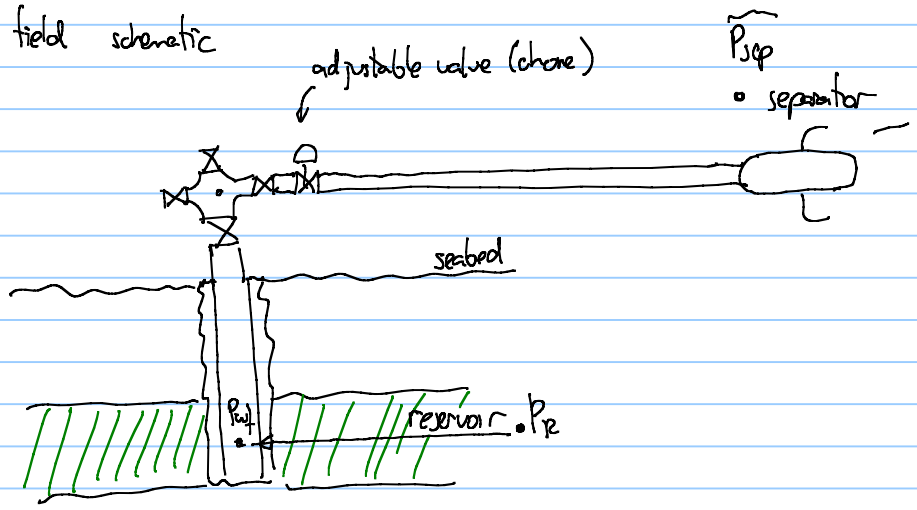
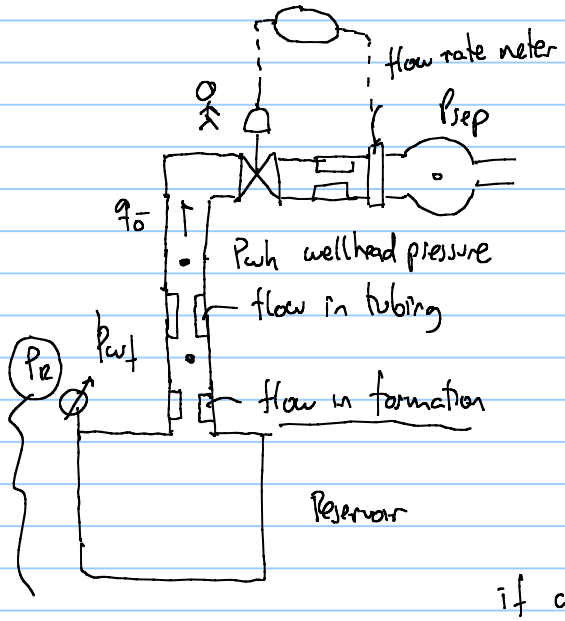
Notes for Youtube video nr. 5

field schematic



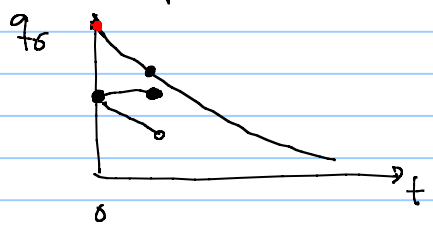
Mechanical analogue of field



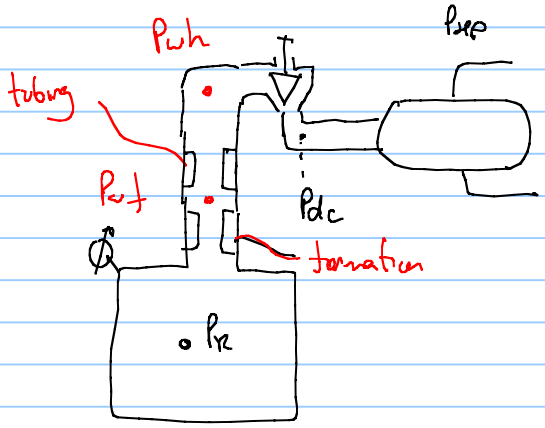
$q_o = f(p_R, p_{sep}, \text{choke opening})$

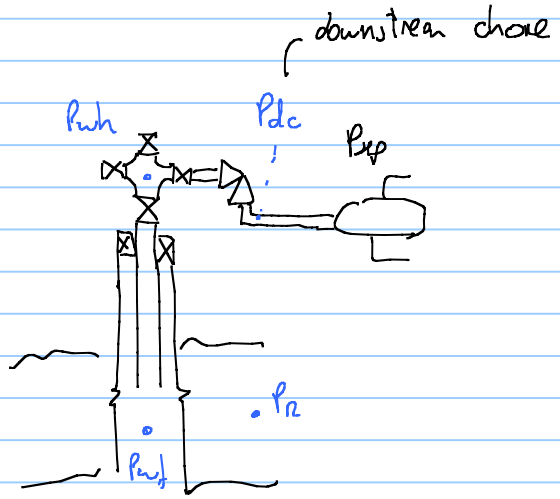
if choke is open

$q_o = (p_R, p_{sep}, \Delta p_{choke})$



mechanical analog of a field (dry gas)

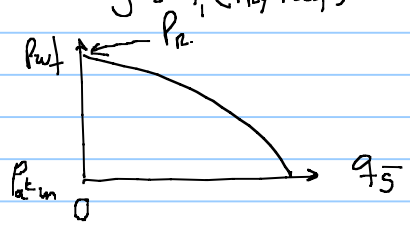




P_{wf} flowing bottom-hole pressure (BHP)
P_{wh} wellhead pressure (WHP)

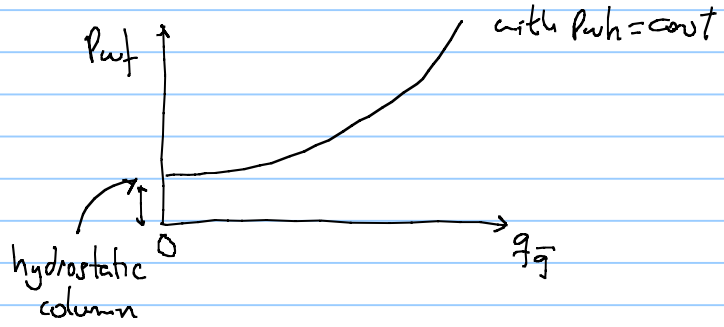
$P_R \rightarrow P_{wf}$ flow in formation (drawdown) IPR inflow performance relationship

$$q_{\bar{g}} = f_1(P_R, P_{wf})$$



$P_{wf} \rightsquigarrow P_{wh}$ flow in tubing $\rightsquigarrow$ TPR tubing performance relationship

$$q_{\bar{g}} = f_2(P_{wf}, P_{wh})$$



$P_{wh} \rightarrow P_{dc} \rightsquigarrow$ pressure drop in choke choke equation

$$q_{\bar{g}} = f_3(P_{wh}, P_{dc}, \text{Opening})$$

- inaccurate model
- highly non-linear
- difficult to converge
- "many" models

$P_{dc} \rightsquigarrow P_{sep} \rightsquigarrow$ pressure drop in pipe

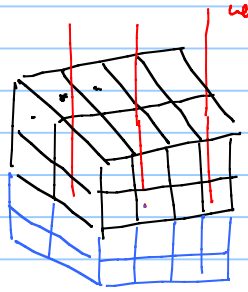
Pipeline / flowline performance relationship (FPR, PPR)

$q_g = f_4(P_{in}, P_{out})$

Production profiles (field performance) are typically estimated with:

examples of commercial software
- ECLIPSE
- CMG
- Intersect
- Nexus
- MRST
- OPM
- SENSOR

• Reservoir simulator.



well
- target rate q_T
- minimum bottom hole pressure →

try to produce target rate, if not, change to minimum bottomhole pressure

in FD, a workflow that is typically used by oil companies to compute realistic production profiles is:

Reservoir engineering
- 3D reservoir model

$q_{target\ rates}(t) \sim q(t)$

$P_{pressure}(t)$ $P_{wf}(t)$

Production and facilities engineering

production simulator (steady-state)

check at each point in time if

$q(t)$, $P_{wf}(t)$ } feasible?

↳ is it enough to reach separator?

example of commercial software
- Pipesim
- Prosper, gap
- Olga
- pipesoft
- ReO

if not, try to make it feasible

flag years in which it is not possible to produce the rates

send feedback to

At early FD, there is usually no information on wells, gathering network or facilities, thus they are typically neglected

- Reservoir simulator "coupled" with a well + gathering network simulator in a IAM software
  - ↳ integrated asset management

examples of software
- Resolve
- Avocet
- Pipe-it (now Tieto)

- material balance + Inflow performance relationship
  - material balance: single term
  - Inflow performance relationship

p_R
S_o vs t
S_g
S_w

$q = f(P_R, P_{wf})$

needs assumption on $P_{wf\,min}$

- material balance + well + network model

P_R
S_o vs t
S_g
S_w

$q = f(P_R, P_{sep})$

- decline or type curves { very early FD }