Originally appeared in:
April 2021, pgs 19-20.
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HP Executive Viewpoint

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Technology to drive decarbonization of the oil and gas industry

THORBJOERN FORS is the Executive Vice President (EVP) of the Siemens Energy's Industrial Applications division. Prior to this position, Mr. Fors served as Chief Executive Officer of the service distribution generation and oil and gas business unit of Siemens. He has also held EVP roles in the organization's industrial power generation and compressions business and within global marketing and sales of new equipment, including industrial gas turbines, industrial steam turbines and power plant solutions.

Mr. Fors is a mechanical engineer with more than 25 yr of international experience in business development, sales, operation and leading global profit and loss units. Over his 17-yr career at Siemens, he has held several senior management positions in both new equipment and customer service. Prior to joining Siemens, he held a variety of leadership positions at ABB Power Generation and ALSTOM in Sweden, Australia and Canada.

Hydrocarbon Processing (HP) was pleased to speak with Thorbjoern Fors (TF), EVP of Industrial Applications, Siemens Energy, to discuss the decarbonization of the oil and gas industry and the technologies that are helping companies meet their sustainability goals.

HP: Many regulations and initiatives are being enacted by companies and countries to decarbonize. How does your organiztion see the future of the oil and gas industry?

TF: There is no question that the world is moving toward a low-carbon future. While this transition will not happen overnight, I see many organizations—from the upstream to the downstream—already making excellent progress in decarbonization. Hydrocarbons, particularly natural gas, are needed to meet the growing demand for power and for many derivative products and fuels society uses every day. I think the industry is becoming more diligent about reducing emissions and I am encouraged by the momentum.

HP: What technologies and steps can advance the processing industry's efforts to decarbonize?

TF: There are several. At the top of the list are increased electrification and power system hybridization, waste heat recovery and co-generation, and hydrogen co-firing in gas turbines. All are commercially proven and have broad applicability in the process industry. For example, Siemens Energy partnered with Braskem in Brazil to modernize the onsite power plant for a major petrochemical complex using our proprietary industrial gas turbines. The new cogeneration plant is fueled by residual process gas with high hydrogen content and will reduce energy consumption by an amount roughly equivalent to a city with 1 MM inhabitants.

Another example is in Canada, where we partnered with TC Energy to build a first-of-its-kind, waste heat-to-power facility that will convert waste heat from gas turbine exhaust at a compressor station into emissions-free power. The energy produced will be enough to electrify more than 10,000 homes and offset 44,000 tpy of greenhouse gases.

HP: Can you detail the three dimensions of the decarbonization journey?

TF: The first dimension—or step for decarbonization—is to target energy efficiency increases by better utilizing waste heat and optimizing plant performance—i.e., the "low-hanging fruit."

The second dimension involves a fuel shift—ideally away from feedstocks like coal and heavy fuel oils—to cleaner alternatives, such as natural gas, hydrogen (co-firing), biofuels and other sustainable alternatives like e-methanol. This could also mean hybridizing onsite power generation by supplementing conventional sources with renewables and energy storage.

The third dimension alludes to measures that can enable organizations to achieve deep decarbonization. This includes technologies such as carbon capture, storage and utilization and the burning of up to 100% hydrogen fuel in gas turbines to produce carbon-free power, and, of course, renewables such as wind power.

While the end goal for many organizations is the same (i.e., net-zero), the journey through the three dimensions looks different for everyone.

HP: How can digital technologies help companies meet their sustainability goals?

TF: Plant optimization goes together with digitalization. Today, operators have access to a host of digital technologies that can enhance the energy efficiency of their equipment and processes. For instance, a 1%–2% efficiency increase in a gas turbine can reduce annual carbon dioxide (CO_2) emissions by thousands of tons per year.

The Shanghai Orient Champion Paper Manufacturing Center is a good example. After considering several options, the customer selected two of our gas turbines to generate clean power. The result was 24% less energy consumed, a 60% decrease in CO_2 emissions and an annual savings of approximately 20%.

Additionally, operators can reduce unplanned shutdowns and minimize emissions associated with venting and de-inventory by improving equipment uptime through performance analytics or remote diagnostic services.

HP: With advancements in new digital technologies to optimize plant operations, how can companies protect their systems from cyberattacks?

TF: The cyberattack on a Saudi Arabia refinery a few years ago demonstrates the aggressive nature of hackers who openly target critical energy infrastructure. While the attack was unsuccessful, a holistic view that involves securing both physical operations and software is vital.

Visibility is the ultimate challenge the process industry faces because equipment operators cannot mitigate cyberattacks they cannot see. We have partnered with another organization to address the visibility gap by developing a novel end-point monitoring and protection system that uses artificial intelligence (AI) to detect and thwart attacks across a network. Incorporating these types of advanced systems as part of a layered, defense-in-depth strategy makes it possible to secure a facility and safely leverage digital technologies.

HP: Digital tools and technologies are nothing without people. How can people and digital tools co-exist to increase plant safety, productivity and profitability?

TF: You are absolutely right. At its core, digitalization is about empowering people to make more informed decisions and connecting the dots with data-driven insights. It is also about enabling new ways of working—for example, transitioning from reactive to predictive maintenance or moving towards unmanned operations by shifting resources to remote control centers.

We recently partnered with the Massachusetts Institute of Technology on a report—*Transforming the energy industry with AI*—that shows how oil and gas companies are using AI for automated monitoring and detection of cyberattacks. While the report discusses the increased need for companies to digitally transform their businesses to remain competitive and secure, one of the key takeaways is realizing that digital transformation is not something any organization can achieve independently. The human element of collaboration and partnerships are critical to success. HP