Notes for Youtube video nr. 3

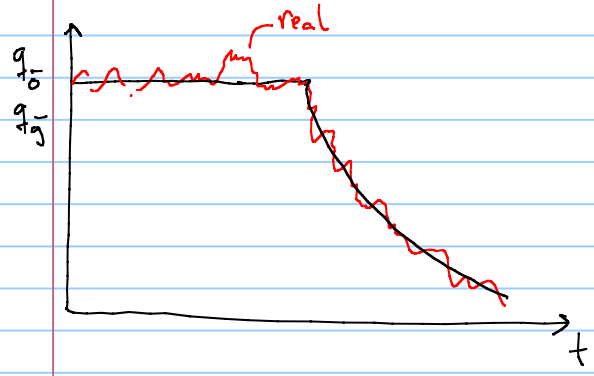
- **Field production performance**
  - production modes (production scheduling)
  - plateau height vs. plateau length
  - deciding plateau height

production scheduling: deciding / forecasting rates of {oil, gas} and associated products {oil, water, gas, water}

during the life of field

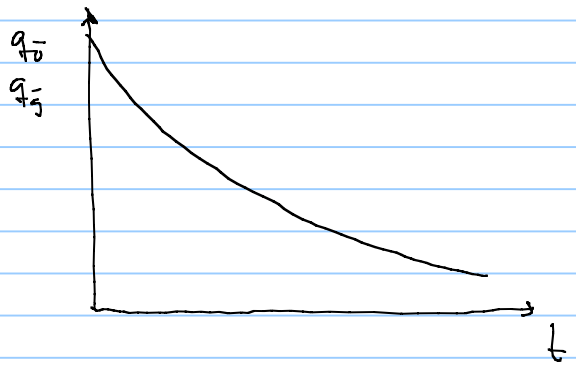
two ways to produce a field

Production mode A "plateau production"

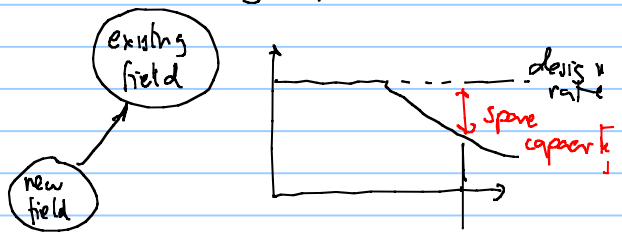


- typically used for gas fields with a contract
- Big-medium reservoir
- standalone development → requires its own facilities, offshore structure etc.

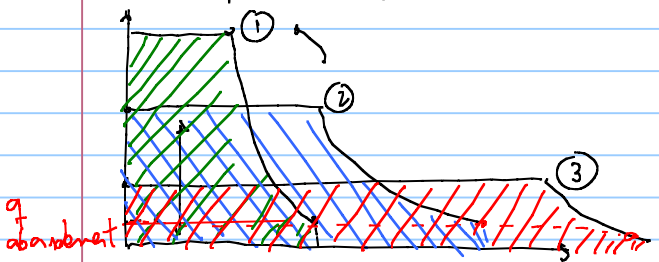
Production mode "B" "decline production"



- produce as much as possible as early as possible
- satellite developments to existing fields that use existing infrastructure

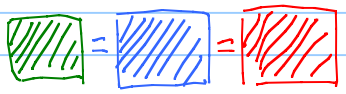


in mode "a" there is a relationship between plateau height and duration

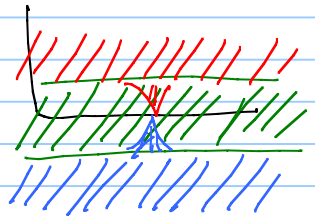


$$N_p = \int_0^t q(t)\,dt$$

↳ cumulative production until abandonment N_{pu}



- for gas, plateau height/length is given by contract
- for oil/gas → there is a requirement by authorities to reach certain RF



higher rates can cause high GOR
high WC
sand production

to define plateau rate an economic analysis must be made

higher plateau → higher revenue

NPV → net present value $NPV = \sum_{i=1}^{N} \frac{CF_i}{(1+c)^i}$

cash flow = revenue − expenses

$\Delta Q_{p_i} P_o^i$ production of oil/gas in year i

i: year

c: discounting rate (5% → 15%) 0.05 − 0.15

$$NPV = \underbrace{\text{Expenses}}_{\text{wells, processing facilities, platform}} + \frac{\Delta Q_p^5 P_o^5 - OPEX^5}{(1+0.07)^5} + \frac{\Delta Q_p^6 P_o^6 - OPEX^6}{(1+0.07)^6} + \dots$$

(1 − 5)

start production

due to discounting, it makes sense to produce as much as possible, as early as possible

$DF = \frac{1}{(1+c)^i}$

year	
1	0.93457944
2	0.87343873
3	0.81629788
4	0.76289521
5	0.71298618
6	0.66634222
7	0.62274974
8	0.5820091
9	0.54393374
10	0.50834929
11	0.4750928
12	0.44401196
13	0.41496445
14	0.38781724
15	0.36244602

if plateau rate is higher → bigger processing facility
→ bigger offshore structure
→ more wells

↓ expenses ↑ become very negative

but also revenues become bigger

for HC fields, plateau rate is usually decided by doing an economic evaluation and sensitivity analyses

exceptions: • Blending of crude.

Rules of thumb for first iteration on plateau rate

for oil: 10% of N_{pu} per year

ultimate cumulative production (at abandonment)

TRR → total recoverable reserves

Example 180E06 stb → N initial oil in place (OOIP)

$$N_{pu} = R_{FU} \cdot N$$

$(0.3-0.5)$

$N_{pu} = 0.4 \cdot 180E06$ stb

$N_{pu} = 72E06$ stb

$$q_{plateau} = \frac{N_{pu} \cdot 0.1}{\text{N° producing day in year}} = \frac{72E06 \cdot 0.1}{0.9 \cdot 365} \simeq 21{,}900 \text{ stb/d}$$

$[Sm^3/d]$

$[stb/d]$

↳ 95% uptime $(0.95 \cdot 365)$

for gas (2-5)% of G_{pu}

Q is either oil or gas
N is for oil
G is for gas