The Role of Process Simulation within Ford Six Sigma

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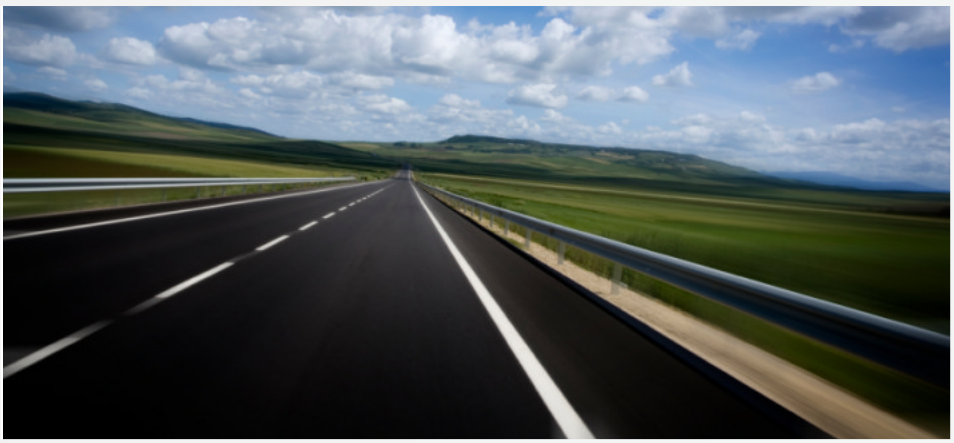
The Role of Process Simulation within Ford Six Sigma



Ford have invested significantly in the Six Sigma Breakthrough Methodology in an effort to improve long term competitiveness through driving down waste and improving process performance, so that there is a positive impact on the customer. Ford was also one of the first companies to adopt WITNESS simulation to help develop effective manufacturing facilities.

Background

Six Sigma is a structured approach to reducing variability, so enhancing the quality of products or services used by many of today's successful companies.

Ford started using Six Sigma approximately 3 years ago. Personnel are seconded for two years from their core function; they are trained in Six Sigma and other key leadership skills; they then focus on delivering projects. Black belts are at the heart and soul of the Six Sigma quality initiative. Their main function is to lead quality projects, remain focused on the delivery of the improvements and develop controls to ensure any improvements are sustained.

Within Ford, black belts are aligned to specific products or programmes with responsibility for leading the improvement projects. They bring a consistent approach and a focus on robust analysis using a proven set of tools and techniques to ensure objectivity and sustainable recommendations.

Six Sigma Methodology
The Six Sigma DMAIC process (Define, Measure, Analyse, Improve, Control) is an improvement system for existing processes or products falling below specification and looking for incremental improvement.

The Six Sigma DMADV process (Define, Measure, Analyse, Design, Verify), is an improvement system used to develop new processes or products at Six Sigma quality levels.

Related Product

"The WITNESS model provided the “What If” capability to access the improvement options, so that improvements could be selected having accurately predicted the outcomes."

-Debbie Crouch, Ford

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Ford employs a variation on these approaches DCOV (Define, Characterise, Optimise, Verify), to realise advantage in its products development. The latest vehicle line up proves this, including the Mondeo, Focus and Fiesta, all of which have benefited from the use of these tools.

One of the crucial elements of a Six Sigma project, is the selection of project metrics. Project metrics should reflect the voice of the customer. Metrics should be measurable, meaningful and provide a common language among diverse team members.

WITNESS and Six Sigma
WITNESS can offer a number of benefits to a Six Sigma programme. If the organisation does not understand the "science" of their processes, they cannot control, modify or improve them. It is first necessary to study a process in order to know which variables affect it. Once this is understood, the variables affecting the process can be manipulated in a controlled fashion to optimize performance. In addition to studying the real process, building a simulation model can help with understanding. The model also provides a test-bed to measure the relative effects of improvement alternatives without undertaking expensive real time experimentation. The optimum alternative can be selected and implemented with confidence in the real world, minimizing the risks to the process and the customer.

WITNESS provides a natural tool to support the Analyse and Improve phases of DMAIC, which also having potential to aid other phases as well.

To support Six Sigma the WITNESS software contains a number of specifically designed features including; direct links with MINITAB, tailored optimization capabilities matching the process improvement methodology, automatic calculation of Sigma ratings for chosen processes, plus a range of modelling tools and reports tailored to the needs of the Six Sigma specialist.

EXAMPLES WITHIN FORD

Dagenham Engine Plant Machining Line
Investigate a machining line that was experiencing capacity concerns which were impacting on downstream activities. The emphasis of Six Sigma being strongly towards data analysis, meant that data was collected specifically designed to support the project and the planned analysis in MINITAB. There are often many changes that could be made which would, in theory, improve a manufacturing facility. It is more difficult to select a small number of changes that work together in a coherent way, to create maximum impact in terms of de-bottlenecking. A small number of changes are required because of the potential disruption and risk inherent in disturbing too many aspects of the production system at once.

A version of WITNESS known as FIRST (Fast Interactive Replacement Simulation Tool) was used. This is a Ford proprietary tool and was specially developed in partnership with John Ladbrook of Ford and designed for quickly modelling machining lines. FIRST automatically creates a simulation model of the facility based upon data input through Excel. This approach provides quick and easy access to WITNESS simulation without requiring model-building skills.

Having populated FIRST with the data that has been collected, the model provides the analytical capability to determine the key changes, which if implemented successfully would provide a significant step improvement. Having experimented with the factors within FIRST, two major opportunities were identified. These improvement opportunities reaped a 10% increase in capacity once implemented.

Chiller Capacity
Chillers provide chilled water to cool machines, support coolant systems and provide environmental cooling. Correctly predicting cooling requirements is vital as too much capacity has a significant cost penalty whilst too little capacity can have quality and environmental penalties. Chiller capacity has historically been purchased based upon the sum of machine supplier stated requirements and an estimate of system uptime.

A predictive model was required to relate the requirements of individual production machines and their operating states to average and peak load chiller requirements. A predictive model of this kind would deliver capital expenditure and operational benefits to the Ford plants. As part of this Six Sigma project, Lanner was asked to provide expert modelling of process chiller capacity.

Results

A WITNESS simulation model was developed in partnership with Ford using Lanner's SIMBA (Simulation Based Application) ActiveX control embedded within an Excel spreadsheet.

The model was constructed in this way to provide the Ford engineers with an easy to use tool for assessing Chiller capacity on future projects and to allow Ford engineers to evaluate and compare individual machine demand. With this model, engineers are able to quickly and accurately predict cooling capacity requirements. This analytical power will result in significant capital expenditure savings and provide valuable information during machine specification discussions and negotiations.