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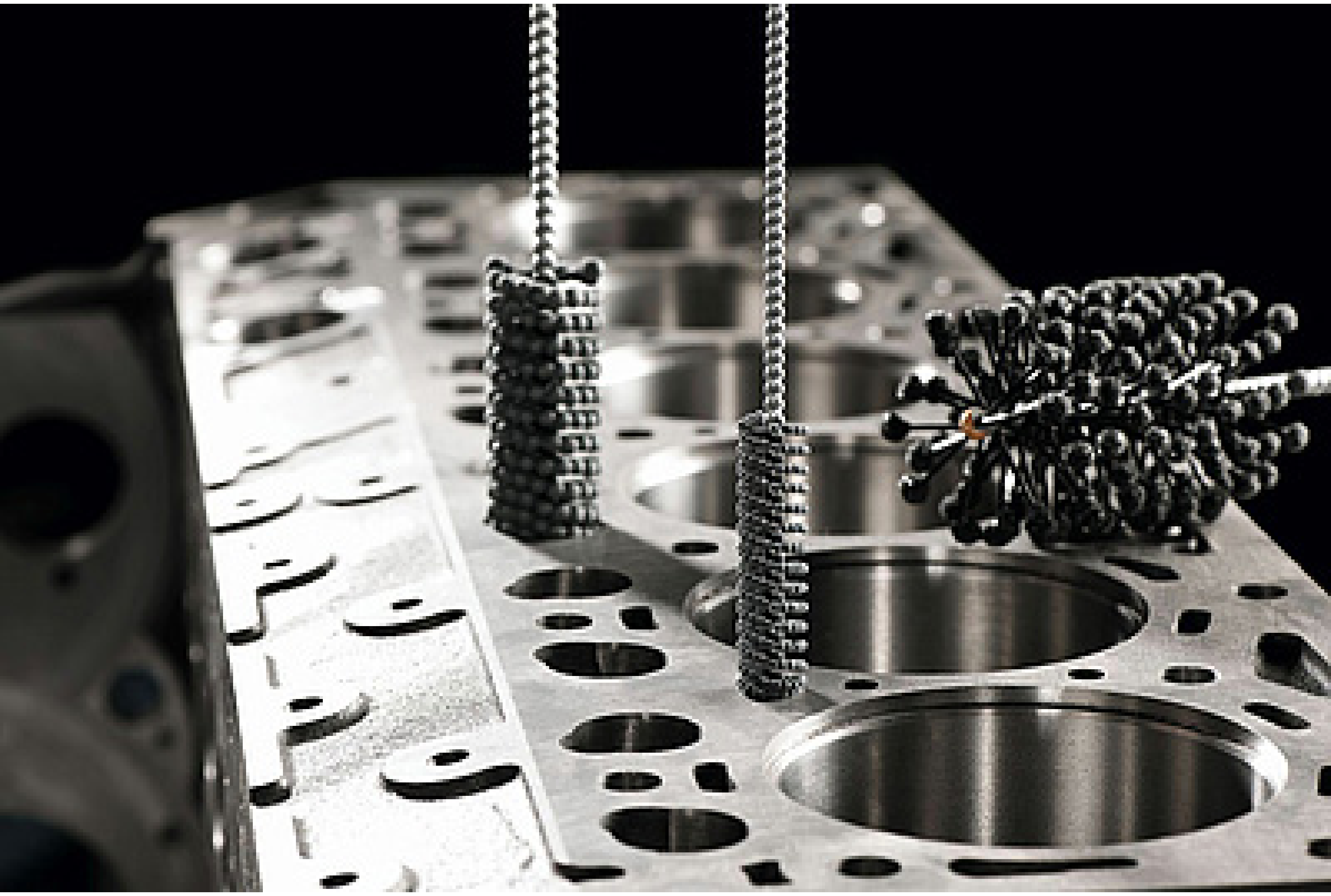
SPECIAL Industrial Parts Cleaning



SPECIAL PRINT

Large Capacity Dryer for Higher Throughput

Large Capacity Dryer for Higher Throughput

A company of the semiconductor industry was faced with a bottleneck in their production process owing to long drying periods of large, high-precision components at the cleaning stage. The challenge was resolved by installing a separate condensation drying chamber designed to meet cleanroom conditions.

VDL ETG Switzerland AG is one of 100 companies of the Eindhoven, the Netherlands, based VDL Groep. They produce high-precision components, mechatronic systems, and complete modules for OEM's for the high-tech industry. This includes aluminium parts - as large as 4,000 mm long, 4,000 mm wide, and 4,000 high – which are cleaned, assembled and qualified after machining.

Long Drying Periods Produce a Bottleneck at the Cleaning Stage

The previous cleaning system had an in-built drying provision. Long drying periods, however, produced a bottleneck in the production process so that rising cleaning needs could not be met. The company searched for a solution to this challenge. A German company engaged in optics recommended Harter GmbH to VDL ETG Switzerland AG. The recommending company has long been using a Harter heat pump based condensation dryer designed for small parts.
The question was whether or not this technology could be employed for aluminium parts of such large dimensions and could be modified for operation in a cleanroom environment. Another mandatory requirement for the dryer was to work as an air-wise closed system because there must be no ambient air intake to ensure absolute freedom from particles.

Extensive Drying Tests

Series of tests were conducted in Harter's pilot plant station to find the best solution. A test cube and a complex geometry aluminium valve housing in a plastic cleaning container were used for these tests. The components were first immersed in deionized water and then tested in two dryer set-ups with different air routeing provisions. The operating parameters, such as temperature and time, were determined giving particular attention to high water entrapment sections. The

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The cleaning capacity could be almost doubled by installing a separate large-capacity dryer.

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The dehumidification module is placed above the drying chamber for space restrictions.

results were used as a basis for the concept solution.

Extensive Drying Tests

The drying chamber finally built from corrosion resistant steel is 4,100 mm long, 4,000 mm wide and 3,600 mm high. The dryer features special corrosion resistant steel recirculation fans able to produce a large air flowrate of 48,000 m³ max. The speed controlled fans with a connected load of 1.9 kW each may be programmed for each item to be dried. The ceiling of the drying chamber is fully clad with high-efficiency particulate absorbing filters to ensure that the drying air supplied to the chamber does not exceed the maximum particulate concentration requirement.
The drying system includes a dehumidification module to provide the required process air. It is placed above the drying chamber for space restrictions. The module is connected to the dryer through insulated piping and removes the humidity contained in the process air. The resulting extremely dry, unsaturated air is passed over the items to be dried in the dryer. A customized air routeing system ensures that the air is perfectly directed onto the components. The process air absorbs the humidity within a relatively short period. When returned to the dehumidification module the air is cooled and thus stripped of its humidity. The resulting condensate is drained off the system while the reheated air is passed into the dryer, again. This way, drying takes place in an air-wise closed system.

Reliable Drying while Carbon Saving

To undergo cleaning the components are fed into the cleaning system through a front sliding door. Upon completion of cleaning, the components are transported right away to the attached cleanroom through the rear sliding door. The components are manually loaded into the dryer which is attached to the cleanroom. Loading and unloading is accomplished through the front door. Defined and infinitely variable temperatures between 40 °C and 75 °C ensure reliable and complete drying, even of blind holes. The components may immediately undergo subsequent processing.
The drying system includes a heating battery with a rated power of 10 kW which is used only for rapid heat-up at the start of the process. The dehumidification module has a rated power of 9.8 kW. The rated power of the complete system in production operation is 18 kW. The heat pump technology integrated in every drying system is thus highly energy and carbon saving which makes it eligible for government subsidy. The cleaning capacity was almost doubled by installing the separate large-capacity dryer.

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