



Bretzfeld, 16.07.2018

Ambient humidity

What influence does relative humidity have on the adsorber?

At a constant temperature of 20 ° C, 0.5 kg of silica gel Orange was flowed through with a volume flow of 50 l / min. The relative humidity varies between 90%, 70%, 50% and 30%. The mass flow reduces with decreasing relative humidity.

Table: Set mass flows and their calculation

Volume flow [l/min]	relative humidity [%]	Absolute humidity [g/m ³]	Mass flow [g/h]
50	90	15,6	46,6
50	70	12,1	36,2
50	50	8,6	25,9
50	30	5,2	15,5

For the determination of the influence of the humidity, the adsorption isotherms are very important, since the relative humidity influences the maximum load according to the adsorption isotherm. The following figure shows the temporal variance due to the different relative humidity. The maximum load decreases with decreasing relative humidity.

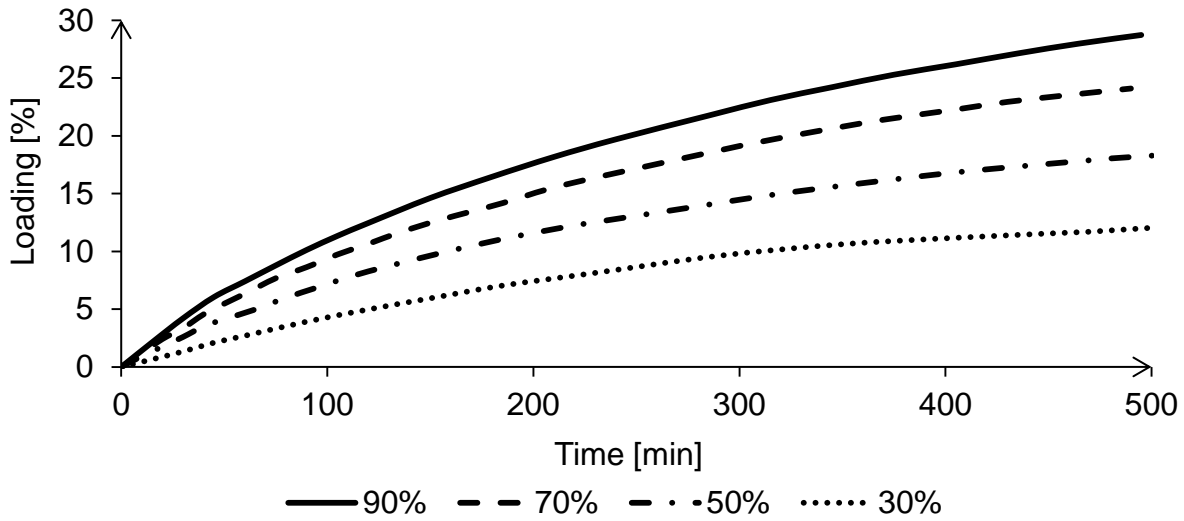


Figure: Dependence of load on time for a different relative humidity.

Table: Maximum load as a function of relative humidity.

relative humidity [%]	Maximum load [%]
90	28,7
70	24,1
50	21,7
30	12,7

At a relative humidity of less than 70%, the second, very dark color change remains. In this area, the maximum load is below the load of the second color change.

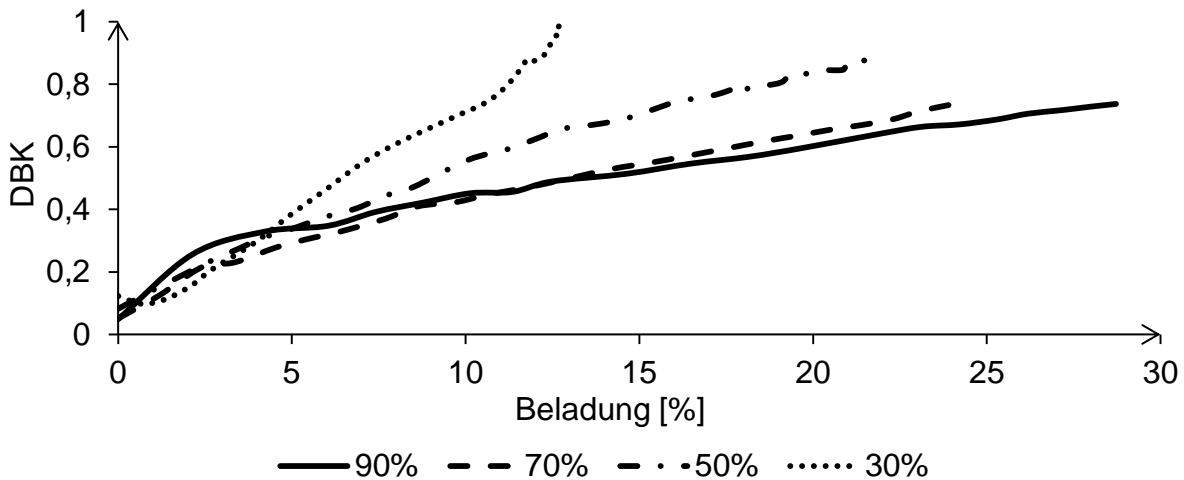


Figure: Dependence of the breakthrough curve on the load for a different relative humidity.

The water absorption of the first color change assumes, for a different relative humidity, a value of $\Sigma_W1 = (65 \pm 4)$ g. In the second color change, the water uptake of the test with 70% relative humidity increases above that of the experiment with 90% relative humidity. The behavior of water absorption as a function of relative humidity is illustrated in the figure.

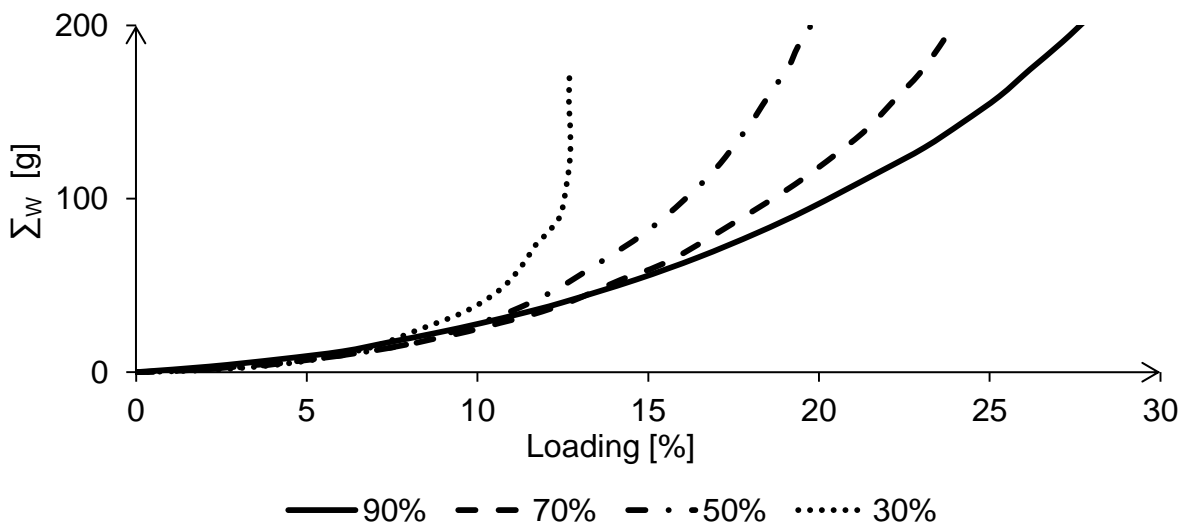


Figure: Dependence of the water sum on the load for a different relative humidity.

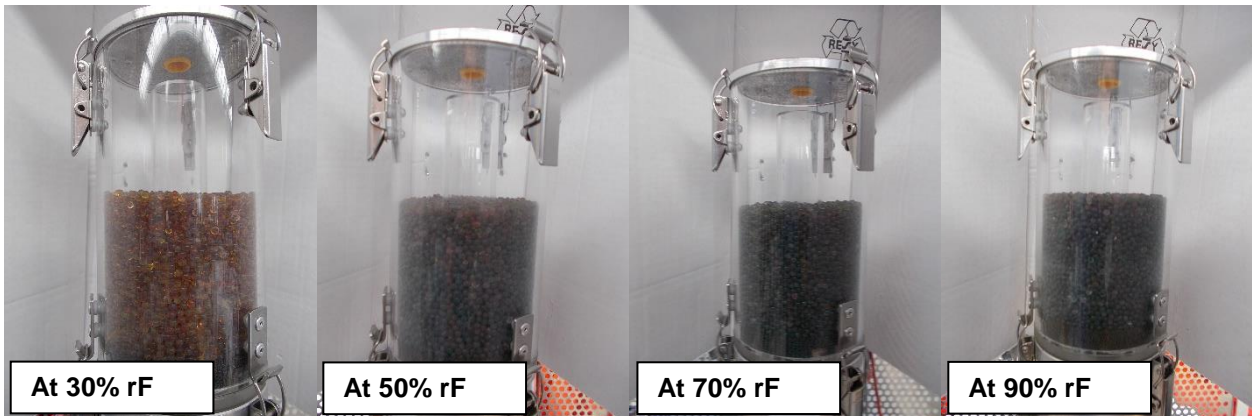


Illustration: Color change with complete loading of the respective humidity.

Result

Ventilation dryers are more suitable for high relative humidity over 70%. With decreasing relative humidity, the service life is increased, but the adsorption properties deteriorate. At a relative humidity below 70%, the standard Silica Gel Orange will not show a complete color change. Thus, the silica gel must be exchanged at the first complete color change.