

## Time for Something New – Heat Pump Assisted Condensation Drying

A globally operating manufacturer of bathroom solutions and kitchen fittings replaced the obsolete dryers of their in-house electroplating facilities by systems representing state-of-the-art technology. The new solutions show excellent energy balances while meeting highest quality standards. A government subsidized system with integrated heat pump makes this possible.

The above manufacturer is Grohe of Lahr, Germany, who should be known by almost everyone. The family business founded by Friedrich Grohe has specialised in shower systems, bathroom and kitchen fittings, bathroom ceramics, and water systems ever since it was established. They produce more than six million hand showers, two million shower rail sets, and 800,000 shower systems a year. All articles are surface finished using electrodeposition processes and require subsequent drying. It goes without saying that good quality, stain-free drying, and tight cycle times are highly important. The Black Forest based manufacturer was ahead of their time because they wanted to curtail their energy consumption quite a few years ago. Their obsolete compressed air dryers were no longer in line with their philosophy.

German drying system manufacturer Harter was also ahead of their time when they entered the market with their heat pump assisted condensation drying systems more than 30 years ago. Energy efficiency was a nice-to-have at that time. This has radically changed for reasons known. With some 2,000 dryers primarily installed in Germany, Austria and Switzerland to date Harter could resolve many drying prob-

lems and optimise many processes. Harter customers in Germany, Austria and Switzerland investing in this energy efficient technology may obtain government subsidy.

### Tests as an expedient basis

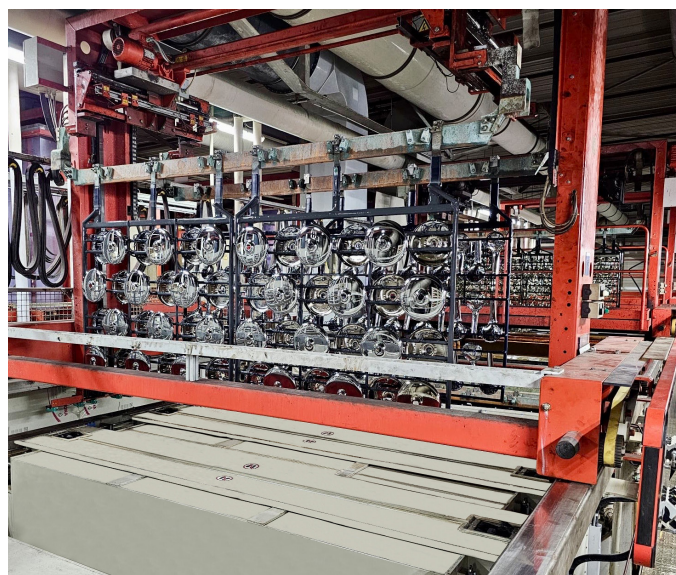
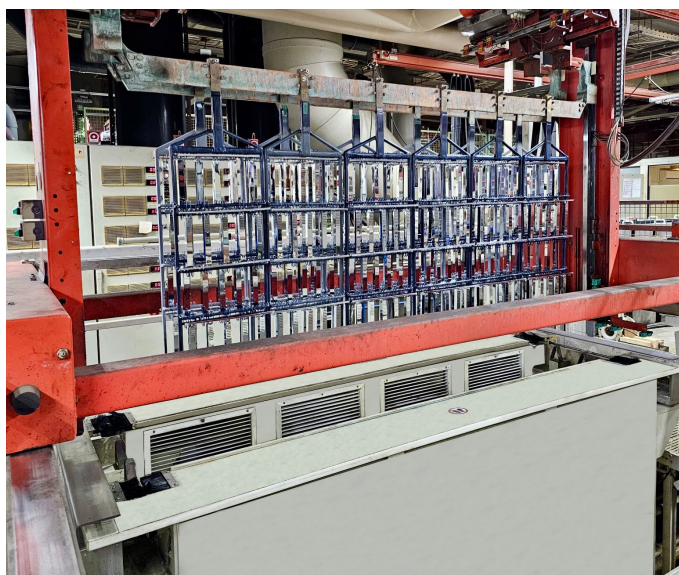
So, Grohe contacted Harter directly at the 2016 O & S fair in Stuttgart, as today's Surface Technology was named at that time. Following a visit to their premises, Grohe accepted Harter's offer to run trials in their test center. *The Test Center is where our ideas are forged*, explains Reinhold Specht, managing owner. *Here we tested the plastic items to be dried for all relevant parameters.* The tests demonstrated that air blowing-off was required to precede drying proper. So, such series of tests always form a reasonable basis for any viable design layout. *Reliability is imperative for us*, says Specht. *The results of the drying tests were excellent. We could satisfy ourselves that Harter's drying worked and how well it worked for our upmarket articles*, reports René Musielik, electroplating department manager of Grohe. In the end, the sanitary items were subjected to air blow-off for two minutes and subsequent drying at 60 °C for eight minutes. Afterwards,

they were completely dry and stain-free. Based on these results, Grohe and Harter together successfully implemented two projects. For the second project, Grohe performed the tests themselves – in a new Harter dryer already installed.

### 80 percent less energy

The two obsolete compressed air blow-off dryers were decommissioned and replaced by a new, energy efficient system. This system consists of two rack dryers and two air blow-off stations made from polypropylene each. The blow-off stations were installed downstream the last rinse. They use non-compressed air.

The dryers feature a movable air knife and swivelling blow-off nozzles. The airflow rate is 9,000 m<sup>3</sup>/h max. The speed of the medium pressure fans is individually controlled by the programme stored to create the required airflow rate for the specific article being dried. Air blow-off is used to remove the better part of the water in items liable to high water entrapment. Harter employs this optional non-compressed air blow-off station to be able to completely dehumidify complex geometries within the specified period.



Harter dryers installed at Grohe ensure excellent drying results for various article geometries and save a lot of energy

# SURFACES

Subsequently, the plastic items placed on carts are moved one after another into the two drying stations. A special feature of Grohe's carts is that they accommodate two racks each which run through all stations together. The dryers feature an air recirculation system with eight fans each. This ensures uniform distribution of air inside the dryer. The special fans create a total airflow rate of 48,000 m<sup>3</sup>/h max. and have a power rating of 0.7 kW. The articles are processed in the drying stations at a temperature of 60 °C for eight minutes to become completely dry and stain-free. The associated heat pump module was installed at some distance from the dryer for space restrictions. The module conditions the required process air and is also responsible for the condensation process. It is connected to the dryer through insulated PPS air ducting. Basically, all dryers and blow-off stations have an automatic lid system integrated. The lids are opened briefly, only for insertion and removal of the material carriers, to retain the precious heat inside the system.

As for energy, changes are also significant. While the compressor for the blow-off station of the obsolete system had a rating of 100 kW alone, the power rating of the new system including air blow-off is a mere 29.8 kW.

## Fast and stain-free

The second Grohe project was about brass and plastic components for water taps plated in turns in their electroplating facility. The existing dryers had also become obsolete and were replaced by rack dryers reflecting the latest state of engineering and energy efficiency. The dryers have twelve air recirculation fans installed each. Harter has come to use ultramodern EC fans. They have a rating of only 0.5 kW and may be continuously speed controlled as required for each article to be dried. Separate blow-off stations were not required for these items

of simple geometries. Still, Harter integrated air knives in the two rack dryers. This may be done to give the operator maximum leeway for future products. Whether air blow-off is provided through integrated air knives or in separate blow-off stations largely depends on the complexity of the items to be dried. For this project, the process air for the two rack dryers was also furnished by a single heat pump module. The cycle time of the line is 3.3 minutes. Items of various designs dried at a temperature of 60 °C become completely dry and stain-free within six minutes maximum. Earlier, the same items used to be still wet after twelve minutes. Again, the energy balance is impressive. Grohe now saves much of their earlier 80 kW power. The rated power of the new technology drying system totals 21 kW.

## Pinpoint drying

There are two factors that govern successful drying with Harter's systems, namely efficient air dehumidification and adequate air routing. Harter employs a physically alternative approach. Extremely dry and, thus, unsaturated air is passed over or through the items to be dried to absorb any humidity present. The air is then stripped, in two stages, of the moisture it carries using the so-called Airgenex® dehumidification technology. The moisture condenses to form water, and the condensate is drained off the system. Subsequently, the cooled air is reheated, again in two stages, using the energy recuperated, and recirculated.

This is a closed air circuit. Drying basically takes place at temperatures between 40 °C and 75 °C, as required for the specific application. As Reinhold Specht emphasizes, it is important to combine dehumidification with pinpoint air routing. Because the driest air is of no avail unless directed to the exact place where it supposed to absorb humidity, he says.

The home-loving drying system manufacturer can resort to a wealth of experience in



Racks holding items to be dried in preliminary condensation drying tests

designing adequate air routing provisions. This is best demonstrated in bulk material applications where Harter's technology is employed for in-container drying. For us, the two projects are a major step into the future. To save so much energy while having excellent drying quality has satisfied all our wishes. The government subsidies topped the two projects off wonderfully, summarizes René Musielik contentedly.

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