

## COMPANY

**Balzer Pacific Equipment Company**

## LOCATION

**Portland, Oregon, United States**

## SOFTWARE

**AutoCAD®  
Autodesk® Inventor® Professional  
Autodesk® Simulation Mechanical**

We never would have taken this project on without a way to create 3D digital prototypes. It was just too difficult to do in 2D given the complexity of the project, the unique design considerations, and the aggressive time frame.

—**Andrew Sears**  
Mechanical Engineer  
Balzer Pacific

# Equipment to move mountains

## Balzer Pacific relies on Digital Prototyping to design and simulate innovative aggregate processing equipment



Image courtesy of Balzer Pacific.

### Project summary

For more than 80 years, Balzer Pacific Equipment Company has supplied the aggregate industry with equipment to move and process sand, gravel, and stone safely and efficiently. In every aspect of its business, the Oregon-based company has earned a reputation for excellence. So it's no wonder that North Dakota-based Knife River Corporation, one of the top aggregate producers in the United States, awarded Balzer Pacific the contract to build a 6,000-ton capacity off-loading barge to transport aggregate along the Columbia River. A critical component of Knife River's efforts to conserve valuable resources and reduce harmful emissions into the environment, the barge would replace the weekly transport capacity of more than 370 heavy-haul trucks requiring thousands of gallons of diesel fuel. As with other projects, Balzer Pacific relied on Autodesk® Inventor® Professional and Autodesk® Simulation software to design and build the barge. With help from Autodesk software, Balzer Pacific was able to:

- Provide visualizations to the customer to communicate design intent
- Simulate on-water conditions to optimize the barge design
- Reduce errors by creating a digital prototype
- Save tens of thousands of dollars in material cost and rework

### The challenge

The talented team at Balzer Pacific needed to develop a design innovative enough to overcome a range of unique design challenges. The barge would have to carry 6,000 tons of aggregate—and still float. Knife River also specified that the barge be able to off-load 2,000 tons of material in an hour, which would mean emptying the barge of 12 million pounds of rock in just three hours. "The barge was the first on-water system we've ever designed," says Andrew Sears, a mechanical engineer at Balzer Pacific. "Not only did we have all the standard considerations for this type of heavy equipment, we had to account for factors such as water level, water displacement, and weight distribution to prevent listing or leaning."

Complicating matters, the barge needed to be fully operational in just over a year. "To meet the deadline, we had to start building before we finished engineering and fabricating system components," explains Sears. "We never would have taken this project on without a way to create 3D digital prototypes. It was just too difficult to do in 2D given the complexity of the project, the unique design considerations, and the aggressive time frame."

# Balzer Pacific offers new services and sets itself apart from the competition with help from Autodesk

## The solution

While other companies bidding on the Knife River project relied on 2D software to develop their proposals, Balzer Pacific created a 3D conceptual model and compelling renderings—and backed its ideas with Autodesk Simulation results. “The amount of detail we presented set us apart from the competition which impressed Knife River,” says Sears. “It won the project for us.”

## Creating a detailed design

As part of the project, Balzer Pacific had to design, manufacture, and install everything above the barge deck. Creating a digital prototype of the 40 x 200 x 20-foot hopper system for a 282 x 78 x 18-foot barge in Autodesk Inventor Professional, Balzer Pacific engineers worked with the original naval architect to make sure what they designed on top of the deck wouldn't compromise the barge.

As Balzer Pacific optimized its design, it relied on Autodesk Inventor Professional to find and address issues as early as possible. For example, engineers relied on Inventor's mass property calculations to confirm the barge wouldn't list too far during loading and unloading. “Inventor made it easy to keep an eye on the weight and center of gravity of the deck equipment as we modified our design,” notes Sears. “If we had to perform these calculations by hand during the design phase, it would have slowed us down drastically.”

Knowing that the installation had to be seamless, engineers used Autodesk Inventor Professional software to compute dynamic behavior of components and to look for interferences between fixed and moving components. “Inventor gave us confidence that everything would fit together in the field,” says Sears.

## Simulating for success

To study reaction forces on the barge and ensure the barge deck could support the massive weight of equipment and aggregate, Balzer Pacific relied on Autodesk Simulation software. “The results of our simulations made it easier to work with the naval architect,” explains Sears. “With the simulation data we provided, he was able to design under-deck supports to handle all the forces and make sure the deck skin wouldn't fracture. We saved a significant amount of time and money and avoided fieldwork by ensuring we maintained an appropriate safety factor.”

When it was time to validate the rotating conveyor used during unloading, Autodesk Simulation software proved exceptionally valuable. “We needed to determine how to support the conveyor and ensure the strength of the conveyor frame and conveyor support tower while safely distributing reaction forces into the barge deck,” explains Sears. “We expanded our simulation capabilities by using a trial version of Autodesk® Simulation Mechanical, which showed us we'd overdesigned the structure.” Sears says that by setting an upper limit on stress and minimizing volume, his team was able to simplify the design and cut around US\$20,000 worth of steel from the tower.

Balzer Pacific immediately applied the savings to upgrade to Autodesk Simulation Mechanical. “When we simulated the motion of the 108-foot rigid metal conveyor, we could see the front end of the conveyor whipping back and forth,” says Sears. “When we built the conveyor, it whipped in exactly the same manner. The fact that Autodesk Simulation Mechanical predicted this behavior so accurately really impressed us.”

## Results

On August 4, 2008, the Knife River barge went into operation. Balzer Pacific credits Autodesk software and Digital Prototyping with helping it deliver the innovative barge on such a tight timeline. The experience also gave Balzer Pacific confidence to move in new directions. For example, Balzer Pacific is taking on more projects for other industries—including gold mining, coal mining, and even macadamia nut processing. Sears says, “Using Autodesk Inventor Professional and Autodesk Simulation Mechanical extends our engineering capabilities and gives us more confidence to look for new design opportunities.”

The results of our simulations made it easier to work with the naval architect. We saved a significant amount of time and money and avoided fieldwork by ensuring we maintained an appropriate safety factor.

—Andrew Sears  
Mechanical Engineer  
Balzer Pacific

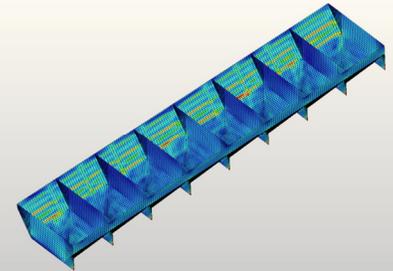


Image courtesy of Balzer Pacific.

Autodesk technology is also helping Balzer Pacific grow the business further by offering additional services. Michael Allen Jr., president of Balzer Pacific, says, “We need to be ahead of the competition and provide value-added design, simulation, and visualization services to our customers. These expanded design and engineering services help us win both new and repeat business because many companies require these types of services—and we can now provide them both internally and externally.”

## For more information

To find out how Autodesk software and Digital Prototyping can help you explore your designs before they're built, visit [www.autodesk.com/digitalprototyping](http://www.autodesk.com/digitalprototyping).



Image courtesy of Balzer Pacific.