



Bretzfeld, 16.07.2018

Air flow through the adsorber

What influence does the air flow have on the use of an adsorber?

0.5 kg each of the silica gel orange were perfused with 90% relative humidity and various air streams or mass flows. At a temperature of 20 ° C, the absolute humidity is calculated to be 15.6 g / m³. The calculated volume flow varies between 50l / min, 100l / min and 150l / min. According to equation 11 on page 26, the mass flow is directly dependent on the volume flow. The calculated volume and mass flows as well as the empty tube velocities are listed in the table.

An increase in the mass flow, ensures a higher adsorptive concentration in the bed, which accelerates the adsorption process.

Table: Set mass flows and their calculation.

flow [l/min]	leerrohrge-speed [m/s]	absolute humidity [g/m ³]	mass flow [g/h]
50	1,04	15,6	46,6
100	2,07	15,6	93,6
150	3,1	15,6	140,4

As the mass flow increases, the time required to reach the first color change of the silica gel decreases. The amount of water increases with the mass flow, since a higher mass flow, with the same breakthrough curve, leads to a higher absolute humidity at the outlet. Thus, more moisture flows into the system.

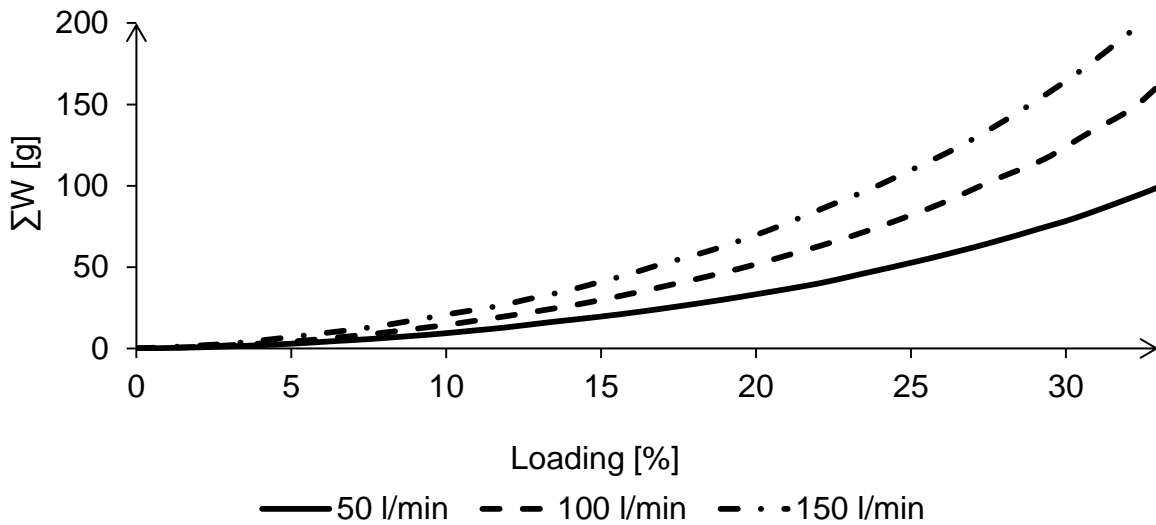


Figure: Dependence of the water sum on the load at different mass flows.

As the mass flow increases, the maximum load is reached earlier. This explains the time difference in the first and second color changes. The following figure shows the dependence of the breakthrough curve on the load. For all mass flows, the breakthrough curve assumes the same value for the same load. This indicates that the breakthrough curve depends only on the load and not on the mass flow. The sum of water shows a behavior like the first color change.

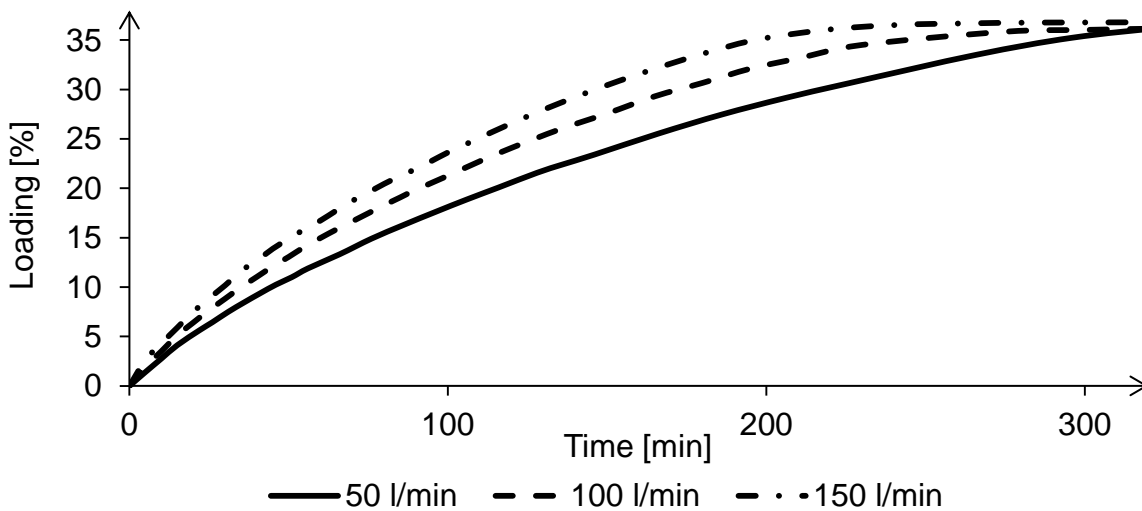


Figure: Dependence of the load on time at different mass flows.

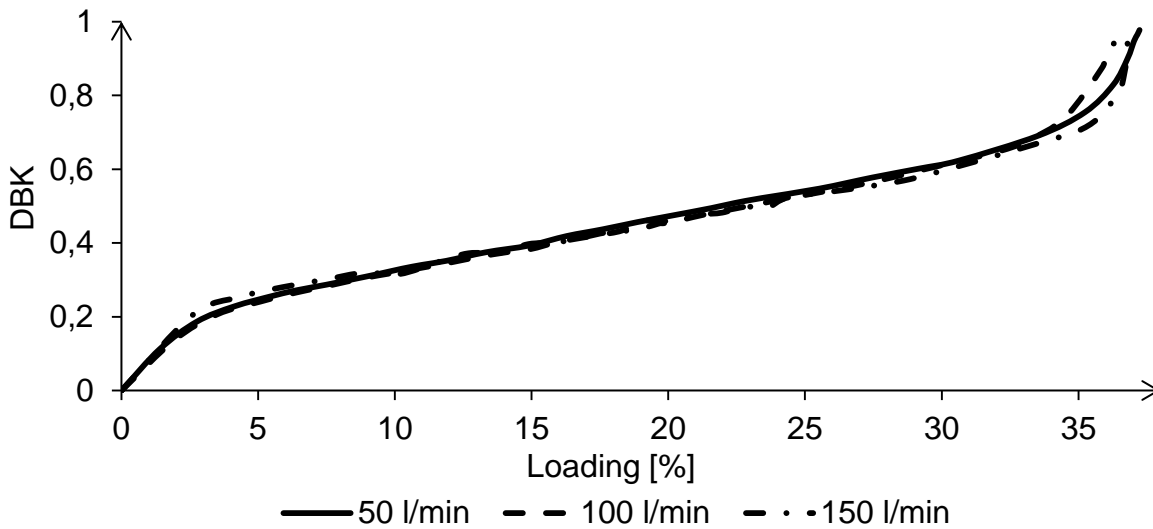


Figure: Dependence of the load on time at different mass flows.

Result

The color change and the breakthrough curve are not dependent on the air flow / mass flow, only on the load of the desiccant. The loading of the desiccant depends on the mass flow. An increase in the mass flow ensures a shorter service life of the adsorber. Likewise, increasing the mass flow will result in a greater amount of introduced water into the system to be ventilated. For this reason, when designing a ventilation dryer, pay attention to the lowest possible mass flow.