

# No Staining Thanks to Condensation Drying

Reduced cost, improved quality, minimized rework – this is what a Hungarian electroplating subcontractor achieved by retrofitting various plating lines installing heat pump based condensation dryers. Germany's biggest chip manufacturer is one of the company's customers

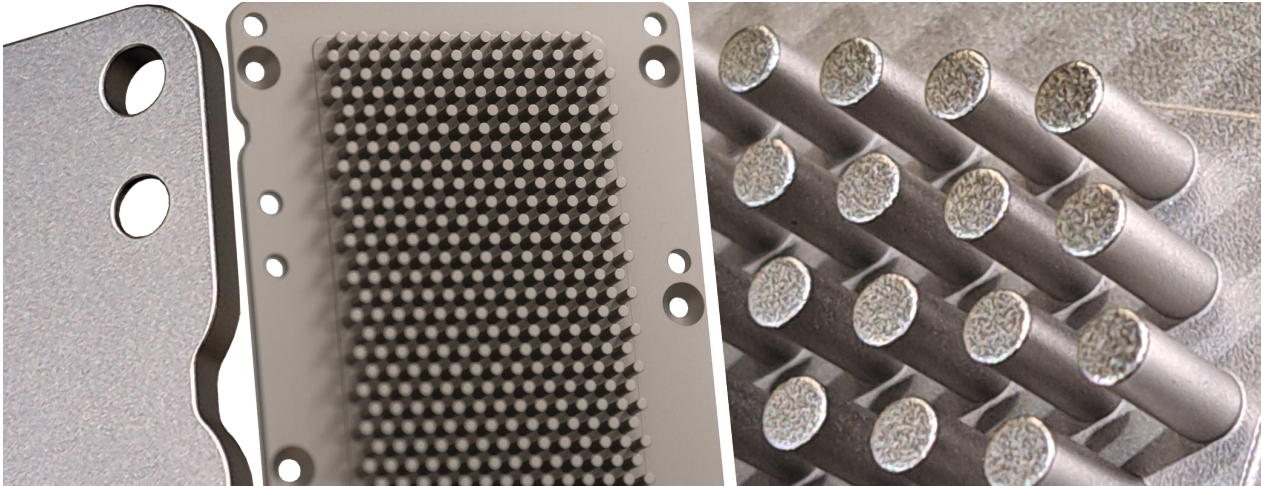


Feszo uses two new plating lines to deposit perfectly solderable nickel plates on components for the power electronic industry.

All electroplating subcontractors are fully aware of the ever rising challenges imposed on industry. The requirement for continuous process optimization has a silver lining though, as so many other things in life. This experience is also shared by Budapest based Feszo Trade Kft. Rising pressure on the Hungarian electroplating subcontractor made the company invest in an alternative drying technology to finally achieve stain-free surfaces. Today,

Feszo can boast excellent results and a good energy balance. The small company has thus secured its foothold on the market.

This alternative drying technique was developed by Harter of Stiefenhofen, Germany, in 1991. "We have long known heat pump based condensation drying because we used to sell Harter sludge dryers in Hungary" reports Zsolt Lambertus, owner and director of Feszo. Drying of waste sludge from electroplating processes is one of



With little energy input, pin-fin components of a renowned chip manufacturer are now dried at about 50 °C for only six minutes to become perfectly dry and stain-free.

drying system manufacturer Harter's principal business activities. Feszó was originally in plant design on the Hungarian market. Enlarging and modernizing its electroplating facility Feszó has now also greatly expanded this field of activity. "When it came to improving our dryers, we knew we would again co-operate with Harter" continues Lambertus.

The relation between Feszó and the German drying system manufacturer Harter dates to the late 1990's. Harter had just put the entirely new heat pump based condensation drying technique on the market. At that time, the technique was exclusively used in sludge drying systems to reduce the weight and volume of filter-pressed sludge by as much as 60 percent. Reinhold Specht, owner and director of Harter, explains: "Considering high disposal cost the cost incurred for transport and disposal may be reduced by a commensurate 60 percent." Sludge drying using this technology was soon in high demand in the whole German-speaking area and was a big success. Reseller Feszó was among the customers in these early days.

Harter advanced their technology within a few years optimizing it for meticulous use in production processes. This marked the birth of the large Airgenex series. From then on, quality problems of electroplating subcontractors or in-house electroplating facilities could also be resolved. Using this gentle and highly efficient (owing to heat pump technology) low temperature process many operators were finally able to manufacture dry and stain-free products – wit-

hin the specified cycle time at that. Meanwhile, Feszó also decided to make new investments in order to continue to meet high customer requirements. "As Feszó had been building electroplating facilities for the Hungarian market for many years we ourselves could take on the planning and design job for the four projects realized so far" says Lambertus. The first dryer was installed in an existing plating line, the following three dryers became part of new lines. And, as in almost every project, Harter subjected OEM items to extensive tests in their in-house pilot plant station. These tests were run to see how the items responded to drying and to determine the parameters for the final solution.

### Stain-free and Energy-saving

All Feszó dryers are rack dryers for components in power electronic applications. Both flat copper plates and special pin-fin base plates are nickel plated for subsequent solder assembly. Then, they are installed in modules for use in motor drives, renewable energy applications, electric vehicles and so on. Quantities in the order of double-digit millions are passed through Feszó's plating tanks every year. The process to deposit perfectly solderable nickel plates was developed by Feszó themselves.

Owing to their extremely complex geometry the pin-fin plates are a great challenge in all processes. They have a lot of chemicals entrapped which makes rinsing very difficult. If proper rinsing is impractical

the impact on drying in terms of staining is aggravated. In the presence of high temperatures of 100 °C the remnants from rinsing are literally burnt into the surfaces. Proper rinsing, non-compressed air blow-off, and drying at low temperatures ensure stain-free surfaces – which was the primary requirement in all Feszo projects. Today, all components pass the final quality inspection. And, energy is, of course, a major issue today.

The drying period in all dryers was reduced by 70 percent. What used to last for 20 minutes and was not fully satisfactory, is now achieved in only six minutes. After this short period, the items are perfectly dry and stain-free. Today's drying temperatures are between 50 °C and 55 °C which has a beneficial impact on humans, material, and machinery alike. 40 kW gas burners which used to burn energy were replaced by dehumidification modules with 6.6 kW power rating in production operation. Moreover, all dryers feature automatic lid systems to keep the precious heat inside the system. For highly complex applications such as Feszo's, Harter includes a non-compressed air blow-off station to remove the better part of the water entrapped before the drying process proper starts.

### Routeing Dry Air Precisely

Each Harter dryer needs a so-called dehumidification module which conditions the required process air and is also responsible for the condensation process. Systems are sometimes designed such that a

single dehumidification module provides for several dryers. The Airgenex module is always connected to the dryer through insulated piping. It furnishes extremely dry and hot air passed over or, for bulk material applications, through the items to be dried. In this process, the hot air, by its physical nature, very quickly absorbs any humidity present. Once returned to the dehumidification module, the air is cooled in two steps, and the humidity condenses to form water. The air is then reheated in two steps and recirculated to the dryer. Harter systems are the only ones on the market to feature a closed air system and to operate exhaust-air-free. This makes operators independent of the seasons and other environmental conditions. Yet, dry air alone does not ensure successful drying. Precise air routeing is critical because the unsaturated air must be precisely routed over or through the items to be dried. "We have acquired much know-how [of air routeing] over the years" reports Specht. Such great technical success is only possible by perfectly matching air dehumidification with air routeing. Lambertus finds himself well equipped for the future with this new technology. "We have better quality than before. And with today's energy prices we profit a great deal from lower energy cost."

[www.harther-gmbh.de](http://www.harther-gmbh.de)  
[www.feszo.hu](http://www.feszo.hu)

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## Drying Processes – an Overview

The term "drying" or "desiccation" / "exsiccation" designates the general process in which liquids are removed from a material or object. The result is achieved by evaporation, vaporization, the use of drying agents, or other technical or chemical processes. A characteristic of drying is the reduction of humidity (removal of humidity or dehumidification) by a usually thermophysical conversion of the liquid which often changes to gaseous state. The term "dehydration"

is also used because the liquid is frequently water. The latter, however, is not fully synonymous with "drying" because it also encompasses mechanical or gravitational methods (mechanical dehydration). In technical applications, it is advisable to use mechanical dehydration first if possible because it is more efficient in terms of energy (about 1/10 of energy cost) compared with other methods. The engineering field dealing with the drying of materials is drying technology.