

BERG PROPULSION AB

Berg transports design process to new horizons with SolidWorks software and TactonWorks



The propeller accounts for a relatively miniscule cost of a vessel, but it can deliver surprisingly big benefits.

That's why Berg Propulsion AB, a \$200 million, century-old propeller manufacturer in Öckerö, Sweden, has transformed the time-honored icon of the industrial age into a highly sophisticated mechanism brimming with 21st-century engineering. Berg's controllable pitch propeller (CPP) has earned the company a reputation for superior reliability. With the CPP, ship captains can adjust the blade angles while the vessel is under way, providing the highest propulsive efficiency.

A ship's propulsion requirements differ tremendously depending on whether it is fully loaded or empty. By controlling the pitch of the blades, a Berg-equipped ship obtains optimum efficiency under either condition, conserving engine life and ever-more-costly fuel. A CPP is also safer and more reliable than a standard fixed-pitch propeller, and is especially suitable for harbor or ocean-going tugs, dredgers, cruise ships, ferries, and cargo vessels that sail to ports with limited or no tug assistance.

CPPs enhance safety by virtue of their superior maneuverability. Ships can reverse thrust direction without waiting for the propeller to slow down. They no longer need a costly reverse gear or reversible engine. In many cases, improved maneuverability also means the vessel doesn't need a tugboat's help to dock at her berth. CPPs also minimize wear and tear on the engine and propeller shaft. Since the pitch of the propeller blades changes the speed of the vessel, the engine itself remains at a steady rate.

Perhaps most importantly, CPPs quickly pay for themselves: even a single percentage point of cargo capacity or fuel efficiency owing to propeller flexibility translates into substantial revenue and cost savings for a shipping company.

Challenge:

- Hundreds of propeller system parts need to be sized for every vessel, starting with the shaft length and diameter.
- No one person, whether salesperson or engineer, can simultaneously grasp all product elements, constraints, and part possibilities for a specific customer's propeller assembly from top to bottom.

Solution:

Berg Propulsion uses an advanced automated configuration system—TactonWorks configuration software combined with SolidWorks—to streamline the design process.

Results:

TactonWorks automatically customizes the entire propeller shaft assembly, along with new parts and drawings, improving design speed and quality and eliminating human errors.

Standard design yields thousands of configurations

Conceptually, a Berg CPP system is standard from ship to ship. Nonetheless, hundreds of parts—starting with the length and diameter of the shaft—need to be sized for every vessel.

For years, this posed a complex and time-consuming design challenge that was vulnerable to errors. Prior to 2001, Berg had designed propeller systems in AutoCAD® 2D design software, later coupled with Berg's rudimentary configurator to automate some design calculations. In 2001, however, Berg started designing in 3D using SolidWorks® 3D CAD software, enabling the company to quickly design more advanced systems with increased accuracy.

The increasing number of product elements and engineering constraints prompted the company to search for ways to streamline the design phase. Berg's library of parts that can make up a propeller assembly had grown to more than 500. No one person, whether salesperson or engineer, could grasp an entire arrangement from top to bottom. This need to streamline the design process was particularly pressing as the company started to tackle the growing Southeast Asian shipping market.

Automated configuration generates final designs on the fly

Berg found a solution in an advanced automated configuration system that lets sales engineers plug a few parameters into an on-screen form and automatically design the entire assembly, encompassing hundreds of parts in the propeller, hydraulic control, and transmission systems.

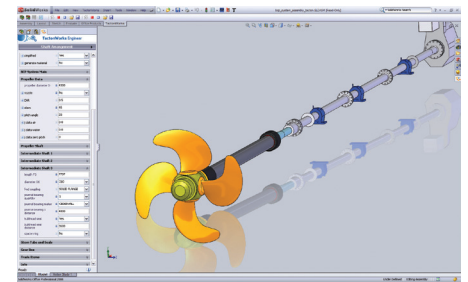
Sales engineers now discuss the ship design with the customer to determine the required shaft length and diameter. Those measurements and a handful of others are plugged into configuration software from Tacton Systems AB of Stockholm, which engages a 3D digital model created in SolidWorks software. "The combined solution pumps out a complete design on the fly configured precisely to the customer's needs," says Jonas Nyberg, applications manager at Berg Propulsion. "We can review the design in real time with the customer and demonstrate the design changes for each selection, making it easier to optimize costs of assemblies. It used to take a few weeks to develop the initial design and present it to the customer for approval."

At the heart of the solution is Tacton Systems' TactonWorks software, a full-featured product configurator integrated completely within the SolidWorks software single window. TactonWorks automatically customizes the entire propeller shaft arrangement assembly, along with new parts and drawings. In addition to design speed, the system has improved quality, eliminating the human errors that naturally arise in a manual design system.

"We now worry about 25 parameters, such as shaft length, diameter, and flange size instead of 250, and the constraints in TactonWorks and SolidWorks software take care of the rest," says Nyberg. "We can be confident of the integrity of the drawings as they are created automatically for suppliers as well as internal production and assembly. Fewer errors mean we never have to halt our design process and redesign parts, which can be very expensive and frustrating when everyone's moving on strict timetables. Fast, error-free configuration also makes it easy to bring new sales engineers into our fast-growing global company without extensive training."

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Applications Manager
Berg Propulsion



TactonWorks is a Certified Gold Products, fully integrated within the SolidWorks software single window.

Structured data opens 'amazing possibilities' for working smarter

The Tacton/SolidWorks software solution systematically saves new designs in the SolidWorks Enterprise PDM system. All dimensions, models, and drawings are stored in a standard format.

"In the past when we opened files randomly, each looked different from all the others," says Nyberg. "We spent a lot of time trying to figure out what we were looking at. Now every model and drawing is structured the same way. You immediately understand what you are looking at."

Berg engineers can now query the SolidWorks Enterprise PDM database and, for example, retrieve all designs with shafts longer than 10 meters. Before, they had to open every file in the database and look for the dimension. That's a significant burden given that more than 5,000 Berg controllable pitch propellers are in service today.

Berg has also used the combined system to automate difficult engineering analysis. "We can write small programs that automate calculations by opening models, pulling parameters, and crunching the numbers," says Nyberg. "By automating the calculations, Berg is making its customers happier and delivering critical calculations earlier."

With all this engineering prowess, one might imagine it's easy to develop hard return-on-investment figures for a design and configuration system. "It's not easy to put dollars and cents to it only because the system has completely changed the way we work," Nyberg explains. "I could calculate a number if we were just doing the same things faster or cheaper, but we're working smarter."

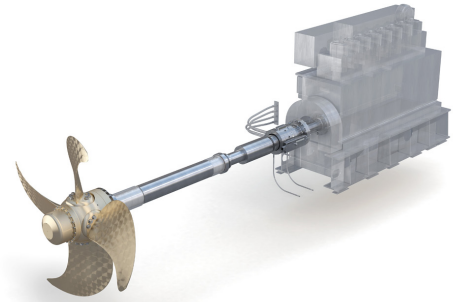
The company plans to integrate the configurator into the very front end of the sales process, tightly integrating every step of configuration, data management, and manufacturing. Nyberg says the new configuration system opens other, "amazing possibilities" for future operations. "We are continuing to harness our engineering expertise and technology to work smarter, develop even more reliable products, and deliver them sooner," says Nyberg. "Every day we hit upon a new idea for transforming our organization, and our customers are benefitting."

For more information, visit:

www.bergpropulsion.com

www.solidworks.com

www.tacton.com/tactonworks



Berg Propulsion's controllable pitch propeller has earned the company a reputation for superior reliability.



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