BellissMorcom

Gardner Denver

HIGH PRESSURE SOLUTIONS

40-bar air for blow moulding at new plant for the Gropper group of companies

Piston compressor
for bottling not-from-concentrate juice

During planning of a new site for the Gropper group of companies, the focus was on energy efficiency and sustainable productivity. This site is used exclusively for the manufacture and bottling of high-quality not-from-concentrate fruit juice. The 40-bar compressed air for the PET blow-moulding machines is generated by a highly efficient piston compressor from Gardner Denver, which is optimally integrated into the processes at the new plant in Stockach, Germany.

Application Details

The Gropper group of companies, based in Bissingen in Swabia, Germany, processed approximately 290 million kilograms of milk (of which 50 million was biomilk) in 2015 in order to create a variety of milk products. The majority of these were sold under the brand names of large retail chains in Germany, and some in other European nations. Gropper employs around 700 people, buys milk from 870 suppliers and in the last fiscal year they achieved a turnover of approximately 400 million euros.

The company is continually expanding and in the last few years they began to manufacture smoothies and not-from-concentrate fruit juices. This has been a success: their annual production of these goods has already reached 80 million kilograms. To pave the way for further growth, Gropper opened a completely new plant in Stockach in autumn 2015.
This plant will focus solely on the production of not-from-concentrate juices, which require refrigerated transport and storage. This ensures that the naturally fresh flavour is well preserved.

Benefits at a glance

- Oil-free piston compressor
- This shaftless motor makes for an exceptionally high degree of efficiency, long service life, and extremely low space requirement
- Double-acting principle: the compressor performs two suction and compression cycles per revolution – at a speed of just 750 rpm
- The most efficient version of the W-series, used by Gropper, has a very large control range of 530 to 1,800 m^3/h (30 to 100 %)
- The compressor has been optimally integrated into the heating/cooling systems of the entire plant

Customer

Molkerei Gropper GmbH & Co. KG

www.gropper.de/en/home

Location

Stockach, Germany

Application

40-bar compressed air for the PET blow-moulding machines

Product

Oil-free piston compressor WH 29 3N with a 325 kW direct drive and a maximum volume flow of 1,800 m^3/h (at 40 bar)

All energy saving measures fully exploited

As the new plant was built from scratch, staff were able to fully exploit the potential of modern factory planning – an area in which they have a great deal of expertise. Berthold Burgmeier, Head of Technology: "We plan and optimise our systems ourselves and efficiency, flexibility and economical energy consumption are extremely important to us."

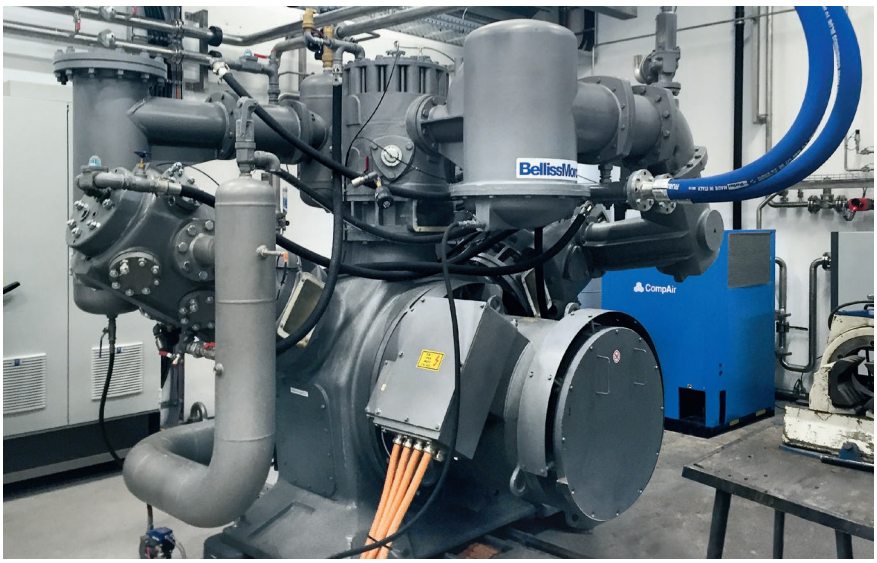
For this reason, both the procurement and life cycle costs are important when it comes to investments. This applies in particular to compressed air generation, which is required when PET bottle production is performed on site. The thumb-sized bottle preforms are "blown up" with compressed air at pressures up to 40 bar before being filled with juice / the beverage / whatever.

Those responsible for planning this system and associated peripheral equipment at Gropper were able to draw on existing experience: four PET blow-moulding machines and bottling lines are already in use in Bissingen. Therefore Gropper had no doubt that multi-stage piston compressors would be the most economic way to generate this pressure level.

High degree of efficiency thanks to direct drive shaftless motor

When compared directly, a W-series machine from Belliss & Morcom – a Gardner Denver Group company – proved to be the best value. Therefore, a type WH 29 3N oil-free piston compressor with a 325 kW shaftless motor and a maximum volume flow of 1,800 m^3/h (at 40 bar) was purchased.

One of the features of the W-series piston compressors is the special drive concept, which does not have a belt drive or gear and clutch. This direct drive shaftless motor makes for an exceptionally high degree of efficiency, long service life, and extremely low space requirement.



Type WH 29 3N oil-free piston compressor, directly driven with shaftless 325 kW motor, and maximum volume flow of 1,800 m^3/h (at 40 bar)

Half-load/full-load control as standard

The W-series piston machines are double-acting: two suction and compression cycles are performed per revolution. They are also easy to control, even with the basic version, because they can be operated half load (50 % of full load) by means of unloading suction valves without reducing efficiency. As they are are optimally balanced and can be supplied on anti-vibration mounts there is no need for a special foundation. And the precision guidance of the piston and piston rod according to the crosshead principle makes for an extremely long compressor service life.

Energy-efficient, frequency-controlled drive with PLC

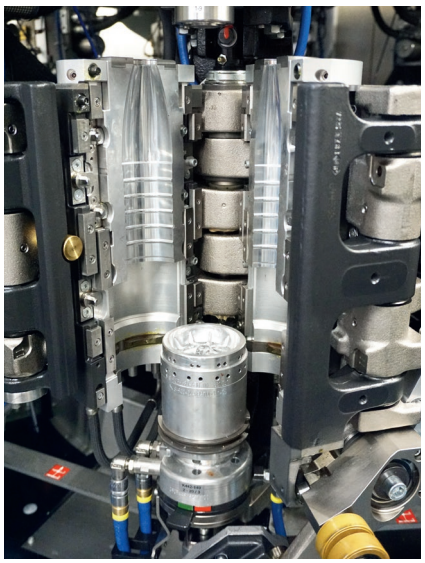
Gropper opted for an even more efficient W-series version with frequency-controlled drive. The piston compressor has a very large control range from 530 to 1,800 m^3/h (30 to 100 %), so that smaller quantities or lighter PET bottles can be produced equally as efficiently (although the plant mainly fills 0.9 to 1.35 litre containers they also fill 0.33 litre bottles). At the same time, there are hardly any off-load losses, as the pressure can be kept constant over a very narrow pressure range.

The system is controlled via a Siemens S7 PLC, programmed by Gardner Denver, which controls the compressor according to demand (with the network pressure as the reference variable). In addition, the pressure can be specifically reduced below 30 bar if lighter bottles are being produced. This also helps to ensure economical, demand-based compressed air generation.

The compressed air experts at Gardner Denver were tasked with the design of both the compressor and the controller. They worked on this together with Claus Meyer, Electrical Engineering Planner at Gropper. They also planned the user interface, which displays the operating states of the plant – which also includes an energy-saving refrigerant dryer with scroll compressor from the Gardner Denver range.

Turnkey systems with highly-efficient cooling

The cooling water for the Belliss & Morcom compressor is provided by a system which was also designed by Gardner Denver. A redundant arrangement of two energy saving pumps with just 5.5 kW of drive power (with a cooling power of 300 kW) is installed on a skid. An energy-saving roof-top cooler takes care of cooling with speed-controlled fans driven via modern



The thumb-sized preforms are "blown up" with a pressure of up to 40 bar.

Bottling plant for not-from-concentrate juices at the new plant of the Gropper group of companies in Stockach

EC motors. These are regulated via the intake temperature and thereby adjust their power to the outside temperature. An automatic summer/winter control adjusts the intake temperature to the current climatic conditions.

Heat recovery: optimum integration in the process

The optimum integration of the compressor in the temperature-controlled processes is crucial for the efficiency of compressed air generation. The system in-Stockach ensures optimum conditions for this, as the entire plant was planned and built from scratch. Berthold Burgmeier: "The compression of the air produces waste heat, which we use for other processes." Therefore, along with the piston machine, Gardner Denver supplied a heat exchanger. The volume flow can be adjusted via a control valve so that the discharge temperature is kept as high as possible, i. e., at approximately 50 °C.

The key component for heat recovery is a water tank with a capacity of 10 m^3, which can be used as a source of hot water or, as an energy reservoir via the heat exchanger. Both the cooling circuit and the heat recovery are also controlled via central PLC of the compressed air station.

High availability

The Belliss & Morcom machine is connected to the general 7 bar plant network at the Stockach plant via a pressure reducer, so that it can also feed into this network in the event of an emergency. The 40 bar network is also redundantly designed: soon, Gardner Denver will be installing a second piston compressor of the same type together with the second bottling line at the Stockach plant. This will act as a backup system to safeguard the compressed air supply for the PET bottle production, and also supply sufficient air for future expansions.

Robert Kupka and Dirk Tenbrink, Key Account, Gardner Denver, plus Berthold Burgmeier, Gropper, in front of the new Belliss & Morcom piston compressor WH 29 H3N at Stockach

Gardner Denver

HIGH PRESSURE SOLUTIONS

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