Improvement in Cycle Time for Output Optimisation

By Nur Hanim Abd. Ghani

Sharp Manufacturing Corporation (M) Sdn. Bhd. (SMM) was founded in 1989 and has expanded as one of the largest electrical and electronics manufacturers in Malaysia. SMM produces LCD televisions, LCD modules and Blu-ray LCD televisions for domestic and international markets including Japan, Europe, United States and Asia regions. The company is located in Batu Pahat, Johor with a built up area of 74,612m^2 comprising three manufacturing plants. Since its first production, SMM has undergone rapid growth and has achieved many milestones, certifications and recognitions including ISO9001 and ISO14001.

SMM is known to be dedicated in improving people's lives through the use of advanced technology and is always committed towards innovation, quality, value, and design. This is viewed crucial for its business sustainability as the electrical and electronics sector undergoes changes in technology and innovation on a day to day basis.

Furthermore, the company endeavors in maintaining high standards in quality while minimising cost of operations in fulfilling customer expectations. Therefore, these goals motivate its 1,559 employees in contributing their best for a greater achievement.

Time wastages in the process of bonding and stamping

It is very much believed by SMM that great innovation starts with strong fundamentals. The need to be innovative must also be compatible with the firm's philosophy on how to unite employees. In SMM, the top management has always supported and provided a range of facilities to encourage employees to involve in innovation. All these have always brought positive impacts to SMM in terms of reducing cost of operations and defect rate, eliminating work inefficiency, improving quality and reducing wastages. On the other hand, this also means that it is encouraged to increase performance by using the 'getting it right at the first time' concept. Employees are now able to produce more output with less input, which indicates that there is an increase in productivity.

Innovation and Creative Circle (ICC) encourages structural initiatives in SMM. It is a well known fact that ICC projects enhance performances. Therefore, in 2013, a team known as In-Team from the department of Auto Surface Mounting Technology (SMT) Production was established by the management to reduce 30 percent of work-time wastages in SMT process. The establishment of this team was due to time wastages in the department which led to work inefficiency. It was identified that the department was only able to produce an average of 1,668 pieces of printed wiring board (PWB) on a daily basis as compared to the actual target of 2,168 pieces. At that time, the operation rate was only at 77 percent. Based on the cost effect analysis, it came to surface that the time wastages resulted in a loss of RM628,289 monthly. The analysis of critical-ability also revealed that this problem was the most critical issue.

Consequently, this issue required a solution as this department is capable in generating a high profit for the organisation. Therefore, the team carried out a benchmarking study to compare the performance of other Sharp manufacturing plants in Poland and Mexico. They discovered that plants in Poland and

Mexico were able to produce 2,100 pieces per day. Following that, In-Team set a target of producing 3,000 pieces per day upon resolving the problem.

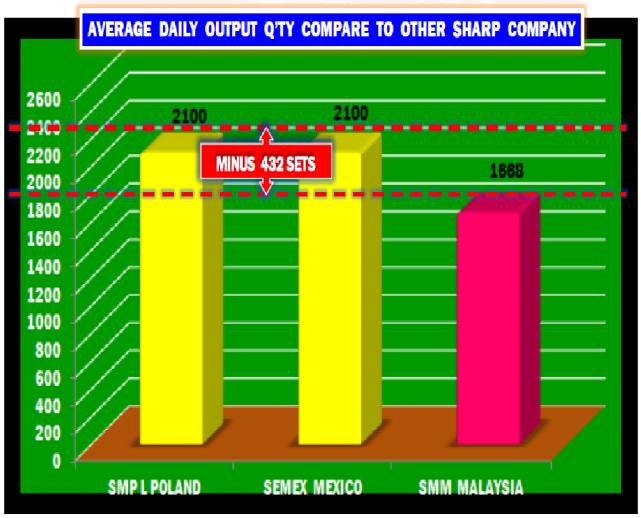
In-house innovative solutions towards efficiency

There are six main processes involved in SMT production which are bonding, stamping, model change, Automated Optical Inspection (AOI), Solder Paste Inspection (SPI) and visual inspection. Previously, bonding and stamping processes recorded the highest time cycle of 48,060 and 6,000 minutes respectively.

The bonding process involves chemical joining and reinforcing of substrates while stamping is a process to mark the model name, lot quantity and production order based on production schedule given beforehand. It was identified that the reflow process in bond dispenser unit and change model with different stamping points in stamping area take a longer duration compared to other processes.

Consequently, In-Team was able to identify 52 potential root causes in a brainstorming session. The root causes were then segregated into five categories of man, method, machine, material and environment using the Fishbone 1 and 2 diagrams. Then, the group finally chose two possible causes that led to a long duration for the mentioned processes. They targeted 30 percent improvement in time for bonding and stamping processes amounting to 33,642 minutes and 4,200 minutes per month respectively. This means that the cost for bonding and stamping processes would be reduced to RM437,010 and RM54,558 respectively.

These targets had brought In-Team to propose six possible solutions for the problem. Subsequently, the team conducted SWOT analysis and implemented experiments on the six solutions to identify the best initiatives that could be achieved to reach the targets. This is to ensure there is efficiency in time, cost and total output performances set by the SMM Management.



Benchmarking study was conducted for comparing performance among Sharp plants.

Fishbone 1 and 2 diagrams were used to identify possible root causes of the problem.

The two solutions to resolve the problem were determined and they are as follows:

Root Cause	Proposed Solution	Action Taken
Bonding process took longer time	To replace the old syringe that took longer working time in Bonding Dispenser Unit	Modify existing bond syringe machine to stencil method
Instability of stamping process	To speed up the stamping process in stamping area	In-house development of robotic jig from recycle materials which will able to change old manual method to automatic stamping process

Through the application of the Plan, Do, Check and Action (PDCA) approach, the team had scheduled the project to begin in March 2013 and end in August 2013.

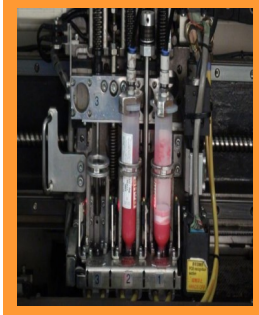
This project only took 6 months of completion period with a total cost of RM4,200.

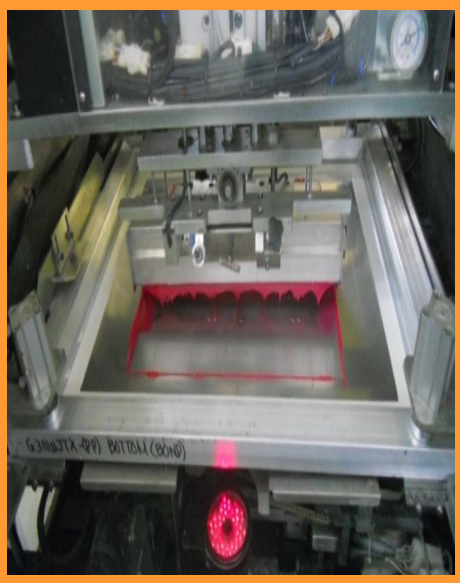
This has resulted in tremendous achievements in terms of on-time delivery to the customers, reduction in operating costs of rework, overtime and manpower as well as increase in sales and quality of the products. Thus, it is no doubt that, these solutions have shown that employees are able to think beyond boundaries and create new ideas in improving work efficiency and eliminating work-time wastages in SMT Production.

Analysis of ICC project in SMM

SMM believes that creative and innovative solutions contribute betterment for Sharp as a whole. Through stencil method in bonding process, SMM only needs a total cycle time of 5.6 second per PWB. Now, SMT is able to produce 60,000 pieces within 16 days with an average of 21,360 minutes indicating a reduction of 55 percent in time cycle. The total of production output has increased to 3,800 PWB per day as compared to 1,668 PWB previously. This has increased the operation rate to 100 percent simultaneously. This resulted SMM to save a value of RM346,833 in work time per month which brings to a total saving of RM4.16 million annually.

BEFORE ICC





The new method of stencil that speeds up the working time in Bonding Dispenser Unit.

BEFORE ICC

The auto stamping process which replacing the old method of stamping.

The automatic stamping method of robotic jig has significantly brought more positive impacts. With this, zero work-time is needed as compared to 6,000 minutes of time taken in stamping process before the implementation of ICC project. It is now needless to place an operator due to the automation method of stamping. This achievement has caused this company to save a total cost of RM81,930 monthly, amounting to RM983,160 annually.

Apart from this, the project is also able to reduce factory wastages by 84 percent which could reduce land pollution. Furthermore, the electricity bill has also decreased due to the reduction in time-cycle.

In terms of intangible benefits, the ICC project has improved communication skill, creative and innovative thinking, teamwork and morale among In-Team. Now, the team is able to share this achievement through various platforms locally and internationally. They are eager to achieve more positive accomplishment using ICC tools and approaches as SMM management provides incentives and recognitions for all the efforts shown by the team. ICC is indeed a dynamic tool for manufacturers towards betterment in their organisations.

Matrix before and after ICC project:

Description	Before	After
Production output (PWB/day)	1,668	3,800
Cycle time - Bond Dispenser Unit (minutes/lot)	48,060	21,360
Operating rate (%)	77	100
Cost saving - Bond Dispenser Unit (RM mil/year)	0	4.16
Factory waste (kg/month)	2.68	0.42
Cycle time - stamping area (minutes/month)	6,000	0
Number of workers - stamping area	1	0
Cost saving - stamping area (RM/year)	0	983,160
Total cost saving (RM mil /year)	0	5.14