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Case Study

Implementing Lean Manufacturing at Siemens Magnet Technology, Eynsham, Oxfordshire, UK.

Since its introduction in the early 1980s, Magnetic Resonance Imaging (MRI) has played a key role in global healthcare. MRI is a non-invasive imaging technique for obtaining cross-sectional images of the body. It is particularly useful for visualising the soft parts of the body, such as muscles, ligaments, tendons, fat and cartilage, as well as vessels. MRI has increasingly widespread applications in the diagnosis of cancer, heart disease and neurological disorders.

Siemens Magnet Technology is the world's leading designer and manufacturer of superconducting magnets for MRI scanners. More than 30% of MRI scanners in hospitals worldwide have at their heart a superconducting magnet produced by Siemens Magnet Technology.

"Using a Witness model forced us to challenge in detail the methodology of our proposed LEAN production process. The result was a change, not only in how we produce, but also how we control and measure production."

John Laister
SCM Process Manager

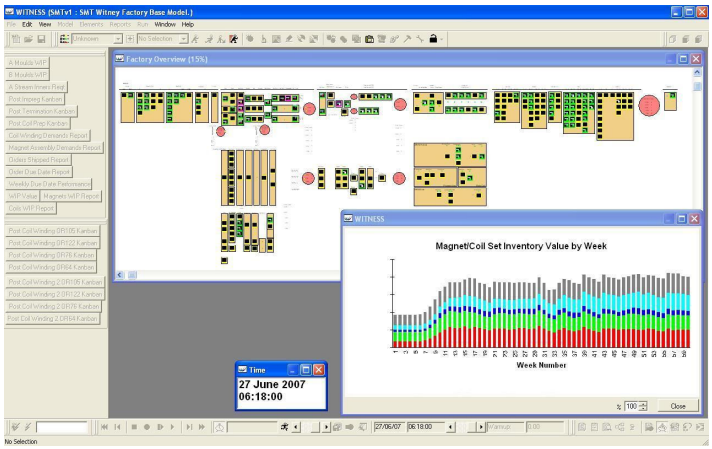
In an increasingly competitive market place, efficient and flexible manufacturing methods are essential in order to minimise costs whilst maintaining delivery performance. For Siemens Magnet Technology this meant reducing inventory and lead times without sacrificing on-time delivery performance. The company manufactures five types of magnet with the process starting with the initial winding of coils and ending with assembled and tested magnets being shipped to customers.

The traditional batch "Push" system was identified as a weakness as it worked to standard end-to-end lead times and could result in excess work in progress at various stages. The large physical size and weight of magnets compounded the issue as space within the factory was at a premium. Long lead times result in a loss of competitive edge. A revised manufacturing philosophy was specified based on a "Pull" system with a number of kanbans located at key points in the manufacturing process. This would give much reduced lead times for final assembly of magnets to customer order but required careful specification of the kanbans in the earlier stages of manufacturing in order to function correctly.

The manufacturing process comprises five distinct stages viz: Coil Winding, Resin Impregnation, Coil Preparation & Termination, Assembly and Test. Each magnet type falls into one of two manufacturing streams reflecting the work content and/or equipment needed for manufacture at each of the stages of manufacture. Some magnet types and their components have dedicated manufacturing at certain stages of manufacture, but all magnets share equipment at some stage. Certain manufacturing stages are labour intensive (e.g. Coil Winding) whilst others (e.g. Resin Impregnation) are capital intensive – each requiring different approaches to maximise local manufacturing efficiency. These complexities and the associated risks to the successful implementation of the "Pull" system led to the simulation exercise being commissioned from Lanner Group Ltd.

The simulation model was created in segments – one manufacturing stage at a time. Detailed discussions were held with the Process Manager of each area in turn. Each manager had a concept design of how the "Pull" philosophy would be implemented in his/her area. This would include not only the equipment and methods but also the number and sizing of kanbans. The creation of the model challenged these ideas and in some cases significant changes were introduced BEFORE the model itself was built! Numerical data such as estimated process timings, yield and rework rates were also gathered.

The model was designed to have a similar look and feel to process schematics already in use by Siemens and was driven by the forecasts for magnet production over a 12 month period. All numerical data is held in an associated Microsoft Excel Workbook (e.g. forecast details, order launch lead times, product quality data, kanban sizes, process timings). The model also considered the quantity and location of required safety stock magnets (required to compensate for final test yield) and the impact on production capacity within the final stages of manufacture.



The model is run by the supply chain group and requires no detailed knowledge of Witness as it is configured in Microsoft Excel. It does however require the user to have a good understanding of the rules and assumptions within the model in order to interpret results correctly. Following the running of the model, key performance data is automatically written back to the workbook by the model. The model itself gives graphical representation of order due date performance, and anticipated inventory levels both in financial and unit terms by magnet type.

Numerous detail changes were made to all areas of the concept design both before and after the model itself becoming available. Indeed a key finding was that the original design had too few kanbans specified and would, if implemented, have led to significant cross blocking of magnet streams with a major negative impact on throughput and lead-times. Subsequent use has been to size the kanbans and to be able to demonstrate to production personnel the impact in neighbouring production areas of increasing/decreasing in their own areas. As is commonly the case in simulation studies, the improved understanding of the planned process at an early stage provides reassurance about future plant performance for everyone connected with the project – whatever their individual responsibility.

It is intended that the model be reviewed quarterly in order that the working assumptions and specifications of both factory and model remain optimal in the light of changing magnet demand, the introduction of new or modified magnet types and new equipment.

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