

Partnering with customers is the key to innovation

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Some 170 years ago, Werner von Siemens and Georg Halske tinkered with their ideas alone in a modest courtyard workshop in Berlin. Today, innovation processes have radically changed. They are far more collaborative and team-driven. At Siemens, we now depend on the concept of Open Innovation, based on the idea of working closely with our customers and external partners to jointly explore new areas for innovation. Our experts also venture outside the company to seek new partners in the highly creative start-up scene. Our goal? Enrich our own know-how with new ideas that drive innovation, help secure the success of our customers, and strengthen our own market position. We know, in the end, that when customers profit from our innovations, they will remain loyal to us – in both good times and bad.

When markets undergo challenging developments, innovative technologies can be the key to turning an industry around. Faced with falling oil prices, the oil and gas industry is now looking to technical solutions to cut costs and boost efficiency. When the price of oil began falling in mid 2014, the industry's initial reaction was to cancel projects, postpone plans and make only urgently required investments. Today, US\$45-50 per barrel has become the new reality, forcing the industry to search for new products, solutions, and business models that restore profitability and provide greater security against future crises. Seeing a crisis as an opportunity, not a catastrophe, leads to new ideas on how to survive – and profit – in a changing business arena. The oil and gas industry is now focusing on cost cuts and greater productivity while, of course, ensuring the highest safety standards.

The best way to find new solutions is to rely on processes that encourage all partners to contribute their respective industry and technical know-how. This pooled expertise can then be harnessed to develop the most efficient and cost-effective applications. Provided that the best ideas, practices and experience of all partners are used, there are many potential benefits. Flexibility, transparent processes and close cooperation are key to innovation. And they are essential for restoring and sustaining the success of all partners even against changing market conditions.

Create added value from upstream to downstream

By applying electrification and automation in the industry, new technical solutions are becoming available along the entire oil and gas energy value chain. Digitalisation not only further expands this potential, but opens up the way to completely new applications.

One excellent example for collaborative thinking, creative development and innovative implementation is the pressure-reducing station in Lubmin, Germany, located at the transfer point between the Nord Stream pipeline and the pipeline operated by Wingas, a long-standing lead customer of Siemens. The gas travelled for three days, and its pressure dropped to some 110 bar. In order to match the pressure specification of the pipeline system following the landfall, the gas is further expanded to 102 bar. In the case of the expansion of natural gas in a pipeline, measures have to be taken before the gas may travel on in order to avoid the freezing of pipes and appliances.

For heating natural gas at a pipeline facility, gas-powered boilers would be the natural choice. But there are ways to use energy in a more efficient and ecologically thoughtful way, such as using the 420 to 500 degrees Celsius waste heat of a gas turbine's exhaust gas. In addition to providing heat, the gas turbine can also simultaneously generate electricity. In the case of the Lubmin station, enough electricity is produced to supply around 50,000 households with up to 200,000 megawatts a year. Two functions are thus intelligently combined to further increase the plant's overall efficiency.

The heart of our solution is the new SGT-750 industrial gas turbine based on a holistic 3D design developed using Siemens PLM software NX and Teamcenter. Thanks to the turbine's numerous sensors and data points, customers can keep track of its status via their access to product data and interfaces. Infrared cameras provide continuous online monitoring of critical rotating parts. And our Sinalytics platform enables us to guarantee continuous remote monitoring of the plant – around the clock, every day of the year. The turbine satisfies our customers' key priority: guaranteed high efficiency and availability. Our engineers also focused on optimally reducing maintenance requirements. As a result, the turbine has an availability record of over 99 per cent. Requiring only 17 downtime days in 17 years of operation, we have designed a market leader.

Digitalisation as game changer

Most other industries have moved from electrification to automation to digitalisation, and are now implementing new technologies to further optimise operations and profit. The oil and gas industry, however, needs to catch up here, particularly with digitalisation. Today's turbulent market landscape offers the industry an opportunity to boost its competitiveness by harnessing new technologies. It can learn from other sectors and adapt



proven digital applications in its own systems. We can provide these applications. By collecting data and knowing how to analyse it, for instance, we can rapidly translate immense quantities of information into continually optimised operational decisions. This capability requires both extensive domain know-how and expertise in complex analytics. In the end, such digital support can be applied in all industry processes – from designing production facilities to optimising services. The more data generated by the whole system, the more possibilities there are to influence and improve individual processes within that system. This leads to safer processes and lower production costs, and ensures faster, more efficient and more reliable operations along the entire oil and gas value chain.

Greater efficiency thanks to additive manufacturing

Additive manufacturing, commonly known as 3D printing, is one of the most promising and innovative technologies of our time. Pointing to the future of manufacturing, this production method already merges the virtual and real worlds. In this process, parts made of plastics, metals or other materials are built up – added – layer by layer based on three-dimensional, software-generated plans. Thanks to the incremental process, forms can be created that would not be possible with traditional casting, milling or forging methods. The technology will not only revolutionise the supply of industrial parts, but enables the creation of completely new and highly complex component designs. At our facility in Finspong, Sweden, we use additive manufacturing to produce spare burner tips for gas turbines. The metal powder bed melting process has been used for years there, and has largely been taken over for the repair of burners, marking a revolution in the service sector. The first 3D-created spare burner heads for heavy-duty gas turbines are now in commercial operation, like at the Brünn CCPP in the Czech Republic. Advantages for the customer: higher flexibility and speed, lead time reduced by 75 per cent.

Modern software applications not only support the planning, operation and servicing of new or existing plants, but optimise their staff training as well. Today, an exact 3D depiction of an oil and gas installation can be visually experienced without ever having to set foot in the plant itself. One of our customers, Total E&P, used the immersive training simulator of our COMOS Walkinside to train field operators for its Pazflor FPSO. While Pazflor was making the three-month journey from a shipyard in South Korea to an oil field 150 kilometres off the coast of Angola, its future crew was being trained onshore in Angola. Once Pazflor arrived in place, the crew was immediately ready to begin work. In another example, digitalisation supports integrated

operations for offshore platforms. For its Ivar Aasen project in the North Sea, Norwegian operator Det Norske wanted to keep the platform crew as few as possible and to largely monitor and control platform operations from land. Our solution was to deliver an onshore remote operations centre with fully integrated electrical, automation and digital solutions for monitoring critical equipment and providing expert support based on real-time big data processing and analytics.

Security first

Along with the operation of a plant and safety of its crew, the protection of plant data generated by digitalisation processes is critically important. The oil and gas industry increasingly sees the need to give priority to cybersecurity. In fact, cyber – along with Health, Safety and Environment (HSE) and terrorism – has become a top concern for oil and gas executives. This concern has been further heightened by a spate of costly cyber-attacks in recent months, such as the mega event at Saudi Aramco when 35,000 computer terminals went down within just a few hours.

To counter such threats, the industry must focus and commit resources to integrate and push cyber vigilance across all enterprise levels. Companies have to rethink their security fundamentals and develop an industrial cyber security strategy. Moreover, they must install an effective cyber-governance model and establish infrastructure defences that include extensive cyber training. Siemens has led the way here by both securing our own products and by developing premium cyber security solutions to protect our oil and gas customers. IT security is one of the 10 key technology fields in which Siemens is conducting intensive research and development to advance the state of the art for industry. We are also contributing to standardisation and promoting the sharing of information and threat intelligence. We use these capabilities to assess risks, secure infrastructure, and develop solutions for ensuring secure data handling across all operations – from the field to the control centre and ultimately for the entire enterprise.

Open Innovation processes depend on combining the know-how of many partners and various industries, and on early and close collaboration among technology suppliers and customers. They help businesses develop and implement new ways to produce more cost-effectively, more efficiently and with greater security – even in challenging times. And the key rule here is clear: only those who are able to react with speed and agility to short-term or extreme market changes can maintain a competitive edge over the long term. ●