NOTES CLASS 9-28-2017

– USE OF SOLVER

x DATA

a_w	m (y)
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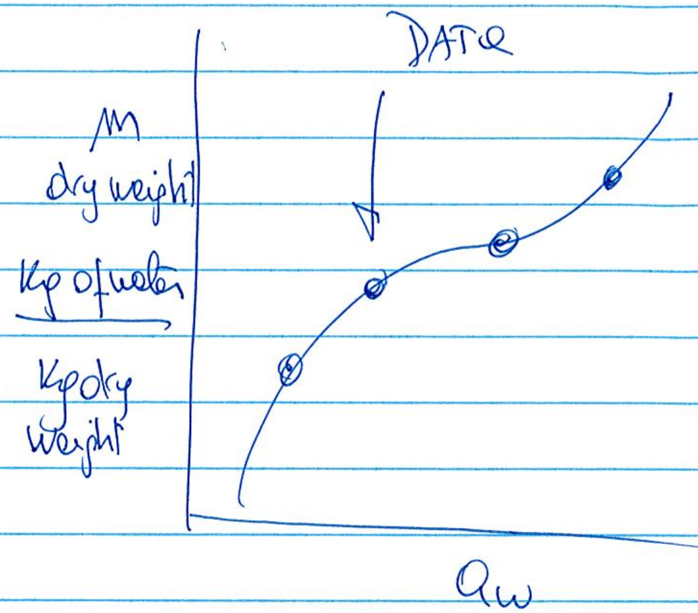
–	–
–	–
–	–



slide 49

$$\underbrace{\frac{a_w}{(1-a_w)m}}_{y} = \underbrace{\frac{1}{m_o C}}_{b} + \underbrace{\frac{(C-1)}{m_o C}}_{m}\underbrace{a_w}_{X}$$

$$y = mx + b$$

$$m = \frac{C-1}{m_o C} = 0.286$$

$$b = \frac{1}{m_o C} = 0.0576$$

$$\cancel{\frac{C-1}{m_o C} \times m_o C} = 0.286 \times \frac{1}{0.0576}$$

$C = 5.9653$

$m_o = 2.91$

$$\frac{Q_w}{(1-Q_w)\,m} = \frac{1}{m_o C} + \frac{(C-1)\,Q_w}{m_o C} \qquad (2)$$

If we know $m = 20\% = 20$

$m_o = 2.91$

$C = \cancel{2.91}\ 5.9653$

We need to get Q_w

$$\frac{Q_w}{(1-Q_w)\times 20} = \frac{1}{2.91\times 5.9653} + \frac{(5.9653-1)\,Q_w}{2.91\times 5.9653}$$

$$\Downarrow$$

$$\underline{\underline{Q_w}}$$

Work a little with the equation you can get a quadratic equation in Q_w and get the roots of the equation and get $\underline{\underline{Q_w}}$ [you get two values one is non-sense so save the good one]

IF THE MODEL is COMPLICATED

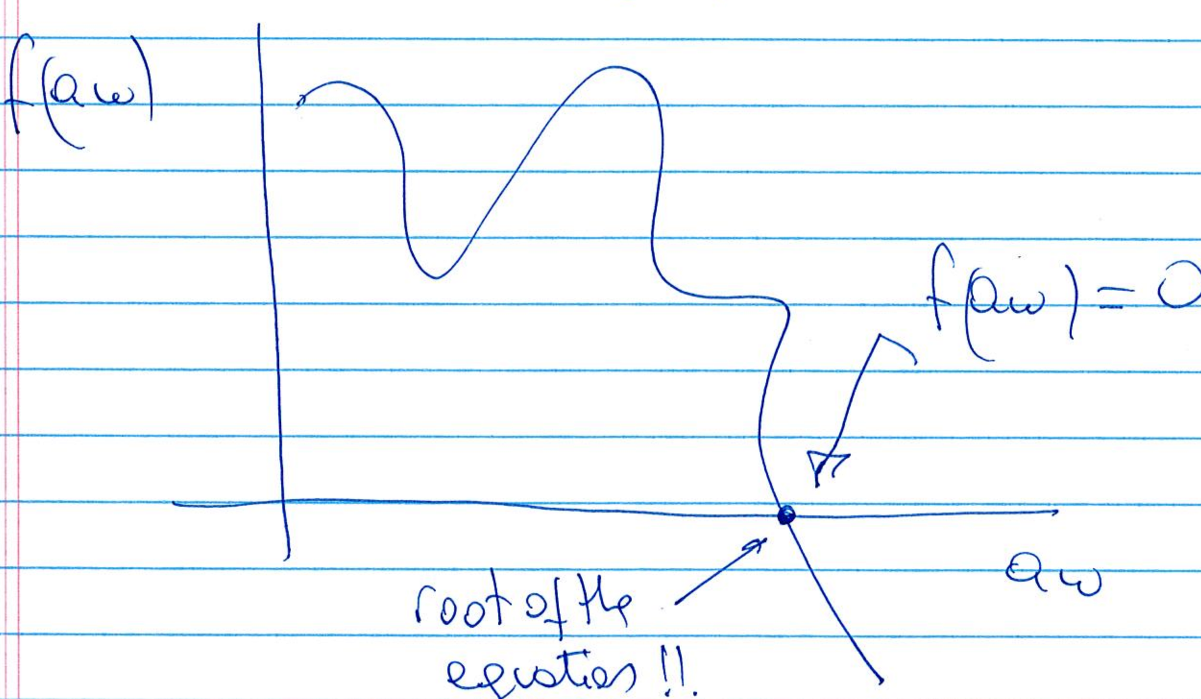
TO GET a_w [ROOT of the Equation]

I can use a tool [To be learnt in ABE 301]

$$\frac{a_w}{(1-a_w)m} = \frac{1}{m_0 C} + \left(\frac{C-1}{m_0 C}\right) a_w$$

$$\underbrace{\frac{a_w}{(1-a_w)m} - \frac{1}{m_0 C} - \left(\frac{C-1}{m_0 C}\right) a_w}_{f(a_w)} = 0$$

$$f(a_w) = 0$$



MATHCAD (4)

$$\underbrace{a_{w,root}} = \text{root}\,[\,f(a_w),\ a_w\,]$$

function ↑ ↑ Variable

$$Sol = \text{root}\,[\,f(a_w),\ a_w\,]$$ function

SLIDE 53

Initial water activity of component 1

slope of the line for isotherms of component 1

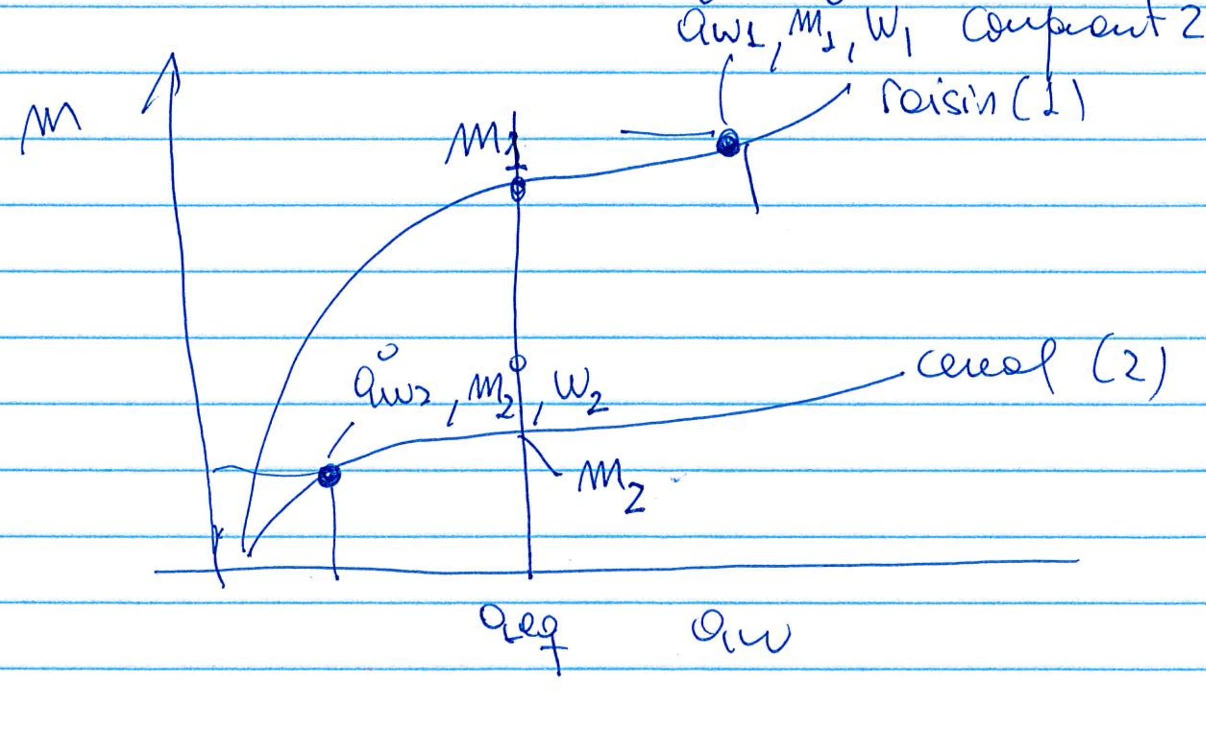
$$a_{eq} = \frac{W_1\, b_1\, a^{o}_{w1} + W_2\, b_2\, a^{o}_{w2}}{W_1 b_1 + W_2 b_2}$$

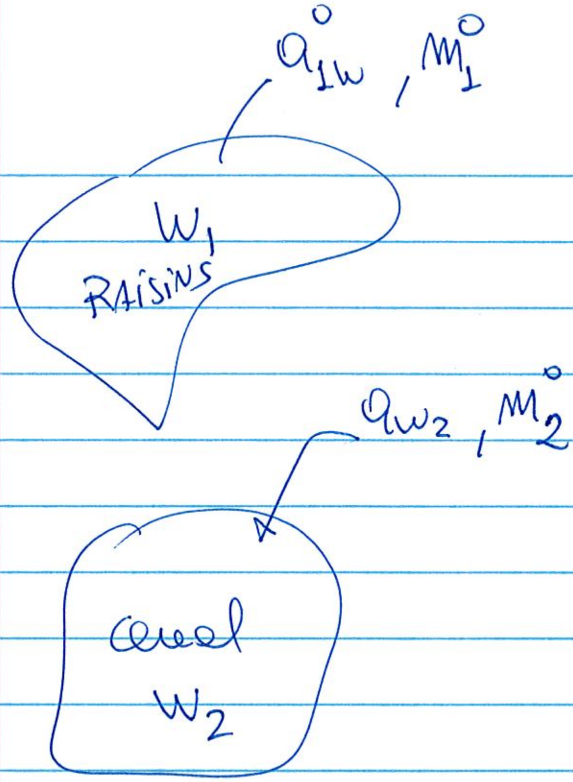
amount of component 1 in Kg dry Matter

initial water activity of 2

slope of isotherm of 2

amount of component 2





MASS BALANCE

What is the initial ~~mixture~~ moisture content of the mixture?

$$\underset{\text{kg of material 1}}{W_1} \times m_1^0 \left[\frac{\text{kg of water initially in 1}}{\text{kg of dry material 1}}\right] + W_2 m_2^0 =$$

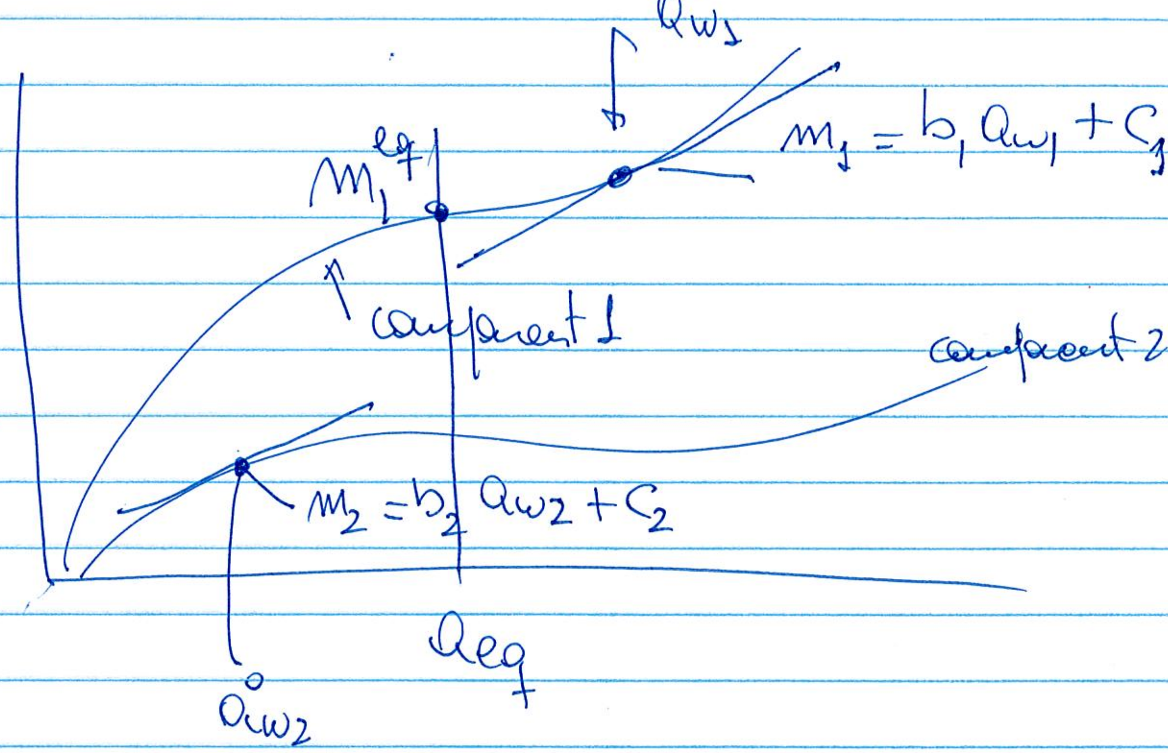
$$= \text{INITIAL MOISTURE CONTENT}$$

$$\boxed{\text{INITIAL MOISTURE CONTENT} = W_1 m_1^0 + W_2 m_2^0}$$

We need to relate m_1^0 with a_{w1} and m_2^0 with a_{w2}^0

In the simplified ["OLD"] approach (6)

$$\longrightarrow M = b\,a_w + C$$



INITIAL MOISTURE CONTENT $= W_1 \underbrace{\left(b_1 a_{w_1}^{o} + C_1\right)}_{m_1^{o}} + W_2 \underbrace{\left[b_2 a_{w_2}^{o} + C_2\right]}_{m_2^{o}}$

MOISTURE CONTENT AT EQUILIBRIUM $= W_1 M_1^{eq} + W_2 M_2^{eq}$

ASSUME THERE IS NO WATER EVAPORATION (7)

[IF WE KEEP THE PACK CLOSE !!]

~~EQA~~ $\boxed{\text{INITIAL MOISTURE CONTENT} = \text{EQUILIBRIUM MOISTURE CONTENT}}$

$$W_1 \underbrace{(b_1 a^{o}_{w_1} + c_1)}_{\text{model you are using [whatever is good!!]}} + W_2 (b_2 a^{o}_{w_2} + c_2) =$$

$$= W_1 (b_1 a_w^{eq} + c_1) + W_2 (b_2 a_w^{eq} + c_2)$$

$$\Downarrow$$

$$\boxed{a_w^{eq} = \text{EQUATION}}$$

$$\boxed{a_w^{eq} \equiv a_{we}}$$