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Ingenuity for life



**GEOMETRIC
SOLUTIONS**

Industrial machinery and equipment

Perkins Engines

Widespread adoption of virtual simulation and process planning yields big dividends

Products

Teamcenter, Tecnomatix,
JT Open

Business challenges

Eliminate late-stage changes to expensive tooling and production processes

Reduce risk of escalating costs and disruption to production schedules

Keys to success

Single, safe source of product and process data

Virtual process planning for assembly and virtual build events

Results

Three-fold increase in process planning capacity compared to previous NPI programs

Investment readily rationalized by time and cost savings

Continually increasing number of unique customer sales configurations

Tight collaboration among colleagues, vendors and customers throughout the NPI lifecycle

Greater product quality

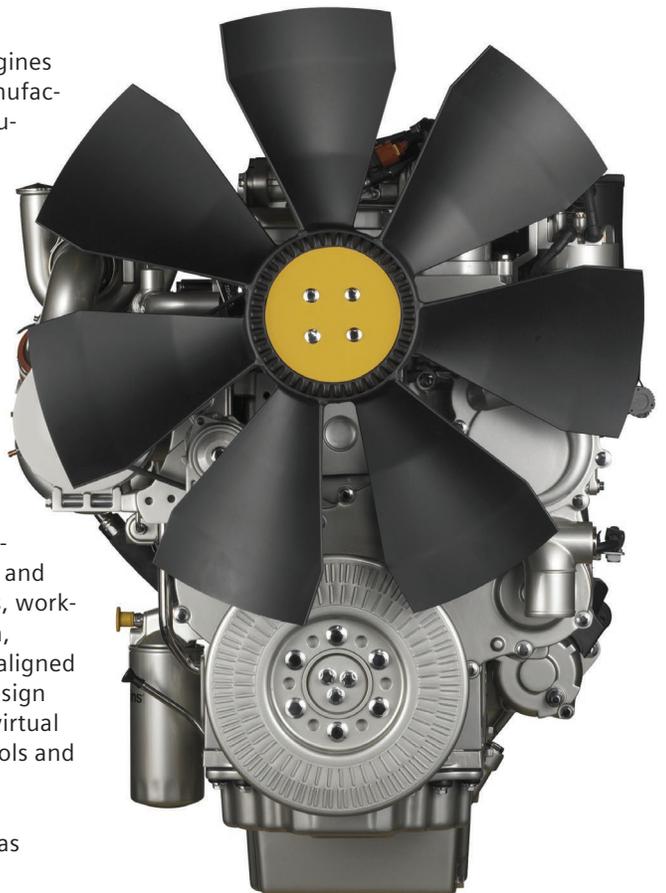
Perkins uses Teamcenter and Tecnomatix for successful new engine launches; achieves three-fold increase in process planning capacity compared to previous approach

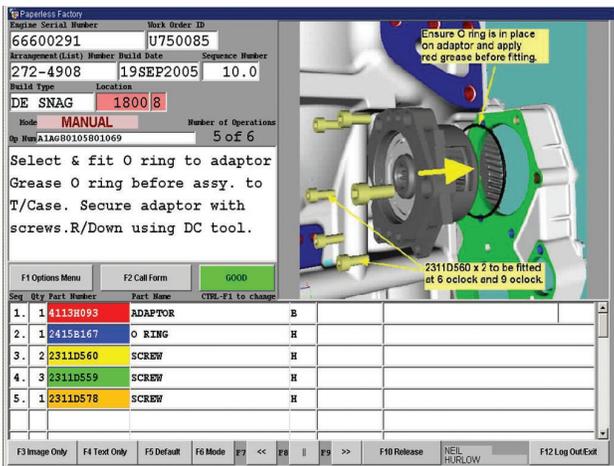
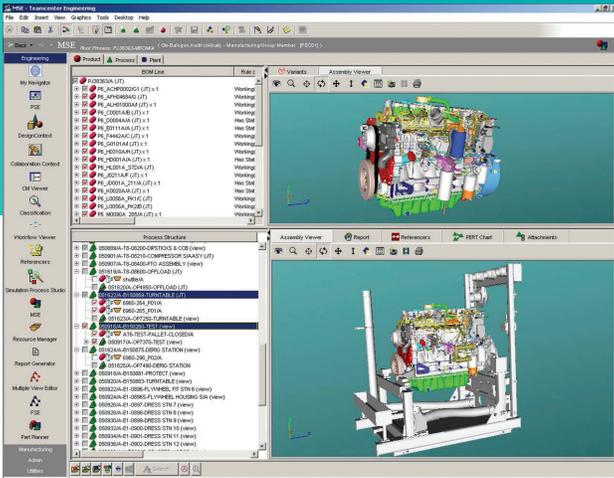
Engine supplier to the world

For more than 75 years, Perkins Engines Company Limited (Perkins) has manufactured diesel engines and power solutions with the highest levels of performance and reliability. The company is now the leading supplier of diesel engines and gas engines in the 4 to 2,000 kilowatts (5 to 2,600 horsepower) range for industrial, construction, agricultural, materials handling and electrical power generation applications. "Everyone within Perkins makes quality a personal issue," says Cliff Gillis, the company's manufacturing technology and systems manager. "The company's mission is delivered by highly engaged and skilled manufacturing professionals, working collaboratively using a common, worldwide planning system that is aligned with suppliers, logistics, product design and operations through the aid of virtual simulation and process planning tools and technologies."

To succeed in its mission, Perkins has made a substantial investment in

advanced manufacturing plant and equipment, and has established Teamcenter® software from Siemens PLM Software as its single source of product and process information across both its engineering and manufacturing environments.





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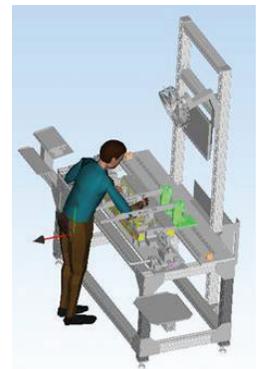
Cliff Gillis
Manufacturing Technology and Systems Manager
Perkins Engines Company Limited

High stakes

In addition to his responsibility for ensuring the readiness of manufacturing facilities for all new products, Gillis is also the deployment champion for virtual process planning for assembly (VPPA) at Perkins. Both aspects of his role complement each other perfectly. Gillis recalls, “In 2005, the company embarked on its Tier 3/Stage IIIA emissions-compliant four and six cylinder engine New Product Introduction (NPI) program. The stakes were high. If the program ran into problems, it would negatively affect customer satisfaction and profitability. Late-stage changes to expensive tooling or production processes would increase the risk of escalating costs and disrupt current production schedules, which could result in missed delivery commitments. To ensure success, we would need a repository of product and process knowledge that would allow us to see the actual part geometry within the context of the whole engine – specific to a customer order and the production process it would be assembled on.”

First plant to implement virtual process planning for assembly

According to Gillis, “The Peterborough facility was the first Perkins engine plant to implement a production VPPA environment. This was achieved in the Teamcenter manufacturing environment, with additional configured manufacturing schema and process validation scripts that VPPA provides us, coupled with a strong relationship to the core principles of lean manufacturing consistent with our goals. It is our single, safe source – Perkins’ central database of product information, product data, process information and process data – all in the JT lightweight 3D data format.” (The JT™ file format is an open and widely used technology for 3D visualization, collaboration and data sharing in today’s product



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lifecycle management (PLM) environments. The JT Open program and JT Open toolkit are part of Siemens PLM Software's PLM Components' suite of software tools that support innovation and promote interoperability in computer-aided design (CAD), computer-aided manufacturing (CAM), computer-aided engineering (CAE) and PLM applications.

"We use Pro/Engineer for product designs with every single model automatically tessellated overnight through scripts developed by our IT (information technology) department, so it can be accessed through Teamcenter," says Gillis. "From the part number or description, I can access the metadata transferred during the tessellation – the designer, material types, mass properties and so on. That means I can collaborate effectively with my vendors, design engineers, operations personnel in the factory and with colleagues in manufacturing and really start to develop the manufacturing process design."

Virtual build events add confidence

Working in the Teamcenter manufacturing environment and using Siemens' Tecnomatix® software, including FactoryCAD™ software, Jack™ software and Plant Simulation software, the manufacturing engineers model the production facilities in detail, creating and sharing a tessellated model of the factory. Gillis explains, "Perkins has developed a work-

ing mathematical model using Plant Simulation discrete-event simulation for process optimization. The environment, based on VPPA and Teamcenter, has enabled us to create a virtual production line and manufacturing routing, associating parts to a workstation, switching the product designs on station by station, and building up the engine in the actual production line sequence. We call this process a virtual build event."

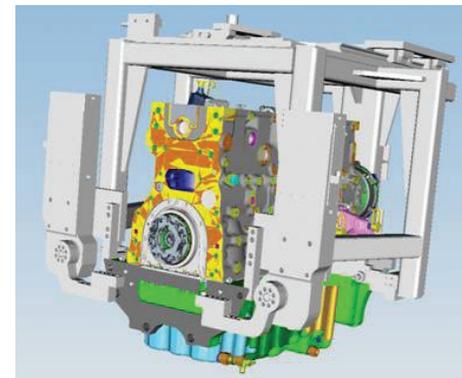
Through these events, Perkins' manufacturing engineers know, with confidence, that before any new engine configuration ever goes near a production line, it will be assembled on the production line in the right sequence, enabling assessment of all necessary tooling requirements before launch. Gillis confirms, "It works. When we introduced our Tier 3/Stage IIIA emissions-compliant four and six cylinder engine, the application of our validated virtual planning tools prevented a significant number of issues that would have had a substantial cost impact later on, had they reached production. Examples include line balancing issues that would have affected cycle time, tooling issues, product compatibility issues and design for assembly issues."

The next big challenge

"Our next big challenge was the Tier 4 Interim/Stage IIIB-compliant four and six cylinder engine NPI," says Gillis. "We planned everything from the start using

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Cliff Gillis
Manufacturing Technology
and Systems Manager
Perkins Engines Company
Limited



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FactoryCAD. It provided what we needed to create detailed, intelligent factory models. FactoryCAD allows us to work with ‘smart objects’ that represent floor and overhead conveyors, mezzanines and cranes, material handling containers and operators. We can then ‘snap together’ a layout model without wasting time drawing the individual items.”



“For the 1200 Series, we were able to perform process planning for more than 100 unique customer configurations compared to previous NPI programs. That represents a three-fold increase in our process planning capacity compared to the previous capability.”

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Perkins Engines Company Limited

Single, safe source

According to Gillis, “When introducing new technology into a proven engine product, you need to engage early. Upfront knowledge – specification changes, additions, modifications, variations and options – is a massive advantage and enables manufacturing to be more influential at the design stage. It means no surprises; it’s an opportunity to evaluate and validate the impact of any changes before those alterations are agreed upon, finalized and committed to, rather than rectifying things after production begins, which is a significant risk to quality, as well as time-consuming and costly.”

Perkins has been on this path since 2005. Gillis notes, “We knew from the work we had done on our Tier 3/Stage IIIA, four and

six cylinder engine that we had the right answer. So, we made a business decision that for all new products, Teamcenter would be the single, safe source of all information. We created and embedded a structured process into the organization – VPPA enabled by Teamcenter – and it serves as the standard to validate the early concept designs for this engine and the corresponding process designs throughout the NPI development program.”

The VPPA approach, with Teamcenter providing the single source of product and process data, was very successful. Gillis explains, “The number of issues occurring in production was reduced significantly and the team picked up all the major concerns that previously would have caused major disruption in the factory. Potential clashes with machines were identified;

Solutions/Services

Teamcenter
www.siemens.com/teamcenter

Tecnomatix (FactoryCAD,
Jack and Plant Simulation)
www.siemens.com/tecnomatix

JT Open
www.siemens.com/plmcomponents

Customer's primary business

Perkins Engines Company Limited designs and manufactures high-performance diesel engines for the construction, power generation, materials handling, agricultural and general industrial markets.
www.perkins.com

Customer location

Peterborough
United Kingdom

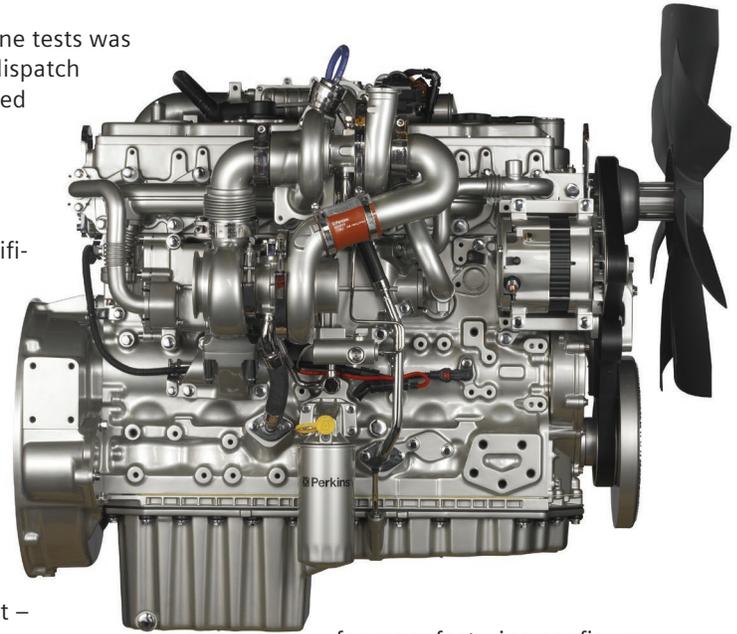
rigging equipment for engine tests was designed; and the engine-dispatch equipment was also designed and rationalized."

Significant value to customer and company

"We have already seen significant value in terms of both financial return and time saved by starting the process earlier, and we see further value in achieving seamless integration with shop floor systems," says Gillis. "There has been a massive adoption of VPPA, with Teamcenter as the foundation, and virtually everyone is using it – manufacturing, engineering, operations, service and aftermarket, all via JT."

Gillis points out, "For the 1200 Series, we were able to perform process planning for more than 100 unique customer configurations compared to previous NPI programs. That represents a three-fold increase in our process planning capacity compared to the previous capability. Today, the number of unique customer sales configurations is ever-increasing."

Gillis says that with Teamcenter as the data linchpin for the company's VPPA process, "Customers get on board sooner than ever, driving demand into the factory and



for manufacturing configuration." He adds, "I can ask any number of questions of the product design, without having to disturb the designers and without trips to the print room. Everything I need is right there on my team's desktop and mine."

Gillis concludes, "The true value is being able to collaborate effectively with our colleagues, vendors and customers throughout the NPI lifecycle. We are now looking to export our experience to other Perkins plants as they embark on the same business transformation journey to ensure that Perkins continues to provide to our customers the best-delivered quality yet."



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