

FULL STEAM AHEAD

STEAM TURBINES: THE SPEED OF DEVELOPMENT IS ACCELERATING

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A whole ecosystem is built around steam turbine technology, consisting of manufacturers, service providers and owner operators. The technology has grown from simple marine applications to many different types of power generation, processing and other applications.

Major players have pursued several approaches to growth and new product development: mergers & acquisitions; licensing and core technology development; and in-house R&D.

Recent M&A's include: Siemens AG acquiring Dresser-Rand; GE's buyout of Alstom Power, and consequent selling of the Alstom gas turbine business to Ansaldo Energia; Mitsubishi & Hitachi coming together as Mitsubishi Hitachi Power Systems; Doosan Heavy Industries & Construction acquiring Skoda Power; and MAN Diesel & Turbo acquiring MaxWatt Turbines.

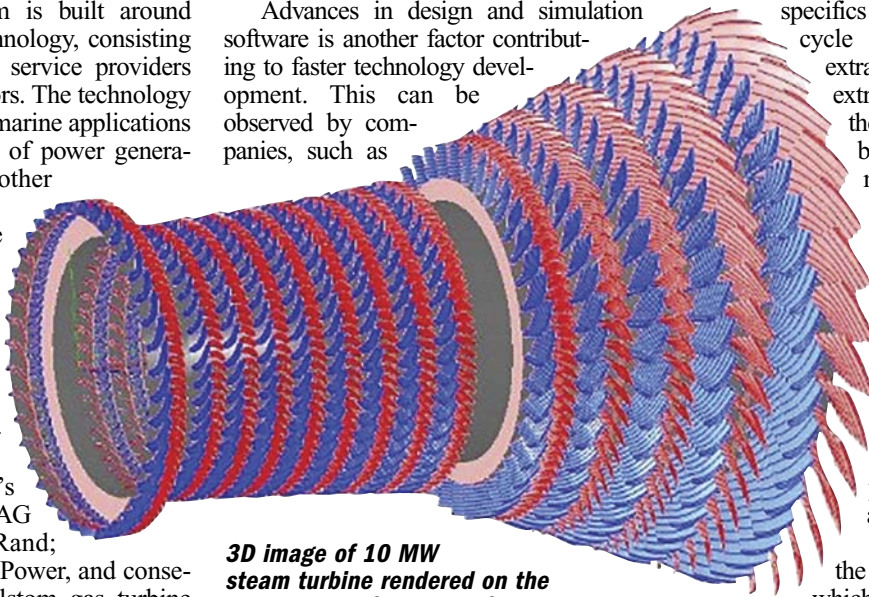
Players, such as MAN Diesel & Turbo, Elliott Group and Leningradsky Metallichesky Zavod (LMZ), are growing through in-house R&D. Others, such as Kirloskar Ebara Pumps Ltd., Triveni Turbines, Bharat Heavy Electricals Limited (BHEL), Hangzhou Steam Turbine Co. Ltd, Dongfang Electric Corporation and Harbin Electric Company Limited, have followed the licensing model by partnering with large companies, such as Siemens, Alstom Power and GE. They also have learned to develop their own technology and are aggressively moving forward at competitive prices.

Many companies acquire technology through partnering and then learn to operate, service, manufacture and eventually design their own technology. This route is supported by advances in software simulation and prototyping as well as market globalization and accessibility to data.

In the past, such leaps in core technology could have taken twenty or thirty years. But today it can be done in less than five years. Additionally, there are ambitious programs in emerging nations, such as "Made in

India", "Made in China", and "Wake up Africa", with local companies fighting hard for their own spot in the global landscape.

Advances in design and simulation software is another factor contributing to faster technology development. This can be observed by companies, such as



3D image of 10 MW steam turbine rendered on the AxSTREAM software platform

Siemens, acquiring product life cycle management company Unigraphics, as well as analytics simulation company CD-Adapco. Others are leveraging their own codes, as well as purchasing commercial codes for the design and analysis of turbomachinery, such as AxSTREAM, and GE's Predix system, which can analyze machine operation.

At power ranges approaching 2,000 MW, however, it is still a challenge to create a technologically advanced, efficient, and price-competitive steam turbine. With this in mind, opportunities may exist at a lower MW range. This does not always mean the lower the better in terms of time and dollar investment. The 1 MW range illustrates this sentiment.

At the 1 MW range, there is little incentive to invest because of the technology's limited efficiency and low price point. U.S., German and Japanese manufacturers are suffering due to pricing pressures from Indian and Chinese competitors, who have comparable technology, at least from the perspective of marketed efficiency and marketed reliability.

Moving up into the 3 MW to 10 MW range, however, the configuration changes from single-stage to multi-stage, and blade geometry and profiles become more state of the art. Here is an opportunity to innovate and compete. At this MW range it will take longer for developing countries to produce

technically competitive turbomachinery.

Although more opportunity exists in this range, the challenge is to account for specifics of the turbine's operating cycle (extractions, pressures at extractions, mass flow rate at extractions, and so on). Unlike the single stage 1 MW turbine, which is a basic machine and operates on narrower operating ranges and conditions, the opportunity exists to design 3 MW to 10 MW range machines for a wider set of cycle and operation conditions.

Specifically, multi-stage turbines:

- Require more complex rotor dynamics analyses

- Have longer blades at the end of expansion process, which require complex 3D aerostuctural calculations

- Require a smooth flow path to avoid excessive opening angles and to organize efficient energy use after upstream stages.

Advances in steam turbine R&D tend to favor larger-scale machines. This means that on the lower end (3 MW to 10 MW), a lot of manufacturers are using old technology. Opportunities exist for OEMs to apply the latest technology, materials and design methods to develop competitive and technologically improved products.

By applying modern software and hardware technologies, material sciences and competitive research, there are opportunities to bring new and competitive products to market, service the existing market, and apply steam turbine technology to other industries. In short, full steam ahead. ■

Valentine Moroz is the COO of SoftInWay Inc., a company that supports over 300 OEMs and service providers via its AxSTREAM turbomachinery design, analysis and optimization software platform, as well as turbomachinery development services from the concept through manufacturing, monitoring and reliability. For more information, visit www.SoftInWay.com

