Joy Mining Machinery

Customer Success Story

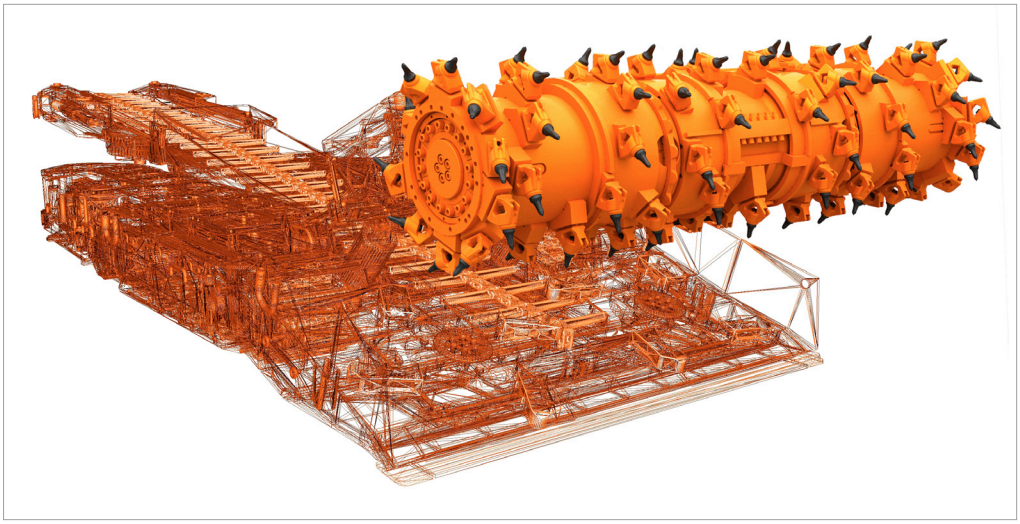
Autodesk® Inventor®
Autodesk® Vault Collaboration
AutoCAD® Electrical
AutoCAD® Mechanical
Autodesk® Maya®
Autodesk® Showcase®
Autodesk® 3ds Max® Design

Digital Prototyping has helped us to maintain our position as an industry leader by enabling us to reduce the number of changes on the shop floor, reduce our time to market, and produce better products for our customers.

—Chris Flynn
Director of Engineering Systems
Joy Mining Machinery

Underground mining machinery leaders.

Joy Mining Machinery uses the Autodesk solution for Digital Prototyping to design and develop new and innovative products.



Project Summary

How do you extract bedded materials from rock in the harshest environments? Ask 91-year-old Joy Mining Machinery, the world's largest producer of high-productivity underground mining solutions. Joy Mining Machinery, a subsidiary of Joy Global Inc., designs and manufactures underground mining equipment to mine coal and other bedded materials, such as salt and potash. The company's machines are very big—ranging from 20 to hundreds of tons each—and they have a tough job: keeping operators safe while they cut into solid rock.

Headquartered in Warrendale, Pennsylvania, Joy Mining Machinery is a worldwide industry leader, thanks in part to its reputation for developing innovative, reliable designs. Using Digital Prototyping software from Autodesk, Inc., Joy Mining Machinery continues to pioneer new machines that set the standard for safety and dependability. Moreover, it is able to:

- Minimize changes on the shop floor
- Lower expenses and speed time to market
- Explore innovative design ideas faster
- Reuse Digital Prototyping data for manufacturing, marketing, and more

The Challenge

Because every machine Joy Mining Machinery's engineers design must meet stringent safety requirements and withstand harsh mining environments, and because of the large size and complexity of these machines—which can contain up to 40,000 parts—Joy Mining Machinery must also be sure that designs for both new machines and rebuilds meet all requirements before manufacturing begins. "Steel is very expensive," explains Chris Flynn, director of Engineering Systems at Joy Mining Machinery. "We don't want to start welding and cutting steel until all stakeholders are completely satisfied with the design."

The Solution

A longtime Autodesk customer, Joy Mining Machinery now uses Digital Prototyping to explore and validate its ideas in 3D—as well as facilitate closer collaboration among members of its global design team. In 2009, the company adopted Autodesk® Vault Collaboration and upgraded to the newest release of Autodesk® Inventor® software, resulting in notable improvements in engineering productivity and efficiency. Joy Mining Machinery also uses AutoCAD® Mechanical to share designs with suppliers that rely on 2D design data and has begun using AutoCAD® Electrical to design electrical controls systems. Additionally, Joy Mining

Autodesk®

Digital Prototyping helps Joy Mining Machinery explore innovative design alternatives—before cutting steel.

Machinery recently started using visualization software, including Autodesk® Maya®, Autodesk® Showcase®, and Autodesk® 3ds Max® Design, to help create near realistic imagery and animations.

Exploring Designs Virtually

Joy Mining Machinery's design process begins when customers provide specifications for a new or updated machine. "We interpret their requirements to create digital prototypes in Autodesk Inventor software," says Flynn. "The longer we keep design iterations in the virtual world, the easier and more cost-effective it is to experiment with new ideas."

The visualization and simulation tools in Autodesk Inventor software help Joy Mining Machinery's team validate design concepts for ergonomics and operator safety. For example, engineers can see whether the operating space is large enough and can provide enough protection from dust. Joy Mining Machinery also conducts stress analysis and simulates a machine's motion to find collisions and other errors that might not otherwise manifest until physical production.

Innovative Design: Joy 14ED

Recently, Autodesk Inventor software helped Joy Mining Machinery's engineers develop the Joy 14ED, entry development equipment that combines mining and bolting operations into a single machine. The Joy 14ED eliminates the need to alternate between two different machines for cutting and bolting, maximizing productivity without compromising safety.

But designing the Joy 14ED presented some new challenges. Most of Joy Mining Machinery's machines require one operator, while the 14ED needs three. Getting all the functionality into the machine while leaving adequate, safe space for operators involved a great deal of experimentation. Since space on the machine was tight, engineers couldn't use standard equipment enclosures, so they tested different shapes and locations during the design phase. Then they used the Inventor Tube and Pipe Routed Systems feature to find the most efficient way to route hydraulic hoses.

"Hoses can take up a lot of workspace, and when they're bundled together they can be as hard as pipe and difficult to move in the real world," says Flynn. "By modeling hoses in the virtual world, we could experiment with the design to find routing that would give operators the space they need. It saved us doing work-arounds on the shop floor."

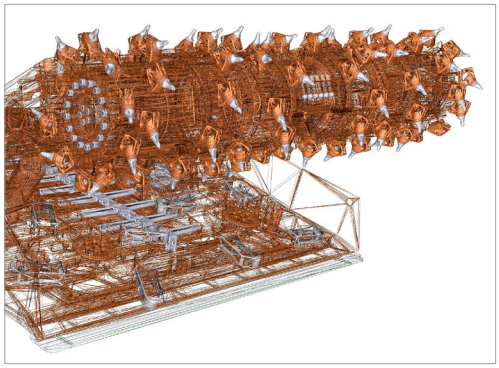
Improving Design Reviews

A more efficient process for developing innovative designs is not the only benefit Joy Mining Machinery has experienced. Digital Prototyping also makes it easier for the company's customers to understand designs before machines are built. "We can interact more effectively with customers at earlier stages of development using Digital Prototyping," says Flynn. "The best part is that we can capture customer changes before we start cutting metal, reducing costs and speeding manufacturing."

Recently, Joy Mining Machinery needed to secure customer approval for a radical new design and decided to take visualization even further. Leveraging Digital Prototyping data from Autodesk Inventor, the company used Autodesk Maya and Autodesk 3ds Max Design to develop a movie about the machine's movements and operation. "The feedback we got on the movie helped us pinpoint the ergonomic and minor operational changes we needed to make," says Flynn. "It was instrumental in helping us meet our customer's needs."

Boosting Productivity

By upgrading to the newest release of Autodesk Inventor software and replacing its existing project data management (PDM) system with Autodesk Vault Collaboration software, Joy Mining Machinery also has helped to improve collaboration and boost productivity for 400 engineers at 13 engineering sites on five continents. "Not only is it much easier for engineers to share designs, we have access to a host of Inventor features we couldn't use with our old PDM system," notes Flynn. "And we transitioned systems globally without a hitch—that's a major accomplishment."



The Result

Joy Mining Machinery reports that its transition to Autodesk Vault Collaboration and the upgrade of Inventor delivered a full return on investment in less than a year. "Before Joy started using Digital Prototyping, we had a lot of changes on the shop floor, and those changes were very expensive," says Flynn. "Digital Prototyping has helped us to maintain our position as an industry leader by enabling us to reduce the number of changes on the shop floor, reduce our time to market, and produce better products for our customers."

For More Information

To find out how Autodesk Inventor software can help you bring innovative products to market faster and at a lower cost, visit **www.autodesk.com/inventor**.

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Images courtesy of Joy Mining Machinery

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