

# Johnson Corporation

## COSMOS HELPS JOHNSON OPTIMIZE DESIGN OF ROTARY JOINT AND SYPHON ASSEMBLY



The dryer section of a high-speed papermaking machine.

Rotary steam joints and syphon assemblies are used in the dryer section of papermaking machines. A continuous sheet of wet paper, which is commonly called a web, is dried by passing it over a series of large diameter, hollow, cast iron, rotating, steam-heated drying cylinders

Pressurized steam enters these drying cylinders through rotary joints. The rotary joints provide the seal between the process piping and the rotating cylinders. The steam heats the surface of the dryer, which, in turn, heats and dries the paper web. The condensed steam is then removed from the dryer cylinders by special syphon assemblies.

"We are often called upon by our customers to adapt one of our products to their special needs," says Alan Ives, Director of Product Development at The Johnson Corporation. "We must have the ability to do this quickly, with excellent and predictable results."

Recently, Ives and his team were challenged to optimize the design of a rotary joint and syphon assembly that is used in the dryer section of high-speed papermaking machines. Refining an already solid design using hand calculations and existing FEA software, however, would have been too time consuming. Without a new engineering solution, the project would have taken substantially more time, with less return on the design investment.

Ives and his team determined that the component parts in the previous rotary joint and syphon assembly could be optimized to reduce weight, increase stiffness, maximize flow capacity, and decrease the envelope size. This had to be done without increasing the stress level beyond the code and design requirements.

To achieve these goals, Ives and his team developed new concepts and analyzed them using COSMOSWorks. The engineers used modal analysis within COSMOSWorks to determine the optimum shape and thickness of the support tube. They then calculated the stress on the related components and determined where the weight could be reduced.

Ives recalls, "We selected several different shapes, put them into COSMOSWorks and let COSMOS decide which ones were stiffer. We then selected the stiffest shapes and used COSMOS to help us determine how to achieve the lowest weight for each component part. We were able to increase the flow capacity of the rotary joint because the size and shape of the components could be designed to provide smooth contours that reduce flow resistance. COSMOS worked very well at every step of the process."

Another important part of the assembly—a ring bracket that holds the entire rotary joint and syphon in place—was redesigned using COSMOSWorks. "With COSMOS, we were able to quickly reduce the size and weight and increase the stiffness of this part as well."

The improvements to the steam joint assembly were significant: A 100 mm size body was reduced in weight from 55 kg to 34 kg. The 89 mm syphon support tube decreased in weight from 48 kg to 27 kg. The ring bracket weight was reduced by one-half. "There was a substantial reduction in weight between the previous design and the new design. That reduction is a direct result of using COSMOSWorks to optimize the design. We would not have been able to achieve as much of a reduction using hand calculations."

→ The Johnson Corporation provides advanced process control systems, rotary joints, syphon and heating systems, and related components for fluid and heat transfer equipment that is used in process industries. Diverse industries such as pulp & paper, steel, plastics, textiles and rock quarries—companies requiring a rotating cylinder or drum that must be heated or cooled—rely on Johnson.

- A 100 mm size body was reduced in weight from 55 kg to 34 kg.
- The 89 mm syphon support tube decreased in weight from 48 kg to 27 kg.
- The ring bracket weight was reduced by one-half.
- Accurately predicted real world behavior of the model.

→ Johnson used COSMOSWorks to analyze the stresses in each of the component parts. COSMOSWorks allowed the Johnson engineers to analyze these parts and track more concepts in a shorter period of time with fewer design iterations. The result was an assembly that was stronger, lighter, and more durable, and it was developed in a fraction of the normal development time. "We found COSMOSWorks to be a very robust package. It helped us achieve all of our design objectives, on schedule," Ives relates. "Without COSMOSWorks, we would have used an older FEA package, one that was much slower and, by comparison, more cumbersome to use." After using COSMOSWorks on this project, engineers at Johnson now use COSMOS software on the design of new products as well as on the enhancement of existing Johnson products.

Ives and his team were also impressed with how COSMOSWorks integrates with their CAD package, SolidWorks. "The integration is absolutely seamless. We can click a menu for COSMOS, while still in SolidWorks, and analyze the stress that a part will experience when it is filled with a liquid and subjected to pressure loading."

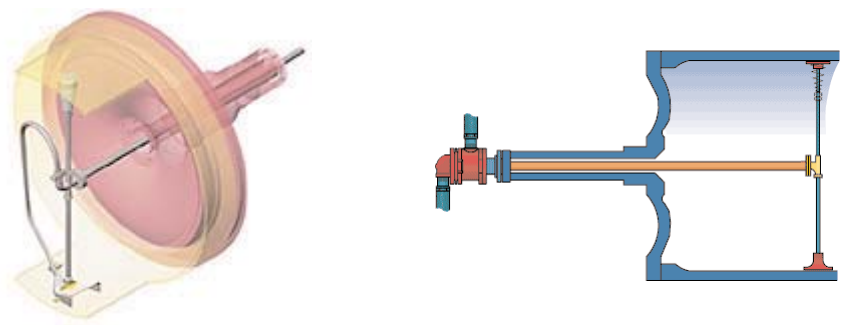
Ives also credits COSMOSWorks for improving communication between the managers and engineers who use it. "The software is very easy to understand. With COSMOS, we can easily see how the model was built. Anyone on our team can pick up where someone else left off and add new calculations."

Most importantly, Ives and his team were able to reduce development time. "COSMOSWorks reduced our analysis time to one-tenth of the old FEA package. Without COSMOS software, it would have been a much smaller project with a more limited approach. I wouldn't have been able to explore as many options and the results would have been much less dramatic."



The Johnson Corporation  
805 Wood Street  
Three Rivers, Michigan 49093 USA  
tel: +1 269 278 1715  
fax: +1 269 279 5980  
email: sales@joco.com

[www.joco.com](http://www.joco.com)



Rotary steam joints and syphon assemblies are used in the dryer section of papermaking machines.

SolidWorks Corporation  
300 Baker Avenue, Concord, MA 01742  
Phone: +1-800-693-9000  
Outside the U.S.: +1-978-371-5011  
Fax: +1-978-371-7303  
Email: [info@solidworks.com](mailto:info@solidworks.com)

SolidWorks Europe  
Phone: +33 (0)4 42 15 03 85  
Fax: +33 (0)4 42 75 31 94  
Email: [infoeurope@solidworks.com](mailto:infoeurope@solidworks.com)

SolidWorks Asia/Pacific  
Phone: +65 6866 3885  
Fax: +65 6866 3838  
Email: [infoap@solidworks.com](mailto:infoap@solidworks.com)

