunches that stuck at the SFC sprocket	<ol style="list-style-type: none"> 3. Applied bypass system to separate the fruits from bunches <ul style="list-style-type: none"> • New chute was developed to allow only bunches to be transferred into the thresher • The chute is located before the SFC drive sprocket



BEFORE ICC IMPLEMENTATION

Vertical Steriliser

FFB is transferred to the Vertical Steriliser from loading ramp for sterilised FFB using steam at 140°C.



Sprocket

This was where the problem of SFC break down occurred due to the entanglement of FFB at sprocket.

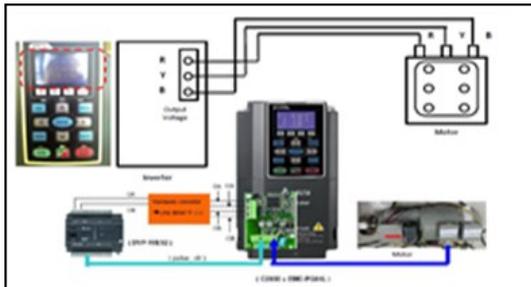
Thresher

To separate oil palm fruits from oil palm bunches for the next process of squeezing the sterilised FFB in the press machine.

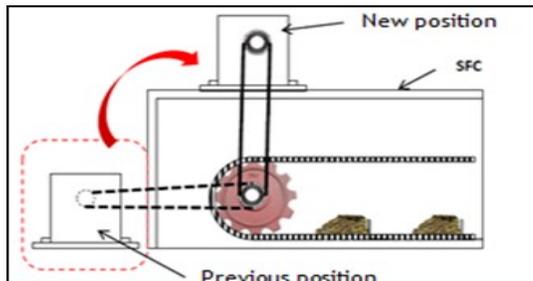
Sterilised FFB Conveyor

The sterilised FFB is transferred in an auto-feeder via SFC to proceed to the next process of detaching FFB in a thresher.

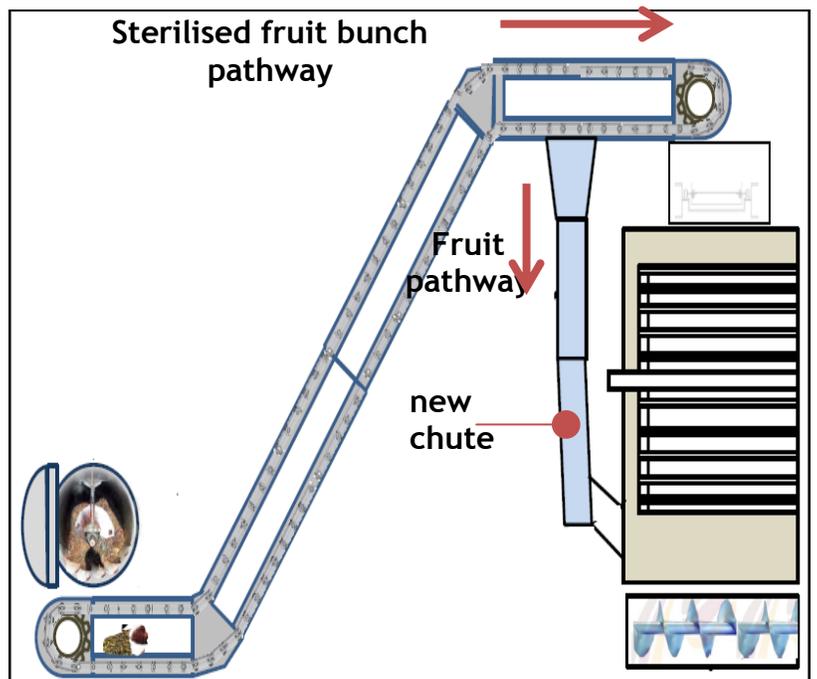
AFTER ICC IMPLEMENTATION



Inverter installation at VS discharge conveyor



Changed the position of gearbox on top of SFC



Adding up new chute

Overall there were three improvements done accordingly. They were installation of inverter, a newer position of SFC gearbox and finally, the application of bypass system. These implementations aided in achieving the set targets. Now, there aren't any cases of SFC break down and this indeed brought to boost of efficiency in processes. With all of these actions, it was very much believed that ICC accelerates innovation and creative thinking skills among the team members.

Analysis Of ICC Project In KMB

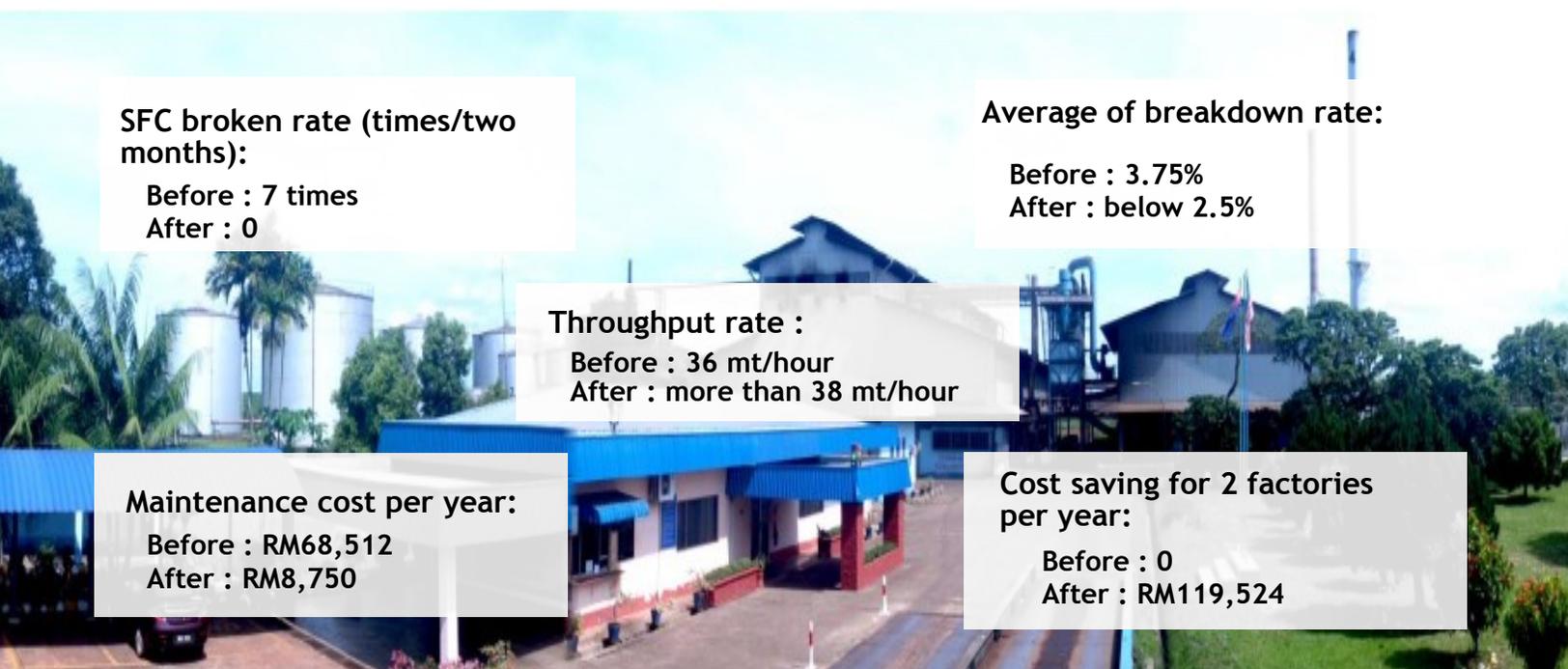
Previously, it was recorded that the cases of SFC break downs happened 7 times in two months. Whereas the average breakdown rate was 3.75 percent and only 36mt of throughput was processed within an hour. In addition to that, the overtime cost, material and maintenance cost was high, amounting to RM68,512 annually. Previously these extra costs were required to process an amount of 195,000mt FFB every year that resulted from additional 285 hours were needed due to the problem of SFC often broke down.

The implementation of ICC has led to a great support from the management team. Moreover, these implementations and ideas of improvement were included in the Standard of Procedure 2014. Now, these solutions are embedded in all two KMB factories and have significantly improved the work processes. In fact, there are no more records on cases of major SFC breakdowns and the break down rate has reduced below than 2.5 percent.

Subsequently, more production yield can be generated as the throughput rate has increased more than 38mt/hour. The investment in ICC project only cost has at RM8,750. An extra 285 working hours was eliminated and yet they were able to process 195,000mt FFB every year. Now, there is no requirement for overtime and additional materials and maintenance costs annually and this has resulted in cost saving of RM119,524.

The ICC project of eliminating SFC breakdown cases has encouraged KMB to produce more quality crude palm oil when FFB is actually processed within 24 hours upon harvest. Following this, the FFA percentage is also reduced simultaneously. This was indeed a proud moment as KMB improvised its quality, services and products as a whole.

COMPARISON BEFORE AND AFTER ICC IMPLEMENTATION



SFC broken rate (times/two months):

Before : 7 times
After : 0

Average of breakdown rate:

Before : 3.75%
After : below 2.5%

Throughput rate :

Before : 36 mt/hour
After : more than 38 mt/hour

Maintenance cost per year:

Before : RM68,512
After : RM8,750

Cost saving for 2 factories per year:

Before : 0
After : RM119,524