



Quantima Compressor at the John Deere Factory in Mannheim

Perfectly regulated: Quantima saves more than € 120,000 in energy costs each year

Anyone supplying tractors from Germany to the rest of the world has to have a very efficient production process. Energy costs at the John Deere factory in Mannheim, which produces well over 30,000 tractors each year, are therefore closely scrutinised. The factory has a sophisticated energy management system, so that it is possible to measure the cost of the seven compressors in the compressed air station. Since installing a CompAir Quantima compressor, the factory has saved around 13% of its annual primary energy costs for power to generate compressed air.

Customer

John Deere GmbH & Co.KG
John-Deere-Strasse 90
D-68163 Mannheim

Product range

at the Mannheim branch: various types of tractor with power ratings from 125 to 240 kW

Aim of Project

Acquiring a variable peak load compressor, reduce idle times, increasing efficiency, energy costs savings

Compressed air station before

6.5 bar factory air network at a rate of up to 350 m³/min; a smaller speed-regulated screw compressor for weekend shifts

Compressed air station neu

Replacement of the old factory air network by the Quantima Q-52 speed-regulated turbo compressor by CompAir

Green is the dominant colour at the John Deere factory in Mannheim. – The green light for highly efficient production. A total of 3000 employees produce various types of tractor with power ratings from 125 to 240 kW for the global market. The tractor factory in Mannheim is the largest tractor production site outside the USA and accounts for around two thirds of the tractors exported from Germany.

A tradition of sustainable production

As a manufacturer of products that work at the interface between nature and technology, John Deere also strives to implement sustainable and energy-efficient production processes. When it comes to the compressed air used as production air throughout the Mannheim factory, the company places a high value on an optimum ratio between energy consumption and generated air when operating the compressor station.

The volume of compressed air needed in the factory is large, in part as a consequence of the extensive vertical range of manufacturing. The central compressed air station is well-equipped to meet that need. Until just over a year ago, six turbo compressors were feeding the 6.5 bar factory air network at a rate of up to 350 m³/min and an additional smaller speed-regulated screw compressor was in use for weekend shifts.



The Quantima Q-52 in the compressed air station at John Deere in Mannheim.



only consumes around 7kW when running idle. There are additional benefits too, including: limited wear, no gear losses so that power consumption is only approx. 2.5% at idle for a 300kW power rating, no oil lubrication and low maintenance costs. The unique compression principle also ensures a consistently high level of efficiency over a large range of speeds, including under partial load.

Turbo compressors are economical – with one limitation

Turbo compressors are the most economical way to generate large quantities of compressed air, but on one condition – the volume required has to be relatively constant. Helmut Rembert, Senior Facilities Engineer at the John Deere factory in Mannheim: “Once the turbo compressors are switched off, you have to wait at least twenty minutes for them to start up again. If you want flexibility, you have to run them idle from time to time. But that is not energy-efficient, because they still consume more than a third of the power they would consume under full load, even though they are not generating any compressed air at all.”

Objective – reduce idle time

As the volume of compressed air that is needed varies dramatically, it was essential to minimise idle times to increase the efficiency of the compressor station.

Helmut Rembert explains what that means in practice: “Our aim was to acquire an additional, variable peak load compressor that switches on and off flexibly and so keeps the idle time of the turbo compressor as close to zero as possible.”

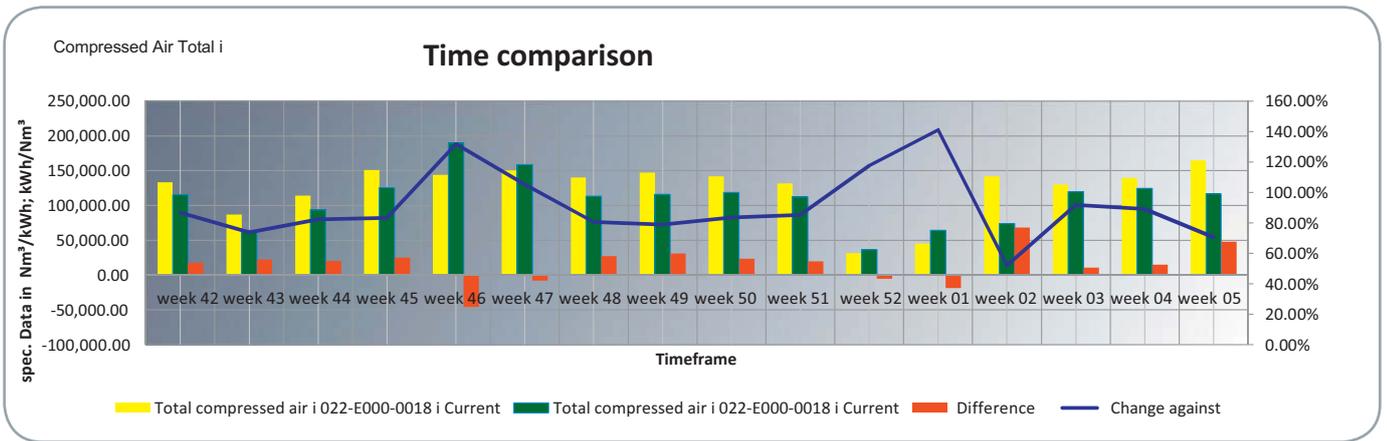
A traditional turbo compressor was therefore out of the question. The search was on for a compressor that would generate as much compressed air as possible with no oil, at variable speed and without gears – and that could be integrated into the existing compressed air station. The managers looked around on the market and quickly homed in on the Quantima compressors from CompAir thanks to their unique design. A speed-regulated high-speed electric motor drives a rotor shaft linked to an impeller at each end. The only moving part, the rotor shaft, is managed with no contact using adaptive magnetic bearings – dispensing with gears and rolling contact bearings. The new drive technology means that the entire system

A boost for efficiency

The Quantima range includes models with outputs from 26 to 71 m³/min and power ratings from 150 to 300kW. John Deere chose a Quantima Q-52 to replace the oldest turbo compressor in the existing compressed air network.

It was very quickly and clearly apparent that the decision had been the right one. The facility management department at the factory has a comprehensive energy management system that measures the power consumption of every machine and system as well as the volume supplied by each compressor – all in real time.

The graphics Helmut Rembert views on his computer clearly show that the ratio of power consumption to the volume of compressed air generated by the Quantima compressor is very favourable. However, the impact of integrating the Quantima Q-52 speed-regulated turbo compressor into the compressor station as a whole is



In concrete figures, a comparison of the energy and compressed air consumption diagrams before and after installation of the Quantima shows savings of 13 % of the energy costs for the overall compressed air station. Calculated over one year, that means energy savings of around €123,000.

even greater. The additional, variable turbo compressor effectively reduces the idle times of the geared turbos and therefore significantly lowers the total energy consumed by the station.

The efficiency gain for the entire compressed air station of 13 % means that the investment pays for itself within approx. 14–15 months

In concrete figures, a comparison of the energy and compressed air consumption diagrams before and after installation of the Quantima shows savings of 13 % of the energy costs for the overall compressed air station. Rembert: “Calculated over one year, that means energy savings of around € 123,000.”

The savings are mainly due to the fact that the idle times of the geared turbo compressors have been significantly reduced and that all the compressors can now be operated closer to their design point and

within their control range. Thanks to these savings, the investment in the new innovative compressor technology quickly pays for itself. The outcome confirms the positive effects of long-term management focused on all the costs over the life of machines and systems.

Summary: efficiency and transparency pay for themselves

This case shows not only just how efficient Quantima compressors are thanks to their special drive and compression design, but also how important it is to have an optimum combination of base load units and variable units. The degree of transparency that can be achieved when comprehensive energy management principles are applied is also remarkable. Helmut Rembert does not have to perform calculations or measurements to evaluate the efficiency of individual compressors or sections of the factory – or to identify trends in energy consumption. The

efficiency of the Quantima compressors – the ratio of power consumption to generated compressed air – can also be read off the screen in real time.

This case shows how efficiency can be increased and emissions reduced during ongoing production thanks to consistently sustainable management.



Helmut Rembert (right), Senior Facilities Engineer at the John Deere factory in Mannheim, and Norbert Nitsche, CompAir Key Account Manager.



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Helmut Rembert, Senior Facilities Engineer





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