Application report

Economical compressed air drying in the automotive sector

Industry:	Automotive
Customer/Location/Year:	GF Automotive, Singen (Germany), 2016
Use of compressed air:	Conveyor air, control air
Installed products:	DRYPOINT RA eco

Sand is the worst enemy of any vehicle transmission. On the other hand, many automotive components such as trailing arms, chassis parts, bearings and transmission housings are literally made in sand, for instance through sand and other casting methods. Dry compressed air plays an important role in automotive production – be it as a reliable transport or as a process medium. Optimized and economical compressed air drying is therefore crucial. For instance, at the GF Automotive plant in Singen.

The seven compressors of GF Automotive push up to 300 cubic meters of compressed air per minute into the compressed air system at the Singen plant. This factory is one of the largest production facilities of GF Automotive, an international division of the listed industrial corporation Georg Fischer AG.

GF Automotive is a leading manufacturer of iron and light metal cast components for transmissions, chassis and body parts for commercial vehicles and passenger cars. The company designs, produces and machines highly stress-resistant lightweight components for car manufacturers and other automotive suppliers. GF products are also found in industrial machinery and consumer products. Among its main production methods are aluminum and magnesium die casting as well as iron sand casting.

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At its main factory in Singen, GF Automotive employs around 1000 people who produce mainly spheroidal graphite (cast) iron components for trucks and passenger cars, including trailing arms, pivot bearings, steering and transmission housings, selector forks, brake calipers, differential housings and car chassis parts. With an annual production capacity of 200,000 tons, the company uses hundreds of tons of sand per day, which is recycled.

Dry compressed air as a transport and process medium

The sand is used to produce the moulds in the factory's huge casting plants. These plants work with sand moulds also known as lost moulds, which means that the moulds are destroyed when the cast parts are removed. The sand is then cooled and recycled so that it can be mixed with new sand and used again in the next mould.

The mountains of sand stored at GF Automotive are of course not moved around with shovels and wheelbarrows. New sand is delivered by rail and pump from the rail cars directly into the factory's silos and from where it is eventually transferred to the die-casting plants. For the sand transports from the rail cars to the silo and on to the sand mould plant, GF Automotive uses dry compressed air, as excessive moisture would lead to lumps in the sand, hampering transport or even clogging up the lines.

Equally sensitive to moisture is the second main application of compressed air at GF Automotive, namely the operation of control valves and other pneumatic components in the die casting machines. Compressed air is also used after the casting process is completed to break away the compacted sand from the finished casts. In this process, a lot of dust is produced, and excessive moisture in the air would quickly destroy the valves and pneumatic equipment.

Compressed air demand: a story of highs and lows

For its two main compressed air applications, GF Automotive depends on air that is perfectly dried to a specified degree – irrespective of the actual operating conditions.

The reliable provision of compressed air that meets such stringent requirements is a high task. As the GF Automotive plant is in operation round the clock in three shifts, the demand for compressed air can vary greatly between day and night, and from busy to less busy shifts. Given the huge fluctuations in demand, achieving a consistent compressed air quality and degree of dryness is a real challenge. In its specifications for the new compressed air system, GF Automotive therefore put reliable high performance and energy-efficient drying at the top of its list of priorities. Energy that is not consumed is energy saved.

BEKO TECHNOLOGIES' DRYPOINT RA eco refrigeration dryers eventually won over GF Automotive and are now in operation for about a year at the Singen factory. From the start, GF Automotive was particularly impressed with the technical concept behind the DRYPOINT RA eco.

Refrigeration drying is the most efficient drying method for compressed air. Conventional refrigeration dryers are dimensioned based on maximum demand. In the real world, the volume flow as well as the temperature and pressure are however subject to great fluctuations, so that conventional dryers consume more energy than is required. And this quickly adds up to huge unnecessary costs.

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In contrast, the refrigeration dryers of the DRYPOINT RA eco series from BEKO TECHNOLOGIES are able to respond instantly to changing demands. From peak loads to tiny volumes – the DRYPOINT RA eco refrigeration dryers process only the compressed air that is actually required. These units are available in two sizes. For volume flows below 1000 m³ per hour, the DRYPOINT RA eco functions as a cycling dryer where the refrigeration compressor is switched off and on, based on demand.

For volume flows from 1000 m³ per hour upwards, the DRYPOINT RA eco combines frequency control of the refrigeration compressor with cycling operation. At these high output rates, the fan is also frequency-controlled, resulting in optimized dryer performance combined with lowest possible energy consumption. This control logic also ensures that the units can be switched within seconds from high to low delivery and vice versa.

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The DRYPOINT RA eco is currently the only refrigeration dryer in the market that offers this clever combination of frequency control and cycling system technology."

Significantly lower operating costs

Thanks to its advanced technical features, the pressure loss, compressed air loss and energy consumption of the DRYPOINT RA eco are much lower than with a conventional refrigeration dryer. GF Automotive thus saves money, as the performance of the unit is optimized at all times, even as compressed air demand fluctuates and ambient conditions change.

In the partial load range, the DRYPOINT RA eco can be run at less than half the cost of a conventional refrigeration dryer. Companies can thus meet their ecological targets and at the same time minimize their costs without having to compromise on dryer performance.

In the DRYPOINT RA eco, the air is dried in a counter-flow process with optimized heat exchange along the entire process path, whereby the downward flow of the air is not obstructed in any way. The heat exchanger cools the compressed air to a temperature of around 3° C. The size and design of the heat exchanger promotes effective cooling while minimizing flow resistance.

GF Automotive also liked the fact that the DRYPOINT RA eco is available with a water-cooled tube bundle heat exchanger (TBH). Given the high dust con-centration in the ambient air at the GF Automotive plant, water cooling is clearly preferable to air cooling.

Reducing refrigerant by a third while slashing GWP in half

The new DRYPOINT RA eco from BEKO TECHNOLOGIES was installed at the GF Automotive factory in early 2016 and serves two die casting plants. It replaces an outdated refrigeration dryer unit and is just one of many products from BEKO TECHNOLOGIES found in the factory in Singen.

This upgrade was not only a smart move with regard to costs and performance, it also helps protect resources, as the DRYPOINT RA eco uses only 20 kilos of refrigerant, which is three times less than was previously used with the old unit. With a Global Warming Potential (GWP) of as little as 1774, the effect of the new refrigeration dryer on climate change is less than half that of its predecessor.

The financial wizards at GF Automotive quickly worked out that the DRYPOINT RA eco was a smart investment, despite the slightly higher initial price. They based their decision on the lifetime costs of the unit, and that is where the DRYPOINT RA eco beats all other comparable systems hands down. Thanks to the intelligent combination of cycling technology and frequency control of the refrigeration controller, the long-term energy savings far outweigh the higher investment costs, resulting in a quick ROI. And the DRYPOINT RA eco keeps on saving, while protecting the environment. It's a perfect win-win situation.

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