

COMPANY

Bosch Rexroth Canada Corp.

LOCATION

Ontario, Canada

SOFTWARE

Autodesk Inventor®
Autodesk Inventor® Professional
Autodesk® Vault
Autodesk® Design Review
Autodesk® DWF™ Viewer
AutoCAD® Mechanical
AutoCAD® Electrical

3D design has allowed us to explore numerous engineering applications that otherwise would have been handled by specialized suppliers. We simply could not have designed and manufactured critical components like the cardanic ring for the Seaway project had we not had Inventor and a complementary FEA program like ANSYS DesignSpace to accomplish the task.

—John Rauscher
 Systems Engineering Group Leader
 Bosch Rexroth Canada Corp.

The right key for new locks

Autodesk software helps Bosch Rexroth Canada Corp. win lucrative Seaway project—and improve customer lead times

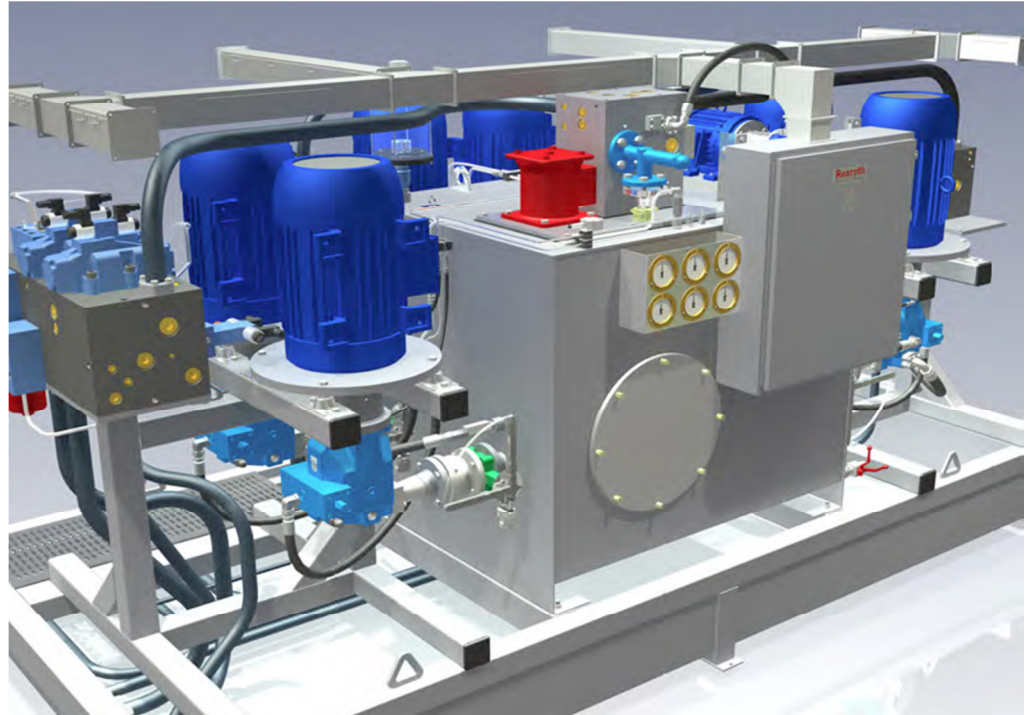


Image courtesy of Bosch Rexroth Canada Corp.

Project summary

Bosch Rexroth Canada (Rexroth) is a partner company of Bosch Rexroth GmbH, the worldwide leader in drive-and-control solutions. Using the powerful visualization capabilities of Autodesk® Inventor® software, Rexroth secured a five-year project to modernize the locks of the St. Lawrence Seaway Management Corporation (SLSMC) on the Welland Canal portion of the St. Lawrence Seaway (Seaway), a 2,038-mile shipping artery that connects the St. Lawrence River from Canada to the five Great Lakes in the United States. Using Autodesk Inventor, Rexroth is designing hydraulic systems for the canal in 3D, and as a result, the company is seeing dramatic reductions in design times and drawing errors.

The company has been able to pass these savings on to the Seaway in the form of improved on-time deliveries and timely responses to design changes. To streamline reviews, Rexroth's customers leverage the free Autodesk® DWF™ Viewer to share and print designs while internal reviewers use Autodesk® Design Review to mark up, and then roundtrip design iterations back into the original Autodesk design software. Rexroth is using Autodesk® Vault data management software on select projects to easily manage design work in progress. With an eye to the future, Rexroth plans to widely adopt Autodesk Vault to help automate its release process, track engineering change orders, and ultimately integrate with the company's enterprise resource planning system.

The challenge

When business increased in late 2003, Rexroth added staff to meet the demand. Despite hiring more designers, Rexroth was experiencing a downward trend in drawing accuracy. Not wanting to jeopardize its mission to provide superior-value products and service to customers in a profitable manner, the company knew change was imminent. Around the same time, Rexroth's management team had presented the organization with a set of goals, including mandates to improve delivery reliability to customers and minimize rework and material waste in all areas.

Rexroth knew that to achieve its goals, migrating from 2D to 3D design software was a must—not only to improve its design creation, but also its production processes. When Rexroth was invited to bid on the SLSMC project, Ben Gilmore, the company's project chief designer, jumped at the opportunity to move from a 2D AutoCAD® solution and put Autodesk Inventor's 3D capabilities to the test. "Our design team used Autodesk Inventor to create animations and renderings in our proposal that helped us gain the Seaway's confidence," explains Gilmore. "By using Autodesk Inventor to create 3D drawings, renderings, and animations,

we convinced the Seaway to change its standard from AutoCAD to Inventor for the project."

CAD Administrator Martin Eberhard adds, "In reality, the SLSMC standard was still AutoCAD. We needed software that would give us 3D visualization, but also enable us to convert the drawings into true DWG™ files after the designs and documentation were complete. This was very important to the Seaway."

In its decision to adopt Autodesk Inventor, particularly for the SLSMC project, Jim Lambert, design engineering manager, says, "We saw clearly that we could leverage Autodesk Inventor for the Seaway project to do designs that we wouldn't have attempted without a 3D system—all while reducing errors and decreasing design times."

The solution

By choosing Autodesk Inventor, Rexroth has been able not only to streamline the design process, but also increase the details included on its designs and improve visualization for everyone from customers to the shop floor. What's more, the software transition was smooth. Rexroth had felt the pain of adopting new software and platforms before, so

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—Ben Gilmore
Project Chief Designer
Bosch Rexroth Canada Corp.

ease of use was very important. "When we migrated from 2D to 3D, we had a lot of doubters," says Eberhard. "But we rolled Inventor out in stages with proper training and those same guys are coming back to me now and saying, 'I can't even imagine going back to 2D.'"

Before Rexroth adopted Autodesk Inventor, the company produced all of its designs in 2D, often experiencing the medium's limitations. "We had trouble visualizing designs," says Lambert. "For instance, the last project we did in AutoCAD involved a complex fabrication. We had a really tough time describing what the piece would look like to the fabrication shop."

Eventually, the team modeled the frame in Autodesk Inventor so they could show in 3D how the fabrication shop needed to build the weldment. "The shop gained a clear understanding of the design by viewing the model in a 3D environment, allowing them to fabricate the weldment much quicker," adds Lambert. "In this way, we've been able to leverage 3D down to the manufacturing shop floor."

Changes 50 percent faster, errors reduced

Its Autodesk manufacturing solution has facilitated Rexroth's design changes, an important benefit for the SLSMC project in particular. Now, Rexroth's designers are able to make changes and distribute new drawings immediately.

"We used to make changes in one view in AutoCAD, but they weren't updated in another view," explains Lambert. "Now, we know that when one feature changes on a model, every drawing that relates to that feature will be automatically updated."

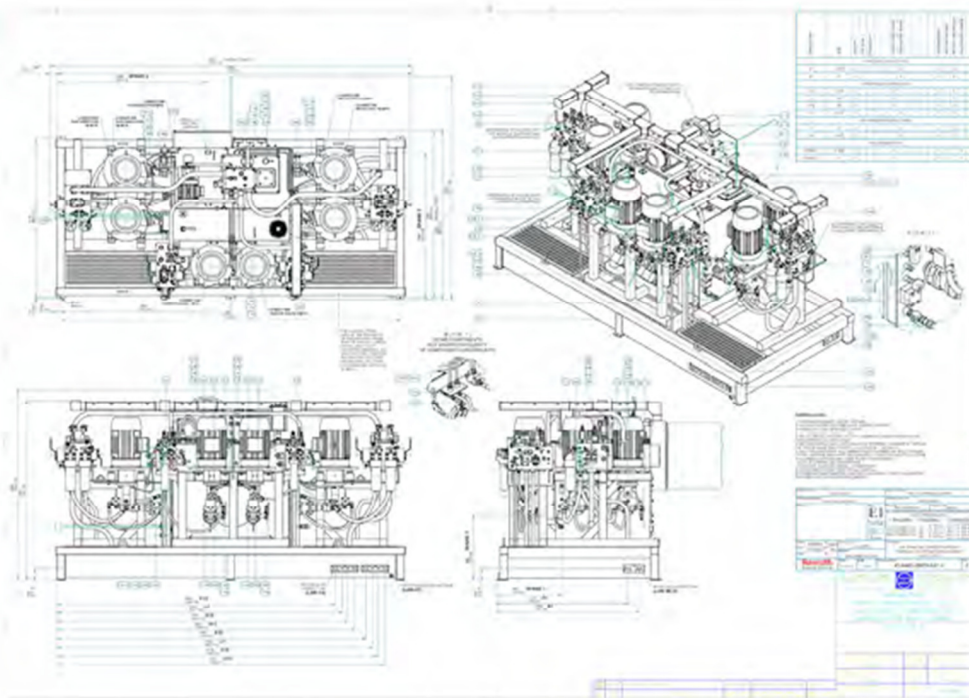


Image courtesy of Bosch Rexroth Canada Corp.

With design changes made easier, and rich visualization showing complex design details more effectively, Rexroth has been able to reduce design errors. Lambert explains, "We deal with a lot of complex shapes that are difficult to envision, which can lead to problems like interferences and incorrect dimensions. 3D helps us address these issues. With Autodesk Inventor, we can see removal areas and interferences between parts. It shows complex shapes, such as hoses, that are true to life, so we can design around them. We now have very few errors on all the projects we design and engineer within our systems group."

Sometimes, the shop floor may even see or suggest a way to do things differently, and they can adjust designs on the fly. "With Autodesk Inventor, we are making changes at least 50 percent faster than we were in 2D," says Lambert.

Saving money with FEA analysis

When Rexroth designed in 2D, finite element analysis (FEA) on critical components was a difficult manual process. As a result, it was a challenge to ensure the most cost-effective design. This would have been particularly problematic for the SLSMC project, where the company designed many critical components facilitating the opening and closing of the gates and water valves from concept to finished product. Complicating matters, the SLSMC project required special materials to combat the potential for corrosion.

By taking models directly from Autodesk Inventor into ANSYS® DesignSpace®, from Autodesk Global Preferred Partner ANSYS, Inc., Rexroth has been able to do its own FEA. And when they have to test a single part, Rexroth's engineers use the FEA capabilities powered by ANSYS DesignSpace within

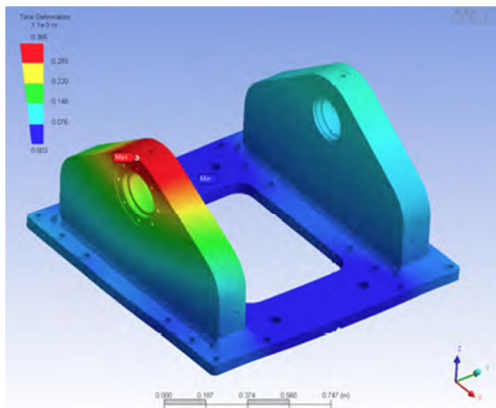


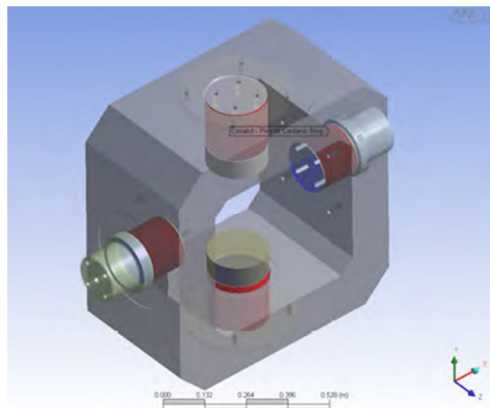
Image courtesy of Bosch Rexroth Canada Corp.



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Autodesk Inventor Professional. "By doing FEA ourselves, we haven't had to over-design on the SLSMC project," says Lambert. "We know exactly what an assembly will withstand under load based on the material we have available. This makes for a very cost-effective design."

The design and FEA capabilities of its Autodesk-ANSYS solution has also given Rexroth the confidence to branch out into new areas: the designing and manufacturing of cardanic rings and the supporting pillow block structures for the Canal's new miter gate hydraulic cylinders. After receiving a higher than expected quote from its normal supplier, Rexroth decided to use Autodesk Inventor to model the design in-house and utilize ANSYS DesignSpace to test it. "Autodesk Inventor gave us confidence to do the cardanic rings



ourselves," says Lambert. "In the end, we produced a more streamlined design and realized a better than expected reduction in costs. Autodesk Inventor allowed Rexroth to move directly from the design stage to production, without the need for expensive prototypes."

Improving the design review process

Rexroth has also looked to its Autodesk manufacturing solution to share designs for both internal and external review. The SLSMC uses the Autodesk DWF Viewer, free software that allows users to easily view and print data-rich 2D drawings and 3D models in the DWF format, to review every new unit Rexroth designs.

"It has helped the customer tremendously to visualize the design," says Lambert. "Our customers can toggle the visualization of individual components of our 3D assembly either on or off, directly inside the DWF viewer, thus gaining a full understanding of the overall assembly and design intent. Once a satisfactory rendering is achieved, the view can be saved as a screenshot, allowing them to communicate a required design change clearly via redline."

Internally, to streamline reviews, Rexroth is using Autodesk Design Review software, which provides an all-digital way to review and mark up 2D and 3D designs without the original creation software. The assembly shop is outfitted with workstations to review assemblies and mark up the DWFs, suggesting new pipe routes and other changes.

"Instead of having to look at a flat drawing and try to picture in your mind where you may have potential problems, it's right there in front of you," says Bob Van Vliet, assembly shop manager.

Adds Lambert: "We like Autodesk Design Review so much that we've actually purchased extra licenses to offer to large customers free of charge. This allows our customers to be involved heavily in the design from concept to finished product, giving them the ability to visualize, disassemble section, redline, and measure the actual 3D model. As a result, we drastically improve communications between the clients and ourselves, ensuring the motion control solution that we propose is exactly what they want; nothing more, nothing less. This in itself sets us apart from our competitors."

Looking ahead

To help it manage its design data, Rexroth has implemented Autodesk Vault software to manage its work-in-progress data on select projects. The company plans to roll out the solution more widely for release process automation, engineering change order tracking, and bills of materials (BOMs) management. "Right now we have an inadequate document management system that consists of asking one another, 'Can you close a drawing?'" says Lambert. "It's very important that we have a secure system that facilitates collaboration and design between designers. So, our plan is to import all of the SLSMC and legacy data into Autodesk Vault. We'd also like it to connect to the SAP system we're implementing."

With Autodesk Vault, Rexroth hopes to keep its managers better informed about project status and improve project workflow. "There are a lot of hard copies we are now stamping and signing," says

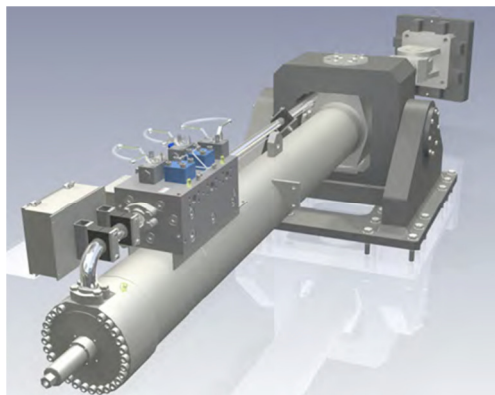


Image courtesy of Bosch Rexroth Canada Corp.

Lambert. "We're looking to Autodesk Vault to help managers find out the status of a project, what documentation has been released to the shop, and what components are completed. We want to do electronic sign-off on hydraulic schematics, which are the foundation of everything we build."

The result

Rexroth's teams have reached new heights of production, creating more drawings and releasing more projects to the shop floor than ever before. With the same amount of staff, Rexroth produced twice the number of drawings in 2005 than it did in 2004.

"Despite the increase in the number of drawings, our design team has reduced its average monthly non-conformances by 46 percent, shaved drawing errors by 25 percent, and increased drawing accuracy by 7 percent," says Lambert. "To top it off, we've estimated that design times have decreased by over 50 percent compared to projects we've done using conventional 2D AutoCAD. Using Autodesk Inventor, projects that once took over 1,000 hours to produce are now being generated in half the time and with far more detail than we ever dreamed possible in the 2D world."

Thanks to the incredible 3D visualization Rexroth now enjoys, the company also has been able to eliminate piping with machined modules. Lambert explains, "Using the 3D visualization of Autodesk Inventor Professional, we produced machining and fabrication drawings to our exact specifications, ensuring fit, form, and function were proofed in the engineering office and not on the manufacturing floor. If we'd used our old piping method, we'd have spent 15 to 20 percent more in material and labor costs."

Autodesk Inventor software has also enabled Rexroth's marketing department to virtually eliminate the cost of photographing products. "We give them animated prototypes," says Lambert. "When our marketing department sees the renderings, they can't believe their eyes. We've received rave reviews."

Rexroth's General Manager of Industrial Hydraulic Systems, Dino Paladino, sums up the success of the Autodesk Inventor implementation this way: "There is no point in obtaining the latest 3D design technology unless there will be a significant return on investment (ROI). Inventor has certainly provided a significant ROI, by allowing our design

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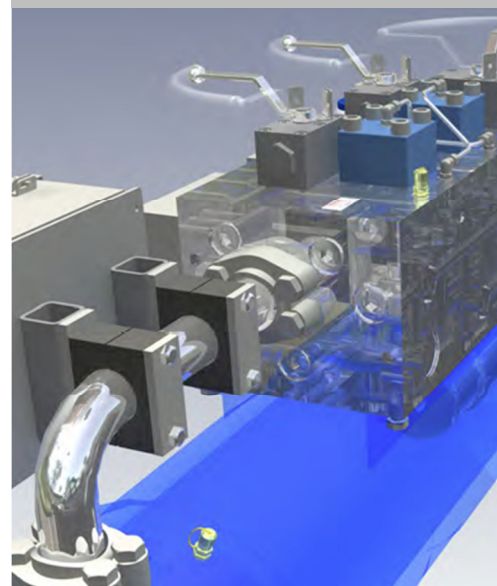


Image courtesy of Bosch Rexroth Canada Corp.

engineering team to design systems efficiently and with less errors and lead time."

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For more information on Autodesk software, visit www.autodesk.com.