

## Dehumidified Air Dryers – Theory and Practice



### Drying plastic granulate

**Dry plastic granulate is essential for high-quality moulded parts.**

The main reasons for moisture on the surface of plastic materials are condensation, dew and unsealed packaging. Any kind of plastic granulate may be affected in this way. Some plastic materials are hygroscopic. They hold water molecules similarly to a sponge. These plastics must always be dried before they are processed. Otherwise the moulding process will result in sub-standard parts. Streaks and insufficient strength can be traced back to a lack of or insufficient drying.

### Drying with dehumidified air

**KOCH dehumidified air dryers dry plastic granulate with dehumidified air until the residual moisture is at the optimum level required for processing.**

This is an energy-saving closed circulating system that functions completely separately from the ambient climate. Dehumidified warm air flows through the granulate, absorbs the moisture on it and releases it to a desiccant. With this constant regeneration, a consistent drying level is achieved in a dew point range from -30 °C to -60 °C.

## The dew point and the drying process

The dew point of the air depends on the moisture it is holding. The lower the dew point, the faster the drying process. The critical limit at which the air quality is no longer sufficient for perfect drying is at a dew point from approximately  $-15^{\circ}\text{C}$  to  $-18^{\circ}\text{C}$ . The dew point of the drying air in the KOCH dryers is always lower than  $-30^{\circ}\text{C}$ , so a long way from the critical point. Completely reliable drying is therefore always guaranteed.

### Some examples:

A dew point (dp) of  $+20^{\circ}\text{C}$

Humid, warm summer weather with air temperature (air temp) of  $+30^{\circ}\text{C}$  and with a residual moisture (rm) of 85 % contains 26 g of water ( $\text{H}_2\text{O}$ ) in  $1\text{ m}^3$  of air. This corresponds to a dew point of  $+27^{\circ}\text{C}$ .

$-2,5^{\circ}\text{C}$  dp and air temp at  $0^{\circ}\text{C}$  with 80 % rm:  $4,00\text{ g H}_2\text{O}/\text{m}^3$

$-30^{\circ}\text{C}$  dp and air temp at  $0^{\circ}\text{C}$  with 100 % rm:  $0,33\text{ g H}_2\text{O}/\text{m}^3$

$-40^{\circ}\text{C}$  dp and air temp at  $0^{\circ}\text{C}$  with 100 % rm:  $0,12\text{ g H}_2\text{O}/\text{m}^3$

$-50^{\circ}\text{C}$  dp and air temp at  $0^{\circ}\text{C}$  with 100 % rm:  $0,04\text{ g H}_2\text{O}/\text{m}^3$

$-60^{\circ}\text{C}$  dp and air temp at  $0^{\circ}\text{C}$  with 100 % rm:  $0,011\text{ g H}_2\text{O}/\text{m}^3$

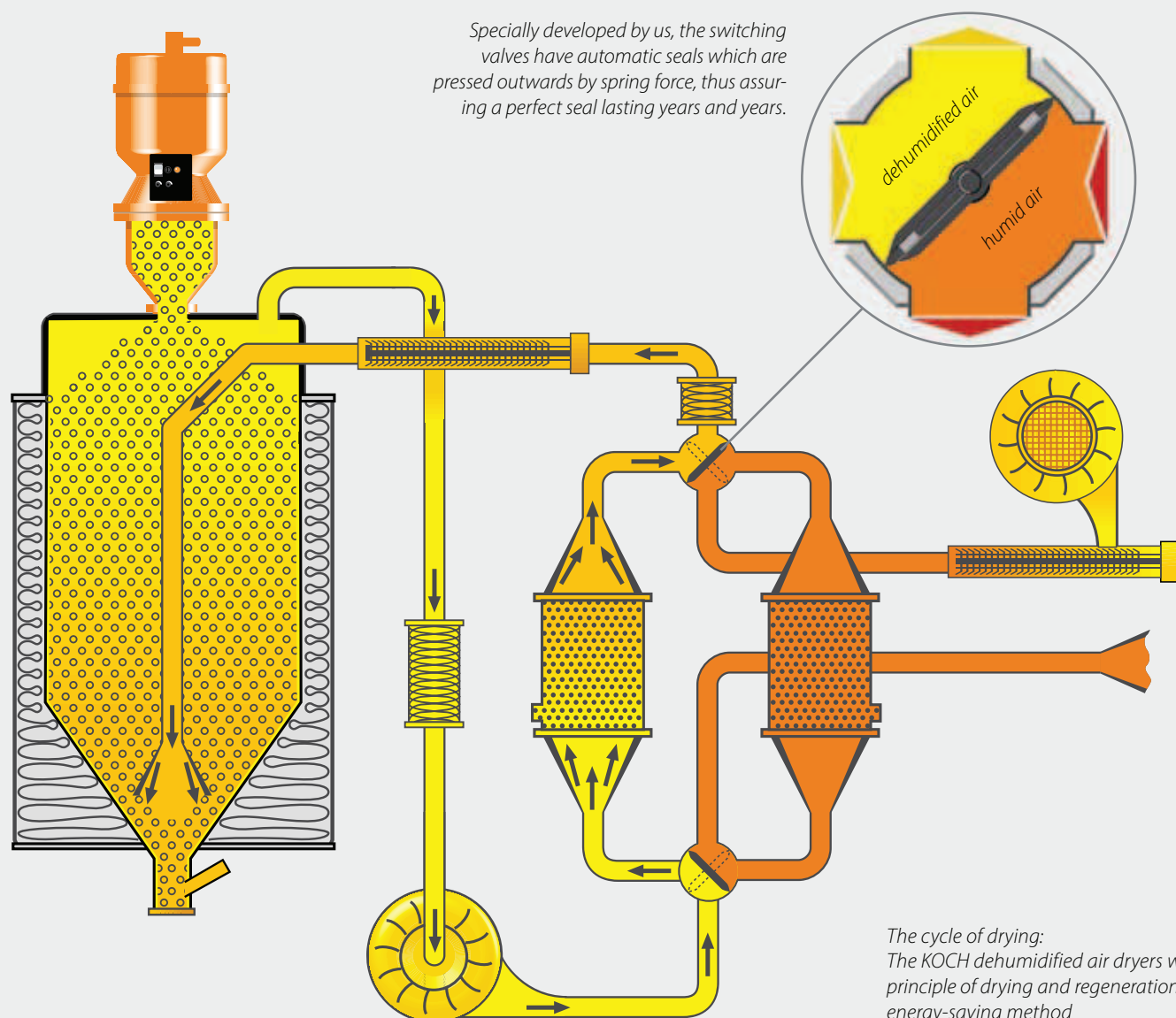
## The objective must be to obtain a low dew point!

This is not only necessary to achieve a faster drying process and save energy, but also so that the hygroscopic granules can be dried to a residual moisture of 0.01 %. This should be observed during drying.

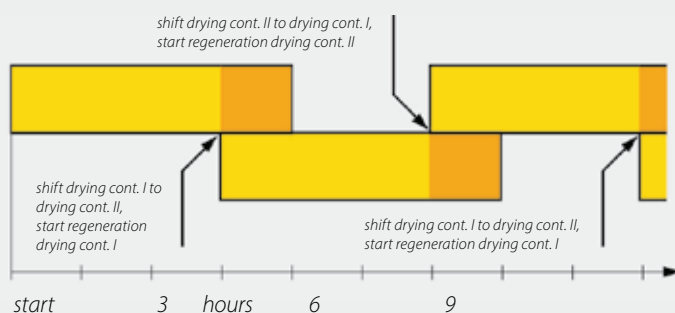


## KOCH dehumidified air dryers – mode of operation

*Specially developed by us, the switching valves have automatic seals which are pressed outwards by spring force, thus assuring a perfect seal lasting years and years.*



*The cycle of drying:  
The KOCH dehumidified air dryers works on a principle of drying and regeneration – the most energy-saving method*



*Schematic diagram of drying and regeneration phases, time-dependent (example)*



## Economical Drying – an inestimable advantage!



### Desiccant

The low pore size of 4 angstrom units (corresponds to pore size of  $4 \times 10^{-10} \text{ m}$ ) guarantees the long service life of the drying agent which is also extremely environmentally friendly.

Every production process focuses primarily on a flawless end product and its economic production. However, economic production is only possible when the production plant operates economically! KOCH dehumidified air dryers operate with low energy consumption levels and are therefore economical. The only decisive factor in the economical efficiency of a dryer is the energy consumption rate required in order to dry a certain quantity of material to a defined residual moisture.

We present a practical example to illustrate how economical our dryers really are: for one kilogram of ABS with an initial moisture level  $< 1 \%$ , the KOCH dryer consumes 0.08 kW per kilogram in order to dry the material to the optimum residual moisture.

**You could hardly dry more economically and at the same time produce a perfect end product.**

## Frequency-regulated blower

Frequency-regulated drying blowers offer further energy savings in the drying process. Optional frequency converters enable the speed of the motor and therefore also of the dehumidified air to be adjusted to the load. This adjustment means that only a quarter of the energy that would otherwise be required is used at half-output, enabling the energy costs for operating the drying blower alone can be reduced by 25% to 75%. Frequency regulation is thus an investment which quickly pays off.



Desiccant container –  
designed to cope with the  
physical demands

# The Dew Point Control System

**The dew point energy-saving programs delivers savings of up to 45%**

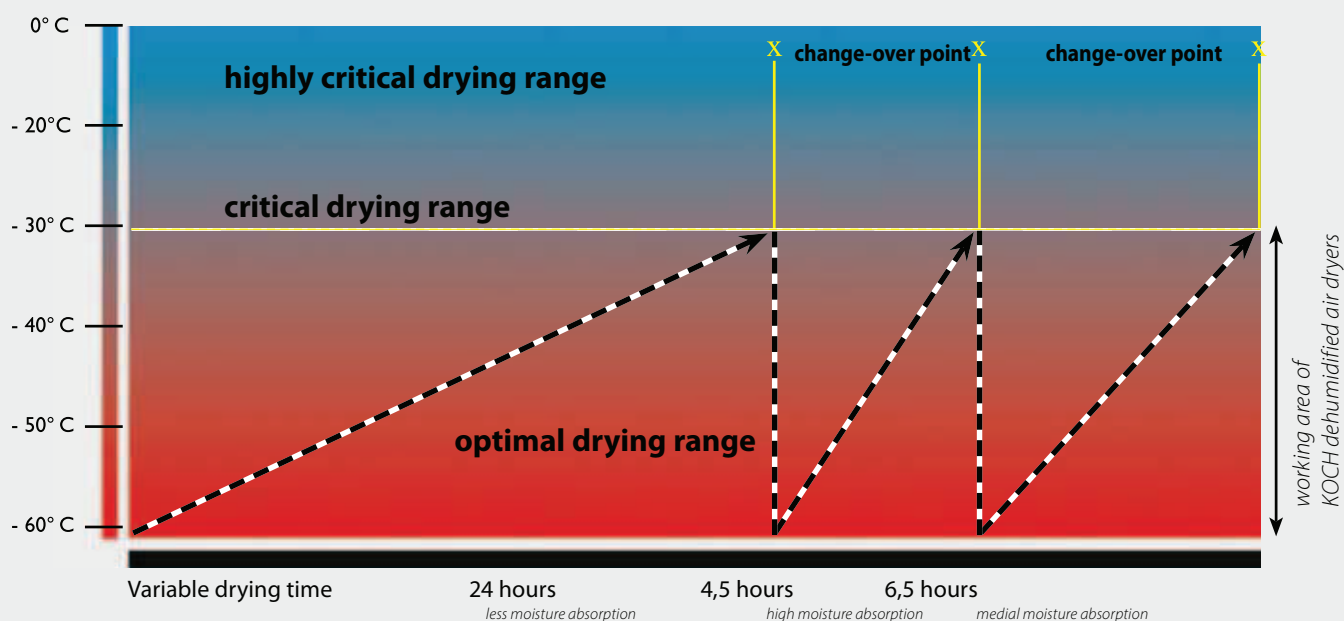
There are two drying systems, which differ in terms of energy consumption: On the one hand there is the energy-intensive system which switches in cycles, irrespective of the moisture in the drying container. This does not take into account whether dry or moist air is being used for the drying process. On the other hand there is the energy saving system; its operation depends on the dew point.

The KOCH dry air dryers take the dew point into consideration as they operate. They do not switch to the new desiccant container until the dew point has reached  $-30^{\circ}\text{C}$ . The dryer always adjusts to the actual circumstances. For wet plastic material, the cycles are shorter; for dry materials, the cycle is accordingly longer.

**The benefit is obvious: A lot of energy is saved in the regeneration and the quality of the end product remains consistent.**

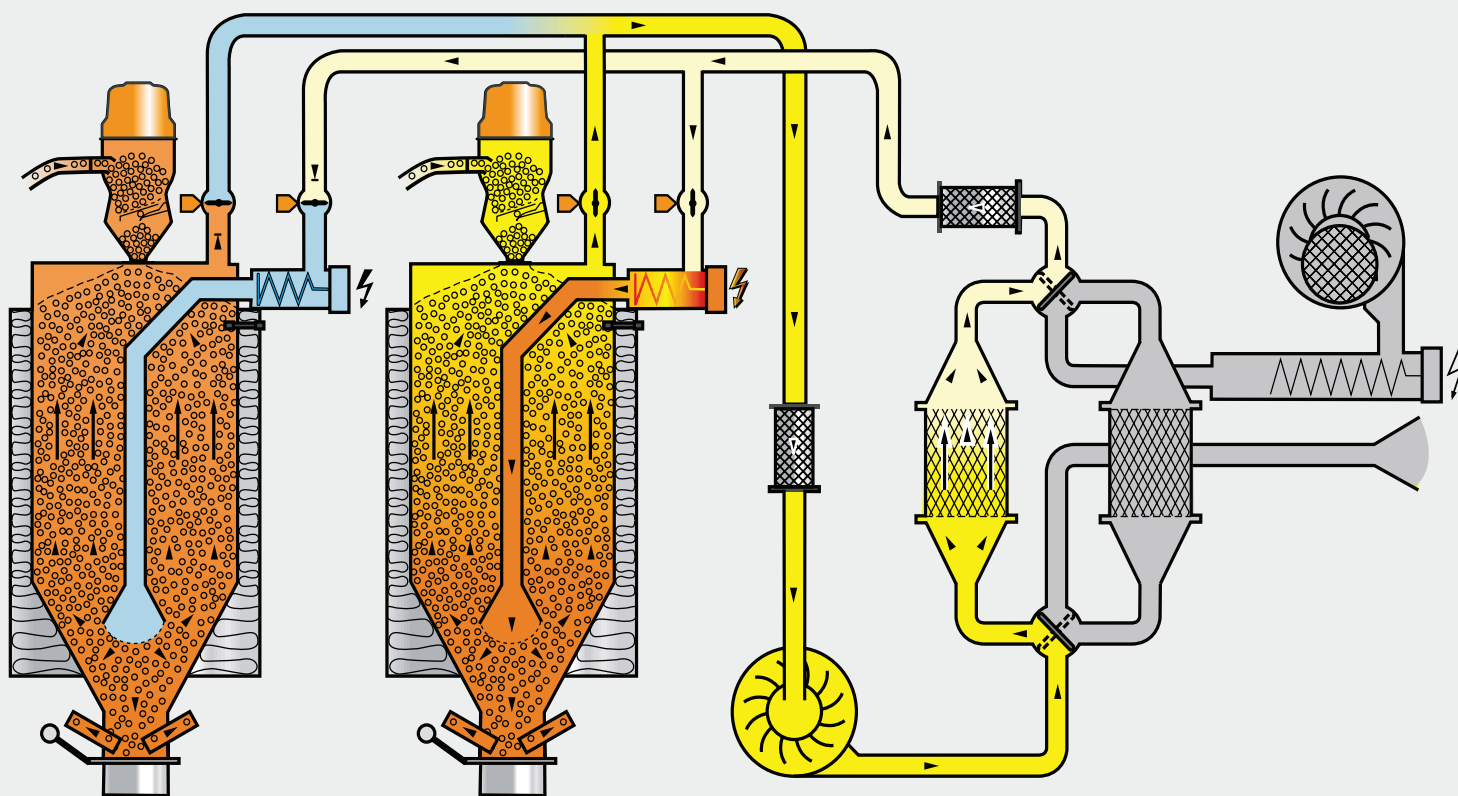


## Drying automatically by dew point control



# The KOCH ECO Control System

Our patented control system for gentle, energy-saving drying that does not damage material



## Controlled drying that is economical, gentle on the material and energy-saving ...

Our optional ECO control system guarantees that hygroscopic materials such as PA, PC, LCP, POM etc. do not become overly dry in the drying containers. When little or no material is removed from a drying container, there is a risk of material damage occurring due to the constant flow of hot air. **The ECO control system stops this happening.** When a certain temperature is reached at the top of the drying container, the drying system automatically switches to idle. The machine only begins to operate again if material is removed or the holding time is too long.

The advantage is that you **save up to 50 % on energy and can access pre-dried material at any time.** At the same time, you can be certain that no damage has been done to the material. The quality of the end product is thereby ensured.

**... a perfect and environmentally friendly solution!**

## Other features:

- the regulating system takes into account the amount of air needed in the container
- the defined air quantity can be regulated – irrespective of the amount and type of material in the container
- the air flows through the container in exactly the quantity required
- optional automatic load adjusting system



## CKT – Sophisticated Drying Technology



CKT 500 dehumidified air dryer with ECO control system

### KOCH dehumidified air dryers: Benefit-oriented in every detail.

From a dew point control system to the patented ECO control system, the dehumidified air dryers are designed to function reliably and for easy operation. The sophisticated technology in the CKT meets all the demands for careful and efficient drying that will not damage the material and can be used for any plastic granulate. Compressed air isn't needed!



All the drying containers are supplied from the factory with **hinged cleaning flaps** as standard.



The **suction container** offers you up to three connection variations for fully automatic material conveying. On the underside of the suction container there is a manually operated locking device for manual extraction of material samples. The design of the container allows no cold zones to develop.



A **return air cooler** automatically switches on when a limit temperature has been reached (required only for temperatures over 130°C).



*CKT 1000 dehumidified air dryers installed in the production of an automotive supplier*