

***Implementing Lean Manufacturing  
at Siemens Magnet Technology.***

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## *Agenda*

- Who are Siemens Magnet Technology & what do they produce ?
- What is the business issue?
- The Solution
- The Project
- Overview of the Manufacturing Process
- The Model
- Outcome
  
- Demonstration

## *Siemens Magnet Technology*

- **Manufacturer of Magnetic Resonance Imaging Equipment (MRI)**
- **Non-invasive imaging technique to obtain cross-sectional images of the body**
- **Introduced in the early 1980's**
- **Increasing use in diagnosis of cancers, heart disease and neurological disorders**
- **UK site produces the superconducting magnet for both Siemens and other suppliers**
- **More than 30% of MRI Scanners world-wide use Siemens' magnets**



## ***The Business Issue Facing Siemens Magnet Technology***

- History of excellence (technical innovation & quality of supply)
- Five different types of magnet produced
- Increasingly competitive market
- Cost of manufacturing had to be reduced
- Inventory levels identified as too high & lead times too long
- Large physical size and weight of magnets creates storage/handling issues
- ... but delivery performance had to be maintained

## *The Solution*

- Replace existing batch production system with a “Pull” system
- Introduce kanban methodology and make only when triggered
- Not straightforward due to nature of some stages of manufacturing
- ... SO
  - How to specify?
  - How to prove performance?
  - How to convince production & planning staff?

## *The Project*

- Five major production areas – each with own Process Manager
- In-house Concept Design Process Maps already developed
- These extended to include numerical data (e.g. process timings)
- Model would imitate Process Map style to aid familiarity
- Numerous meetings with Process Managers (individually and in groups)
- Many detail operational issues resolved before model build started (not unusual !)
- Model validated by individual process areas and by responsible Process Manager
- Overall responsibility and on-site co-ordination by Planning dept.

## *Overview of Manufacturing Process - 1*

- Five basic stages
- Coil Winding, Resin Impregnation, Coil Preparation & Termination, Assembly and Testing
- Five magnet types broadly split into two manufacturing streams (A&B) reflecting work content



## *Overview of Manufacturing Process - 2*

- Some magnet types have dedicated manufacturing equipment at certain stages but all share equipment at some stage
- Certain stages are labour intensive (e.g. Coil Winding) whilst others are capital intensive (e.g. Resin Impregnation)
- Differing approaches needed to maximise local efficiencies





## The Model - 1

- Conventional Witness model linked to MS Excel Workbook
- Model driven by forecast demand for magnets
- Order launch lead times, product quality data, kanban sizes and process timings all configurable from Excel

**Siemens Magnet Technology Eynsham Site Model**

**Run Model**

Key Performance Indicators:

	Number of Orders	Early Delivery	On-Time Delivery	Late Delivery	Average Value of Inventory
Magnet 1	200	98.00%	1.00%	1.00%	£5,059k
Magnet 2	250	95.00%	2.00%	3.00%	£3,936k
Magnet 3	250	93.00%	5.00%	2.00%	£1,428k
Magnet 4	250	90.00%	5.00%	5.00%	£3,228k
Magnet 5	150	96.00%	1.00%	3.00%	£4,348k
<b>Average (wtd)</b>		<b>94.09%</b>	<b>3.05%</b>	<b>2.86%</b>	<b>Total £17,999k</b>

Model Start Date: 01 May 2006

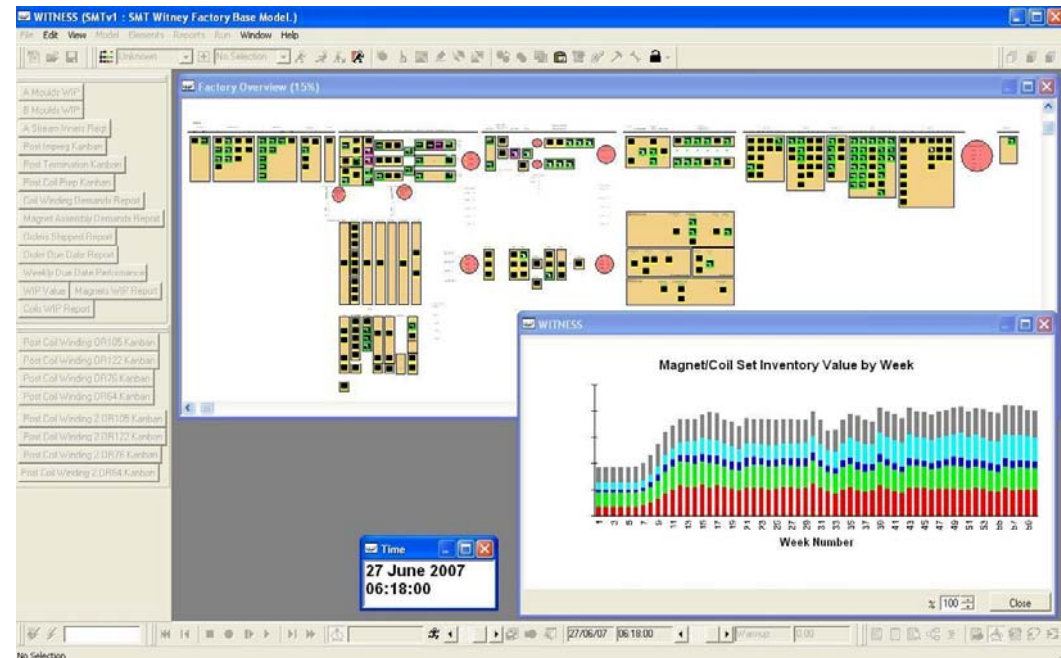
Reassign orders if no safety stock cover following magnet failure

Magnet 1 ABC		Magnet 2 CDE		Magnet 3 FGH		Magnet 4 IJK		Magnet 5 LMN	
Launch Leadtime (days)	RT Plot Rework Rate	Launch Leadtime (days)	RT Plot Rework Rate	Launch Leadtime (days)	RT Plot Rework Rate	Launch Leadtime (days)	RT Plot Rework Rate	Launch Leadtime (days)	RT Plot Rework Rate
20	5.00%	20	5.00%	20	5.00%	20	5.00%	25	5.00%
15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%
3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%

Due Date	Air	Due Date	Air	Due Date	Air	Due Date	Air	Due Date	Air
1 11/07/2006	0	1 11/07/2006	0	1 11/07/2006	0	1 11/07/2006	1	1 12/07/2006	0
2 11/07/2006	0	2 14/07/2006	0	2 14/07/2006	0	2 17/07/2006	0	2 19/07/2006	0
3 14/07/2006	0	3 18/07/2006	0	3 14/07/2006	0	3 27/07/2006	0	3 22/07/2006	0
4 15/07/2006	0	4 18/07/2006	0	4 15/07/2006	0	4 27/07/2006	0	4 24/07/2006	0
5 15/07/2006	0	5 19/07/2006	0	5 17/07/2006	0	5 01/08/2006	0	5 25/07/2006	0
6 17/07/2006	0	6 21/07/2006	0	6 19/07/2006	0	6 01/08/2006	0	6 29/07/2006	0
7 17/07/2006	0	7 24/07/2006	0	7 25/07/2006	0	7 05/08/2006	1	7 01/08/2006	0
8 18/07/2006	0	8 25/07/2006	0	8 31/07/2006	0	8 05/08/2006	1	8 05/08/2006	0
9 21/07/2006	0	9 25/07/2006	0	9 01/08/2006	0	9 07/08/2006	0	9 21/08/2006	0
10 21/07/2006	1	10 28/07/2006	0	10 02/08/2006	0	10 07/08/2006	0	10 23/08/2006	0
11 22/07/2006	0	11 28/07/2006	0	11 05/08/2006	0	11 18/08/2006	0	11 26/08/2006	0
12 22/07/2006	0	12 31/07/2006	0	12 08/08/2006	0	12 18/08/2006	0	12 26/08/2006	0
13 24/07/2006	0	13 31/07/2006	0	13 09/08/2006	0	13 18/08/2006	0	13 29/08/2006	0
14 25/07/2006	0	14 31/07/2006	0	14 12/08/2006	0	14 19/08/2006	1	14 29/08/2006	0
15 26/07/2006	0	15 01/08/2006	0	15 14/08/2006	0	15 19/08/2006	0	15 01/09/2006	0
16 26/07/2006	0	16 02/08/2006	0	16 16/08/2006	0	16 22/08/2006	1	16 04/09/2006	0
17 26/07/2006	0	17 02/08/2006	0	17 19/08/2006	0	17 22/08/2006	1	17 06/09/2006	0
18 28/07/2006	1	18 04/08/2006	0	18 19/08/2006	0	18 24/08/2006	0	18 09/09/2006	0
19 28/07/2006	0	19 05/08/2006	0	19 21/08/2006	0	19 24/08/2006	0	19 12/09/2006	0
20 28/07/2006	0	20 07/08/2006	0	20 26/08/2006	0	20 25/08/2006	1	20 13/09/2006	0
21 29/07/2006	0	21 08/08/2006	0	21 28/08/2006	0	21 28/08/2006	0	21 15/09/2006	0
22 29/07/2006	0	22 08/08/2006	0	22 29/08/2006	0	22 29/08/2006	1	22 26/09/2006	0
23 29/07/2006	0	23 11/08/2006	0	23 01/09/2006	0	23 29/08/2006	1	23 29/09/2006	0
24 31/07/2006	0	24 12/08/2006	0	24 02/09/2006	0	24 05/09/2006	1	24 03/10/2006	0
25 01/08/2006	0	25 15/08/2006	0	25 05/09/2006	0	25 07/09/2006	0	25 08/10/2006	0
26 01/08/2006	0	26 19/08/2006	0	26 05/09/2006	0	26 07/09/2006	0	26 09/10/2006	0

## The Model - 2

- Limited high level reporting fed back from the model to Excel
- Most reports held in Witness and predominantly displayed in graphical form
- Key reports are order due date performance and anticipated inventory levels (both in financial and unit terms by magnet type)



## *Outcome*

- Original design had too few kanbans
- Significant cross blocking of magnet streams
- Major negative impact on throughput & lead-times
- Later used to size kanban operation
- Specified location and numbers of safety stock magnets
- Now to be updated and used quarterly to ensure rules and trigger points remain optimal

***Demonstration***