Water discharge from ventilated piles (air track) **Compiled on: 07/09/14**

If a pile is ventilated during rotting, water is usually discharged from the pile as the temperature of the air at the inlet is lower than the air at the outlet. The air exiting therefore has a higher water absorption capacity and can transport the water.

The following formula can be used for calculating this.

The diagram provided shows the water absorption capacity at different temperatures and amount of material ventilated ((1 to 10 m³ air per m³ material).

Mass of water

$$m_w = m_f - m_t [kg/h]$$

Mass of moist air

$$m_f = Q * \rho [kg/h]$$

Mass of dry air

$$m_t = \frac{m_f}{1+X} [kg/h]$$

absolute humidity

$$X = \frac{0.622 * f * p_s}{p - f * p_s} [kg/kg]$$

Saturation pressure

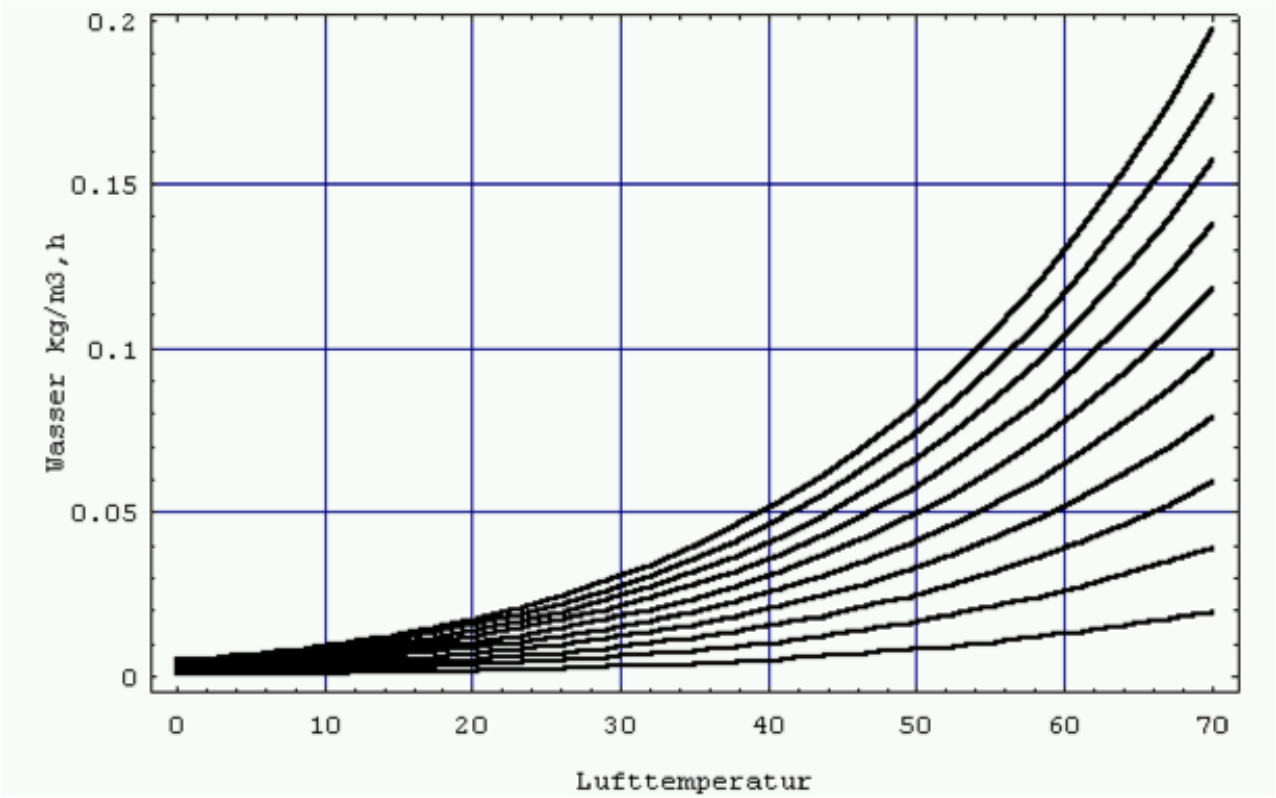
$$p_s = 2.72 * 10^{-8} * T^5 + 2.87 * 10^{-6} * T^4 + 2.57 * 10^{-4} * T^3 + 1.47 * 10^{-2} * T^2 + 4.39 * 10^{-1} * T + 6.12 [hPa]$$

Density of the moist air

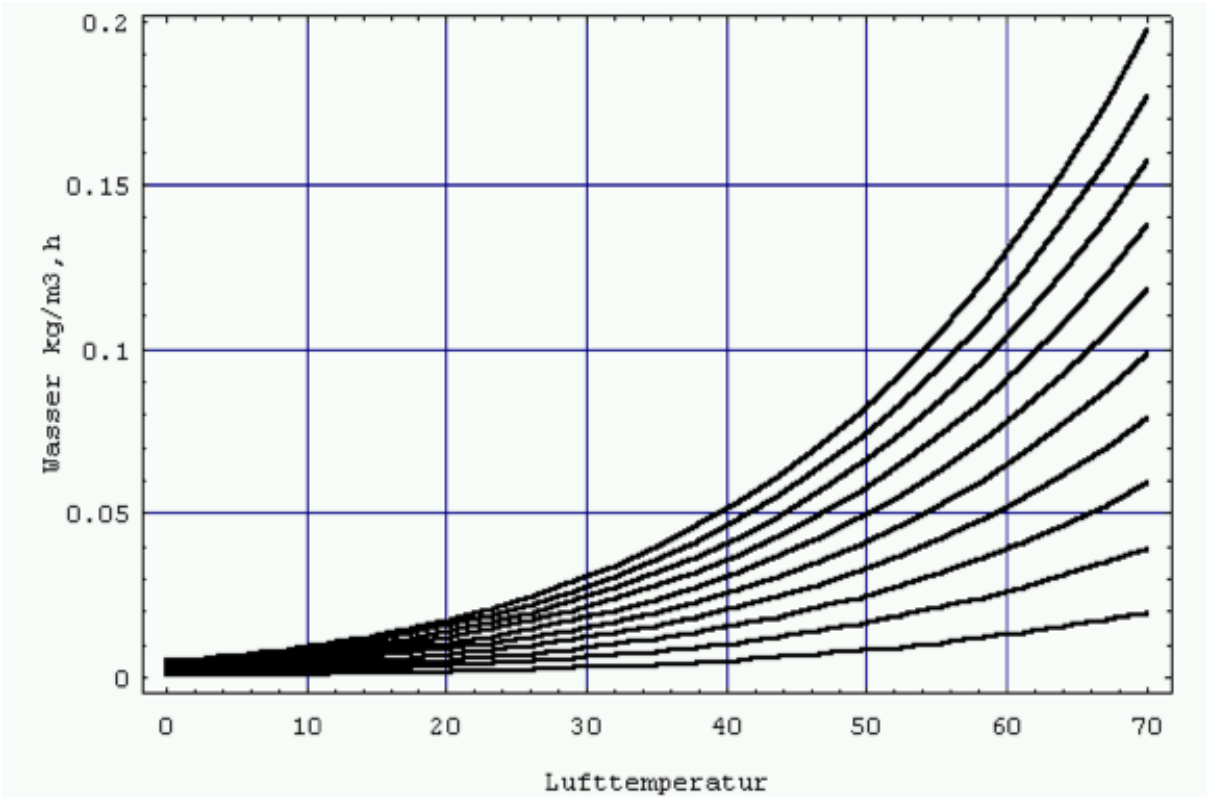
$$\rho = \frac{p * (1+X)}{R_D * (0.622+X) * T} [kg/m^3]$$

f	=	relative humidity [%]
p	=	atmospheric air pressure [Pa]
m_w	=	mass of water [kg/kg]
m_f	=	mass of moist air [kg/kg]
X	=	absolute humidity of the air [kg/kg]
R_D	=	Gas constant of water vapour (461.4 Nm/kg,K)
Q	=	Volume flow of air [m^3/h]
T	=	air temperature [□C]
m_t	=	mass of the dry air [kg/kg]
ρ	=	density of the moist air [kg/m^3]
p_s	=	saturation pressure [Pa]

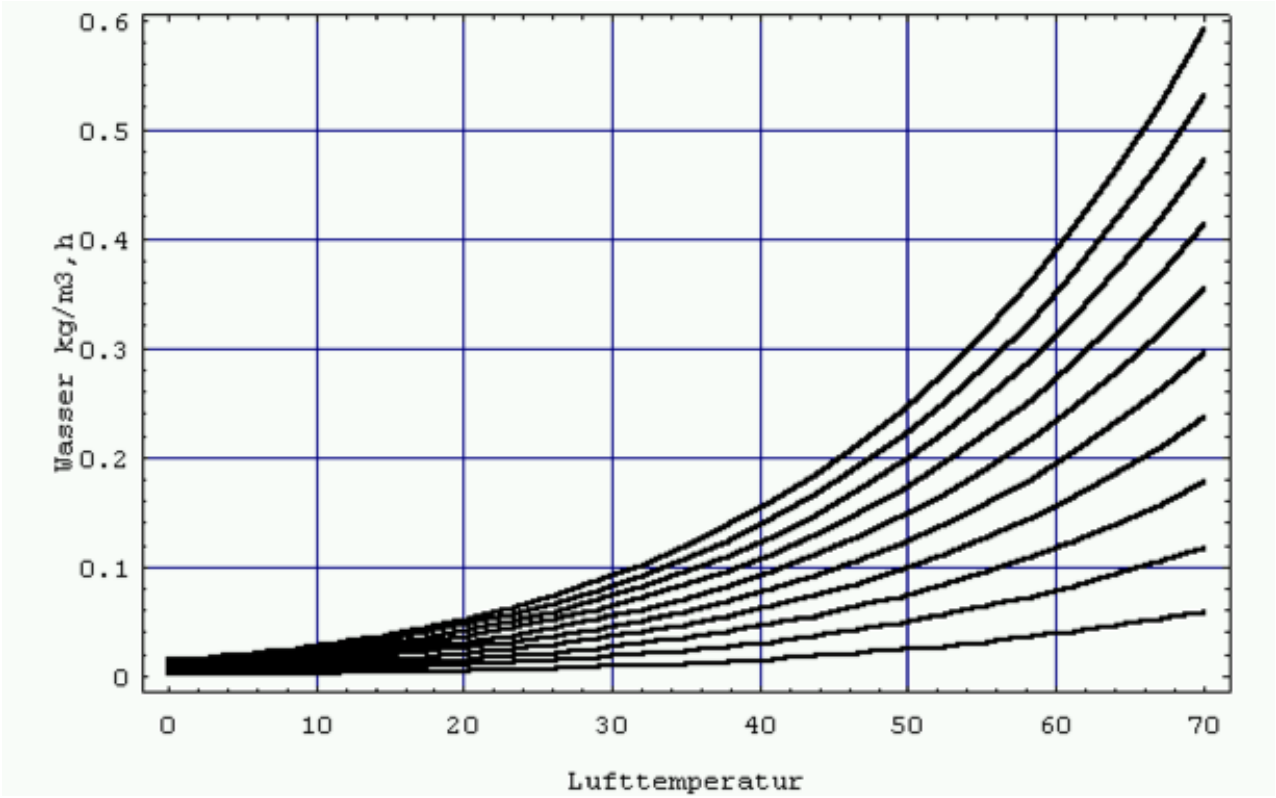
The water discharge of different relative humidities is calculated in the following. The group of curves represent ventilation quantities from 1 to 10 m³ air per m³ material.



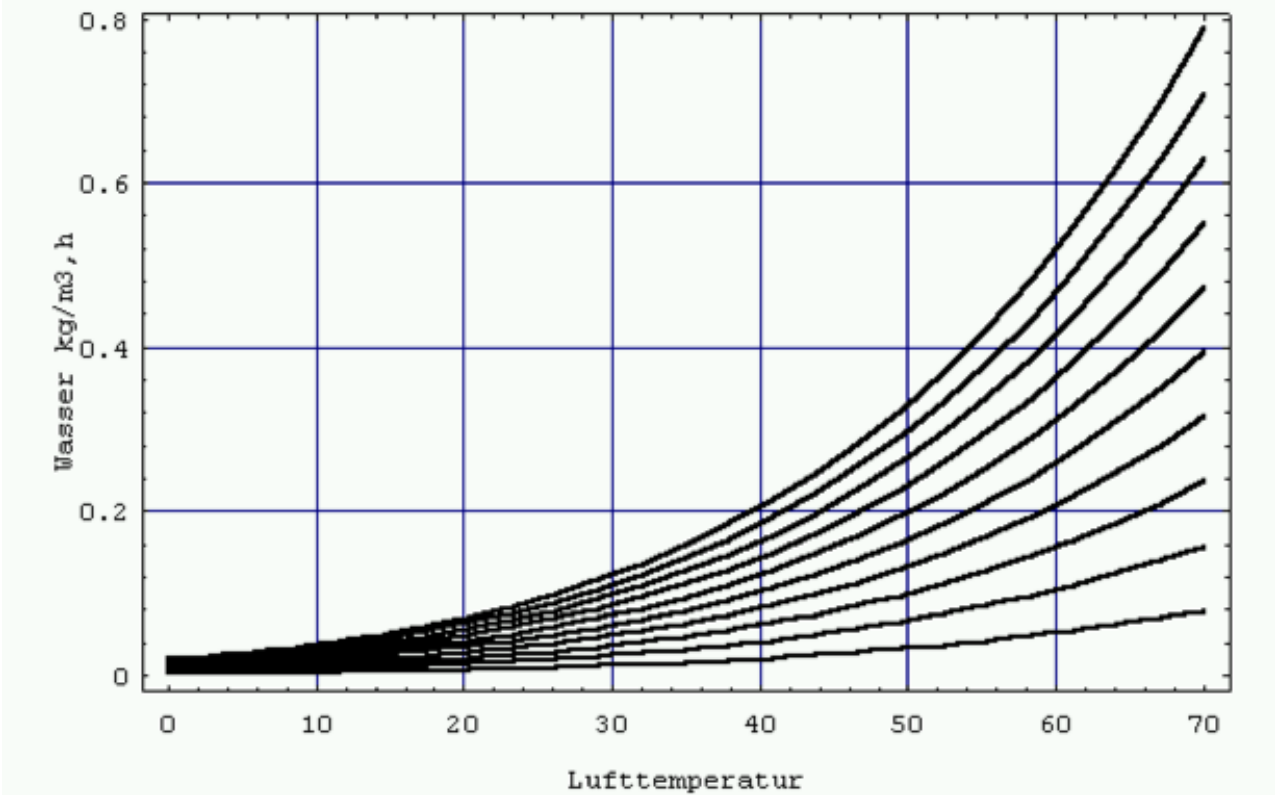
Quantity of water in kg/m³ material and h at 10% rel. humidity



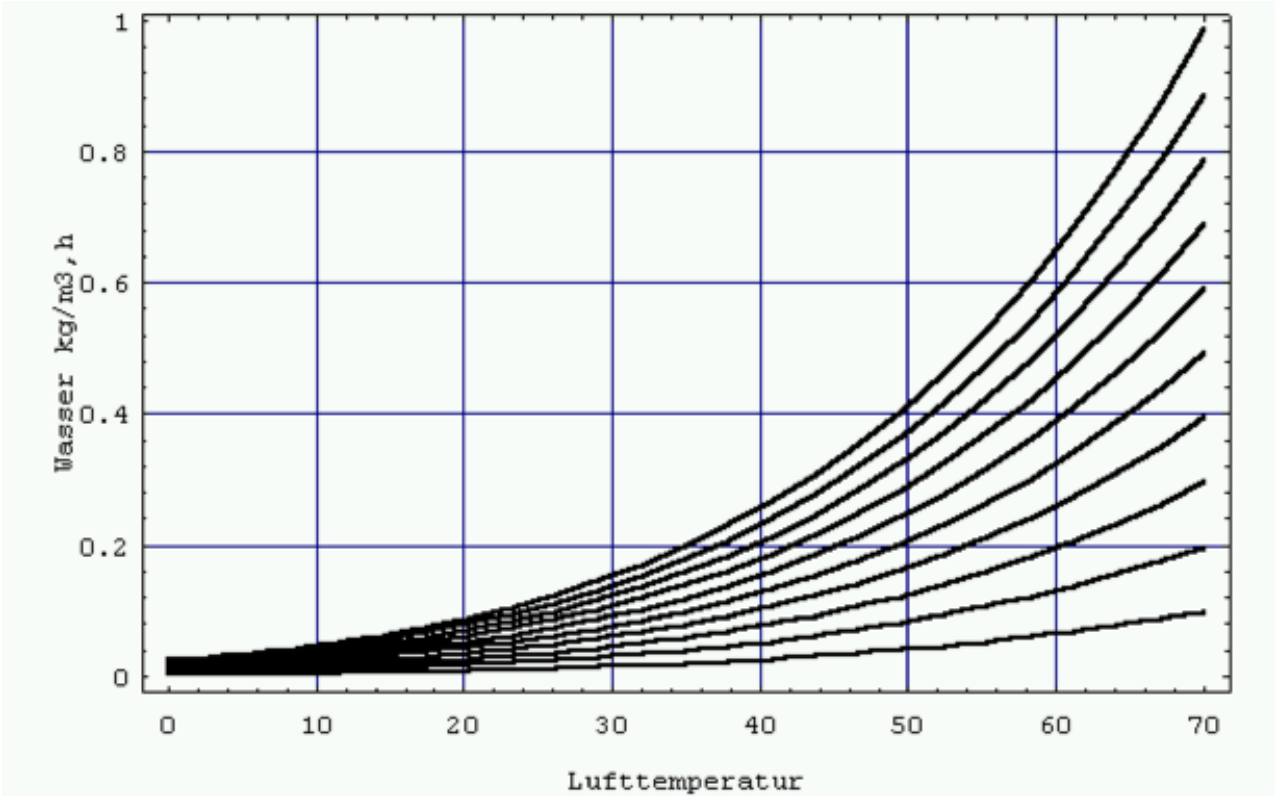
Quantity of water in kg/m³ material and h at 20% rel. humidity



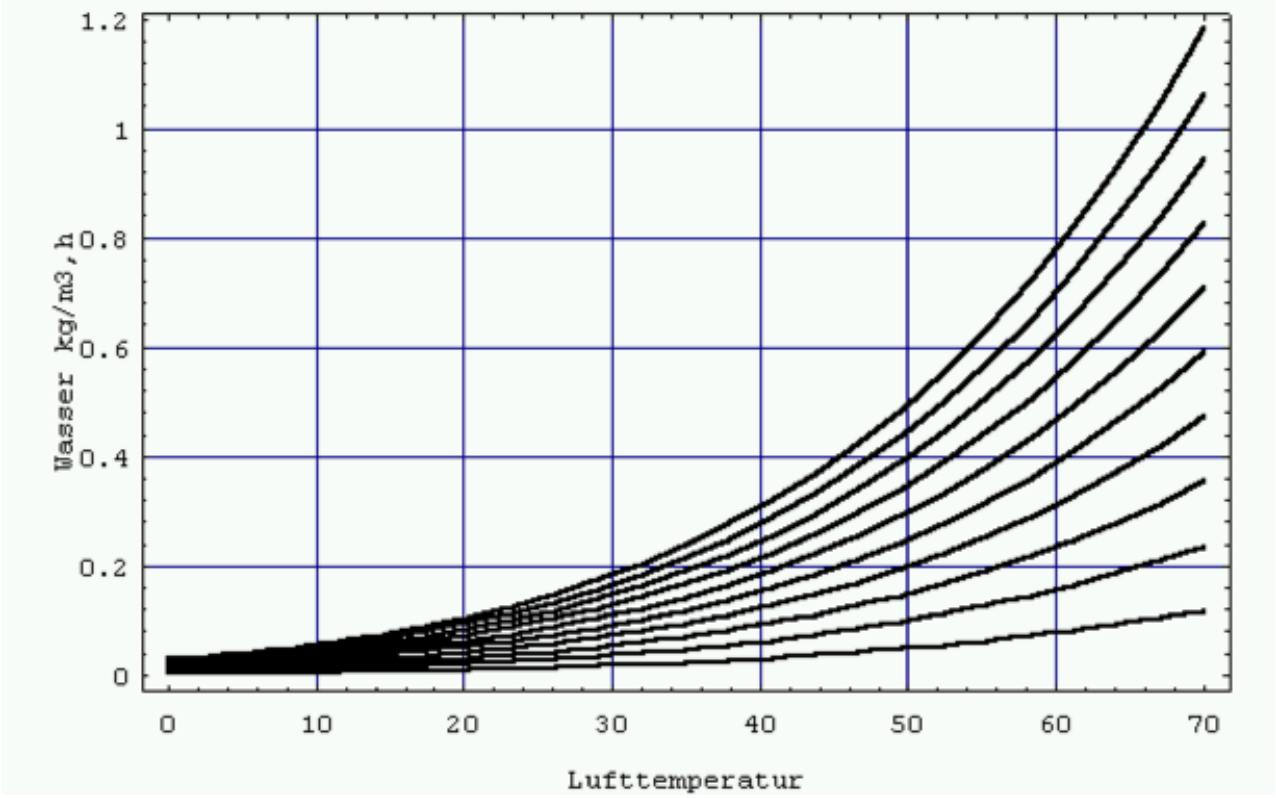
Quantity of water in kg/m³ material and h at 30% rel. humidity



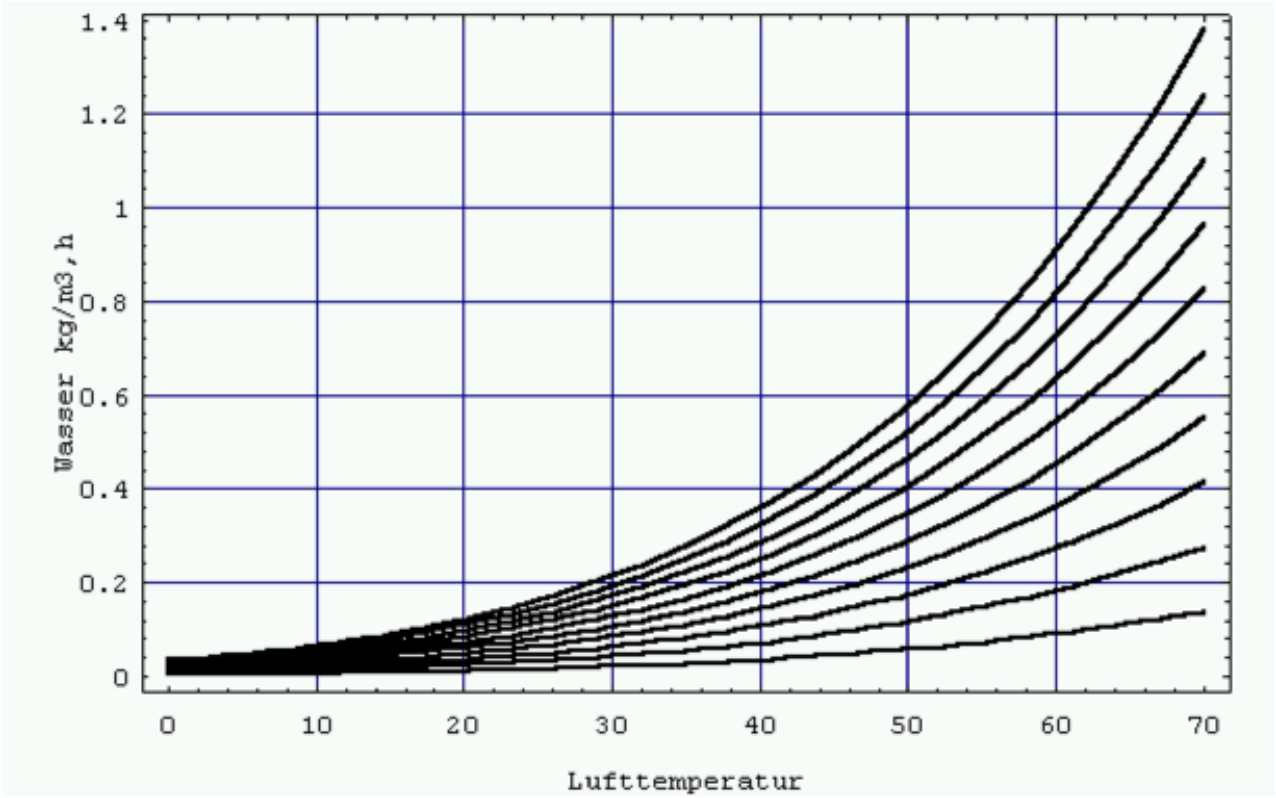
Quantity of water in kg/m³ material and h at 40% rel. humidity



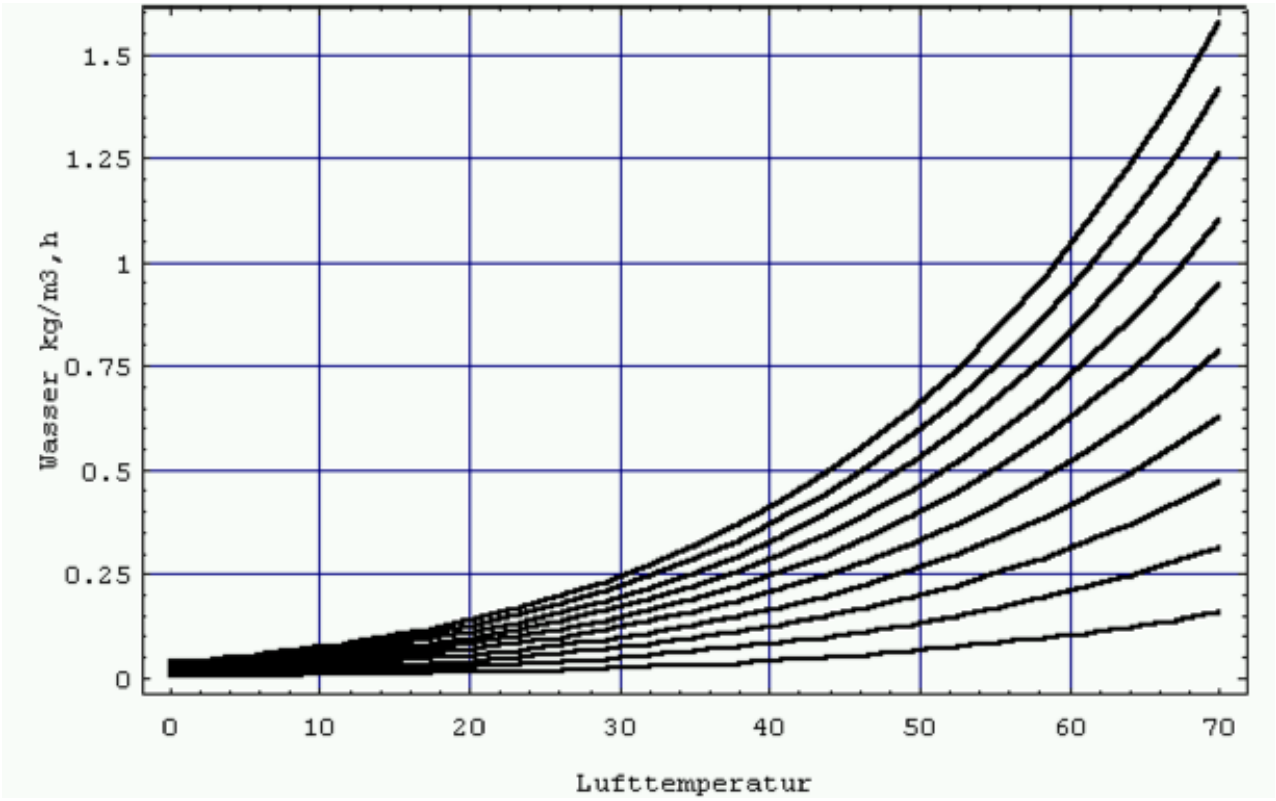
Quantity of water in kg/m³ material and h at 50% rel. humidity



Wassermenge in kg/m³ Material und h bei 60% rel. Luftfeuchte



Quantity of water in kg/m³ material and h at 70% rel. humidity



Quantity of water in kg/m³ material and h at 80% rel. humidity