



CASE STUDY
D37HRS – PureAir

The most economic configuration for oil-free compressed air generation

An innovative PureAir machine enhances piston compressors' effectiveness

The compressed air stations at the Früh brewery, renowned far beyond the Rheinland for its Kölsch beer, rely on two oil-free CompAir compressors: a piston compressor from the Champion series, which is used in many breweries, and a regulated-speed PureAir machine, which works based on an innovative compression principle. Both compressors were selected and installed by Hermann Mönnichs Drucklufttechnik GmbH who have been working with Früh since 1972.

Application details

As you approach the Cölner Hofbräu P. Josef Früh KG premises, it soon becomes clear that the popularity of Kölsch beer extends well beyond its home town. The vast amount of beer brewed on the 100,000 m² site is far too much to be drunk by the residents of Cologne alone.

Früh Kölsch is actually a nationwide brand sold through large chain stores and specialist beverage wholesalers. Thanks to its fresh taste, the top-fermented full-strength beer is enjoyed even abroad. The brewery, which was founded in 1904, was situated right next to Cologne Cathedral for more

Overview

▶ Client

Cölner Hofbräu P. Josef Früh KG

▶ Location

Cologne, Germany

▶ Application

Oil-free compressed air for a bottling plant

▶ Product

As a peak load compressor, the regulated-speed oil-free D37H RS compressor supplements 4 fixed-speed oil-free compressors

▶ Customer Benefits

Optimum combination of unregulated base load machines with a regulated-speed peak load machine for demand-based, high-quality and oil-free compressed air



The Fröh brewery produces around 365,000 hectolitres of Kölsch per year – with the highest hygiene standards.

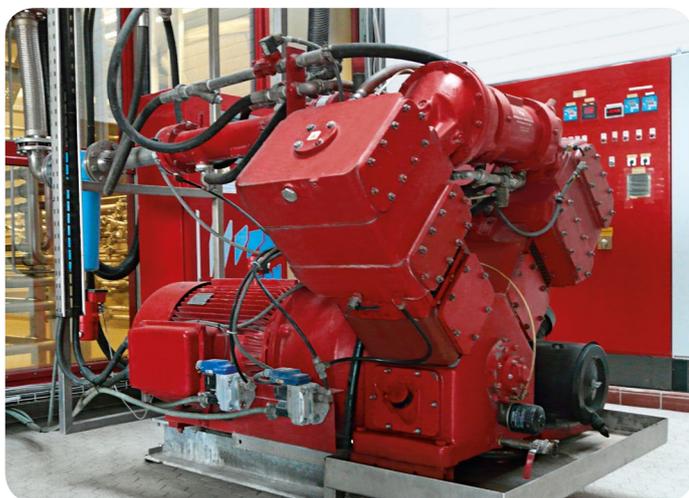
than eighty years. In 1987, the company relocated to the north of the city, where a modern, large-scale brewery was set up, which brews around 365,000 hectolitres of Fröh Kölsch each year. After further construction work, a second bottle filling line was commissioned in 2006. This fills up to 35,000 bottles per hour.

Stringent hygiene standards

The brewery's extremely high hygiene standards play an essential role in the excellent quality of its beer. "Instead of using thermal treatment, we use purely mechanical, energy-efficient and gentle membrane filtration prior to bottling," says engineer Axel Spelzhaus, Head of Production Engineering at Fröh Kölsch. Membrane filtration requires hygienically flawless processes – no contamination may enter any part of the brewing process, including via the compressed air. That is why Fröh only ever uses oil-free compressed air generation with central treatment and – where necessary – decentralised sterile filtration.

The compressed air is generated in a central station, which was originally designed in the 1980s to house four fixed-speed oil-free piston compressors. In 2001, the compressed air system was extended to include a 55-kW CompAir Champion piston compressor painted in the brewery's signature red.

Proven and efficient: since 2001, an oil-free piston compressor from the Champion series has been used in the central compressed air station.



Economic base load generation using a Champion piston compressor

As of 2004, those in charge at the brewery continued to optimise the compressed air network. The targets were set by carrying out regular compressed air audits. "In 2006, we installed a combined control system and replaced a piston compressor with a regulated-speed screw compressor. This configuration enabled the network pressure to be lowered and the load/off-load performance of the piston compressors to be optimised. The controller was programmed to rely primarily on the Champion compressor as it is the most effective machine among our base load compressors," says Axel Spelzhaus.

What makes the Champion compressor so effective is its two-stage operation. During the first stage, a pressure of approximately 2.5 bar is created. Then the air flows through an intermediate cooler and is compressed to 7 bar during the second compression stage. The compressors can also operate at full and half load: in the case of half load, the pistons only compress upwards; at full load, they compress both upwards and downwards. The system is characterised by a high level of efficiency, even at half load when energy consumption is 53%. This method of operation enables a narrow pressure range to be achieved, which would otherwise only be possible with regulated-speed compressors.

Around 365,000 hectolitres of Fröh Kölsch is bottled and filled into barrels in one of the most modern bottling plants in Europe.



With new piston ring and valve materials, the series offers clean guidance of the pistons in cross-heads to allow long service life with low wear.

A precise overview of compressed air costs

An excellent set of metrics supported the brewery's decision to improve its compressed air generation. "We always record the compressed air energy consumption and the volume flow generated. This gives us a precise overview of the compressed air costs and enables us to carry out targeted optimisation measures."

The logical extension of the fixed-speed oil-free compressors was a regulated-speed oil-free compressor for use as a peak load machine. Früh had acquired one in 2006 but was not satisfied with its high maintenance costs and subpar reliability.

PureAir: oil-free compressed air generation with water as the coolant

Compressed air specialists at Hermann Monnichs GmbH, Früh's trusted advisors since 1972, therefore recommended the purchase of a PureAir compressor from CompAir in 2013. This series provides oil-free compression and works based on a special compression principle, whereby a bronze alloy screw and a pair of gate rotors made of carbon fibre reinforced plastic compress the air. As there is no metal contact, the compressor does not need any oil as a lubricant, coolant or sealing medium. Water is injected as a coolant. The resulting conditions support very low compression temperatures,

Old and new stand side-by-side in Früh's compressed air station: Champion piston compressor (right) and regulated-speed PureAir compressor.



The PureAir D37HRS generates oil-free compressed air based on an innovative and highly efficient operating principle.

which in turn lead to compression that is almost isothermal with low energy consumption.

This machine – a PureAir D37HRS – was integrated into the compressed air station and has since operated to the satisfaction of Früh management. Was there any doubt about implementing the as yet uncommon compression principle? Axel Spelzhaus: "No. We trust the technology from CompAir and have relied on Monnich's advice for more than 40 years. We didn't hesitate. And the results speak for themselves: the machine works perfectly."

Axel Spelzhaus, Head of Production Engineering at Früh Kölsch (left) and Mark Mönichs, Managing Director of Hermann Mönichs Drucklufttechnik GmbH, who have been taking care of Früh Kölsch for two generations now.



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Your benefits at a glance

- ▶ Single-stage, direct-driven compression element maximises efficiency and minimises maintenance
- ▶ High-quality water injection lubricates, cools and seals the compression process, maximising efficiency
- ▶ Guaranteed pure, oil-free compressed air generation – without downstream compressed air treatment
- ▶ The speed regulation adjusts the volume supplied and the energy consumption to suit the compressed air demand

Continuous energy efficiency optimisation

Optimising the energy required for compressed air generation is a key task for Axel Spelzhaus, as the compressed air station accounts for 10% of the brewery's entire electricity consumption. Compressed air aside, Früh also goes to great lengths to continually increase energy efficiency during operation. In the brewhouse, the utilisation of waste heat has been optimised, and the power of the cooling devices now automatically adjusts to suit the actual demand and the prevailing weather conditions.

Also, three years ago the brewery commissioned its own CHP, which produces 20% of the brewery's electricity while simultaneously supplying steam and heat. "Working together

with the production managers, the process flows are constantly tested, and data is collected and evaluated with the aim of making production as energy efficient as possible. Thanks to our process control system, energy generation and production can be linked with one another. And our ISO 50001-certified energy management system, which we introduced in 2015, brings it all together," comments Axel Spelzhaus. The company therefore still has some work to do before they have fully optimised their compressed air generation. One of their next steps is to install a new combined control system. "The optimum interplay of compressors plays a key role in achieving the most economical compressor station configuration – and creating outsize compressed air efficiency gains," says industrial engineer Mark Mönnichs, Managing Director of Hermann Mönnichs Drucklufttechnik GmbH.