



Fiat models their manufacturing systems to reduce work in process.

(Photo courtesy of Fiat.)

Fiat Reduces WIP by 48% with Simulation

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In real life, it is too difficult to manipulate the manufacturing system according to different production strategies. Simulation was used for this study because it was the most suitable tool to help understand the causes of changes in systems variables on the Work In Process. The purpose was to understand the behavior of the system and evaluate various strategies to reduce WIP.

The Problem

The objective of the study was to decrease excess WIP in the workshop. System analysis was used in order to detect the most important reasons of excess WIP. These can be summarized as follows:

- large lot sizes
- long set-up times
- long lead times
- ineffective production scheduling
- breakdowns of machines
- non-value-adding activities of operators

The Solution

First, a model of the actual system was constructed. The reasons for excess WIP in the workshop were analyzed and identified. Then the model was verified and validated. After that, the problem solving approach was developed. By testing the results of changes on variables, the minimum stock level was reached.

ProModel was used for gaining an insight into the relationships among different variables. Running experiments of the scenarios helped to set the rules for the production system to improve productivity. Therefore, an insight was gained for understanding the relationships between WIP and the others such as lead times of pieces, lot sizes and set up times. By keeping the technological constraints constant, the most important tool for increasing the productivity of the shop

floor comes out of setting rules for production.

The proposal for decreasing WIP are divided into two groups:

- Scheduling
- Technological

The scheduling recommendations included:

- creating lot sizing methods
- material pulling to the system (the number of pieces going into the systems should be equal to the required number of output)
- lead time monitoring and lead time

Minimizing WIP forces recognition of all waste and abnormalities in the system because WIP hides the non-value-added activities.

- reduction through waste elimination
- machine-operator assignments done according to priority of jobs
- increasing the number of multi-process material handling operators

The technological recommendations included:

- reduction of set up times
- methodical improvements
- automation of machines where possible
- layout optimization
- the preventative and productive maintenance

The Results

As a result of the modeling effort, there was a 48% reduction on the average WIP in the workshop. The majority of this improvement was gained from applying scheduling rules, and the rest was gained with technological improvements.

In the study, the most important results of the project were:

- cost reduction in WIP
- reduction of lead times
- better quality monitoring
- space reduction
- better scheduling rules

As a result of the improvements the cost of material was reduced by the same amount. There was a 14% improvement by implementing only the scheduling rules.

This study brings out the importance of one piece flow rather than producing in batch and bearing the cost of excess WIP. Minimizing WIP forces recognition of all waste and abnormalities in the system because excess WIP hides the non-value-adding activities. It also facilitates quality control by making the full process observable.

Communication was improved both among the operators and between operators and their leaders. This improvement was a result of them discussing the results or their suggestions.

The next step is to increase the usage of the simulation tool in productivity improvement studies. Currently, two additional projects have been started at TOFAS-Fiat. □

FIND OUT MORE

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