Say goodbye to high energy costs for good

Speed-controlled compressors with integrated heat recovery find their place in a winery

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Huge potential for saving energy lies untapped in many companies' compressed air networks. This form of energy, which is used in almost every production plant, is amongst the most expensive there is – and the F. W. Langguth Erben winery in Traben-Trarbach on the River Moselle is no exception. The company's long-serving compressors were wasting huge amounts of energy. To become more sustainable and more cost effective, the winery decided to upgrade to two speed-controlled screw compressors with direct drive and integrated heat recovery. As a result, Langguth Erben has now cut its energy costs by around €34 000 a year.

One of Germany's most scenic wine regions can be found between Trier and Koblenz in the Central Moselle valley and at its heart lies the sleepy town of Traben-Trarbach. North of the town, the Mont Royal hill juts out into the River Moselle. Here, above the vineyards, is the F. W. Langguth Erben GmbH & Co. KG winery, whose wealth of experience makes it one of the biggest players in the European wine-making market. Its most popular wines include the Erben table wine range, the Erben original range with its classic bouquet and the Erben exclusive range, a real treat to wine enthusiasts. "In an average year, we bottle around 40 000 000 litres of wine," says Heinz Blümling, winery manager at F. W. Langguth Erben. During production the company is particularly keen to use efficient process technology. "Especially now as energy prices never seem to stop rising, sustainable production is very important for us," says Blümling. And the winery's management team quickly agreed that the key to low energy costs is to plan your compressed air systems well. Langguth Erben mainly uses compressed air as operating air, for example to control valves and sometimes for bottling too.

Old equipment resulted in high costs

"We used to have two oil-lubricated screw compressors with loaded / idle mode control for the compressed air supply," says Blümling. They had been in use for 15 and 35 years respectively. "We were having to maintain the older one, which was close to retirement, more and more frequently," he adds. "And it was becoming uneconomical." On top of that, to keep the compressed air oil-free, each compressor had its own preparation chain of cyclone, pre-filter, dryer, after-filter and active carbon filter and these components were being fully loaded at all times. "This all consumed huge amounts of energy because the compressors ran at full output at all times and there were huge pressure losses in the lines," explains the winery manager. "The experts at Almig came to talk to us about our ancient technology. Because we wanted to drastically cut our energy costs, they produced a compressed air analysis for us."
Avoiding idling periods

Almig took numerous measurements in both the high- and low-load phase. "We analysed the different operating periods to find out where and when different consumption levels were occurring," explains Markus Steckmeier, the Rhine-Main-Saar regional manager for Almig. It quickly became clear that huge amounts of energy could be saved by avoiding idling periods, permanent load cycles and the higher compression levels these bring. "With 500 000 to 600 000 load cycles a year, this soon translates into a huge amount of energy," says Steckmeier. "We calculated that the old compressors were very wasteful." The compressed air experts guaranteed big savings.

During production the F. W. Langguth Erben winery is particularly keen to ensure energy efficiency

Various solutions were discussed but speed-controlled, directly driven compressors soon proved the favourites. "These are the most energy-efficient. Compared with compressors with loaded / idle mode control, they use around 30 % less energy," explains Steckmeier. Following an in-depth discussion, the winery opted for two screw compressors from the VARIABLE 55 series. "These oil-injected screw compressors are fitted in the factory with heat exchangers and water control valves to warm heating water up to 70 °C," says the Almig engineer. The new systems can be controlled to between 2.2 and 10 m³/min, meaning they offer a capacity of 20 m³/min. The 15-year-old piston compressor system which is still being used adds another 4 m³/min. The operating pressure is between 5 – 13 bar. "At peak times, the amount of compressed air required in the winery can reach 16 m³/min," says Steckmeier. "And our solution can easily cope with that."

Almig’s Control 3 is used to control the speed-controlled compressors in the network. Older, contactor-controlled or third-party compressors, which may be speed-controlled, for example, can also be connected to this control with a module. "This synchronises the two new systems and the old compressor, enabling us to tap into the full energy efficiency of speed control because we only produce the amount of pressure we actually need," explains Steckmeier. This pressure is kept constant. If consumption increases to the maximum limit, the second compressor is activated. A speed reserve is maintained to avoid fluctuations in pressure caused by the compressors being activated and deactivated. In the main load phase, i.e. the main production time, both systems run in synch at the same speed. In the low-load phase, when less is being produced or at the weekends, just one compressor runs. This is automatically adapted to the consumption profile. The VARIABLE runs at all times even if little compressed air is required. Since the machines are in the mid speed range, both the energy requirement and noise emissions are lower. The components are also subject to lower loads which impacts positively on the compressors’ service life.

Oil-free and dry compressed air

"Oil-free and dry compressed air is crucial to production," says Blümling. But the former quality levels were fine because the product didn’t come into direct contact with the compressed air during bottling. This explains why the company opted not to switch over to say an active carbon absorber or oil-free production. "The new systems are fitted with a sub-microfilter and two active carbon filters as standard. The second active carbon filter is for back-up only," explains Steckmeier. A refrigeration dryer is also integrated in a separate housing in this series. The parameters of this refrigeration dryer are tailored to the system in question. "One benefit is that the refrigeration dryer is kept separate from the compressor’s hot zone," says Steckmeier. "So there is no refrigerator effect in the hot zone."

The compressed air first enters a manifold with a large cross-section and surface area, where it is cooled further and the free condensate precipitated. The compressed air is then prepared using the pre-filter, refrigeration dryer, and fine and active carbon filters.
New solution delivered in two weeks

"The whole system had to be updated during the company holidays," remembers Steckmeier. "So we only had two weeks." But that was all it took for the Almig staff to remove the old system and the piping and ventilation ducts no longer needed, erect the new equipment, deliver and install the new piping, adapt the ventilation ducts and sort out the ventilation system. The old piston compressor system kept the plant ticking over during the work.

Almig took various measurements during the project. "At the start we used a fixed consumption profile to calculate a compressed air cost of 1.989 cents per m³ of compressed air with the old systems. A comparative measurement showed that the consumption profile had changed - and not in our favour," says Steckmeier. The old consumption profile contained a very distinct phase with average output. The comparative measurement with the new systems suddenly displayed one long and one short high-load phase during the day shift and very low minimum consumption during the night shift. "Despite this we managed to reduce our energy or compressed air costs to 1.286 cents per m³," says Steckmeier with a smile. The new system minimises losses from leaks and drainage, while the process has been optimised too. Although the low-load phase lasts for a longer period and the compressors don’t run at the optimum operating point, this doesn’t have a negative impact on the overall energy balance.

Two and a half year payback

Thanks to the new compressors, the winery has now saved around €23,000 in energy costs. Heat recovery will deliver additional savings of around €11,000. The total investment amounted to around €80,000. Taking into account the reduced energy costs and heat recovery, the new compressors will have paid off in less than two and a half years. Added to this is the fact that the new systems will be much cheaper to maintain as the V-belt drives are totally maintenance-free. The new systems also have external oil separating cartridges, making major assembly work on the oil receiver covers unnecessary.

The normal maintenance interval for these compressors is 4,000 operating hours. The controls are fitted with a balancing monitoring system as standard. Service technicians, but also Langguth-Erben staff, can follow the performance of the last few days or weeks of operation and see the compressors’ utilisation rate and whether there is still a reserve remaining. "If we find that the operating circumstances have changed considerably, Langguth Erben can respond immediately," says Steckmeier.

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