

CASE STUDY

L 75 RS plus CDT

Project overview

- ▶ **User**
Petrochemical company
- ▶ **Usage site**
Location in North Germany with around 400 staff
- ▶ **Application**
Compressed air as dry working air
- ▶ **Product**
3 speed-regulated, lubricated rotary screw compressors L 75 RS plus
2 hybrid dryer CDT
- ▶ **Energy cost savings**

Rotary screw compressor	- 10,300 €/a
Hybrid dryer	- 12,200 €/a
Differential pressure	- 2,500 €/a
Total	- 25,000 €/a

(Model calculation: compared with a fix speed rotary screw compressor with integrated refrigerant dryer and downstream desiccant dryer)



Thorsten Bockelmann, Technical Director of Unimatic GmbH in the compressed air station planned by Unimatic.

Dry compressed air for the petrochemical industry

New compressed air station: Fine-tuning for energy savings

Most chemical companies operate in a very energy-conscious way and set themselves clear goals with regard to continuous energy savings – the production of compressed air is a vital part of this. Using this as a prerequisite, Unimatic GmbH planned a new compressed air station for a North German petrochemical company with three, speed-regulated rotary screw compressors and a dryer combination by CompAir specifically with energy saving in mind.

The company employs around 400 staff and processes a wide range of refinery products into high-grade raw materials and additives, which are used amongst others, for the chemical industry, in addition to pharmaceuticals and consumer goods production.

Working air for a wide range of tasks

The extensive area with direct rail and port connections has two compressed air networks. One supplies the pneumatic valves and control elements with instrument air (i-air). The other provides working air – w-air for short – for various applications.

Since the compressor hall, in which the working air has been produced, needs to be used for other purposes, those responsible decided to invest in a new, energy-saving compressed air station and commissioned Unimatic GmbH with the development. Unimatic is already managing the production and preparation of compressed air for the user at another site.

Compressors: High efficiency across a large control range

Unimatic not only specialises in these kinds of tasks but also in the planning of pneumatic and electrical automation technology facilities. The company, which has worked with CompAir in the area of compressed air technology for many years, also brings with it the relevant application expertise.

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The Unimatic engineers decided to use three, speed-regulated L 75 RS type lubricated CompAir rotary screw compressors with a producible volume flow of 2.4 - 13.5 m³/min. Thorsten Bockelmann, Technical Director at Unimatic GmbH: "These compressors work across a wide speed range and are highly efficient. Therefore, two compressors can each run well at half load and produce compressed air to meet demand. The otherwise conventional cascading is not necessary." Another advantage of the machines is that they do not require much maintenance.

One reason for the energy-saving operation of the L-Series is the highly-efficient electric motor of the compressor stage, which is manufactured in the modern CompAir factory in Simmern/Hunsrück. The electronic DELCOS XL controller enables the efficient monitoring of the operating parameters and a continuous adjustment of demand and supply quantity.

The three compressors are cooled using water from the company's own spring; the water is also used for various other cooling purposes. This application also shows that a precise analysis of the individual compressed air requirements is necessary in order to decide which compressor technology represents the most favourable lifetime costs.

Dryer: Innovative hybrid technology

The working air requirement of the chemical company is intermittent. It is therefore even more important that all required air is produced cost-effectively. The three compressors with two hybrid dryers fulfil this requirement. The chemical company is one of the first users of the innovative CDT compressed air dryers by CompAir. They have a refrigerant and desiccant dryer combined in one compact housing; in terms of control technology they are connected in such a way that the quality of compressed air required is always available.

The untreated, moist compressed air is first fed into the refrigerant dryer via a primary filter. A high proportion of water vapour is removed from the air that is fed in. The air then flows through a very compact desiccant dryer stage with high-performance upstream and downstream filters for the separation of oil, water aerosols and particles. In this phase, the moisture content of the air is reduced to a pressure dew point of at least -40°C.

Model calculation:

Energy usage cleanly halved

The CDT dryers used here are equipped with a bypass pipe to guarantee dew points above zero in summer and below zero in winter, as required. In this case, the dryers can be operated purely as refrigerant dryers or in combination with their desiccant stage, as desired. This switch function and the optimal control, system-related tuning of refrigerant and desiccant drying via the variable temperature and moisture content, saves the user so much energy that the acquisition costs are quickly recovered.

The combined technology of the CDT series provides significantly lower energy consumption values in comparison with conventional heatless and heat regenerated desiccant dryers. Unimatic has proven this during the course of the development.

Thorsten Bockelmann: "In a model calculation of energy consumption, we have compared the combination of CompAir compressor and hybrid dryer with a competitor's rotary screw compressor which has an integrated refrigerant dryer with a downstream desiccant dryer. The quality of the compressed air is identical for both, as is the supply quantity. At 8,000 operating hours and electricity costs of €0.12/kWh, the hybrid dryer incurs processing-related energy costs of around 6,100 euros. For the system with separate refrigerant and desiccant dryers, the costs are 12,200 euros. The user therefore saves 50% of the energy. Added to this are the energy costs resulting from the increased differential pressure. At 0.6 bar, this is also double that of the hybrid dryer. This equates to a further energy cost saving of around 2,500 euros – and the added financial costs of the acquisition are recovered within a short space of time."

Space saving: Containers on the second level

The entire installation is accommodated within a small space in a station which has been constructed over a single-storey building. The compressors and dryers were lifted in using a mobile crane and then Unimatic personnel took over the assembly and pipe work. Since its installation, the station has operated without any problems – and with significantly reduced energy costs.

The basis for the efficiency gains is the safe production of compressed air by the tried-and-tested L-Series rotary screw compressor technology which, at low speeds and comparably minimal heating, operates highly efficiently and thus contributes to a reduction of more than 10,000 euros in electricity costs.