HARTER
drying solutions

# 75% $CO_2$ SAVING

by Airgenex®-Condensation Drying

In view of rising energy prices and the global warming problem politics, society and industry must take the responsibility for using resources sparingly and sustainably. This is a major challenge, particularly for industry.

The German Federal Government aims to cut carbon emission by at least 65 percent by 2030 compared to 1990 levels and to reach greenhouse gas neutrality by 2045. Industry is deeply involved in this process. The government's targets include a reduction in carbon emission by raising energy efficiency to obtain a 60 percent reduction of power consumption by 2030. In support of the new climate related targets the government has launched the 2022 Immediate Action Programme for climate protection. The programme provides an additional 8 billion EUR for overall climate protective measures in the next few years.

The HARTER Airgenex® condensation drying technology offers a product for use in the highly energy-intensive industrial drying field with significant benefits both in terms of ecology and economy

_ lower cost of operation
_ lower resource consumption
_ independence from fossil energy
_ more stable process conditions
_ large carbon saving potential

## Percentage carbon emission reduction


# DRYING IN A CLOSED AIR CIRCUIT CIRCUIT – WITH NO SUPPLY AND EXHAUST AIR

Airgenex®-condensation dryers in electrical power operated drying systems can save about 75 percent of carbon emissions compared with conventional exhaust-air systems. Also, the process parameters of our systems can be kept constant which has very positive effects on process reliability.

The HARTER Airgenex®-condensation drying technology is based on a heat pump to heat and dehumidify the air in the drying chamber. Other than in conventional systems, the air is recirculated in a closed circuit.

Advantages of a closed air system are that (1) almost the whole energy is retained in the system, and (2) the environment inside the drying chamber may be varied almost freely irrespective of ambient conditions, such as relative humidity.

The tests were set up such that conventional exhaust-air drying systems, which dry items by circulating hot air in an open drying chamber, and the HARTER Airgenex® system, which dries items by precisely routeing dehumidified air in a heat pump based, closed air system, could be compared. It was essential to ensure comparable results in order to arrive at an unbiased energy consumption relation. The parameters measured were relative and absolute humidity as well as temperature in the drying chamber over time. These are the essential drying parameters.

## For the purpose of a diploma thesis, the energy efficiency, and with that, the reduction in carbon emission by Airgenex®-condensation dryers were studied.

The object of this study was the drying of items by removal of water adherent to non-hygroscopic materials in rack and in-barrel applications. The latter are different both in set-up and air routeing.

Comparative measurements were conducted to record

_ the temperature in the drying chamber
_ the relative/absolute humidity in the drying chamber
_ the power consumed

The airspeed inside the drying chamber was not reflected in the final analysis because the fan settings remained unchanged throughout the tests. So, airspeed did not affect the comparability of the test results. Fan power consumption was not reflected for the same reason.

Care was taken in both test set-ups to have the same temperature in the drying chambers and to keep this temperature constant, as possible, in order to obtain comparable test results.

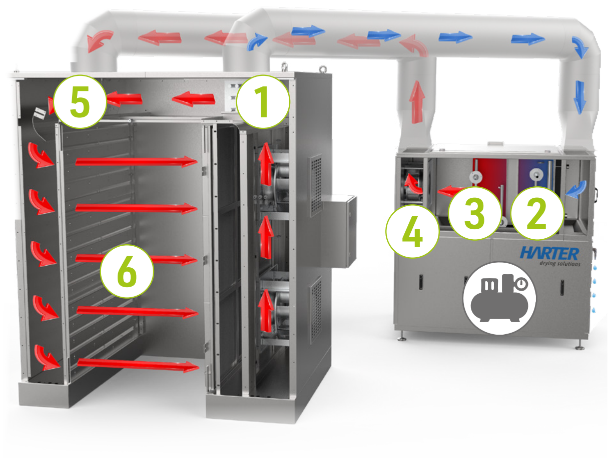
**Low Power Consumption**

The results showed that the power requirements of the systems under test were largely different under the same conditions.

The power consumption of the conventional exhaust-air dryer was 20 kW (electrical heating power) while that of the Airgenex® condensation dryer was 4.6 kW (electrical power). Carbon emissions of the two systems were compared on the basis of their power consumption. Thus, the carbon emission of the dryers in operation may be concluded from the test results. Other factors (peripheral processes) were not reflected. Emission calculation was based on 6,200 annual operating hours of each system and on the German electricity mix. As a result, the Airgenex® used on the given system

**SAVES ABOUT 57 TONS PER YEAR!**

## Dehumidification in the Closed Air Circuit




1. Humid air is extracted from the drying chamber and subjected to dehumidification.
2. Humidity condenses on the air cooler fins and leaves the dehumidification module through the condensate collector and drain.
3. The air heater heats the dry air to the required process temperature.
4. The process air fan provides the necessary air circulation between the dehumidification module and the drying chamber.
5. The dry unsaturated air is passed into the drying chamber where it blends with the main recirculation air and flows over or through the products to be dried.
6. The main recirculation air circulates within the drying chamber and ensures uniform drying

## Sources

**Diploma Thesis by Michael Knoedl 2009**

For details on how the tests were set up and performed refer to Michael Knoedl's thesis. The study is available from the Deggendorf University of Applied Sciences library or through HARTER GmbH.

**Federal Ministry for Economic Affairs and Energy**

_ Federal Climate Protection Act
_ Climate Action Plan 2050
_ Climate Action Programme 2030
_ 2022 Immediate Action Programme

HARTER drying solutions

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