

Bucyrus International, Inc.

MOVING THE SURFACE MINING EXCAVATION MARKET WITH SOLIDWORKS

A global leader in the manufacture of shovels, drills, and draglines for the surface mining industry, Bucyrus International, Inc. grew in 1997 through the acquisition of the Marion Power Shovel Company. As part of that acquisition, Bucyrus began an assessment of how the merged companies developed and manufactured products.

The obvious starting point was the company's design and engineering tools, according to designer Frank Szpek. "With 2D drafting, final assembly detail drawings for such things as hydraulic plumbing runs were occasionally completed after the actual factory fit-up was done," he explains. "We knew 3D solids were the way to go to achieve improved efficiencies, so we acquired several seats of SolidWorks® software and began experimenting, using it in a limited role on small projects."

Getting a Jump on the Market

Bucyrus' early experience with SolidWorks led the company to select the package as its standard design tool and implement it fully on the design of a revolutionary Bucyrus product: the 135-ton-payload, 795B Electric Mining Shovel with Hydraulic Crowd. Mining companies use mechanical shovels to load massive haul trucks with earth and minerals. Each bucket required to fill a haul truck is referred to as a "pass." The greater payload capacity planned for the 795B would enable the filling of a 360-ton haul truck in three passes instead of four. Each pass eliminated translates into cost savings and increased productivity.

While the 795B provides immediate benefits to mining operations, the shovel was designed in anticipation of a new generation of haul trucks with up to 400-ton capacity, which the 795B could fill in three passes, the same number required to fill existing haul trucks. Bucyrus wanted to get a head start on the market by anticipating an increase in haul truck size while meeting current needs.

"The entire machine was modeled and detailed in SolidWorks," notes Greg Feld, Chief Engineer. "SolidWorks has allowed us to do more conceptual design while reducing our design cycle by 25%. The software really proved itself on this project."

A View from a Cab

One of the biggest benefits of using SolidWorks software on the 795B was the ability to visualize the final machine in 3D, according to designer Derrick Juul. "The relationship of components to the view from the operator's cab has always been a challenge for us," Juul says. "An assembly could block an operator's view of the haul truck. In the past, we sometimes didn't discover a visibility problem until the machine was assembled on the shop floor, which could set us back two to three months. With SolidWorks, we have a better handle on where everything is located because it's all modeled in 3D."

Since the company's founding in 1880, the name Bucyrus® has become synonymous with excavating equipment. Used extensively on the excavation of the Panama Canal, one of the largest excavation projects of the early twentieth century, Bucyrus machinery has evolved over time in both size and sophistication. Headquartered in South Milwaukee, Wisconsin, Bucyrus International, Inc. has earned a worldwide reputation for innovation in the design and manufacture of surface mining equipment including shovels, drills, and draglines, through its commitment to leveraging technology to help its customers meet their productivity goals.



The Bucyrus Model 795B Electric Mining Shovel has more than 60,000 total parts.

- Shortened design cycle by 25%
- Reduced analysis (FEA) time by 20%
- Raised product confidence level by 25%
- Improved management of large assembly models

Bucyrus also took advantage of the dynamic assembly capabilities in SolidWorks to perform clearance checks on large assemblies and moving pieces of the 795B, which comprises more than 60,000 total parts. Bucyrus used SolidWorks assembly capabilities to make sure there were no interference problems. "All of our machines are big and involve thousands of components. We have a walking dragline with more than 200,000 components made up of many assemblies and subassemblies. SolidWorks helps us handle large assemblies more easily and resolve problems that in the past were not discovered until we began assembling the machines on the shop floor," notes Rick Correll, Computer Graphics Administrator.

By leveraging the 3D visualization and large assembly capabilities in SolidWorks, Bucyrus improved its product confidence level in the 795B by 25%.

Integrated Applications Save Time

By using applications integrated with SolidWorks, Bucyrus has taken a concurrent approach to engineering and realized additional productivity gains. Through consulting services provided by IMPACT Engineering Solutions, Inc., a SolidWorks Gold Services provider, Bucyrus performed an audit of its engineering information flow and developed and implemented a plan to address a full range of integration and process issues, including infrastructure, training, and maintenance.

Using the Matrix® product data management (PDM) system to manage SolidWorks design data, three teams working in parallel on three different mechanical zones completed the design of the 795B. "By bringing information out of Matrix into SolidWorks, we kept current with the other design teams," Szpek says.

Using COSMOS/Works® finite element analysis (FEA) software, which is fully integrated with SolidWorks software, Bucyrus cut its analysis time on the project by 20%, Feld said. The number of Bucyrus engineers who can use FEA has doubled as a result.

Bucyrus also uses SolidWorks Animator and PhotoWorks™ rendering software to produce photorealistic animations for customer presentations. "Instead of doing shadow casts and trying to make 2D drawings come to life, the graphics we produce now take the conversation to an entirely new level," says Marketing Manager Kent Henschen.

A global leader in the manufacture of shovels, drills, and draglines for the surface mining industry, Bucyrus International, Inc. began evaluating 3D mechanical design systems in 1997 in an effort to improve design productivity and create computer visuals. Bucyrus selected SolidWorks mechanical design software because of its ease-of-use, large assembly capabilities, 3D visualization and animation features, and close integration with PDM and analysis tools.

By using SolidWorks, Bucyrus has shortened its design cycle by 25%, reduced its analysis time by 20%, and raised product confidence by 25%. SolidWorks gave Bucyrus the confidence and agility to develop a revolutionary new product – the 795B Electric Mining Shovel with Hydraulic Crowd – and push the parameters of the surface mining equipment market.



Bucyrus International, Inc. uses a variety of fully integrated add-on products for capabilities such as FEA analysis, PDM, rendering, and animation.



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