Lean Manufacturing Product & Process Flow at Gurit

From Possibility…

SP Systems (now trading under the Gurit brand) is an international manufacturing company employing approximately 800 people worldwide, but with its main production facilities on the Isle of Wight. Specialising in the manufacture of materials used to make wind energy blades, marine products and high performance cars; it turns over approximately £70m a year, and has plants in the UK, Spain and Canada. Having been established in 1980, SP Systems became part of the Swiss conglomerate Gurit in 2003; with complete integration into the Gurit Group finalised in early 2006. The key products produced are 'prepregs' – glass, or carbon fibre, sheets impregnated with resins - and the bulk resins and hardeners used to layer the sheets together. SP Systems has received numerous awards and commendations, and in late 2004 was voted Best Business in Britain by the British Chambers of Commerce.

Despite the company's enormous growth and public recognition, it operates in a highly competitive and largely commoditised market. It is essential for SP's continued success that it makes efficiency gains necessary to deliver to the customer on time and in full, and to maintain a profit.

Although SP had applied a number of Lean tools over the previous 18 months, there had not been a systematic application of tools via a structured Lean process and therefore benefits were not being sustained. SP were clear that a formal, better-resourced approach was required in order to achieve the benefits the business needed.

OUR APPROACH

The project began by undertaking a diagnosis of SP's systems, working practices and shop floor environment.

This included:

- Evaluating the effectiveness of the key product value-streams (the end-to-end process of meeting customer requirements for the different key products)
- Identifying the different types of waste created throughout the various processes
- Assessing the quality of the physical environment (looking at how well the production facilities were organised, cleaned and visually managed),
- Reviewing the readiness and capability of the organisation to cope with change

The output of the diagnostic was an implementation plan focusing on the key themes of Lean training and education, improved flow of product and materials (implementation of Just-In-Time principles), improving individual machine productivity, and improving the visual management of the factory by implementation of the 5 Ss.

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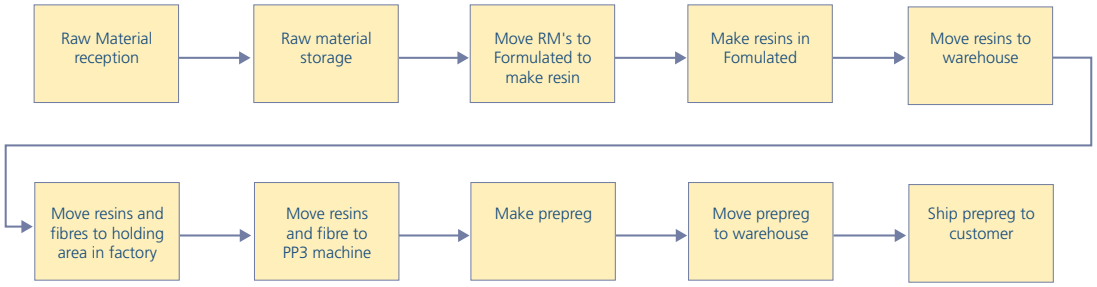
The aim of this case study is to look at how the flow of the main product line in SP, namely '**wind energy prepreg**', was reviewed and improved using a series of Kaizen Blitzes. Wind energy prepreg is the largest volume product in SP and is usually made on the PP3 machine. It is made of glass, or carbon, fibres which are then impregnated into a flat sheet using a mixture of resin and hardener. This is then used by clients to build wind turbine blades.

WHAT DO WE MEAN BY 'FLOW'?

Flow is used as the generic term for the application of Just-In-Time principles to the planning and production of products. The underlying aim is to reduce the cycle time from receipt of raw materials to shipment of finished goods as much as possible. This involves challenging planning assumptions, batch quantities, stock levels, management of raw materials and the physical organisation of the shop floor.

The product flow through the PP3 machine is quite simple, although the flow of information required to make the process work in SP was anything but simple. Prior to Lean, the process looked as follows:



Although the Flow looked simple in principle, in practice it led to all sorts of problems. In the first blitz the following issues concerning production planning and the flow of materials from Formulated to the PP3 machine were identified:

- There was a large movement of products into and out of the warehouse
- Raw material and intermediate product stock was too high – over 4 weeks of normal usage
- Stock control and product shelf lives were poorly controlled
- A large amount of space was required on the shop floor to hold all the raw materials for future production runs, as well as finished products waiting to return to the warehouse
- The planning and ordering of raw materials for manufacture was done separately for resins and prepreg products, leading to either very high intermediate stocks or productions-stops due to lack of material
- Raw materials for prepreg were ordered according to the production plan rather than actual progress, so Production could find themselves with either too much being delivered, or waiting for materials for the next order
- Lots of administrative time was spent on reconciling material discrepancies due to perceived operator error on the shop floor, for what turned out to be only small quantities
- Due to a policy of attempting to extend shelf lives, some batches of hardeners had to be frozen and defrosted, unnecessarily adding movement and time

To Actuality…

Rarely when looking at value-streams can the whole process be tackled in one go. Improvement must be undertaken in discrete areas, whilst bearing in mind the overall improvement objective. Given the diagnostic and the evident problems with flow, a series of Kaizen Blitz workshops were held with the objective of reducing stock and simplifying information and product flows.

The aim of the first workshop was to improve the supply of formulated intermediate products (resins and hardeners) to the PP3 machine. The 5-day Kaizen Blitz was run involving staff from the PP3 machine, Formulated, Production Planning and the Warehouse.

The second blitz focused on product flow from the warehouse to the PP3 machine and looked in more detail at the production planning process and scheduling.

The third blitz looked at changeover times and simplifying the changeover process from carbon fibre to glass fibre products and vice versa.

The production team also implemented a 5S process in the PP3 area to improve the visual management, cleanliness and organisation of the machine and surrounding areas. Some of the benefits of the workshops are "**commercial in confidence**", but the following gives a flavour of what was achieved.

RUNNING THE KAIZEN BLITZES

The main improvement themes emerging from the first blitz were:

- Establishing a simple card kanban to manage the ordering and movement of materials between the machines producing resin and hardener and the PP3 machine
- Eliminating the movement of any intermediate stock to and from the warehouse
- Simplifying and formalising the physical flow of products around the factory
- The removal of unnecessary paperwork used for movement and recording of stock discrepancies
- Improving the production planning system to avoid other large orders interfering with the kanban
- Increasing the hardener batch size by 10% to make the best use of the drums it went into and the kanban floor area
- Improving the resin transfer process

In the second blitz the following improvements were identified:

In each case, the same overall process took place:

- The team are trained in the principles of Lean, identification of waste, how to redesign processes, what a good process looks like and how to implement change
- The current process is mapped to ensure that all blitz participants have a shared view of what actually happens at the moment
- The team then brainstorm all the problems and locate them on the process map. As part of the problem generation the team go out and gather missing data on process and performance
- The team are then challenged to design the perfect process; one not based on current constraints, but delivering perfection. This removes the mental barriers that people tend to have when thinking about improvements to processes in areas that they know well
- The team then inject reality into the perfect process developed, to come up with a feasible solution that can be implemented within a 30-day period
- The solution is tested by going out and reviewing its practical application with all those affected
- **The team then develop a list of actions that can be broken down into:**
  - those things that can be implemented during the last two days of the blitz
  - those things that can be implemented within a week of the blitz
  - those things that can be implemented with a month of the blitz
- A short briefing is held for those that will be affected by the blitz and to collect any views, or suggestions
- The team then carry out the 'in-workshop' actions and develop an implementation plan to cover the remaining actions
- A senior management briefing is prepared and presented on the afternoon of the last day to ensure senior management buy-in and commitment to the implementation of the new process
- The workshop finishes with the action plan agreed. The remaining actions are carried out, with a review session normally planned for about a month after the blitz

- The physical segregation of raw materials and those awaiting despatch
- Putting the ordering of raw materials into the hands of the operators to remove a complex process using many handovers and different documents
- Eliminating most of the post-production paperwork, which saved time and reduced stock discrepancies
- Changing QC processes to ensure that products went immediately into the warehouse
- Better communications between operations and warehouse staff

The third blitz focused on reducing changeover times using a simple SMED (Single Minute Exchange of Dies) methodology. Improvements included:

- Better cleaning tools, preparation of materials before changeovers, changing of pumps and valves, duplicate sets of some materials, etc.

THE BENEFITS

Over the three blitzes, many processes were eliminated or greatly simplified. Systems that had evolved over time were critically reviewed by operators, planners and managers together and were re-designed with Lean thinking in mind.

Some benefits were:

- Total hardener stock was reduced by 80% and eliminated completely from the warehouse
- The kanban process operated with no need for production planning to be involved, saving them time
- Thousands of forklift truck trips to and from the warehouse were eliminated
- Production capacity on one machine was increased by better batch sizing
- Challenging the existing practice of putting some products in freezers meant that this practice could be eliminated entirely, reducing cycle times
- The team was able to influence external customers to take products in weekly rather than monthly batches,smoothing demand and allowing the kanban to operate more effectively

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- The danger of products going beyond their shelf-life was removed
- The elimination of some unnecessary paperwork and the combination of other paperwork led to the saving of two-person months per year of admin time
- Many raw materials previously shipped by batch from the warehouse were put into a line-side kanban. This eliminated a massive amount of planning, admin and production staff time and improved supply reliability enormously
- A pre-printed raw materials ordering sheet was provided so that operators only had to highlight their requirements. This could then be passed to the warehouse with a time slot for delivery to the machine
- Over fifty sheets of paper records that had to be filled in by operators were removed, reducing administrative time from over an hour to less than 10 minutes per batch
- One third of floor space next to the PP3 machine was freed up by shipping all products directly to the warehouse rather than 'staging' some for 24 hours before shipment
- Time lost on the main machine due to waiting for raw materials dropped by 75%
- Admin staff time per batch was cut from over an hour to less than five minutes by eliminating the many stock discrepancies that previously occurred
- Changeover times were reduced with better use made of the labour available to drive changeovers

Both the outcomes and process have delighted managers at Gurit. Russell Taylor, Lean Project Manager said:

'It's fantastic. Analysing waste end-to-end and giving people the ability to challenge throughout the business is amazing. Getting the shop floor involved, for example in doing 5S, rather than doing it to them has been incredible.'

Gurit are now driving many further process improvements themselves using the resource of the Lean Project Manager and Lean Facilitators trained by Ad Esse.

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FURTHER INFORMATION

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