WITTIG
INDUSTRIAL SYSTEMS

Durable rotary vane compressors with a total power of 3600 kW at Saint-Gobain Oberland in Wirges, Germany

Toughing it out: compressed air and vacuum for container glass production

Saint-Gobain Oberland AG is one of the leading manufacturers of container glass. Its Wirges/Westerwald factory in Germany produces some 1.5 million bottles per day, using huge quantities of compressed air in various compression stages. The compressed air is generated by extremely durable rotary vane compressors, which as well as requiring little maintenance are highly energy efficient.

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Container glass production:
Wirges/Westerwald factory in Germany produces some 1.5 million bottles per day.

Compressed Air Stations
Two large compressed air stations with an installed compressor/vacuum pump power of around 3,600 kW.

Compressors/Vacuum pumps
Four Wittig ROW 460 rotary vane compressors, each with a motor power of 250 kW, and one ROW 460 with a motor power of 315 kW network at a rate of up to 15,000 m^3/h.

Four ROW 600 two-stage rotary vane compressors generate up to 15,000 m^3/h of compressed air for the 6-bar network.

Three pump stations generate a vacuum of 200 mbar (absolute). The pumps operate under the rotary vane principle. The three pump stations can generate up to 13,500 m^3/h of vacuum.

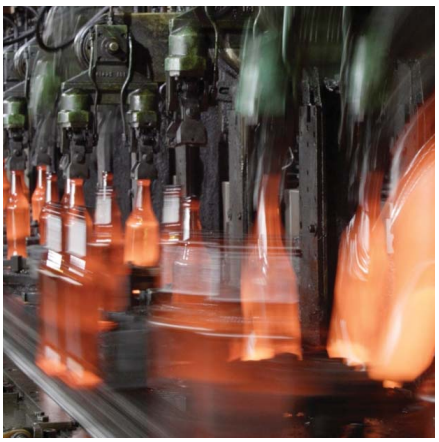
Two oil-free CompAir R 180 piston compressors with a capacity of 2,000 m^3/h for the 6-bar network.

Sand and soda, lime or dolomite and recycled glass: these are the ingredients used to manufacture bottles and glass containers. The process also requires very high temperatures and (compressed) air as a conveying and process medium – and on a vast scale, because the greater the production volume, the more cost-effective the processes.

Saint-Gobain Oberland AG, one of the giants in the sector, manufactures around 10 million glass packaging containers every day at its four German factories. Since 2010 the products have been marketed to the food and beverage industry under the Verallia brand. The Wirges factory in Westerwald produces some 1.5 million units per day.

Watching the production process unfold on a tour of the factory is impressive. Compressed air in various compression stages is involved in several phases of the process. It starts with the pneumatic conveying of the individual materials into the mixing plants. After mixing, the powdered batch is introduced into one of two tanks, each with a capacity of some 300 metric tons, where it is melted at a temperature of around 1,600°C and then held at that temperature. The hot stream of molten glass discharged from the tank is divided into portions, and the redhot material is carried – again pneumatically – through ultra-heat-resistant troughs to the forming plant.

The forming process is supported by compressed air and vacuum: the hot material is pressed into the mold by compressed air, while the vacuum "draws" the glass up against the walls of the mold. Together they establish the conditions for uniform wall thicknesses.



Caution Hot: Molten glass at temperatures of over 1100°C is shaped into bottles and containers in forming plants.

The bottles are then cooled under controlled conditions. At the “cold end” – which in the glass container industry refers to temperatures below 600°C! – the bottles and containers are annealed, 100% inspected, and packaged.

3,600 kW installed compressor power

With daily output running to seven figures, it’s hardly surprising that the Verallia factory in Wirges uses huge amounts of compressed air. As Andree Merten, team leader for mechanical systems and media, explains: “We have two large compressed air stations with an installed compressor/vacuum pump power of around 3,600 kW.” The air supply adjacent to the melting tanks is the biggest energy consumer in the production process, and the managers attach a corresponding degree of importance to energy-efficient compressed air generation. “The energy management system at the factory is certified to EN ISO 50001,” says Andree Merten. “We record all energy usage data and utilize the results not only to optimize consumption but also for the purposes of preventive maintenance."

Rotary vane compressors produce large amounts of compressed air

The bottle-forming section has four Wittig ROW 460 rotary vane compressors, each with a motor power of 250 kW, and one ROW 460 with a motor power of 315 kW. The compressors run all year round, feeding an almost constant volume of compressed air into the 4-bar net-work at a rate of up to 15,000 m³/h.

Rotary vane compressors from Gardner Denver Wittig generate compressed air for the 4-bar network.

Four ROW 600 two-stage rotary vane compressors generate up to 15,000 m³/h of compressed air for the 6-bar net-work. This compression level is used as general process and factory air for a wide variety of tasks at the cold and hot end.

Both networks use both fixed-speed and regulated-speed compressors. As well as providing an economical base-load supply, this arrangement also allows for demand-led production, supplying the volume of compressed air that is needed at any given time with no off-load running.

Vacuum pump stations operate on the same principle

Three pump stations, supplied – like the compressors – by Gardner Denver Wittig, generate a vacuum of 200 mbar (absolute). The pumps operate under the rotary vane principle. The three pump stations can generate up to 13,500 m³/h of vacuum.

Oil-free compressed air production with piston compressors

So in total there are twelve high-output units operating in the two power plants, all based on the rotary vane principle. The only exception is the oil-free 6-bar network. This uses two oil-free CompAir R 180 piston compressors with a capacity of 2000 m³/h.

Four two-stage ROW 600 rotary vane compressors generate up to 15,000 m³/h of compressed air for the 6-bar network.

Vacuum air is generated by pump stations, which also operate under the rotary vane principle.

The energy management system at the factory is certified to EN ISO 50001. We record all energy usage data and utilize the results not only to optimize consumption but also for the purposes of preventive maintenance.

Andree Merten, team leader for mechanical systems and media

They supply compressed air for the "cold end" of the factory, where air can come into contact with the finished products. In addition, the laser optics in the sensors involved in the quality control process also require oil-free air to clean them.

Outstanding values for "compressed air consumption per bottle"

So why did Saint-Gobain Oberland in Wirges decide on the rotary vane principle and choose Gardner Denver as its supplier? It comes down to two main reasons: energy efficiency and the durability of the equipment. The energy efficiency has been confirmed in an internal evaluation carried out across all factories. As Helmut Schuckart, maintenance team leader for mechanical systems and media, explains: "The results of this assessment, which measured compressed air consumption per bottle, were outstanding".

170,000 operating hours with minimal maintenance

At least as important to the managers is the very long service life of the rotary vane compressors and pumps. This too is attributable to the compression principle: moving rotary vanes made from aluminum are pressed against the wall of the compression chamber by aerodynamic and centrifugal forces. These forces, along with the oil film that forms there, create a highly effective, contactless seal between the rotor and the housing wall – preventing any wear. The low rotational speed of around 1,500 rpm, the low rotor weight, and the small number of moving parts also contribute to the long service life and the extremely low maintenance requirement. The oil content is removed from the compressed air by means of ultraefficient integrated oil separators.

The evidence can be seen "live" in Wirges: a fully operational vacuum pump station dating from 1972, when the Wittig brand was still owned by Demag AG, is still in service there as a stand-by machine. In addition, the Verallia factory in Westerwald has been using rotary vane compressors for its compressed air supply since 1990. One of the first Wittig machines is still in use, having notched

High-class workmanship from 1972: this vacuum pump is still in service as a stand-by machine.

Saint-Gobain Oberland in Wirges uses two CompAir piston compressors to produce oil-free compressed air. This type of compressor is also widely used in breweries – an important customer sector for CompAir, Simmern.

up a total of 170,000 operating hours. According to Helmut Schuckart: “The maintenance requirement is extremely low. They have an oil change every 8,000 hours and we replace the bearings and vanes after 50,000 to 60,000 operating hours. Other types of compressor are much more maintenance-intensive.” That is why rotary vane compressors are commonly used in production facilities that need large volumes of compressed air, 24 hours a day.

Intake cooling increases efficiency and lowers service costs

Another advantage of this compression principle is the option of intake cooling, which Saint-Gobain Oberland has implemented for its low-pressure network in Wirges. “Before being compressed”, Helmut Schuckart explains, “the air is cooled to –20°C, drying it at the same time. This avoids the need for a downstream treatment stage and increases the compressor efficiency by 15 to 20%.” This design measure also helps to lower service costs because it reduces the oil temperature.

Under the challenging conditions of glass production, the high energy efficiency and long service life of the oil-lubricated Wittig rotary vane compressors play an important part in the cost-effective operation of the Wirges factory – and elsewhere too. Rotary vane compressors from Gardner Denver Wittig are also in use at the headquarters of the Saint-Gobain Oberland Group in Bad Wurzach.

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Images on page 1:
Saint-Gobain Oberland Glasherstellung
Images on pages 2–4:
Gardner Denver Schopfheim GmbH

Helmut Schuckart, maintenance team leader for mechanical systems and media (left) and Torsten Kock, systems director at Gardner Denver Schopfheim GmbH.

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