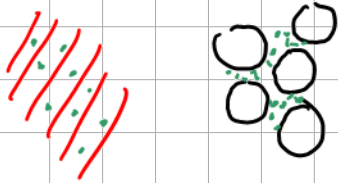


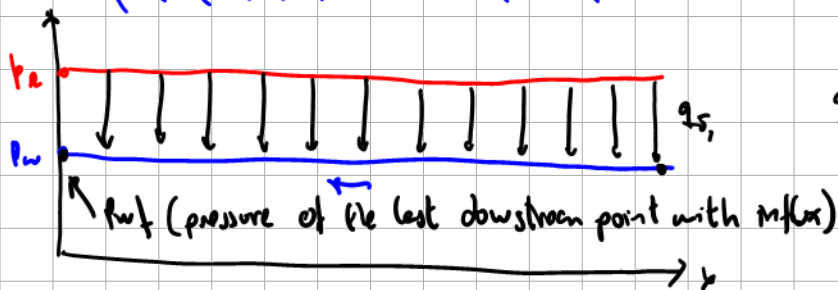
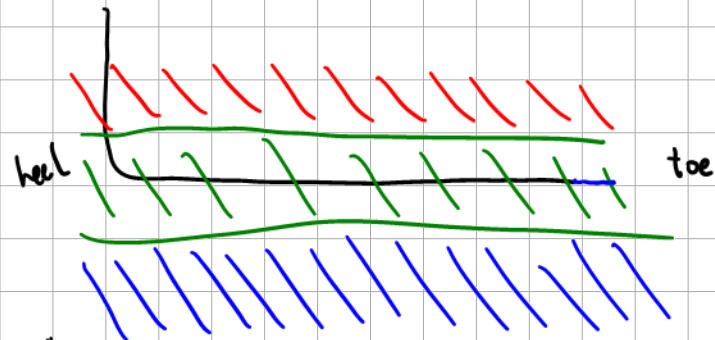
formation damage



concentric and perforating

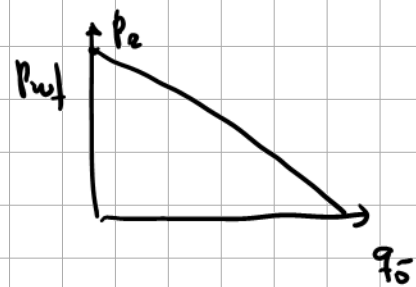


variation of pressure along wellbore in horizontal wells

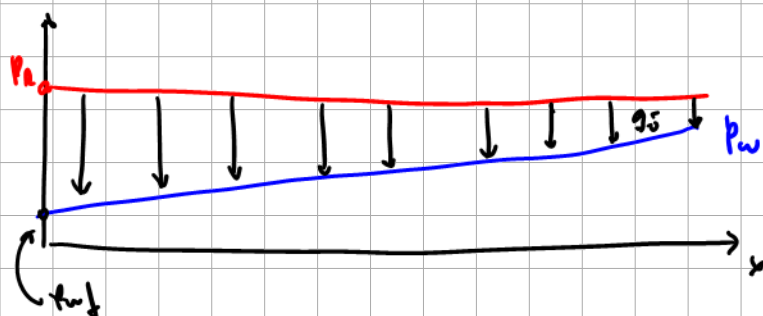


$$q_s \propto (P_e - P_w)$$

TPR for this case

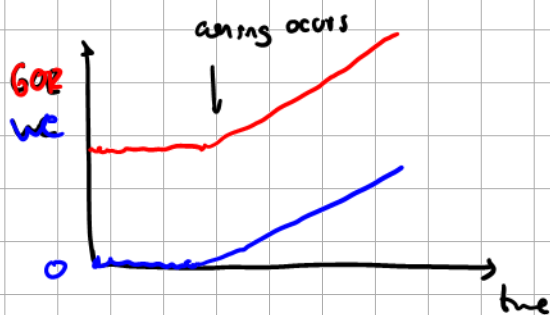
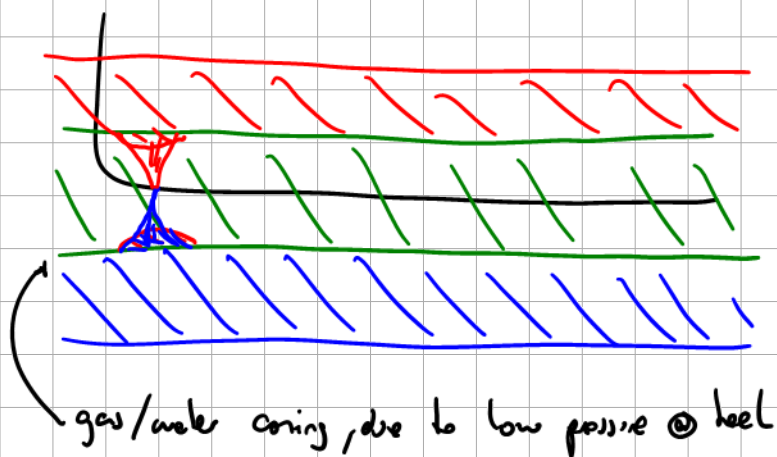


$$q_{0,well} = \int_{x_{toe}}^{x_{heel}} q_{s, hbl} \cdot dx$$



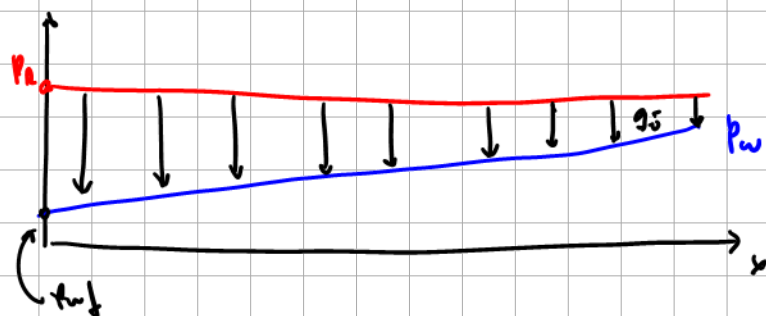
$$q_s \propto (P_e - P_w)$$



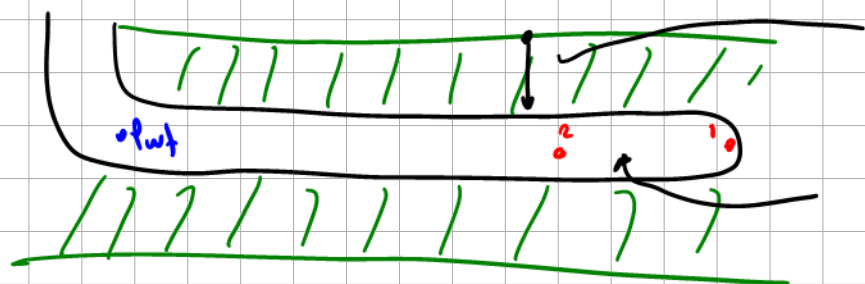


$$q_g = GOR \cdot q_o$$

$$q_w = \frac{w_c}{1-w_c} q_o$$



$$q_o = \alpha (P_1 - P_w)$$



probably is linear

$$q_o = J (P_1 - P_w)$$

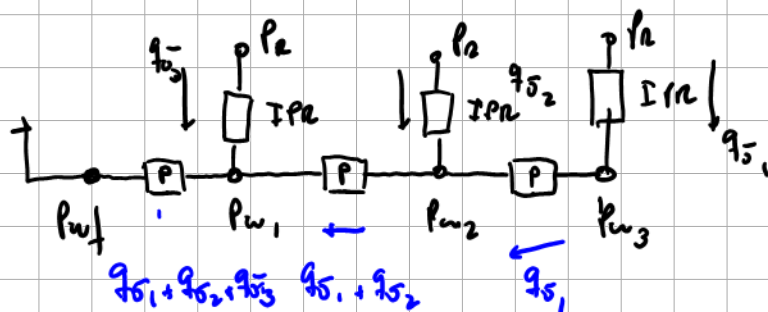
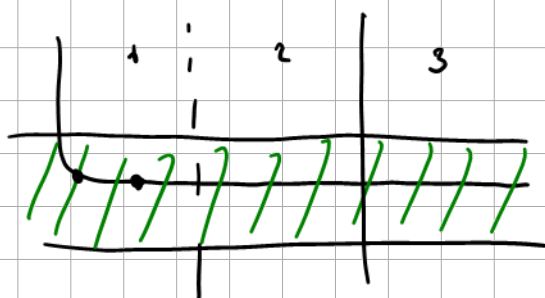
$$\frac{P_1}{\rho g} + \frac{v_1^2}{2g} = \frac{P_2}{\rho g} + \frac{v_2^2}{2g} + \frac{f L}{\phi} \frac{v^2}{2g}$$

friction losses

$$(P_1 - P_2) = \rho \frac{f L}{\phi} \frac{v^2}{2}$$

$$\frac{dP}{dx} = \rho \frac{f}{\phi} \frac{v^2}{2} \quad v^2 = \left(\frac{q_o B_o}{A} \right)^2$$

$$\frac{dP}{dx} = \rho \frac{f}{\phi} \frac{8 (q_o B_o)^2}{\pi^2 \phi^5} \quad A = \frac{\pi \phi^2}{4}$$



$$q_{s1} = J_1 (p_2 - p_{w1})$$

$$q_{s2} = J_2 (p_2 - p_{w2})$$

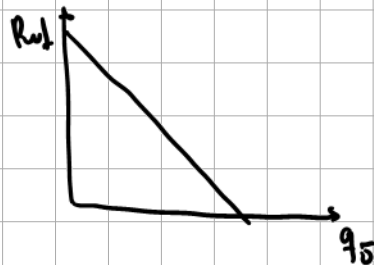
$$q_{s3} = J_3 (p_2 - p_{w3})$$

$$p_{w3} - p_{w2} = \frac{f \cdot l}{\pi^2 \phi^5} (q_{s1} \cdot B_{o1})^2$$

$$p_{w2} - p_{w1} = \frac{f \cdot l}{\pi^2 \phi^5} (q_{s1} B_{o1} + q_{s2} B_{o2})^2$$

$$p_{w1} - p_{wf} = \frac{f \cdot l}{\pi^2 \phi^5} (q_{s1} B_{o1} + q_{s2} B_{o2} + q_{s3} B_{o3})^2$$

NEQ	N unknowns
1	2
1	2
1	2
1	0
1	0
1	1
6	7



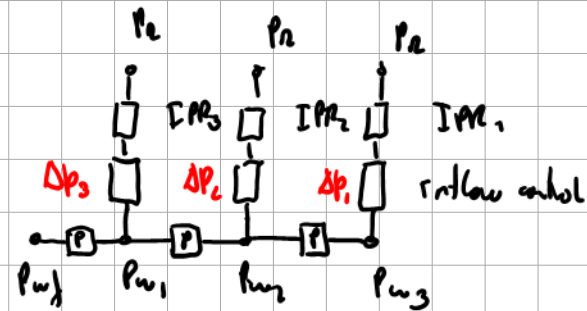
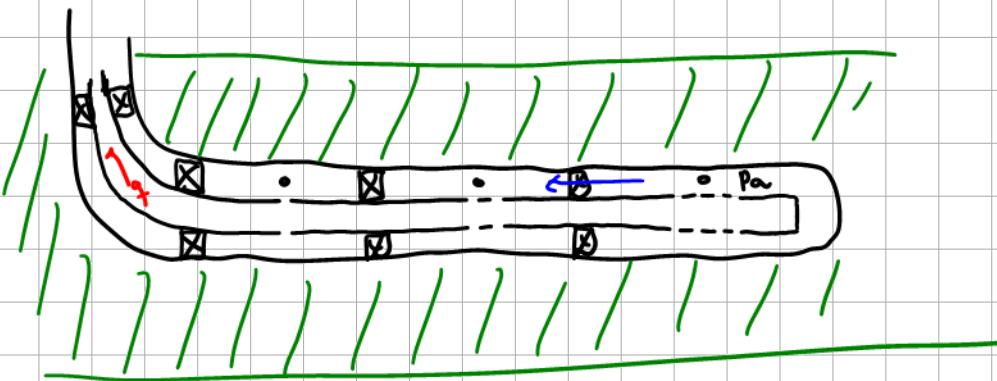
$q_s \rightarrow p_{wf}$

$p_{wf} \rightarrow q_s$

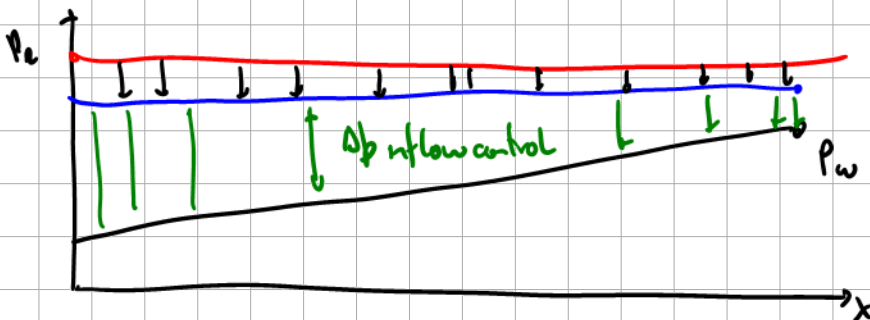
provide p_{wf}

provide $q_s = q_{s1} + q_{s2} + q_{s3}$

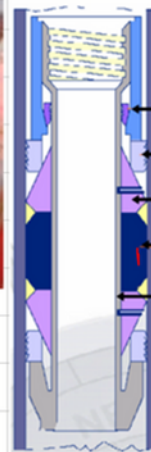
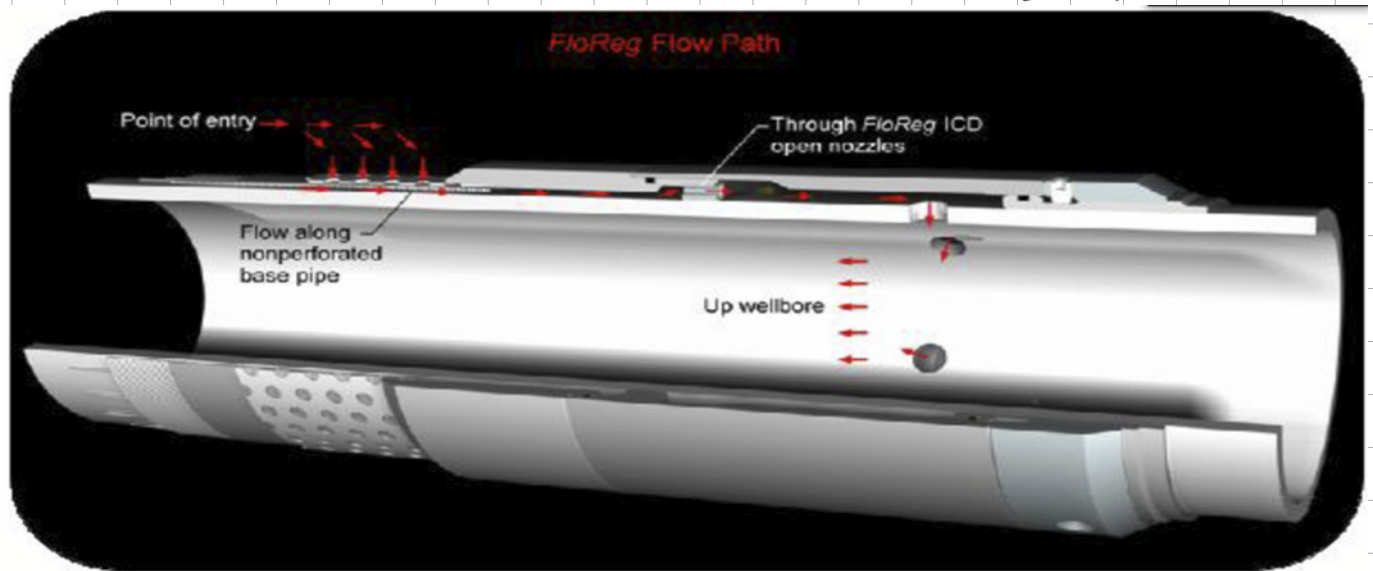
Inflow control



$\Delta p_3 > \Delta p_1$ to compensate



ICD: inflow control device



As the packer sets, the inner mandrel moves up, driving the cone underneath the slips, pushing them into the casing wall. The sealing element is compressed & extruded to the casing wall.

- Lock Ring and Mandrel
- Slips
- Cone
- Seal
- Inner Mandrel

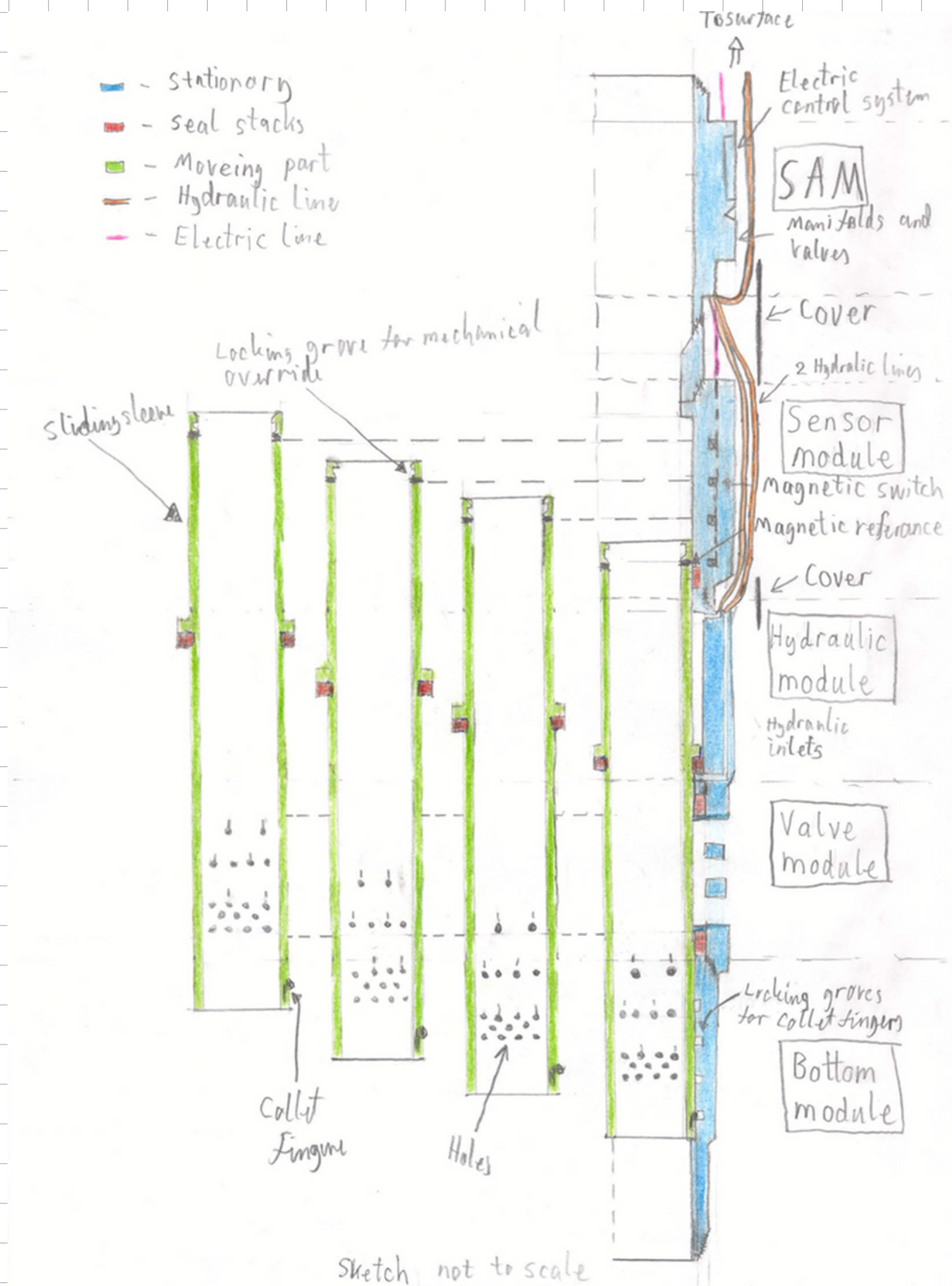
Ability to effectively set a packer depends on having a clean, non corroded set point and reaching the set point without fouling the slips or failing other components.



Hydro-Set, Hydro-Release

inflow control technologies

ICV : inflow control valve



AICV : automatic inflow control valve device

wc1 GOR T