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Preliminary Tests of Low Temperature Drying in the Test Center

Drying and flashing off water-based paints in the painting line takes much time and energy. Heat pump based condensation drying provides an efficient process. The technique provides a combination of low temperatures and extremely dry air in a closed air system.

Jonas List

Harter developed their heat pump based condensation drying technique more than 30 years ago and has optimized it ever since. The German company banked on an in-house Test Center from the first to conduct feasibility tests and to determine parameters.

Prospective customers may satisfy themselves of the efficiency of low temperature drying and have their components tested for response to the parameters temperature, time, humidity, air speed and airflow rate. Several multifunctional dryers are available for diverse process types. The test series provide information relating to the drying properties of the specific product. Following an exhaustive preliminary exchange, two engineers conduct the tests. Then, the drying specialists analyse the results and prepare a report. All these actions aim at achieving a solid basis for the layout and design of an appropriate drying system. Process changes, such as the use of water-based instead of solvent-based paint, are often the reason for trials in the Test Center. Here are some examples.

Dry after 20 Minutes

A big German conglomerate used a gas operated and energy squandering dryer they wanted to replace. The items to be tested were electric motors with a water-based paint coating. This application included drying and cooling. Harter's heat pump technique allows temperature equalization and cooling to be easily integrated in the process. The tests showed that the temperature could be considerably reduced – from 98 °C to 60 °C. The time required for drying in these tests was 20 min, only one third of the previous 1 hour drying period. The drying quality is basically improved by the fact that the paint dries uniformly from the inside out, which was also the case here.

A manufacturer of components for lattice type transmission towers placed an order for research tests with Harter. The company was looking for a drying solution to be integrated in the painting line of a new production hall. A factory manager they knew well had recommended Harter's experts. They painted angle sections, T and H sections in the Test Center and tested the components using various parameters. They used exclusively water-based paints. The steel specialist was very impressed by the test results because they had been rather sceptical before considering that the coating thickness was more than 180 µm. All components were dry after 20 min. Drying at defined low temperatures was very much appreciated by the tower manufacturer because it implied better quality. The final solution will probably be a 20 m long drying tunnel. The heat pump technology integrated in all drying

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Several multifunctional dryers for various types of processes are available for preliminary tests in the Test Center.

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Test Center staff together with the customer conduct feasibility tests and test components for response to temperature, time, humidity, air speed and airflow rate

		BEFORE		TEST RESULTS	
		DRYING	COOLING	DRYING	COOLING
Electric motors		59 min 98 °C	10 min 17 °C	25 min 60 °C	12 min 17 °C
Steel tower components		NOT AVAILABLE		20 min 40 °C	N/A
Bumpers		20 min 90 °C	N/A	15 min 60 °C	N/A

Tabulated results of the tests reported

systems ensures both efficiency and reduced energy consumption.

Tests at the User's Premises

The project of an international automobile supplier is somewhat different. They wanted to convert their existing continuous dryer for bumpers. Their goal was to improve drying quality while realigning their energy balance. In this application, the bumpers leave the cleaning system und require drying before subsequent paint coating. Following cleaning, the components are conveyed to an air blow-off tunnel where they are stripped of the better part of the water entrapped. Downstream follows a 30 m long gas operated drying tunnel. Problems were the high energy consumption and the high temperatures. Plastic components are inevitably deformed at 90 °C.

Initial tests in the Test Center were conducted on the manufacturer's components without the transport skids for the conveying system. As the results turned out to be promising, the automobile supplier desired to know more. They wanted the components including the skids to be tested. For this purpose, Harter manufactured a so-called wooden dryer, which can best simulate real situations, and delivered it to the customer's premises. Harter engineers installed this dryer including the heat pump module and the control cabinet. They gave the automobile supplier staff extensive instructions for conducting the tests on their own. Tests of the original skid-mounted components showed that drying at 60 °C required only 15 min although the carrier accommodates two sets. Harter has meanwhile installed the required air routeing system in the customer's existing dryer and connected it to the heat pump module. Drying is now successfully performed on a heat pump basis. A 60 m long drying tunnel at another site of the customer is planned to be converted within short.

Quality Improved, Time and Energy Saved

Harter has realized more than 2,000 industrial drying projects to date. Their systems are capable of pinpoint dehumidification at defined low temperatures and may have temperature equalization and cooling provisions added. The integrated heat pump technology enhances the efficiency of this low energy technique, which is eligible for government subsidy in Germany, Austria, and Switzerland as of 2017. The fact that the systems use a completely closed energy circuit has further benefits. The process becomes much more reliable as the operators are completely independent of the seasons and fluctuations in the climate. Moreover, staff and production areas are no longer exposed to the negative effects of exhaust air because the process is emission free. The low drying temperatures used are gentle to both the products and the product carriers which is particularly important for plastics. Most prominent, however, are the quality improvements and the energy and time savings obtained by heat pump based condensation drying. //

Author

Jonas List

Technical Sales

Harter GmbH, Stiefenhofen, GERMANY

jonas.list@harter-gmbh.de

www.harter-gmbh.de