

SIEMENS

Ingenuity for life

Industrial machinery

Calder

Pump package manufacturer uses Solid Edge to meet exacting industry standards while minimizing footprint and weight

Product

Solid Edge

Business challenges

Reduce package weight and footprint

Meet stringent regulations and demanding client specifications

Deliver to strict deadlines

Keys to success

Quickly create design concepts

Quickly design structural steel framing using Solid Edge Frames

Use Solid Edge Simulation to confirm structural performance

Utilize access to design projects while mobile using the Microsoft's Surface Pro

Results

Speedy concept design

Size and weight optimized

Design integrity confirmed through analysis

Potential problems identified early

Fabrication costs reduced

Material waste avoided

Clearer customer communication

With Siemens Digital Industries Software solution, Calder saves time and money

Minimizing weight and footprint

Weight and space become crucial factors when supplying equipment destined for a location such as an offshore oil/gas platform, especially if the overall package is the size of a house and comprises multiple sub-assemblies and tens of thousands of parts. In addition, it is essential that any design is absolutely right prior to fabrication as the special highly corrosion-resistant stainless steels required for demanding and hazardous environments

are very costly materials. These are just some of the challenges facing Calder Ltd., which has been providing high-quality pumping solutions since 1981.

The company serves a range of markets including energy, automotive and civil engineering. With particular expertise in designing for high-pressure, high-saline, hazardous area environments, Calder has many customers in the oil and gas sector, where design integrity and safety are paramount. Nearly half of all packages made for the offshore environment are supplied in an environmental enclosure designed to withstand an overpressure blast event.



Results continued

Typical saving of 20 hours on shop floor

Product complexity and quality supports Calder's reputation



In order to deliver high-specification products that meet the most stringent regulatory and customer requirements, Calder uses Solid Edge® software from product lifecycle management (PLM) specialist Siemens Digital Industries Software. Consultancy and support are provided by Siemens Digital Industries Software partner, Prion Cutting Edge.

Precision at an early stage

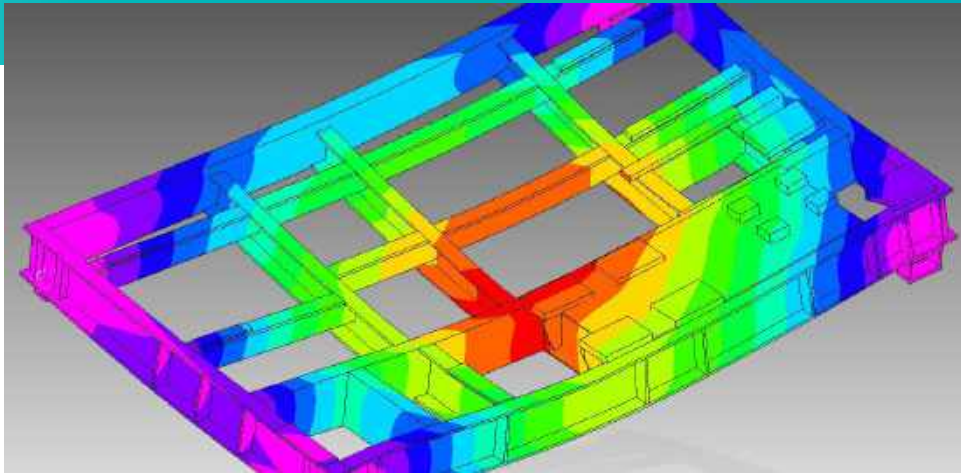
One of the key conditions for Calder is to design for ease of manufacture, assembly and maintenance yet, sometimes, the design team only has a week in which to produce an initial design concept. "What I like most about Solid Edge is that I can quickly make several models with all the major parts and compare the best options

for process flow, ease of access for maintenance, footprint and cost," says Ben Monkton, lead mechanical engineer at Calder.

Calder's design engineers use the Solid Edge Frames feature to design the structural base-frame and equipment support of a pump package. Designers start with basic 2D sketches and then extrude 3D profiles along each sketch; once these are complete other components can be assembled to the frame feature and modified, if necessary. "Once the frame has been designed using Frames in Solid Edge, we can easily make design changes by replacing the frame element," explains Chris Morgan, design engineer at Calder. "Within Solid Edge, this operation is quick and easy

"We know quantities and costs before we order and can avoid waste. In addition we can give customers accurate lead times."

Peter Elliott-Moore
Engineering Director
Calder



“Solid Edge saves a huge amount of time in the workshop.”

Peter Elliott-Moore
Engineering Director
Calder

to execute, typically only requiring the designer to replace the 3D section associated with the sketch. Any assembly relationships between the existing frame and components will be maintained. Further, especially when working with bespoke folded shapes, any update can be made on the master 3D segment and distributed through the model, without the need to edit individual sections.”

Nearly every package is unique and within the basic frame tool designers can quickly move large items such as the tank, pump and motor in order to find a solution that meets the specification. “Using Solid Edge to design in 3D enables us to see everything in great detail,” says Morgan. “This visual clarity allows us to check for clash interference, confirm tolerances with confidence and utilize every bit of space, minimizing the clearance between different pipes and reducing the overall footprint. Without this capability, we would not be able to produce the complex designs we need.”

Monkton adds: “I also use the Frames feature for tube runs and electrical cable routing. Knowing the exact size and length of each tube means that I can predict the cost as well as prepare accurate and highly detailed drawings for the fabricators and shop floor engineers.”

The fabrication of supports and enclosures within a pump package involves a large

amount of sheet metal work. Morgan notes, “It is very easy and quick to use the Solid Edge Sheet Metal feature, which allows users to create geometry, stretch faces, create flanges by pulling an edge and even create enclosures from a solid using the Transform tool.” All of this can be done with a high level of precision, and material thickness can be changed easily using the material table. Doors, supports, brackets and many other items are all designed using the sheet metal capabilities in Solid Edge.

Synchronous technology supports speedy geometry changes

Calder buys specialist components such as diesel engines, motors and high-pressure



pumps and these are often supplied with a full 3D model of the whole assembly. Use of Solid Edge enables designers to incorporate such models quickly and easily into the overall package. If any amendments are required, they can easily be done using synchronous technology, which does not require access to design history.

“Synchronous technology is very good for altering geometry, for example deleting a part, removing a hole or changing the length of a shaft,” says Morgan. “If, for example, I get to the end of a design for a tank, I can use synchronous technology to make very specific changes without affecting related items such as fillets. What works well is the ability to move between synchronous technology and ordered capabilities, using them both. I would, for example, always design fixed items such as hole patterns within the ordered environment.”

Involving all team members

Early stage design reviews enable every aspect of a developing design to be discussed. One of the enablers for this is the Microsoft’s Surface™ Pro tablet, a fully



functioning version of Solid Edge for mobile devices. With Surface Pro, design reviews can be made more dynamic. Instead of collecting all parties in one location at a specific time, the design can be taken to various stakeholders as and when required. This not only reduces the impact on people’s schedules, it also allows the design to be enriched through wider user input.

“Input from our service team is critical as they have the most on-site experience with our machines and can identify problem



“Our customers are looking for more than a safe and reliable pump; they demand engineering competence and Solid Edge enables us to demonstrate our capability.”

Ian Calder-Potts
Chairman
Calder

areas with regards to operation and maintenance,” comments Morgan. “The geometry view manipulation on the Surface Pro provides a great interface for reviewing this type of application with them. Using Solid Edge, we can highlight removal space as a separate item and, on the last few projects, we had fewer clashes as a result of such a thorough review. Our ability to use Solid Edge for animating a process, such as cleaning a tank, also highlights critical aspects of the process function. For example, the best pattern

dealing with exotic stainless steels, every fitting saved and each weld reduced contributes to a cost-efficient design. A 3D representation of the pipework helps us see where these savings can be made without compromising the process that the pipework has been designed for,” says Monkton.

Clear communication with customers

Likewise, the use of Surface Pro enables the sales team to confirm that the design meets all the customer’s requirements. Monkton explains “When meeting customers, we can portray design objectives more clearly at the initial stage. We can show a complete package, demonstrate how it fits into an application and reveal what is inside. We can rotate a model and show that there is no interference; or focus on certain key elements by turning off particular details.” With full access to design projects while mobile, amendments can be reviewed and documented in the presence of the customer.

Confirming structural integrity with simulation

Following training provided by Prion Cutting Edge, Calder uses Solid Edge Simulation to analyze frames and size sections correctly. “Designers can quickly conduct a finite element analysis (FEA) study to evaluate structures against load criteria, in order to meet strength requirements whilst minimizing material usage,” says Monkton. “This leads to a design which is structurally sound and cost-effective.”

Calder is currently building a library of FEA models. This legacy information can be used to support design decisions on component geometry during the initial stages of a new project with similar loading conditions and dimensions. This helps reduce the quantity of calculations required at the concept stage, freeing up design time. Even with the application of FEA, some physical testing is still required. “Once a product is built, the components



“On the last few projects we had fewer clashes.”

Chris Morgan
Design Engineer
Calder

and nozzle type for getting full cleaning coverage inside a barrel.”

Base frames and pumps typically have a 16-week lead-time at the manufacturer/fabricator, so the ability to confirm design decisions at an early stage enables Calder to minimize overall timescales. “Seeing a pipework route laid out not only highlights the need for extra drains or vents, it shows access to valves and indicates how the pipework can be assembled and removed from a unit. It also gives a better appreciation of the complexity of fabrication. When

must be pressure or load tested," explains Monkton. "But we are now much more confident that they will pass the tests."

In one situation, a pump package had to be loaded onto a specific truck for transportation, yet analysis revealed that the tipping and pulling of the loading process would cause the frame to deflect. Designers used Solid Edge to add structural strength to the base frame without changing basic geometry, and subsequent analysis confirmed that the modified frame was sufficiently robust.

In another case, a major multinational company had to transport two pump units into deep forest, but the total anticipated weight of 20 tons made over-the-road transportation impossible. Calder devised a



way to design the package as separate sub-assemblies, each weighing no more than 3.5 tons. This made it feasible to carry each assembly by helicopter and assemble it on site. "Without our 3D design and analysis capability, this project would have taken much longer," says Peter Elliott-Moore, engineering director at Calder.

"Designers can quickly conduct a finite element analysis study."

Ben Monkton
Lead Mechanical Engineer
Calder

Customer service and cost-effectiveness

"Our use of Solid Edge saves a huge amount of time in the workshop," says Elliott-Moore. "Thorough detailing may add hours in the early stages but the end result is a more complete design because we are addressing potential problems before they arise. If we put two extra hours of design time at the front end of the process and prevent a problem at the assembly stage, then we not only have a better product, we typically save 20 hours of shop floor time."

Because everything is generated using Solid Edge, it is easier for Calder to prepare bills of materials (BOMs). "We know quantities and costs before we order and can avoid waste," says Elliott-Moore. "In addition, we can give customers accurate lead times."



Solutions/Services

Solid Edge
solidedge.siemens.com

Customer's primary business

Calder has been providing cost-effective, environmentally responsible and high-quality pumping solutions since 1981. With particular experience in hazardous and demanding environments, where design integrity and safety are critical, the company designs, manufactures, installs and services high-pressure pumps, compressors and vacuum equipment.
www.calderltd.com

Customer location

Worcester
United Kingdom

Solution Provider Partner

OnePLM
www.oneplm.com

Calder has realized cost savings and avoided the environmental impact associated with the printing of large-scale drawings. These are no longer necessary because 3D design data is passed directly to suppliers as STEP or DXF files. Further efficiency improvements are underway; for example, the development of spreadsheets that contain dimension and location reference points and are linked to Solid Edge. These automate certain repetitive processes and save user time.

Calder is also developing a standard parts system, a database of fixtures and fittings within Solid Edge that will support the re-use of components. The use of Surface Pro is already being expanded on the shop floor and there is clear potential to use it further with fabricators. The company is also looking to extend the use of Solid Edge Simulation within the design team.

Calder has a turnover of £25m, 75 employees and a state-of-the-art test facility. Sales recently rose by 260 percent over a five-year period and according to Ian Calder-Potts, chairman and founder of Calder, the use of Solid Edge certainly contributes to business success: "I can sit with a customer, use Surface Pro as my tablet to share a 3D model and show that we fully understand the customer's needs and the specific application," he says. "Our customers are looking for more than a safe and reliable pump; they demand engineering competence and Solid Edge enables us to demonstrate our capability."



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