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## Siemens, Scheiter and the tire industry on the path toward Industry 4.0

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The tire industry is an international business, with manufacturers all around the world. The Scheiter Ges. mbH company in Austria provides complete systems for supplying media such as hot water, cold water, steam, vacuum, and nitrogen for curing presses used to vulcanize tires in tire production. Process expertise is particularly important because the demands on the pressure and temperature of the medium are especially high. Last but not least, reliability plays a decisive role because production comes to a standstill without a reliable supply of media. In the field of automation and drive technology, Siemens, as a seasoned veteran partner to Scheiter has set standards in Industry 4.0 and digitalization – not only in tire production.

Vulcanization is a complex process characterized by two main parameters: pressure and temperature. The green, or uncured, tire is transferred to a mold inside the curing press which gives the tire its final appearance, including imprinting the profile. But it is not just the external shape

of the tire that is decisive, the internal shape is important too. Pressure and temperature are supplied through an inner membrane known as the bladder which is inserted into the green tire. The temperature profile must also be just right: e.g. if the heat were too high, the tire would become too hard. Steam/hot water, steam, and steam/nitrogen are pumped into the bladder. These media allow for precise control of the temperature and pressure curves as well as the hardening times, depending on the current process requirements. Even more parameters must be considered to define the correct temperature process, such as the starting temperatures of the green tire and of the machine. All in all, it is an extremely demanding process, especially considering that the vulcanization of a tire can take anywhere from ten minutes to one day in the case of tires for mining vehicles. In modern production plants, the process data of each individual tire is documented – ultimately to continuously check internal processes and to ensure the highest quality. Today's tire production is automated and completely digitalized.

## What about the medium, temperature and pressure?

True expertise in tire production is in the process sequence: knowing what temperature and pressure are required at which point and for which medium. In order to ensure the necessary level of productivity, some tire manufacturers have more than 400 curing presses in operation. Supply of compressed air, hot water, steam or nitrogen to the presses plays a critical role here, as only one supply infrastructure is in place (provision, distribution, automation) for all the presses. Consequently, all the presses and thus the entire factory would come to a stop if the supply of media were to



Fig. 1:  
Piping for SCHEITER® hot water plant with recovery system including all secondary plants for the tire industry

fail. It is also a challenge for the automation system to ensure that only a specific number of curing presses can be started up simultaneously in order to avoid causing impermissibly extreme pressure drops in the supply lines. At the same time, it is also important to be economical with the media that is fed into the bladder: It is in the interest of plant management to recover as much media as possible due to cost considerations.

## Media supply as a key technology

The specialist company Scheiter Ges.mbH. Scheiter Ges. mbH Wärmetechnische Anlagen (heat engineering plants) has been in service for almost 25 years as a specialist company in Vienna (Austria). The family-owned high-tech company has comprehensive plant engineering know-how and consistently relies on long-term customer relationships. Innovation drives and motivates employees because they are fully aware of the quality and the comprehensive customer benefits of the systems they deliver. Naturally, this also applies to the media supply systems for curing presses delivered around the globe. Scheiter has thereby succeeded in feeding around 95% of the recoverable media back into the process, which is considerably higher than the market average. Thanks to patented technology, a uniform

distribution of temperature in the bladder and savings in steam of approx. 50% per cycle are also achieved.

## Process stability and energy efficiency

In addition to the extraordinary energy efficiency, another advantage of the Scheiter systems is that the pressure and temperature parameters are kept extremely stable. Considerable pressure fluctuations can occur in the media infeed if the medium is removed unevenly. With its advanced experience and technology, it is not only possible for the company to keep these fluctuations at less than  $\pm 0.5$  bar (with 20 to 35 bar of pressure applied) in the hot water feeder; temperature stability is also extremely high at  $\pm 0.5$  °C. With pressure fluctuations of up to  $\pm 10$  bar, competitors' systems are considerably less stable. Furthermore, a technological lead also means that only the highest quality components are used – both in electrical and mechanical systems. Each system is developed for specific customer needs. This means that as early as the engineering phase, consideration is already given to what end product, i.e. which tires, will be manufactured. In addition to the creation of new systems, another business field is the thermal engineering and energy-oriented retrofit of existing systems – namely, heat recovery. The optimal dimensioning of a supply system plays an important role for Scheiter. Using the latest measurement technology, Scheiter has comprehensive knowledge of how to lay out the system for each medium and at every temperature. As a result, the systems remain stable both at

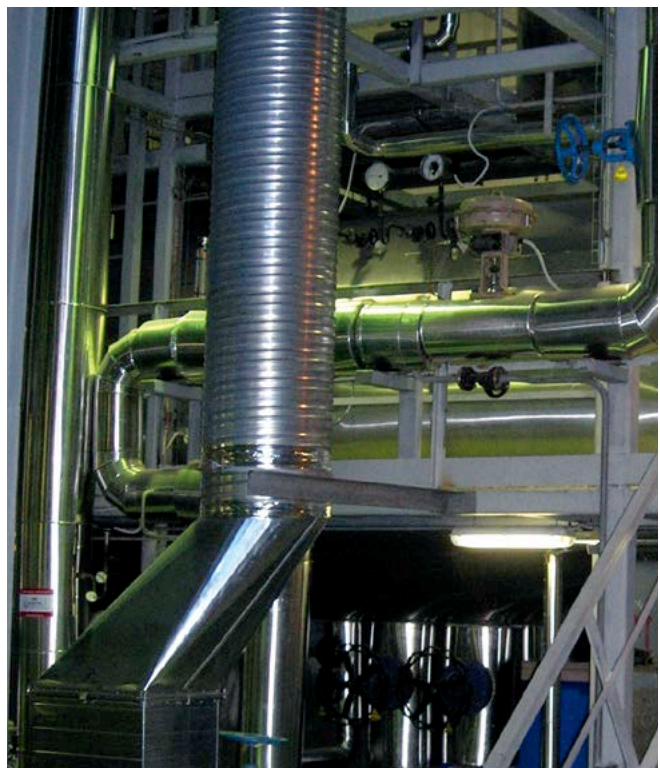


Fig. 2:  
SCHEITER® hot water direct exchanger with heat and media recovery system incl. thermic degassing





**Fig. 3:**  
Switch board for SCHEITER® hot water plant with recovery system including all secondary plants for the tire industry

very low loads and during overload (20 to 120% of the rated load).

### **Reliability is key for automation**

It goes without saying that a technology company such as Scheiter must also have in-depth knowledge of and reliably utilize the products of all suppliers - starting with container construction and continuing up through control and automation engineering. From the viewpoint of rapidly advancing digitalization and Industry 4.0, standardization is becoming increasingly more important in tire production. Both Scheiter and its customers appreciate the advantages of the Siemens Simatic S7-1500 control, which is seamlessly integrated into the automation architecture of the plant and masters the respective process-related tasks thanks to its wide range of functions. The TIA Portal makes the configuration and programming especially easy. The control algorithms integrated in the operating system of the controller allow for precise managing of all temperatures and pressures without much programming effort and thus allow Scheiter to easily implement the tasks required for supplying the media. This controller is also

used in the other plant areas, and for the tire manufacturer, this has the advantage that the maintenance team is familiar with the automation components in the media supply system as well. The media supply system provided by Scheiter can therefore easily and cost-effectively be integrated into the maintenance concept at the plant end. All the field devices, such as valves, flow meters or temperature sensors, are connected via Profinet, the open fieldbus standard in accordance with the Profibus User Organization (PNO). The field devices are all coordinated by the central Simatic S7-1500 controller and their measured and control values are visualized in the control room so that it is easy to guarantee operation and control of the media supply.

### **Customers benefit from Siemens as a global company**

The right portfolio – including distributed, mobile operator control and monitoring devices – rounds out the performance range, for example, with the distributed control units attached to the curing presses, which allow the data to always be visible even in this area. Siemens products and systems stand for functionality and a high

degree of reliability. And this is the decisive factor in supplying media to curing presses: without it, nothing runs. Scheiter's experience to date with the automation solutions from Siemens has been extremely positive in terms of reliability. Because the hot water systems require supervision, the required control cabinets are installed within view of the media supply system. These are therefore located in a rather harsh environment. The effort Siemens puts in to achieve maximum reliability can be seen in a concrete example: The Simatic S7-1500 controller is G3-certified, meaning it possesses a very high degree of resistance to the effects of sulfur – a welcome characteristic indeed in the harsh conditions of the tire industry. This capability for resistance has a direct effect on the lifespan of the controller. Because longevity is also a concern for many users – along with all the consequences: even with new generation products, customers can be confident that the systems will retain their compatibility and the supply of replacement parts will be guaranteed over the long term, because knowledge never gets lost at Siemens. A stronger focus is now also placed on energy monitoring. The Energy Suite from Siemens provides planners, system integrators and users with software tools for keeping an eye on energy consumption. Siemens customers can be assured of a very appealing Total Cost of Ownership (TCO). Global availability

and worldwide service round out the performance range of Siemens in the international tire industry.

### Further improvements to be expected

At this point, it is worth taking a brief glance into the future: Siemens is currently cooperating with various tire manufacturers to develop a library for the TIA Portal, which will be provided to both the tire manufacturers and, in particular, to suppliers like Scheiter to allow the uniform, standardized programming and visualization of controllers, valves and other automation components. This is another step toward simplifying operation and for servicing of media supply, as well as any other production machines used in the manufacturing of tires.

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Subject to change without prior notice  
Produced in Germany

DIFA-B10099-00-7600

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