معادلات مادة هيدروليكا الآبار والمضخات (٤٣٧ هزر) جماد أول ١٤٢٨ هـ

$$Q = \frac{\pi k \left(h_e^{\,2} - h_w^{\,2}\right)}{\ln \frac{r_e}{r_w}} \qquad Q = \frac{2 \pi k D \left(h_e - h_w\right)}{\ln \frac{r_e}{r_w}}$$

$$Q_R = \frac{\pi k}{\ln \frac{r_e}{r_w}} \left[\left(h_e^{\,2} - h_w^{\,2}\right) + \frac{R}{2k} \left(r_e^{\,2} - r_w^{\,2}\right) \right]$$

$$Q_s = \pi d_s L_s P \left(1 - C\right) \cdot V_s$$

$$(No)\,at\,1cm^2 = \frac{1 \times P}{\frac{\pi}{4} d_{one}^{\,2}}$$

$$Q_p = \left[\frac{\pi k \left(h_s^{\,2} - h_w^{\,2}\right)}{\ln \frac{r_e}{r_w}} \right] \times \left[1 + 7 \sqrt{\frac{r_w}{2h_s}} . \cos \frac{\pi h_s}{2h_e} \right]$$

$$Q_s = 2 \pi k r_w \left(h_e - h_w\right)$$

$$Q_{max} \rightarrow h_w = 0 \qquad \Delta Q\% = \frac{Q_{Basic} - Q}{Q_{Basic}} \times 100$$

$$Q_{max} \rightarrow h_w = D \qquad T = K D$$

$$Q_p = \left[\frac{2 \pi k h_s \left(h_e - h_w\right)}{\ln \frac{r_e}{r_w}} \right] \times \left[1 + 7 \sqrt{\frac{r_w}{2h_s}} . \cos \frac{\pi h_s}{2D} \right]$$

$$h_{2he} - h_w = \frac{Q_p}{4 \pi k} \times \left[\frac{2}{h_s} . \ln \frac{\pi h_s}{2 r_w} + \frac{0.2}{h_e} \right]$$

$$h_{2he} - h_w = \frac{Q_p}{2 \pi k} \times \left[\frac{1}{h_s} . \ln \frac{\pi h_s}{2 r_w} + \frac{0.1}{D} + \frac{1}{D} . \ln \frac{r_e}{2D} \right]$$

$$h_e^{\,2} - h^{2}_{\,i} = \frac{Q_i}{\pi k} \ln \frac{r_{ei}}{r_i} = C_i$$

$$h_i = \sqrt{h_e^{\,2} - C_i} \qquad Z_i = h_e - h_i$$

$$Q_1 = Q_2 = \frac{2 \pi k D \left(h_e - h_w\right)}{\ln \left(\frac{r_e^{\,2}}{r_w . B} \right)}$$

$$Q_1 = Q_2 = Q_3 = \frac{2 \pi k D \left(h_e - h_w\right)}{\ln \left(\frac{r_e^{\,3}}{r_w . B^2} \right)}$$

$$Q_1 = Q_2 = \frac{\pi k \left(h_e^{\,2} - h_w^{\,2}\right)}{\ln \left(\frac{r_e^{\,2}}{r_w . B} \right)}$$

$$Q_1 = Q_2 = Q_3 = \frac{\pi k \left(h_e^{\,2} - h_w^{\,2}\right)}{\ln \left(\frac{r_e^{\,3}}{r_w . B^2} \right)}$$

$$Z_t = z_1 + z_2 + z_3 + \ldots Z_n$$

$$Z_t = \sum z_i = \sum_i^n (h_e - \sqrt{h_e^{\,2} - C_i})$$

$$z_i = h_e - \sqrt{h_e^{\,2} - C_i}$$

$$Q_1 = Q_3 = \left[\frac{2 \pi k D \left(h_e - h_w\right) \ln \left(\frac{B}{r_w} \right)}{2 \ln \left(\frac{r_e}{B} \right) \ln \left(\frac{B}{r_w} \right) + \ln \left(\frac{B}{2 r_w} \right) \ln \left(\frac{r_e}{r_w} \right)} \right]$$

$$C_i = \frac{Q_i}{\pi k} \ln \frac{r_{ei}}{r_i}$$

$$Z_t = \sum z_i = \frac{1}{2 \pi k D} \sum_i^n Q_i . \ln \frac{r_{ei}}{r_i}$$

$$Q_2 = \left[\frac{2 \pi k D \left(h_e - h_w\right) \ln \left(\frac{B}{2 r_w} \right)}{2 \ln \left(\frac{r_e}{B} \right) \ln \left(\frac{B}{r_w} \right) + \ln \left(\frac{B}{2 r_w} \right) \ln \left(\frac{r_e}{r_w} \right)} \right]$$

$$Q_2 = \left[\frac{\pi k \left(h_e^{\,2} - h_w^{\,2}\right) \ln \left(\frac{B}{2 r_w} \right)}{2 \ln \left(\frac{r_e}{B} \right) \ln \left(\frac{B}{r_w} \right) + \ln \left(\frac{B}{2 r_w} \right) \ln \left(\frac{r_e}{r_w} \right)} \right]$$

$$Q_1 = Q_3 = \left[\frac{\pi k \left(h_e^{\,2} - h_w^{\,2}\right) \ln \left(\frac{B}{r_w} \right)}{2 \ln \left(\frac{r_e}{B} \right) \ln \left(\frac{B}{r_w} \right) + \ln \left(\frac{B}{2 r_w} \right) \ln \left(\frac{r_e}{r_w} \right)} \right]$$

$$N_s = 0.2108 N \left(\frac{Q^{0.5}}{H^{0.75}} \right) \qquad H_m = h_S + K Q^2$$

$$\frac{Q_1}{Q_2} = \left(\frac{N_1}{N_2} \right) \times \left(\frac{D_1}{D_2} \right)^3 \qquad \frac{H_1}{H_2} = \left(\frac{N_1}{N_2} \right)^2 \times \left(\frac{D_1}{D_2} \right)^2$$

$$H = HSt + hf + hp + \frac{V^2}{2g} \qquad H_m = H_{St} + h_f + h_p$$

$$\frac{BP_1}{BP_2} = \left(\frac{N_1}{N_2} \right)^3 \times \left(\frac{D_1}{D_2} \right)^5 \qquad WP = \frac{Q \times H}{102}$$

$$h_f = f \cdot \frac{L}{d} \cdot \frac{V^2}{2g} = \frac{f L Q^2}{12.1 d^5} \qquad NPSHR = \sigma H$$

$$NPSHA = P_{atmos} - Z_s - hf_s - P_V \qquad BP = \frac{Q \times H}{102 \times E}$$

$HSt = HSd \pm HSs$ $\qquad$ $Hm = Hmd - Hms$

$$P_{atmos} = 10.33 - 0.00108 E$$