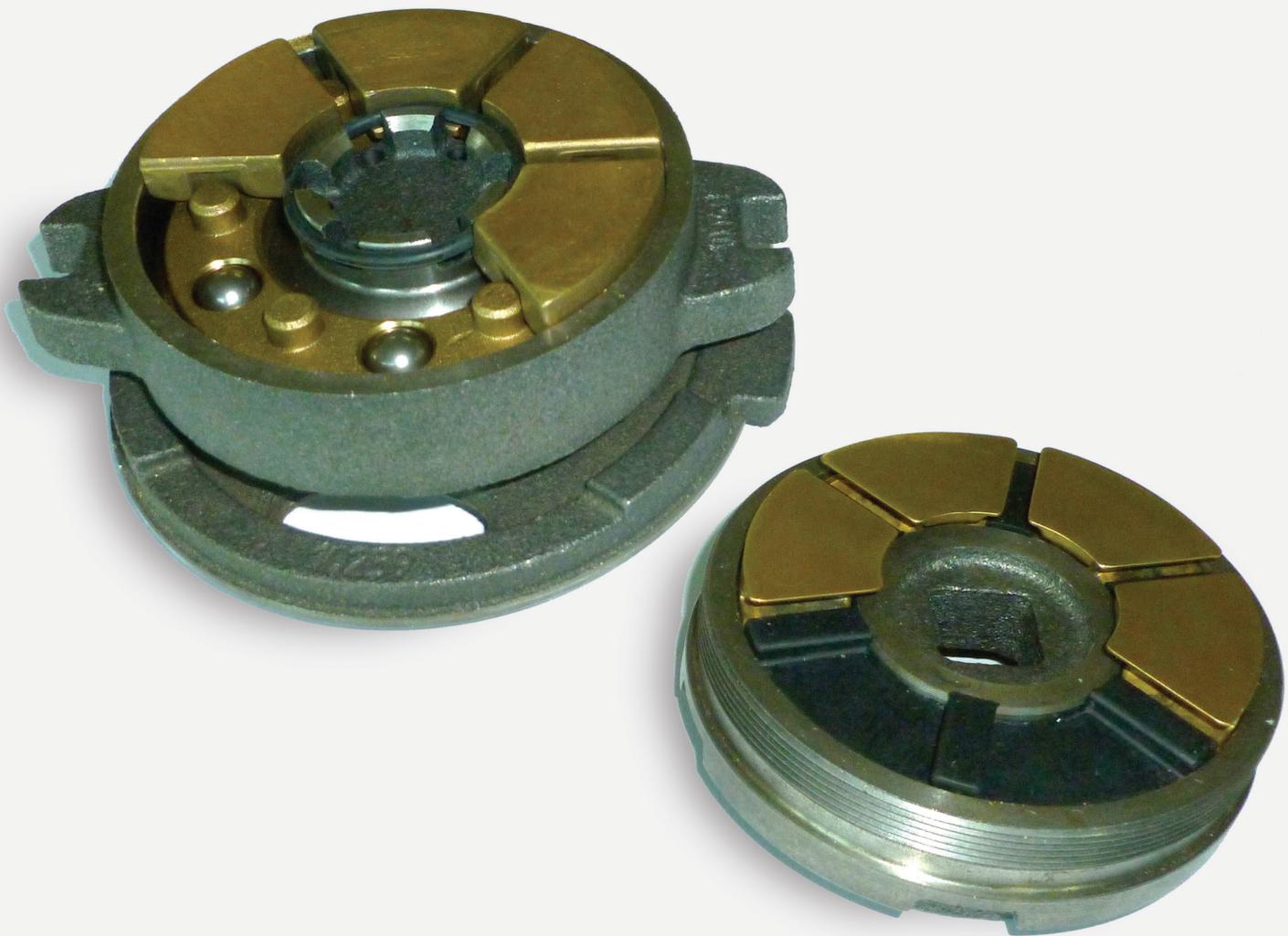


CAPRARI S.P.A.

ACHIEVING INNOVATION IN INDUSTRIAL PUMP
DESIGN WITH SOLIDWORKS SOLUTIONS



With SOLIDWORKS design, analysis, flow simulation, and inspection solutions, Caprari is driving innovation in industrial pump design while simultaneously reducing prototyping and testing time and costs.

caprari
pumping power

Challenge:

Improve the competitiveness of the company's measuring and dispensing industrial pump products by boosting innovation to improve pump performance.

Solution:

Implement SOLIDWORKS Standard design, SOLIDWORKS Professional design, SOLIDWORKS Premium design and analysis, SOLIDWORKS Simulation Premium analysis, SOLIDWORKS Flow Simulation computational fluid dynamics (CFD) analysis, and SOLIDWORKS Inspection Professional software solutions.

Benefits:

- Increased fluid-film thrust-bearing performance in submersible pumps by 300 percent
- Cut prototyping and testing time by 66 percent
- Reduced prototyping and testing costs by 99 percent
- Decreased scrap and rework by 15 to 25 percent

The Caprari Group is a leading international manufacturer of centrifugal pumps, electric pumps, and submersible motors for civil and industrial water and wastewater pumping applications. Founded in 1945 by Amadio Caprari, the company has continually expanded and diversified its business, responding to the world's changing water-pumping needs through the development of innovative products and services. Caprari provides efficient solutions for supporting deep-well pumping; waste and drainage water lifting; residential, industrial, and agricultural water supply and distribution; and wastewater treatment.

Until 1998, Caprari utilized 2D design tools. However, increasing competition and growing market demand for better measuring and dispensing pump performance prompted the company to evaluate 3D design as a means for streamlining its processes, improving pump performance, and boosting innovation, according to Research & Design Manager Antonio Gambigliani.

"We needed a better way to advance the science of pump design," Gambigliani explains. "Working in 2D, it was difficult to accurately produce parts from 2D designs, and then prototype and test them efficiently and cost-effectively. For example, the impeller blades on our pumps are complex surfaces, and we need to be able to design and manufacture them with a high degree of precision. We also believed that 3D design would provide opportunities for using finite element analysis [FEA] and computational fluid dynamics [CFD] simulation technologies to save time and money during prototyping and testing."

After evaluating leading 3D CAD systems, including Solid Edge®, Pro/ENGINEER®, think3®, and SOLIDWORKS®, Caprari decided to standardize on SOLIDWORKS, implementing SOLIDWORKS Standard design, SOLIDWORKS Professional design, SOLIDWORKS Premium design and analysis, SOLIDWORKS Simulation Premium analysis, SOLIDWORKS Flow Simulation (CFD) analysis, and SOLIDWORKS Inspection Professional software solutions. The company chose the SOLIDWORKS design and simulation platform because it is easy to use;

includes robust, integrated FEA and CFD tools; and provides access to a range of third-party partner applications.

"We liked SOLIDWORKS because we found the Feature Manager to be very intuitive," Gambigliani recalls. "The software is affordable, requires less training, and fully integrates CFD and FEA tools inside the 3D CAD environment."

DEVELOPING BETTER WAY

With SOLIDWORKS solutions, Caprari has achieved its goals of improving product performance and introducing industry innovations. For example, the company introduced a re-engineered version of the fluid-film thrust bearing for submersible motors, securing a new patent by advancing technology first developed more than a century ago. Specifically, Caprari used SOLIDWORKS design and analysis tools to simplify and enhance the kinematics of fluid-film thrust bearings first developed by George Michell and Albert Kingsbury, resulting in a performance boost of 300 percent.

"We used SOLIDWORKS Simulation Premium tools to analyze and optimize our updated design," Gambigliani says. "By using different materials—rubber, brass, graphite, and steel—and investigating deformation under stress, we were able to optimize the design to use a fixed box and shoes mounted on rubber. This simplification improved performance because it reverses the deformation elasticity skid to increase and retain the interposed lubricant film and permits the rubber of the shoe to oscillate in all directions."



"Using SOLIDWORKS FEA and CFD analysis capabilities, we can conduct 10 virtual tests on 10 different design options in one month. Doing the same thing with actual tests—the way we used to do it—would take at least three months and tens of thousands of euros. We have shortened our prototyping/testing cycles and cut their costs by 99 percent through the use of SOLIDWORKS structural and CFD simulations."

—Antonio Gambigliani, Research & Design Manager

VIRTUAL PROTOTYPING SAVES TIME AND MONEY

Caprari leverages SOLIDWORKS FEA and CFD tools to thoroughly study, validate, and optimize designs in a virtual simulation environment, reducing multiple physical prototyping cycles and the attendant time and cost, as well as reducing scrap and rework on the shop floor by 15 to 25 percent. "Using SOLIDWORKS FEA and CFD analysis capabilities, we can conduct 10 virtual tests on 10 different design options in one month," Gambigliani notes.

"Doing the same thing with actual tests—the way we used to do it—would take at least three months and tens of thousands of euros," Gambigliani continues. "We have shortened our prototyping/testing cycles and cut their costs by 99 percent through the use of SOLIDWORKS structural and CFD simulations."

DRIVING FUTURE OF INDUSTRIAL PUMP DESIGN

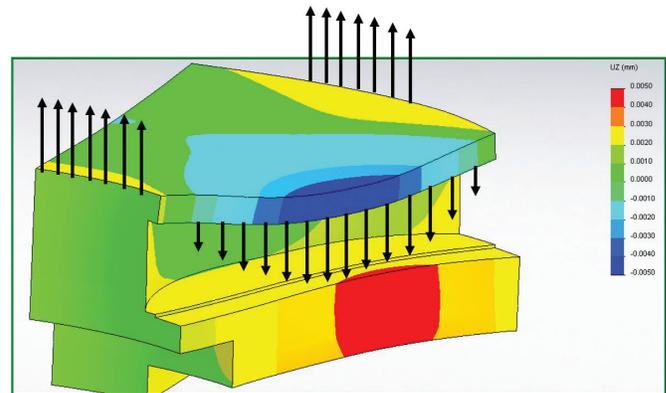
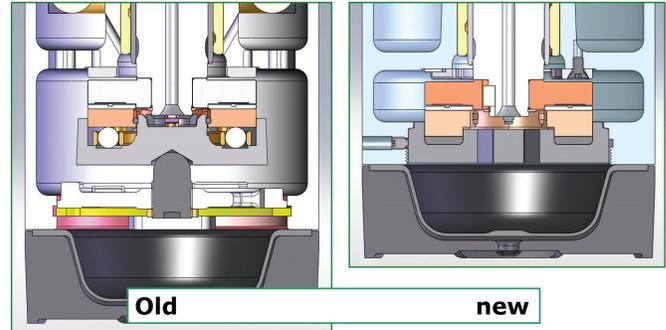
Because the SOLIDWORKS 3D design and analysis platform provides Caprari with advanced simulation, design optimization, and virtual prototyping tools, the company can continue its successful optimization of established technologies to produce the innovations that are driving the future of industrial pump design. "Many pump designs were first developed more than a century ago, and then refined and improved since then," Gambigliani stresses.

"Only with the power of SOLIDWORKS 3D design and simulation tools—through which new ideas can be developed and investigated—can we give new impetus to the optimization and innovation of pump technology," Gambigliani adds. "By leveraging 'virtual testing,' we can efficiently and affordably study the flow rate, manometric pressure, power, and efficiency of different design concepts, leading to the innovations that will make our products competitive for years to come."

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Tapping the capabilities of SOLIDWORKS Simulation Premium FEA and SOLIDWORKS Flow Simulation CFD analysis software, Caprari simplified and enhanced the kinematics of fluid-film thrust bearings first developed by George Michell and Albert Kingsbury, resulting in a performance boost of 300 percent.

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