The Insider's View

Forces that drive the global pump industry

Flowserve model CN reactor feed pump.

Eric van Gemeren began his career as a marine systems engineer in the Canadian navy, then transitioned into Aerospace, and later into the Power Generation business. He is currently vice president of Research and Development (R&D) for Flowserve Corporation, a leading supplier of fluid motion control products. With experience in engineering, operations, supply chain, marketing and channel development work, he has had opportunities to view the business from a variety of different angles. *Nuclear Exchange* spoke to van Gemeren about some of the main forces currently driving developments in the global pump industry and power generation in particular.

By Joanne McIntyre

"For pump suppliers globally, the biggest single shift in our business today is our role in taking cost out of our end users' business," van Gemeren began. "We are expected to help them be more profitable by changing from a strict focus on original equipment (OE) supply to a more expansive partnership role. There have been a lot of evolutions in our business that make it possible to deliver significant cost reductions by bundling value-added packages of services. These now cover the whole spectrum from the engineering design of a project to servicing, overhauls, decommissioning and all points in between. There are some subtly different trends among the oil and gas, power generation, and petrochemical industries, but clearly the vast majority of demand is coming from outside traditional OECD economies in countries like China, Brazil and Middle East with developing economies."

Powergen driving intelligent designs

The increase in the size of both nuclear and conventional power plants demanded in today's market is creating some

Eric van Gemeren: "Suppliers can deliver significant cost reductions by bundling value-added packages of services".

significant driving factors for design evolution, explained van Gemeren.

"Plants are not only much larger than we have seen before; they must also have greater operating efficiencies, more uptime and better reliability. EPCs around the world are focusing on much larger equipment with greater capacity and output than we have designed in the past. EPCs and end users try to get every ounce of thermodynamic efficiency out of a power plant, and this is driving some real materials challenges for equipment providers. It is essential that we work to supply equipment for plants in those types of operating conditions."

It's not just the increasing demands on operating conditions that are placing pressure on equipment design. "Some regions of the world are also facing critical shortfalls in experienced engineers, not just to get the plants commissioned but to actually operate and maintain the plants. These pressures translate into choices for plant designs that can be operated with far fewer people than in previous generations. Furthermore, they are looking for equipment that has a much larger mean time between failures, thereby reducing the maintenance requirements," he said.

Van Gemeren continued, "Another important factor is also greater demand for data at the point of use. This is specifically in support of the fewer skilled resources available but also in response to new environmental and safety regulations that place greater demands on the plant to be able to track critical safety events or near-misses. That drives the demand for more data throughout the plant down to the equipment providers. A lot of end users and EPCs require that instrumentation be provided by the Original Equipment Manufacturer (OEM), so the intelligence has to reside on the pump itself. The manufacturer of the pump understands its failure modes better than anyone else. They will know what to look for and be able to translate patterns of instrumentation readings to foresee impending failures, and recommend corrective actions, maintenance procedures, special tooling, and replacement parts.

"Being able to provide an intelligent system helps the owner-operator understand when an aberration or performance anomaly is serious enough to shut it down or let it limp along until the next planned shut-down, and what kind[s] of spare parts, special tools and maintenance procedures are needed for shut-down maintenance work. It's now possible to provide a system that can support the pump with constant monitoring, minimizing unplanned down-time."

Pressures on the pump industry

The general trend towards higher pump unit efficiencies, decreasing natural resources and investigation of new, leading-edge technologies for the exploration of alternative energies have caused a considerable focus on metallic and non-metallic materials and their combination. In the power industries, higher pressures and temperatures required by ultra-supercritical applications can only be realized with the help of highly advanced alloys, including sophisticated methods in post heat treatment and surface refinement of parts and components. In subsea pumping applications, multi MW submerged pump and motor units today are required to run maintenance free for more than three years at 4000m sea depth in an extremely harsh environment and varying operating conditions. Down-hole well water pumps today reach into the 2 MW range and installation depths up to 800 m below ground, challenging the dynamic behavior, cooling system and thrust force management of the units.

"The other really big impact on the industry has come from the boom of the fracking industry, not only in North America but also hydraulic fracturing in Eastern Europe. Fracking has increased demand for high-pressure, high-reliability pumps to support the rigors of that business," he pointed out.

Striving for energy efficiency

"In an industrial plant, the largest single component of cost related to a pump is the energy that it takes to actually run it," van Gemeren expounded. "Therefore, the degree to which we can introduce new technologies and new suites of services to reduce energy consumption can have a significant influence on overall profitability."

"Computational fluid dynamics and finite element analysis modeling provide the next generation of tools to better simulate what goes on inside a pump and shaft seal. These tools help us design products that have a much higher hydraulic efficiency. The same flow rates and pressure outputs in a smaller package consume a lot less energy. Motor designs are much more efficient in terms of their ability to convert the potential energy from an electrical power source into kinetic energy that drives a pump. Motor technology continues to be a hot topic of research and exploration in the pump industry. The industry as a whole is getting a lot smarter and needs to look for innovations that really increase up-time, allowing the same output from much less energy input *and* significantly reducing the need for skilled engineers to operate and maintain that equipment. I think, in the near future, we will see a lot of great new innovations being accepted by end users and actually commercialized in the field," van Gemeren concluded.