

Being Ahead of Time

Understanding the role digitization, decarbonization, and sustainability play in the future of the compression industry.

Manufacturers are under pressure to not only keep pace but advance their technology in a constantly evolving industry. This involves taking a proactive approach to identifying and solving customer challenges before they become a larger problem. Kirk Lupkes and Mariangel Melean from Siemens Energy discuss how their company is embracing emerging technologies like hydrogen compression, advanced rotor designs, and predictive digital services to support energy transition goals. They also highlight how Siemens Energy is reshaping how industrial compression systems are built, maintained, and optimized for a lower-carbon future.

TURBOMACHINERY: How do you identify emerging customer needs before they become industry-wide demands?

KIRK LUPKES: Anticipating market changes and evolving customer needs for new products and system solutions is a significant challenge in today's world. We made it a priority to go beyond our own internal assessments by actively seeking customer feedback to help guide our product development and improvement efforts. Recently, this involved engaging our customers through demonstrations of our advanced rotor compressor running on 100% hydrogen. This approach not only helps mitigate risk for our customers but also eases their adoption of new technologies like this. We can then take the opportunity to discuss future development plans and gather input early in those processes. By doing this, we are not only addressing current compression solutions, but also what we can offer in years to come. By embracing an ahead-of-time mindset, we can serve as a strategic partner to customers and take an active role in driving the global energy transition, as opposed to just reacting as it unfolds.

TM: Why are compressors becoming so essential in industrial applications?

LUPKES: Compressors and compression systems have always played a key role in our traditional oil, gas, and chemical processing industries. They are the drivers of these industrial processes. While we certainly remain committed to continuing to serve these industries, the rise of alternative fuels and decarbonization initiatives is paving the way for the use of turbo compressors and other turbomachinery-based technologies we're developing to address new market demands. Notably, we see strong potential for hydrogen and syngas compression to facilitate the production of ammonia and methanol as fuels and alternative energy carriers as well.

TM: Decarbonization and sustainability is at the forefront of the energy industry. What technologies do you offer to assist in reducing emissions?

LUPKES: Decarbonization technologies, such as the development of our Turbo Heater, represent a significant growth area for turbomachinery as we meet the needs of customers looking to decarbonize their processes. This technology is especially useful for those hard-to-abate processes in industrial sectors. Some of these decarbonization technologies will be closely based on optimized versions of our current integrally geared compressors and our single-shaft turbo compressor products.

MARIANGEL MELEAN: Since decarbonization is a big focus for us, we have several technologies available for this purpose, but I'll mention just a few. The first one is Seal Protect. This is a leak-tight seal for compressors that eliminates the need for traditional seal gas boosters. By using this technology, we can protect the system from contamination without needing extra power or a complex booster system. Ultimately, this translates into lower emissions for our customers.



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From the service side is brownfield electrification which converts older gas-driven equipment to electric drives. This directly cuts CO2 emissions without needing to replace whole systems. We work with what is already there, which is a big win for sustainability and for budget. We also offer upgrade packages for sites that run integral gas engines. These packages can help combustion efficiency, and lower methane and NOx emissions, which allows our customers to meet the environmental regulations without having to sacrifice equipment performance.

TM: What technological breakthroughs have been most crucial in improving compression efficiency?

LUPKES: Our company has always been striving for efficiency improvements in all our turbo compressor products, both in terms of operating costs and serviceability. Our single-shaft compressor product line offers market-leading technology, with new technologies on the way to better meet those changing customer requirements. For our single-shaft and integrally geared compressors, this includes ongoing improvements to our aerodynamic designs, including new impeller families, and improved stator components.

Seals, bearings, and other packaging technology has been enhanced for performance to drive down the cost of the overall compression solution. We continuously evaluate and develop manufacturing technologies and materials to improve reliability and reduce cost. For our reciprocating compressor lines, one of the most recent developments is our new MAGNUM™ Plus valve. By combining the proven features of the standard MAGNUM and Hammerhead™ valves with new innovations, the evolving operator requirements for higher compressor uptime, reduced power consumption, and lower operating costs can be met. These valves can be installed in any brand or configuration of a reciprocating compressor, and they're designed for gases of any molecular weight. They are particularly well-suited for hydrogen, which supports some of those decarbonization initiatives. Hydrogen applications can really put unique demands on the compressors in terms of efficiency, reliability, and flow flexibility, too.

TM: What are some initiatives that Siemens Energy has implemented to improve response times with service programs?

MELEAN: Lead time equals speed, and speed really matters when equipment is down or when our customers need help fast. Therefore, this is one of the areas from the service side that took priority. A lot of the initiatives that we are driving can be simplified into two categories: people and process. On the people side, we have grown our teams and invested heavily in training. Essentially, we now have more capacity to tackle both the lead-to-order and bidding phase, as well as execution on all fronts, from engineering to boots on the ground.

On the process side, we have streamlined manufacturing for key components by increasing inventory alongside creating special crisis cells to be able to fast track urgent orders. This allows us to move fast when something critical comes up. Lastly, we developed an AI tool called RepairSelect. It can generate diagnostics and repair recommendations using a chatbot-type experience.

TM: What changes in the energy sector are driving your current research and development (R&D) focus?

LUPKES: Alongside improving our products by reducing costs and improving efficiency for traditional applications, the push for decarbonization in the energy sector is steering our R&D in several new directions. The best example is the Turbo Heater. Some of that R&D is also focused on applying our current products to challenging applications like hydrogen compression or carbon capture and storage. The growing demand for hydrogen requires flexible and cost-effective compressor solutions for storage, transportation, and use in different industries and processes.

In recent years, our company has made great advancements in our hydrogen single-shaft turbo compressor technology. The STC-Svm product line combines the best attributes of our legacy DATUM and STC product lines and represents the next generation of industrial inline compressors. With the STC-Svm platform and our advanced rotor technology, we've been able to increase impeller tip speed limits by over 50% relative to products of similar capabilities. This is possible without compromising the material limits as specified for hydrogen in API-617. The compact design comes with fewer stages and fewer casings.

TM: Digital services empower companies to harness technology to transform operations. How is Siemens Energy digitizing compression?

MELEAN: Digitizing compression and service means examining the process from start to finish, not merely upgrading hardware. Imagine if your compressors could tell you what they need before they need it with remote diagnostic services. Something that we offer shifts the way we do maintenance from reactive to predictive. It is a lot more than smart tech. Rather, it is about collaboration between us and the users. Our users can connect their plant data to our original equipment manufacturer experts, and that way, we can provide 24-7 troubleshooting and proactive support.

We are also transforming how we handle repairs on our equipment. On the inspection side, we have laser scanning which eliminates the need for manual measurements. This increases the speed and accuracy of our inspections. Laser scanning is offered in most service locations as well as at our customer sites. Advances in laser welding have occurred, too. Compared to conventional techniques like TIG, laser allows us to control the amount of heat that goes into the part we're repairing. With the right weld procedure, we can perform weld buildups that don't require stress relief and won't allow for any distortion. Developing a weld procedure that meets API standards and has the mechanical properties of the original base metal is a tricky thing to do. Many companies out there offering this technology are unable to meet API standards, but we have the capability to do so. What is even more exciting is we're commissioning a brand-new laser cell at our Houston Service Center. This cell will perform anything from minor to major laser weld repairs on our equipment.

So, these repair solutions are all part of our commitment to innovation and we believe keeping us "ahead-of-time" and ahead of our competitors.