SMED Case Study: Steel Tools Manufacturer

By Perry Tong

The Challenge

After our client, a Steel Tools Manufacturer in the mid-West of the USA instituted a Lean programme for inventory the production facility struggled. They were not able to get a good product mix out to the finished goods inventory due to relatively long changeover times for cutting dies. Steel tool (final product) cutting dies need to be replaced after every 4 Kanban batch runs of 225 pieces each. This frequent changeover, occurring once every hour of work is necessary to maintain and re-sharpen the cutting die's cutting edges. Current changeover time for the cutting die was approximately 60 minutes and included the use of a single 10 ton forklift though the die weight was 5 tons. Nearly 50% of a working day was 'wasted' on changeovers not including the impact of the 'inability' to achieve a high product mix for agility to meet with product demand requirements of a Lean programme.

Going to Gemba with the client we walked the floor together to discover what could be 'costing' production such a long changeover time. Discoveries included:

- Long travel time/distance from maintenance room to machine line(s) with an average of 200 metres travelled per die accounting for 10 minutes of changeover time
- Tool cutting cell was raised 1.5 metres off the floor thus hoisting of die necessitated a larger then absolutely necessary forklift and thus incurring more floor space for movement and a slower pace of movement (die lifted to utilize gravity during cutting process – hoisting both ways accounted for 15 minutes of changeover time)
- Damage to die when transporting the rectangular shaped hardened steel cutting die caused poor fits to cutting machine during assembly (also related to hoisting)
- Poor fits called for a variety of securing bolt sizes to be readied for installation of die (securing bolts have to be machined to re-fit the die after damage from transportation and hoisting which costs an average of 15 minutes for 'customising' new bolts)
- Post installation inspection and test run of cuts yield acceptable rates of 95% variance (in number of pieces conforming to specifications); lower rates would mean a re-stripping and re-installation of a spare die (test runs took 10 minutes including final setup and run of 5 minutes). Die re-installation occurred in approximately 8% of die changes.

COE's Response

Working with the production manager and tooling supervisor COE sought to shorten the travel time between the parts room and the actual line and recommended that the production line be re-aligned to bring it closer to the parts room as the parts room was purpose built and could not be dismantled as easily as the production cell. A secondary plan prior to the implementation of the cell re-alignment was to line up spare dies next to one side of the cutting cell. The latter was implemented immediately and this cut the external setup time down from 10 minutes (travel time, lifting and aligning) to 3 minutes (to lift, shift by 3 metres and align the die slab).

Raising the cutting cell platform to utilize gravity was an energy saving measure practiced by the plant. To reduce the hoisting time and damage possibilities COE recommended and the plant implemented that a pit of re-enforced concrete be dug with guide rails for the die slab installed so that the die slab could be lowered down instead of being hoisted higher for stripping and installation. This investment resulted in lower weight forklift requirements (down to 7 tons) and increased agility of the forklift around the work area thus reducing working times by 10 minutes to reach a 5 minute time for this step. The guide rails increased the safety of the tooling team while also reducing the time required to manually align the die to the cutting cell.

The purchase and use of hardened rubber ‘boots’ for the corners and sides of the die slabs reduced the damage of the die from some 15% occurrence to less than 1% occurrence and this decreased both the frequency of required re-installation of ‘new’ dies and the machining of bolts to hold the die in place for cutting. An overall reduction of average time in this aspect of changeover resulted in a 12 minute reduction to 3 minutes overall and also lowered costs in relation to the number of new bolts required since damage was considerably less.

To lower final setup, inspection and test run time we experimented over 4 weekends and many nights the possibility of utilize a simulacrum of hardened wax that could be cut in the tooling room. This simulacra and a horizontal machine setup instead of a vertical machine setup to utilize gravity allowed for the correction of variance is the cutting die to be increased from 95% accuracy to 99% accuracy while ensuring that no die containing high variance was sent to the shop floor. Testing and implementation over a period of 3 months showed a rate of re-installation that was less than 1% of changeovers during the implementation period.

Project Costs & Yields

Overall the cutting die changeover time decreased from about 60 minutes to approximately 11 minutes with a dramatically lower rate of rejects for re-cut dies.

Primary improvements gained from the investments made on this project were an increase in product mix from 4 per shift to 7 per shift which enabled the production facility to meet varying customer demands as dictated by distribution centre Kanban systems. This represented an increase of OTIF delivery rates (to FG staging area) of 93% to 99.5% in terms of mix and volume. Operator productivity levels and machine up times were increased from approximately 50% to 85% as internally measured by the customer.

Secondary improvements included lower forklift movement (energy consumption) and a safer working environment (lesser machine movement on the shop floor). Movements around the shop floor are also now slightly quicker due to a smaller sized / tonnage forklift in use.

	Before	After
Cutting Die C/O Time	60 min	11 min
Product Mix per Shift	4 products	7 products
OTIF Delivery Rate	93%	99.5%
Machine Up-Time	50%	85%
Maintenance Staff	8	7

Costs for this SMED implementation crossed a little over USD 100K for all the work and materials bought and used in the plant. This amount was recouped in a matter of 4 months from an accounting perspective which did not include intangibles such as improved workplace safety and the cost of re-installing re-cut dies. Customer satisfaction levels were not monetised for benefit accrual on this project.

Tooling team productivity increased by some 20% and 1 (out of 8) tool maintenance personnel were re-assigned to another area of the plant. Today the tooling team operates on an excess capacity basis and spend more time on reducing the variation of re-cut dies. This work has generated an excess number of spare dies that is truly required by the plant which was then sold to a similar plant (different company) in Asia.

About the Author

Perry Tong is the Singapore-based Managing Consultant for Centre for Organisational Effectiveness Pte Ltd, a management consulting company. He helps companies in Asia, Europe and North America understanding the importance of process improvement with impact on working capital reduction and increased customer service level. He has extensive experience in implementing process and organisation improvements for various industries.

Perry can be reached at Perry.Tong@COE-Partners.com