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COVER STORY:

CFturbo

Envisioning the Future
of Hydraulic Design

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Special Topic: Pump Optimization Systems

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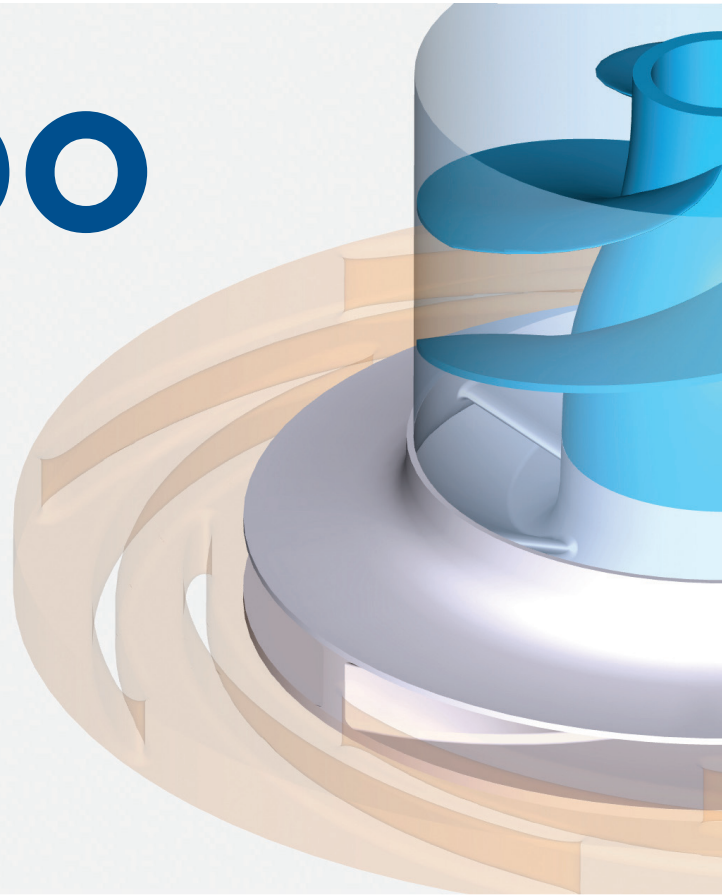
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CFturbo

Envisioning the Future of Hydraulic Design



CFturbo's innovative, reliable, and high-quality software has earned it the reputation as a leading design-orientated engineering company with cutting edge technology. Following the path of legendary German engineering, the company's outstanding user-friendly software makes CFturbo continually sought after in the industrial industry.

By Chelsea Hall, Digital Strategist, CFturbo

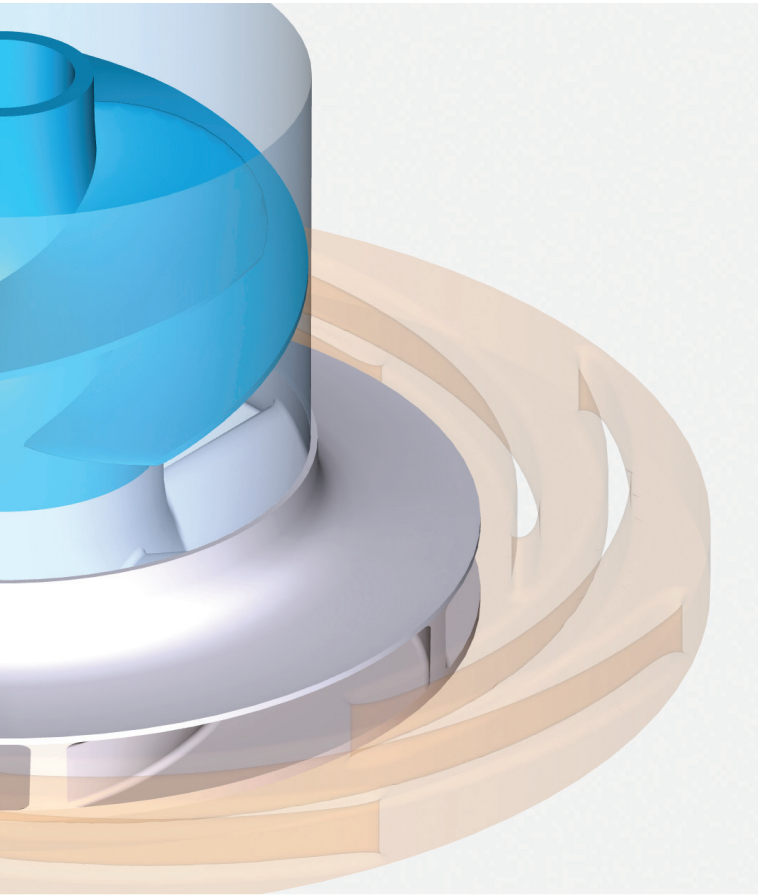
Historical Overview

CFturbo was established as a spin-off from CFDnetwork GmbH, a successful engineering service consultancy for Computational Fluid Dynamics, in 2008. Together, Mr. Ralph-Peter Mueller, founder of CFDnetwork, and Dr. Gero Kreuzfeld, co-founded CFturbo with a singular vision in mind; to make the turbomachinery design process fast, easy, and affordable.

Headquartered in Dresden, Germany, with another office in Brooklyn, New York, the company has 20 full-time employees that operate out of the two locations. In addition to its core staff, CFturbo also works with a global network of independent distributors in order to ensure that the needs of all its costumers are met. The company's commitment to maintaining an international presence in a number of countries, including: China, India, Japan, and South Korea, France, Italy, Spain, Russia, Turkey, and the UK, is essential to ensuring its global success.



CFturbo founders: Ralph-Peter Mueller (left) and Gero Kreuzfeld (right).



Diverse Range

To satisfy the ever-changing needs of its clients, CFTurbo offers its proprietary turbomachinery design software, CFTurbo. Equipped with a new kind of interoperability to build automated CAE-workflows, CFTurbo services a range of customers spanning a wide variety of industries, including aerospace & defense, automotive, energy, oil & gas, HVAC, marine, process industry, appliances, and medtech. This software guides the user, step-by-step, through the complete design process of a turbomachine. A first draft can be generated automatically, with design details controlled entirely by the user.

Due to the progressive nature of market requirements, and a desire to fulfill all of its customers' specific requests, the CFTurbo code is under continuous development. With two major software releases each year, CFTurbo is continually implementing new features and improvements. Customers can expect an affordable, accurate, reliable, robust, and user-friendly solution for conceptual turbomachinery design, simulation, design exploration, and optimization. Unlike any other code, CFTurbo can also be uniquely combined with different CAE-codes of other vendors.

The advanced technology used to create the software allows CFTurbo users to create axial, mixed-flow, and radial pumps, blowers, fans, compressors, and turbines. While each module offers quality simulations,

the CFTurbo pump design module is by far the most popular module from the product family. The pump module is made for the design and optimization of all types of rotodynamic pumps and supports the design of axial, mixed-flow, and centrifugal pumps. Special pump components like inducers or sewage water impellers can be created as well.

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Product Applications

There is an ongoing global trend towards highly efficient turbomachinery and systems, as they consume less energy and cut costs for businesses. This trend gained traction in recent years due to strengthening regulations, which require companies to reduce CO₂ emissions.

In the water and wastewater industry, there is vast potential for improvement when it comes to making pumps more efficient. According to the GRUNDFOS website:

"...Pumps account for about 10% of the world's total electrical energy consumption, and up to 90% of them are inefficient. If we switched them to energy-efficient pumps, we would save the equivalent of the residential energy consumption of one billion people. Less than 1% of the world's freshwater is available to us. 90% of the world's freshwater is used for agriculture and industry. Up to 70% of the water pumped in some cities is lost."

CFTurbo is the preferred and the most widely used design tool in the world for the water and wastewater industry.

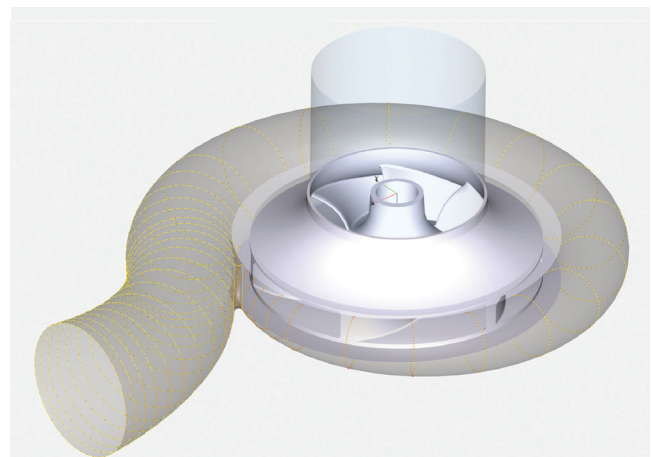


Figure 2: Centrifugal end-suction pump.



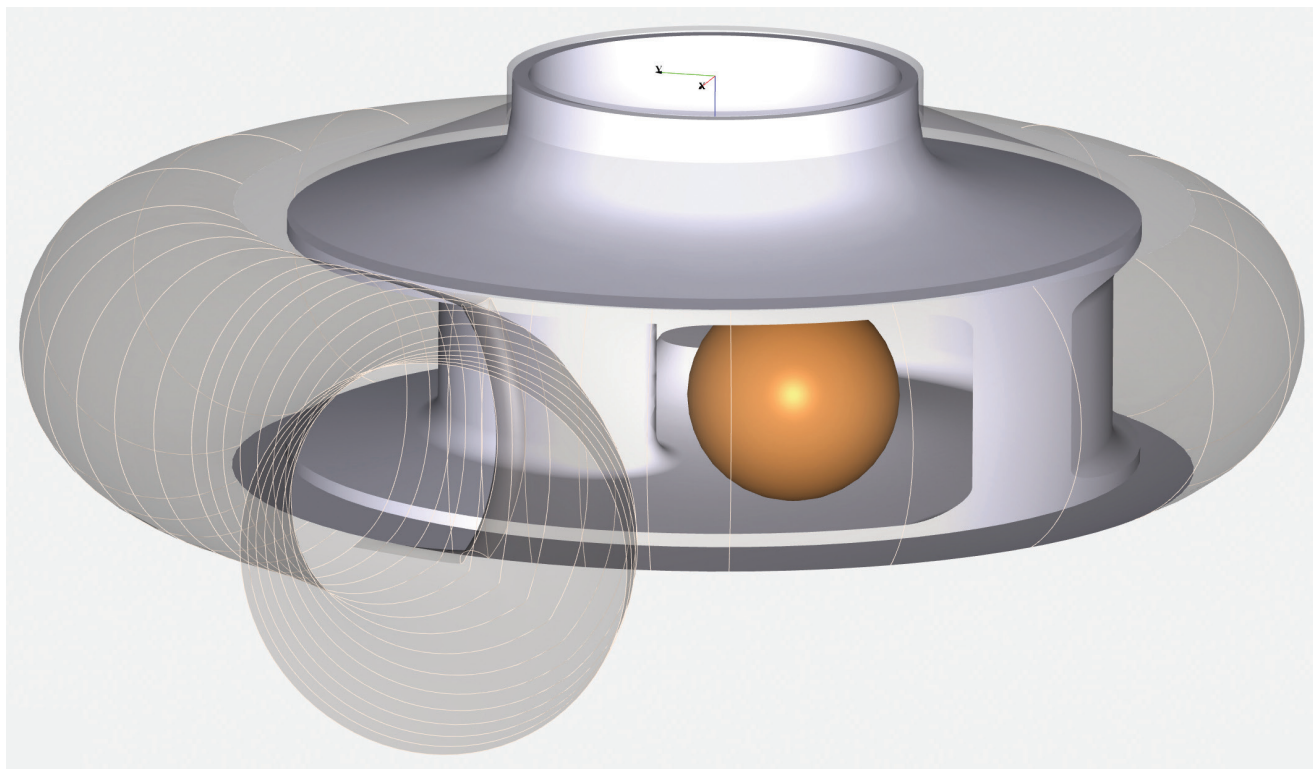


Figure 3: Radial waste water pump.

Combined with state-of-the-art CFD-codes like ANSYS-CFX, FINE/Turbo, Simetrics MP, STAR CCM+, or TCFD, and with optimizers like DAKOTA, HEEDS and ANSYS-optiSlang, it leads to unrivaled productivity in the development process of efficient pumps. Figures 1 – 5 show the various types of pumps designed with CFturbo.

Innovative Engineers

CFturbo's engineers come from a number of academic departments and industries such as: aerospace, automotive, mechanical engineering, chemical and process industries, as well as from IT and software companies. With over 200 years of combined experience in engineering, the individuals at CFturbo are able to not only create long-term development plans but also anticipate industry trends, giving them a strategic advantage in the market. The combined expertise and know-how helps the company to achieve its dominant underlying philosophy:

“Smart software solutions enable the fast and accurate design of efficient pumps, blowers, fans, compressors, and turbines with, or without, in-depth specialized turbomachinery knowledge.”

To realize the potential of this philosophy, CFturbo has established three departments within the company.

The software team is responsible for the core development of the CFturbo code. Based on market requirements, the team has developed numerous new

“Smart software solutions enable the fast and accurate design of efficient pumps, blowers, fans, compressors, and turbines, with, or without in-depth turbomachinery specialist knowledge.”

features, which are scheduled to be presented at the upcoming software releases.

The engineering services team provides conceptual design, simulation, design exploration, and optimization for any kind of turbomachinery, including physical prototyping. The work is not limited to rotating equipment. General CFD, FEA, and thermal simulations are offered, as well as consulting services to start-ups and investors.

The CAE-workflows team focuses on the automation of CAE-workflows for turbomachinery. As the software efficiency is based on increasing computational power, design exploration and optimization processes must be automated to make it efficient. Here the challenge is to combine various codes from different vendors into a robust, user-friendly solution.

CFturbo Advantages

CFturbo is the most user-friendly turbomachinery design software on the market. In particular, the 3D modeling capabilities are much more advanced than those of its direct competitors since it uses a 3D-CAD kernel in its system. CFturbo models contain all of the usual 3D-CAD components like points, curves, surfaces, and solids. There are export formats to all major CAD, CFD and FEA codes available, but unlike any other turbomachinery design software, the interoperability of its code allows straightforward automated workflows for simulation, design exploration and optimization.

The latest release, CFturbo 2020.R1, has numerous enhancements compared to the previous version. For example, the 2020.R1 version has Inverse Blade Design based on blade loading calculations, explicit Rake Angle definition on leading and on trailing edges, Flexible Stacking for blade angles in meanline design mode, a higher number of design parameters for Volute Optimization, the specification of Local Mesh Refinement areas for CFturbo SMP (SimericsMP), and a significantly streamlined process of CFturbo applications in ANSYS Workbench. With the new version of CFturbo, users have significantly higher design flexibility; they can explore and optimize more models much faster and with higher accuracy.

Looking Forward

Today, more than 200 companies around the world turn to CFturbo for their needs in Turbomachinery Design.

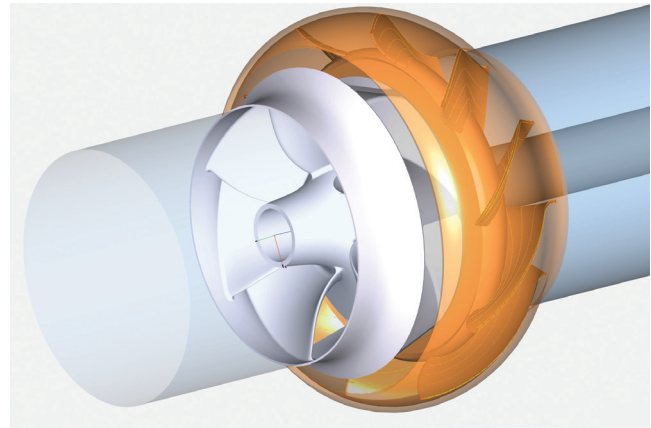


Figure 4: Mixed-flow bowl-diffuser pump.

With roughly 20 new customers each year, the company's global clientele is comprised of small, mid-size, and large corporations. Additionally, CFturbo has partnerships with numerous universities around the world to provide students with access to the latest solutions in turbomachinery design and simulation.

Looking to the future, CFturbo sees ample opportunity to streamline the turbomachinery design process further. It strives to continue making computational fluid dynamics accessible to engineers coming to the drafting board, with varying levels of expertise and offering unique user experiences. The company projects that the next business field areas in which it will experience future growth will be in the designs of hydro turbines and marine propellers, followed by wind turbines and aerial propellers.

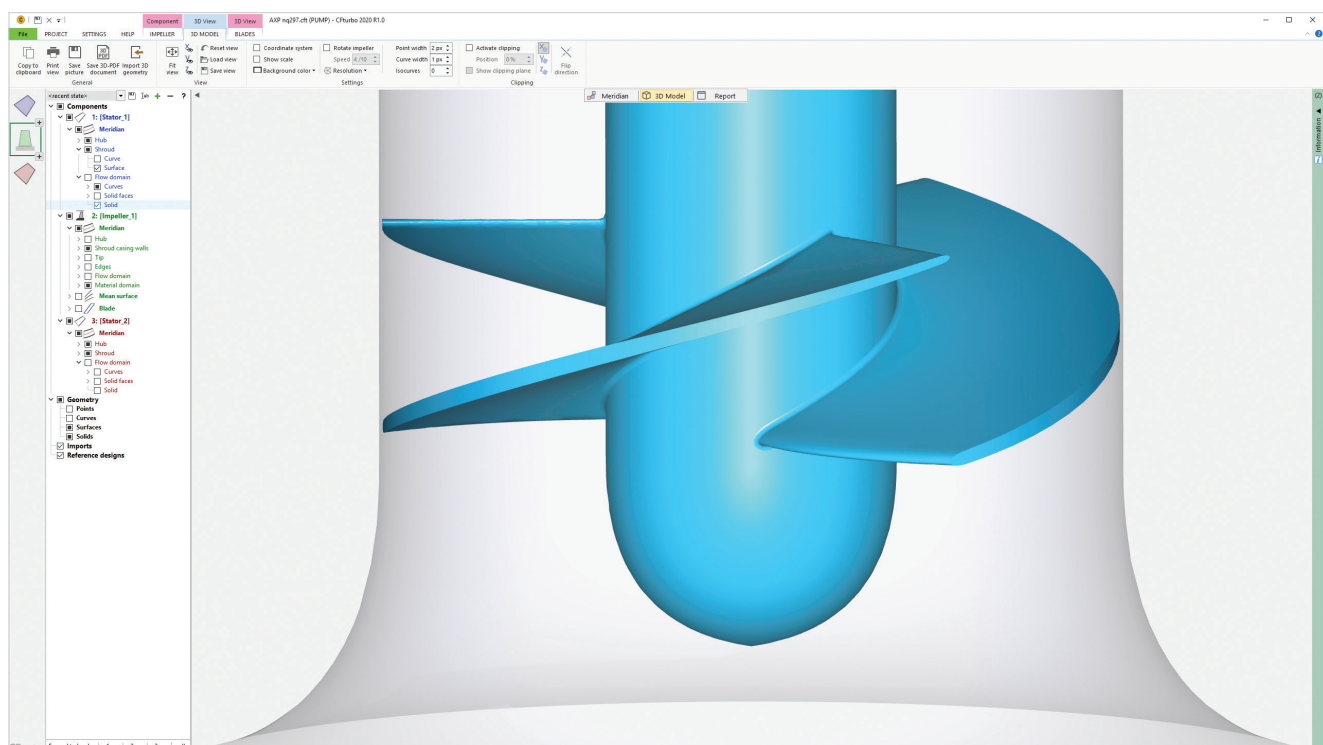


Figure 5: Axial, high flow-rate pump.

