## Samson Opens Test Center

# Innovation Center Is Driving Digital Transformation

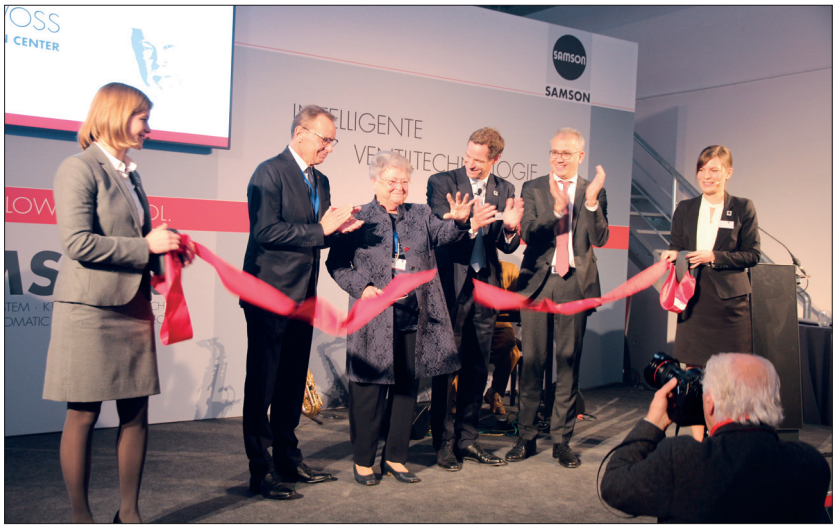
With the Rolf Sandvoss Innovation Center in Frankfurt/Germany, Samson has built the state-of-the-art Research and Development (R&D) and test center in the valve technology industry. The digital transformation of the company shall be secured this way. The Innovation Center was officially opened in November 2017 after two years of construction. Prior to the opening, specialised journalists had the opportunity to visit the test center and extensively question the Samson board of directors on the subject.

»We manufacture iron«. This statement is no longer applicable, explained Dr. Andreas Widl, chairman of Samson. Rather, the company goes beyond the manufacturing of iron – toward intelligent, connected systems. The digitalisation has begun at Samson, but the Innovation Center is set to drive it forward even further. While digitalisation currently makes up merely 1% of business, it is expected to reach 50% in 2025, Widl estimates.

Digitalisation means that valves no longer »simply« for example, regulate flow rates, but that they are intelligent. »The data that a valve provides has a certain value, because behind it are operative costs or rather business models«, Widl says. »For example, energy can be saved if data analysis shows that a pump is running in front a closed valve.« Samson wants to raise these potentials, develop new products, and establish new business models. And at the center of all it all is the human.

### Employees at the center

With the changes that the company has undergone, it is important that the employees are involved. Both Widl and chairman of the board, Dr. Nikolaus Hensel, stress this. »Changes must not be on the backs of employees«, Hensel said at the official opening of the Innovation Center. Potential fears and reservations have to be addressed. Constant training and education are vital to achieve this.




*Official inauguration of the Rolf Sandvoss Innovation Center: Edith Sandvoss, widow of Rolf Sandvoss, symbolically cuts the red ribbon under the applause of Dr. Ing. Nikolaus Hensel (l.), chairman of the board, Dr. Andreas Widl, chairman of Samson, and Tarek Al-Wazir (r.), deputy prime minister of the state of Hesse*

Employees are the focal point at Samson. It has been an old tradition that nobody stood for quite like Rolf Sandvoss, Widl said. In his honour, the Innovation Center was named after the great nephew of the founder and honorary chairman of the board, who passed away in December 2014.

More than 4,000 employees in more than 60 companies are employed at Samson. »With 1,650 employees, Frankfurt is the largest company location of a valve manufacturer worldwide«, Dr. Ingo Koch, Chief Officer of finances, controlling, HR and legal, explains. The company trains in twelve different professions, not just to meet society's responsibilities, but also because of difficulties to find qualified specialists on the market.

For the »exceptional dedicated commitment to the state of Hesse«, Tarek Al-Wazir, deputy prime minister of the state of Hesse, thanked the company at the opening ceremony. The industrial basis of the state is an important component, he said. Samson recognized well in time that a company need to be digitalized, and was a pioneer in that aspect. That people's fears and reservations must be addressed, was also one of his concerns, and qualification opportunities are essential. »The statement ›You are done training‹ will not exist in the future«, according to Al-Wazir.

»Technology is made by humans«, says Dr. Thomas Steckenreiter, Chief Officer of R&D. »Innovation only happens when people work together.« And this shall happen in the Innovation Center. People are to work together interactively, talk to each other, exchange ideas, experiment,

*Dr. Andreas Widl, chairman of Samson*

*Dr. Thomas Steckenreiter, Chief Officer of research and development*

make errors, try out. »That is the foundation for innovation.« Steckenreiter sees the Innovation Center as a meeting place for engineers, researchers and scientist. With the new, integrated R&D and test center, Samson wants to cover the future requirements in terms of testing and development activities of the entire company. »Furthermore, it serves as a research and certification platform for our customers and partners – and in this sense will be operated as profit center«, Raul Fuchs, Chief Officer of sales and marketing, explains.

## Innovation Center

The Innovation Center is located at the eastern end of the Samson premises in Frankfurt. An area of more than 7,000 $m^2$ is available for prototyping, simulations and a wide variety of tests. In addition to the classical field of research, such as materials science, flow engineering, cryogenics, acoustics, control engineering, device safety, and system integration, topics like data analysis, and cloud technology should be taken up.

The goal is the digital transformation of Samson products. Important foundations for that are the complex plant engineering, as well as the digital infrastructure, with which the variety of tests, process media, process conditions and fields of application are made possible. Additionally, they constitute the base for the research, development and testing of products for all Internet of Things and Industry 4.0 environments. »We have more than 200 testing facilities with which we can develop new products«, Steckenreiter says. These shall achieve a high level of reliability in a wide variety of applications already when they are launched onto the market.

## Simulations

Simulations play a key role in the development of new products. Through an early involvement of simulation tools in the development process, it is possible to gain detailed predictions over the product behaviour. Further along in the R&D process, a prototype developed largely based on simulations is subjected to real-life functional and wear tests.

Through the integration of prototype manufacturing into the Innovation Center, it is possible to determine at a very early stage, whether new products are commercially viable. Particularly with complex components, prototype construction can provide valuable insights for serial production. Here, prototype construction relies increasingly on additive manufacturing technologies next to classical machine tools and CNC-controlled machining centers.

In the area of valve design, Samson is performing simulations in regards to solid mechanics/finite element method (FEM) and computational fluid dynamics (CFD). Through solid mechanics simulations, predictions are made about, among others, elastic and permanent deformations caused by external forces as well as thermal influences, so that conclusions can be made about compressive strengths and fatigue failure of all components. By using CFD simulations the fluid mechanical properties of every single part within a valve are analyzed. For example, minimizing pressure losses and resulting flow forces, as well as avoiding dead zones and high turbulence intensity, are parameters for optimizing the flow center.


*»Digitalization is a challenge«, says Tarek Al-Wazir at the inauguration ceremony*

## Fluid mechanics

With its digital infrastructure and the corresponding systems, the Innovation Center makes, among others, real time testing including simulations of various plant and operating conditions possible. Any manner of process medium states – liquid, gaseous, vaporous, and multiphase all the way to solid-laden fluids – can be simulated here on various testing tracks. The foundation for this forms the complex system infrastructure with an installed power of 5.5 MW and more than 250 valves made by Samson and Samson subsidiaries in various nominal sizes and pressure stages. »We can test valves until a nominal size DN 500 for pressures up to 120 bar in the Flow Labs«, such as globe, way, three-way, or angle valves – and various valve types with their different overall lengths can be tested.

Flow rates of up to 9,000 $m^3/h$ can be generated on the water test benches. Critical process environments with pressure levels up till 120 bar can be simulated in the high pressure test bench, and a solids concentration of particles up to 1 mm in size is an optional feature.

Special test fields allow for testing equipment in their industrial application environment. This includes, among others, cold box applications with cryogenic, liquid nitrogen used in air separation and regulators without auxiliary energy used in district heating and cooling systems.

*In this Flow Lab, the functions of non-powered controllers are tested as separate components in simulated district heating networks: valve sizes DN 15 to 300 for steam at a temperature of 230 °C to 13 bar pressure and a flow rate of 5,000 kg/h*

Steckenreiter excitedly announces. This includes, among others, flow, acoustic and functional tests, instrument calibrations, as well as simulations under specific plant conditions. In doing so, all flow-relevant coefficients that guarantee the functionality of the products with all types of process media, can be determined.

In the final expansion stage, the Innovation Center provides 26 test benches grouped into different Flow Labs based on test medium, pressure and type of application. The flow test benches are built modularly, so that different valve designs –

## Life cycle tests

In order to predict application specific maintenance intervals, extensive life cycle tests on single components and entire control valves are subjected in the Innovation Center. The service life of a control valve is dependent on many influencing factors. The chemical, thermal, and climatic resistance of materials used is significant. Additionally, the influence of various process and plant conditions, for example the cavitation erosion or flow-induced vibration at closure members, should be considered. For this purpose, accelerated simulations can be performed on parts and entire devices made of metals and non-metallic materials to test their resistance to the different atmospheric conditions that exist across the world. Further purposes of materials engineering are the examination of thermal resilience of materials and material compounds with varying temperature control cabinets and climatic chambers that cover a temperature range of –70 to 300 °C, as well as investigations in terms of corrosion resistance.

## Electromagnetic compatibility

To ensure device safety and electromagnetic compatibility of electrical products, all test concerning protection class, protection against contact and insulation, up until testing utilised cables and the protective conductor terminal are performed at the Innovation Center. Testing for electromagnetic compatibility ensures that products work properly in an electromagnetic environment without causing electromagnetic interferences that affect other pieces of equipment, plants or systems within the same environment. Additionally, in an absorber hall for radiated disturbances and emission readings, tests with a frequency up to 18 GHz can be conducted.

## Plant engineering

The size and variations of utilised actuators and sensors in the Innovation Center make it possible to emulate systems that are of similar complexity as the systems of customers. With the installed infrastructure, classic valve tests can be performed and future-oriented, connected scenarios can be simulated.

With an installed power of approximately 220 average households, pumps are operated with corresponding frequency converters, compressors, machine tools, as well as many further testing devices. A majority of the installed power is needed for 18 pumps with varying pressure levels up to 120 bar, flow rates as high as 9,000 $m^3/h$ and various media.

More than 2 km of pipes in nominal sizes up to DN 1000 are installed in the Innovation Center. For shut-

ting off and controlling the flow in the center's pipelines, more than 250 valves in different sizes and pressure ratings made by Samson and its subsidiaries have been installed. Next to signals of numerous pumps and control valves, values such as pressure, flow rate, temperature, filling level, changes in travel, force, torque, conductivity, as well as acoustic signals are recorded. Altogether, the digital infrastructure covers approximately 1,700 signals in a networked measuring and automation landscape.

## Digital infrastructure

The evaluation of sensor and control valve data as well as the maintenance data from the Innovation Center in the digital infrastructure allows for a complete aggregation of data for data analysis and visualisation. With that, new concepts for control, monitoring, diagnostic and safety tasks will be realised. Additionally, Samson focuses on the development of algorithms for valve diagnostics or rather preventative maintenance of control valves, but also for processes, plant sections surrounding the valves and entire plant systems. Next to classic archiving of testing data, the continuous communication infrastructure in the Innovation Center also allows for recording of real-time data through links to cloud computing systems.

*More than 2 km of pipes in nominal sizes up to DN 1000 are installed in the Innovation Center; some of them were illuminated colored on the occasion of the inauguration*

Furthermore, the communication infrastructure ensures the compatibility of smart Samson products with all common process control, engineering, and asset management systems. In the Smart Valve Integration Center of the Innovation Center can, for example, examined the integration of positioners into modern process control systems, and can additionally demonstrated the handling of different communication protocols such as Hart, Profibus Pa, and Foundation fieldbus.

The focus is, however, on the application of new integration concepts such as FDI and UPC UA and the integration of future-oriented communication channels. Especially the realization of cloud connections, for example with the Samson-made Sam Digital Hub, is a essential part of the digital infrastructure. ■

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