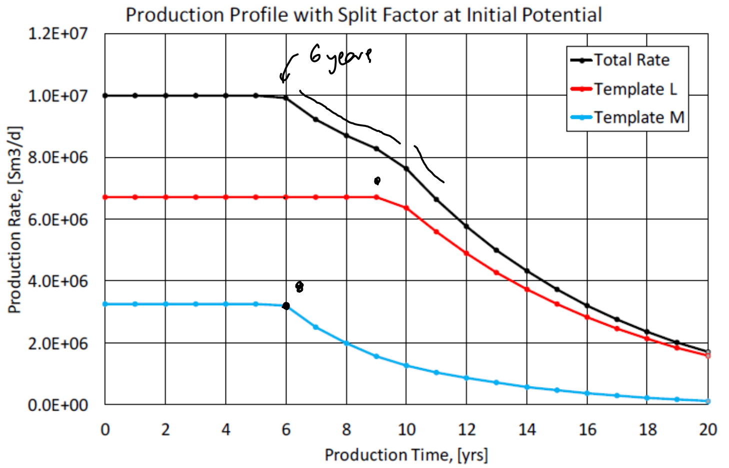
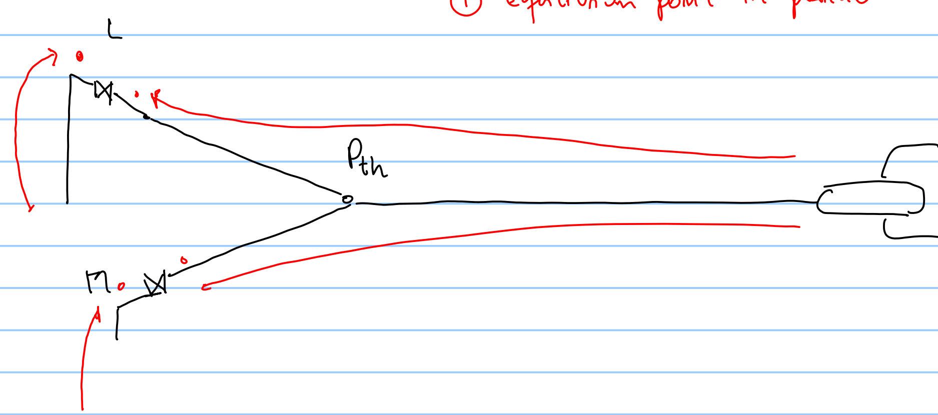
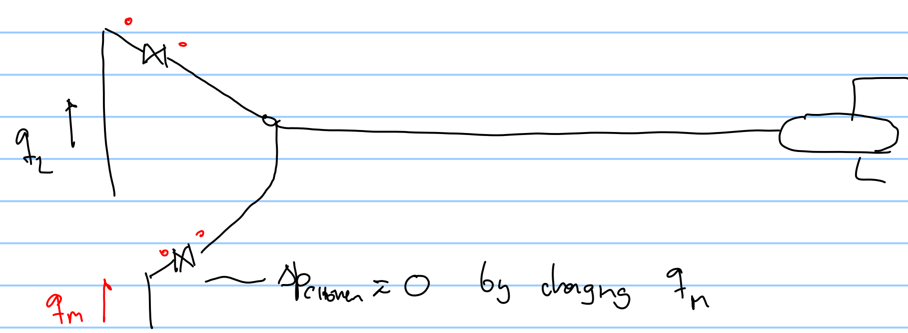
- Review of problem 1, ex. set 3
- Class exercise (exam problem)



① equilibrium point in plateau

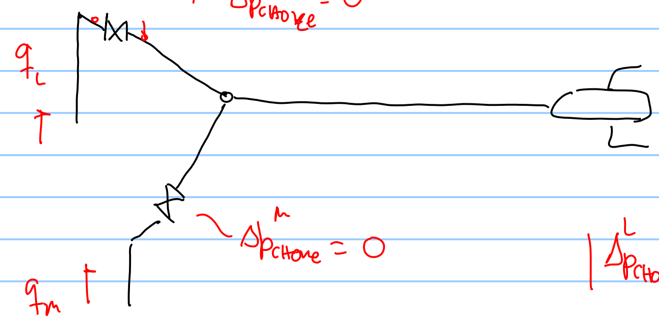


② template M enters in decline $\Delta P_{choke} \leq 0$



$\Delta P_{choke} \approx 0$ by changing q_M

③ template L enters in decline

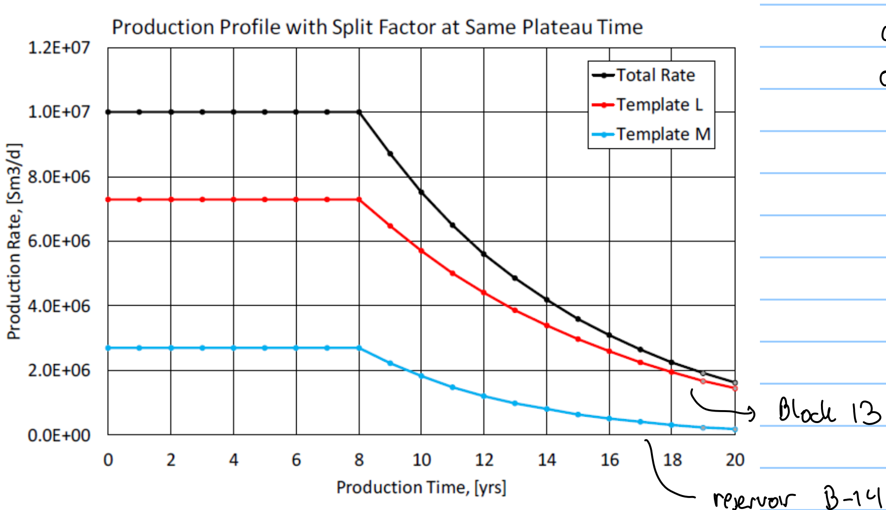


$\Delta p^L_{choke} = 0$

$\Delta p^m_{choke} = 0$

$|\Delta p^L_{choke}| + |\Delta p^m_{choke}| = 0$

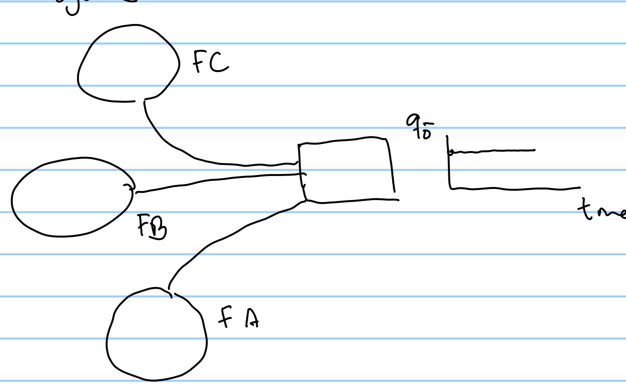
Changing the production splitting can change significantly the plateau duration.



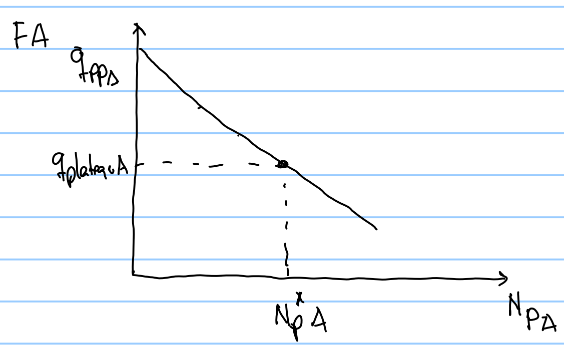
0.73 template L

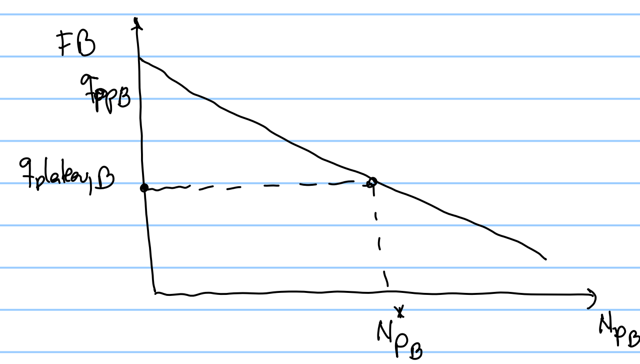
0.27 template M

for multi-reservoirs systems



when 2 reservoirs





given $q_{f,plateau}$

chose $q_{plateau,A}$, read N_{pA}^{*}

$$t^{A}_{end,plateau} = \frac{N_p^{*} A}{q_{plateau,A} \cdot N_{day/year}}$$

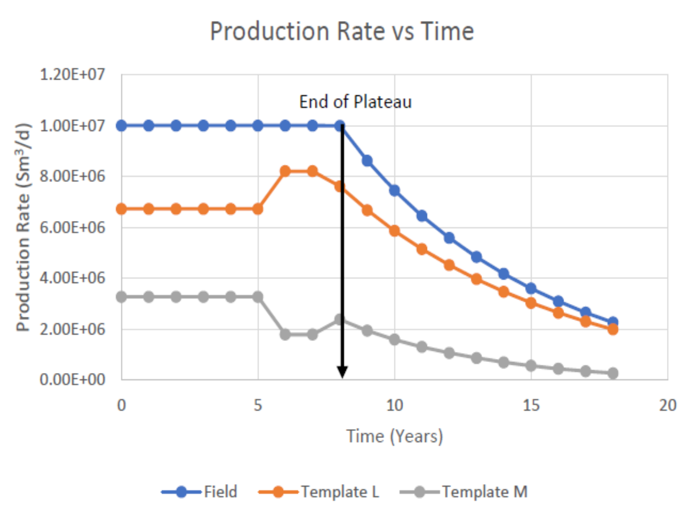
$$q_{plateau,B} = q_{field,plateau} - q_{plateau,A}$$

to maximize plateau duration

$$t^{A}_{end\,plateau} = t^{B}_{end\,plateau}$$

$$t^{B}_{end\,plateau} = \frac{N_{pB}^{*}}{q_{plateau\,B} \cdot N_{day/year}}$$

Note: be careful with constraints ! → maximum allowable production per well
API blending
CO_2, H_2S content
etc.

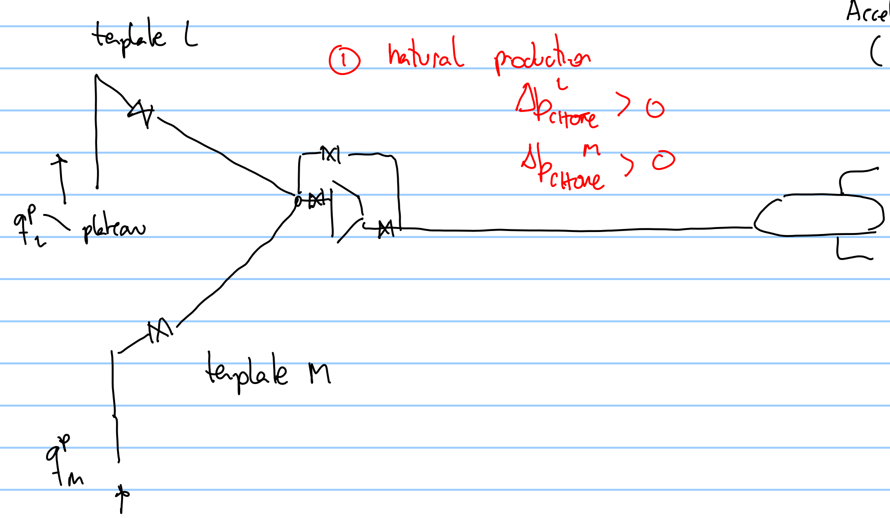


It is also possible to change production splitting mid-way

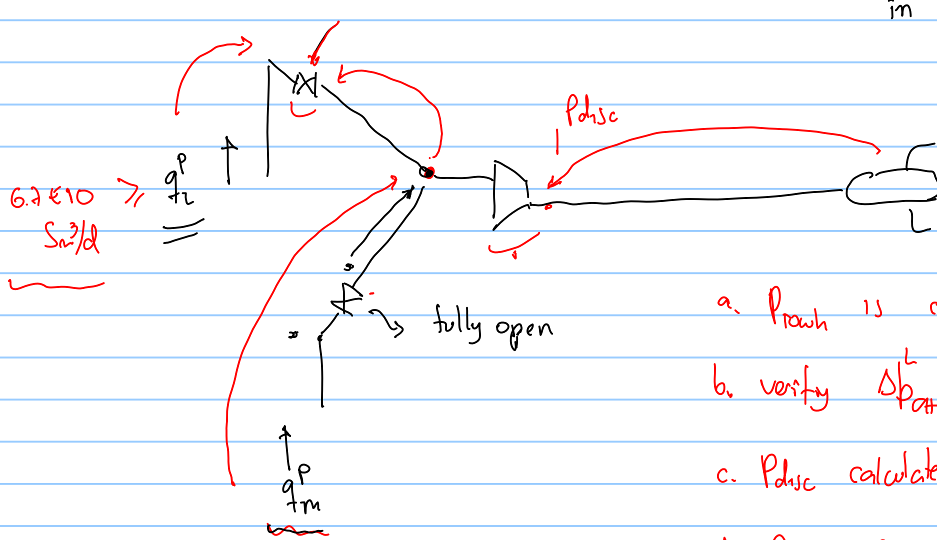
• Task 2. simplified compressor

compressor enables: higher recovery factor
Accelerates production
(prolonging plateau
higher values during tail production)
↳ recovering earlier
↑NPV

① natural production
$\Delta p^{L}_{choke} > 0$
$\Delta p^{M}_{choke} > 0$



② template M enters in decline, but we still want to produce it in plateau mode!



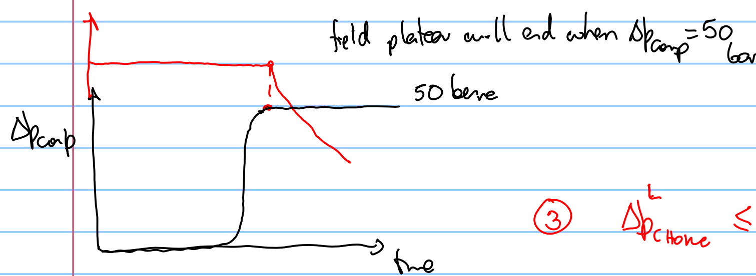
a. P_{twh} is calculated co-current from M

b. verify $\Delta p^L_{choke} > 0$

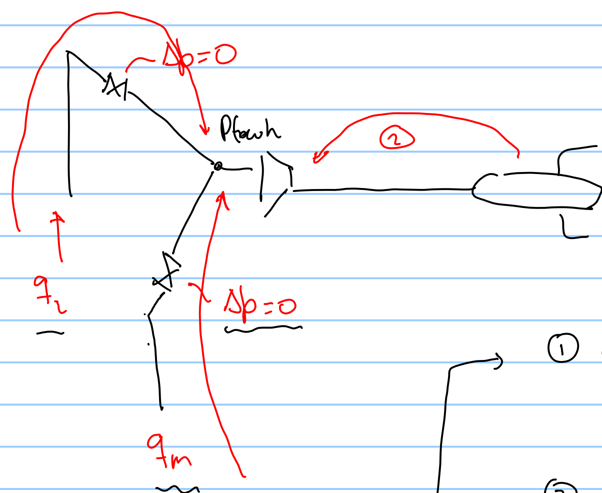
c. P_{dsc} calculated from P_{sep}

d: $P_{dsch} - P_{tow} > 0$

$P_{ds} - P_{tow} \leq 50$ bar



③ $\Delta p^L_{choke} \leq 0$ – fully open choke with $\Delta p_{comp} = 50$ bar



① assume $q_L < q_L^P$

$q_M < q_M^P$

② calculate P_{dsch} (counter-current from sep)

③ max q_{field} is obtained when Δp_{comp} is maximum, therefore:

$$P_{twh} = -50 + P_{dsch}$$

④ move co-current to P_{tow} from L and M and check if

$$P_{twh} = P^M_{twh} = P^L_{tow} \ ?$$

not

yes

solution

alternative:

(4') move counter current from P_{towh} to P^{m}_{temp}

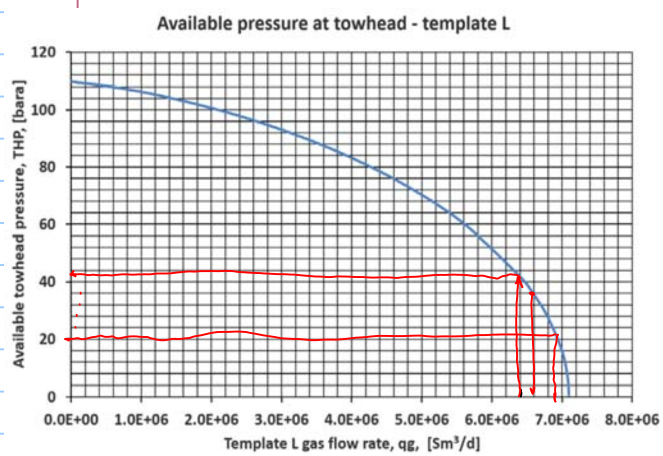
and $P_{tow} \rightarrow P^{L}_{temp}$

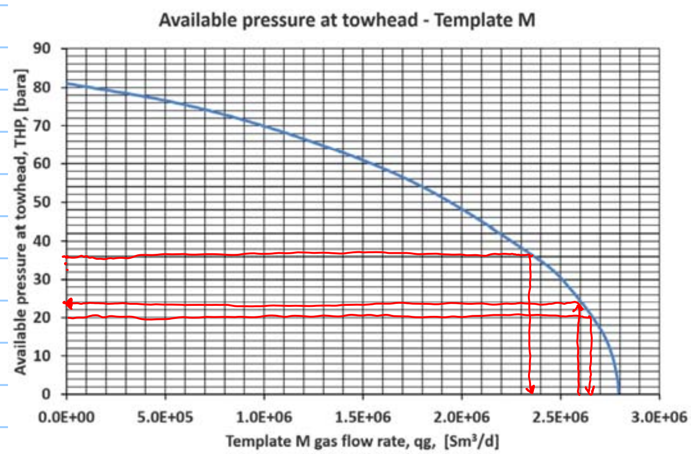
move co-current from m to P^{m}_{wh}

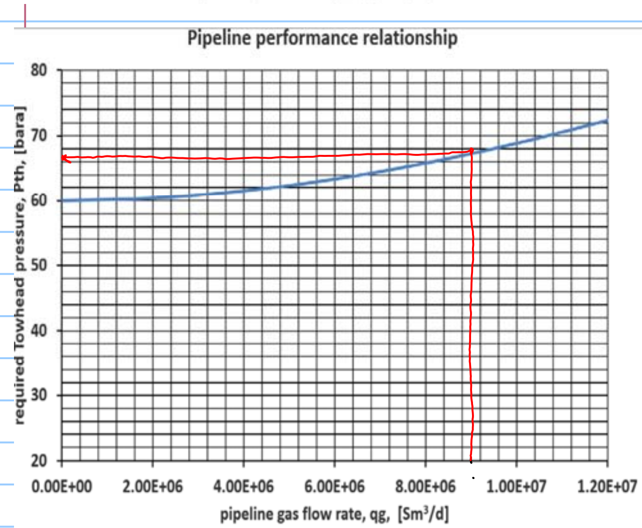
move co-current from L to P^{L}_{wh}

change q_L and q_m such that $\begin{cases} \Delta p^{m} = 0 \\ \Delta p^{L} = 0 \end{cases}$

Class exercise:







$q_m + q_L = 9\,E06\ Sm^3/d$

(1) $P_{disc} = 67$ bara

(2) assume $P_j = 20$ bara

$q_L = 6.9\,E06\ Sm^3/d$

$q_m = 2.65\,E06\ Sm^3/d$

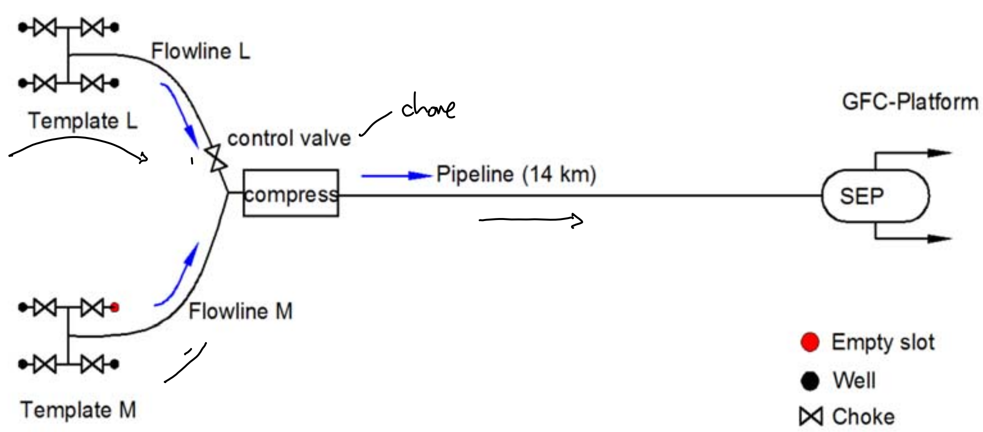
$q_T = 9.5\,E06\ Sm^3/d$

assume $P_j = 36$ bara

$q_m = 2.35\,E06\ Sm^3/d$

$q_L = 6.6\,E06\ Sm^3/d$

it is possible: $\Delta p_{comp} = 67 - 36 = 31$ bar



task2.

$P_{dish} = 67$ bara $f(q_{field})$

$q_{field} = 9E6\ Sm^3/d$

$q_L = 6.4\ E6\ Sm^3/d$

$P_{upstream\ control\ valve} = 41$ bara

P_{wh}^{L}

$q_M = 7.6\ E06\ Sm^3/d$

$P_{wh}^{m} = P_{junct} = 24$ bara

$\Delta p_{chone}^{L} > 0 \quad 41 - 24 = 17$ bar

$\Delta p_{comp} > 0 \quad 67 - 24 = 43$ bar