


PCP START UP & OPTIMIZATION RECOMMENDATIONS

keep it moving 

FOREWORDS

Preliminary objective of starting procedure is to recover in minimum of time the fluid at surface in safe condition for the well and the system.

Final objective is to reach optimized and stable steady state condition in term of:

- Production
- Dynamic fluid level (avoid dry running)

See annex A for Startup and steady state conditions definition

Several cases exist:

- New pump:
 - in a new well (no history, no records)
 - in a known well (with history and records)
- Re start pump :
 - pump already in hole (stopped) in a known well (with history and records)

Well specificities:

- Solids production
- Oil viscosity
- Dog leg severity
- Gas
- ...

Pump start shall be adapted to cases and well specificities.



A new pump installed can present lower performance at initial start than few weeks after due to elastomer chemical swelling. Thus special care must be taken regarding pump speed increased and fluid level above pump monitoring in order to avoid dry running operations.

PCP start up & optimization recommendations

DAY#1 – START UP RECOMMENDATION / NEW PUMP

- **Step 1:** Check PCP design or previous operating data to define final target to be reached in term of operating speed, rod torque, production.
- **Step 2:** Monitor fluid level, confirm sufficient level above pump.
- **Step 3:** Start up at 100 RPM (+/- 20 rpm depending of well) with a ramp up of 3 to 10 seconds.



Risk of stick and slip issue depending on rod length size. Ramp up timing can be adjusted accordingly.

- **Step 4:** Record time, speed, torque (or current) every 10 minutes. Repeat measure until 30 minutes after start up minimum. (used Annex B to fill records)
- **Step 5:** Calculate torque rise (difference between 2 consecutive torque measurement divided by previous record)
Torque rise = (Torque @ t+10min – Torque @ t) / Torque @ t
- **Step 6:** If Torque rise is below 20% within 10 minutes then **increase speed by 25 rpm** maximum and repeat step 4
- **Step 7:** If Torque rise is above 20% keep PCP running for 10 minutes more and repeat step 5
- **Step 8:** Pursue speed increase and records every 10 minutes until fluid at surface. Record time when fluid at surface. (use Annex C curve to predict time for fluid to reach surface)
- **End of PCP Startup**



Do not exceed 200 rpm after commissioning at day #1 depending on well history and challenges.
Do not operate pump at speed and production that could conduct to dry running.



Recorded torque to be compared with torque given into pump data sheet or pump bench test to estimate PCP load, solid production or any abnormal operations. Torque value can also be used for trouble shooting purpose.

DAY #2 & DAY #3 – INITIAL OPTIMIZATION / NEW PUMP



Confirm sufficient level above pump before any pump speed increase.
Speed increase is possible only if torque rise is below 20%.

- **Step 1:** Monitor fluid level and adjust speed accordingly:
 - a. fluid above pump < 150 m → reduce PCP speed by 25 rpm or more
 - b. 150m < fluid above pump < 250 m → do not change PCP speed
 - c. 250m < fluid above pump < 500m → increase PCP speed by 25 rpm max
 - d. 500m < fluid level above pump → increase PCP speed by 50 rpm max
- **Step 2:** Record time, speed, torque (or current) every 10 minute. Repeat measure until 30 minutes after speed change. (used Annex B to fill records)
- **Step 3:** calculate torque rise
- **Step 4:** If Torque rise < 20% → step 1
- **Step 5:** If Torque rise > 20% → step 2
- **Step 6:** Stop optimization when required speed or required production is reached or when 150m < fluid level < 250m



Recorded torque to be compared with torque given into pump data sheet or pump bench test to estimate PCP load, solid production or any abnormal operation. Torque can also be used for trouble shooting purpose.

ROUTINE OPTIMIZATIONS / NEW PUMP



Chemical swelling may occur during the first 2 months of production. Production of PCP may increase after a while, this is why, to avoid dry running, it is recommended to speed up progressively and to regularly monitor the fluid level above pump during this period.

- Repeat initial optimization procedure (as described in section #3) during first 2 months at the following time interval:
 - day #5
 - day #10
 - day #20
 - day #30
 - day #45
 - day #60

For each optimization record time, speed, torque on annex B.

- Repeat initial optimization procedure on a monthly basis during pumps life

For each optimization record time, speed, torque on annex B

PUMP RESTART

PCP restart procedure is similar to new pump startup but faster.

- **Step 1:** Check PCP design or previous operating data to define final target to be reached in term of operating speed, rod torque, production.
- **Step 2:** Monitor fluid level, confirm sufficient level above pump.
- **Step 3:** Start up at 100 RPM (+/- 20 rpm depending of well) with a ramp up of 3 to 10 seconds.



Risk of stick and slip issue depending on rod length size. Ramp up timing can be adjusted accordingly.

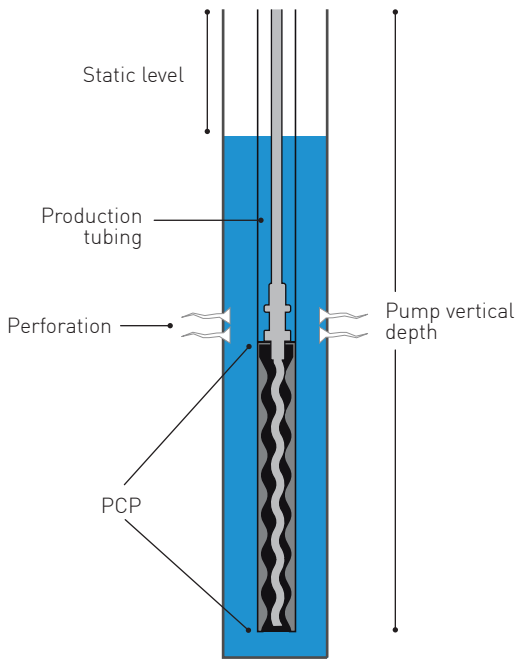
- **Step 4:** Record time, speed, torque (or current) every 10 minutes. Repeat measure until 30 minutes after start up minimum. (used Annex B to fill records)
- **Step 5:** Calculate torque rise (difference between 2 consecutive torque measurement divided by previous record).
Torque rise = (Torque @ t+10min – Torque @ t) / Torque @ t
- **Step 6:** If Torque rise is below 20% within 10 minutes then **increase speed by 25 rpm** maximum and repeat step 4. Do not exceed previous pump speed in steady state condition as maximum speed
- **Step 7:** If Torque rise is above 20% keep PCP running for 10 minutes more and repeat step 5
- **Step 8:** Pursue speed increase and records every 10 minutes until fluid at surface. Record time when fluid at surface. (use Annex C curve to predict time for fluid to reach surface)
- **End of Pump restart**
- Conduct initial optimization procedure on a monthly basis during pumps life.
For each optimization record time, speed, torque on annex B.



Use previous Startup record (speed, torque records) to compare the trends. Recorded torque to be compared with torque given into pump data sheet or pump bench test to estimate PCP load, solid production or any abnormal operation. Torque can also be used for trouble shooting purpose.

ANNEX A - START UP AND STEADY STATE CONDITIONS DEFINITION

@start up



AT START UP

Fluid level is in equilibrium at pressure reservoir.

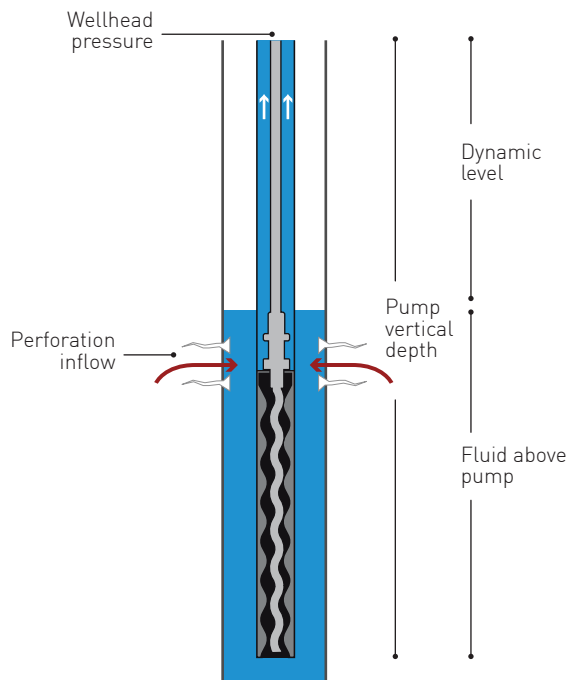
i.e:

Fluid level in the annulus = Fluid level in production tubing

Fluid above pump = Perforation depth -

(Pressure Reservoir in m + CHP in m) - Pump vertical depth

@stable conditions



IN STEADY STATE CONDITION

Dynamic level and Fluid above pump are stable

i.e:

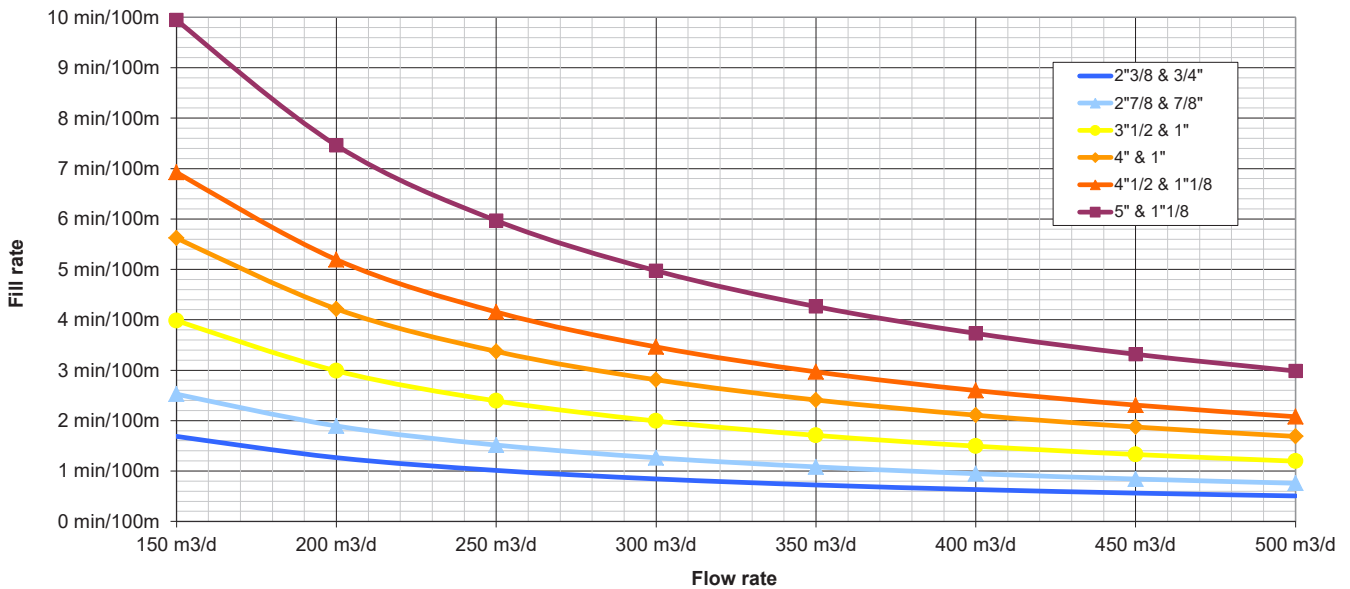
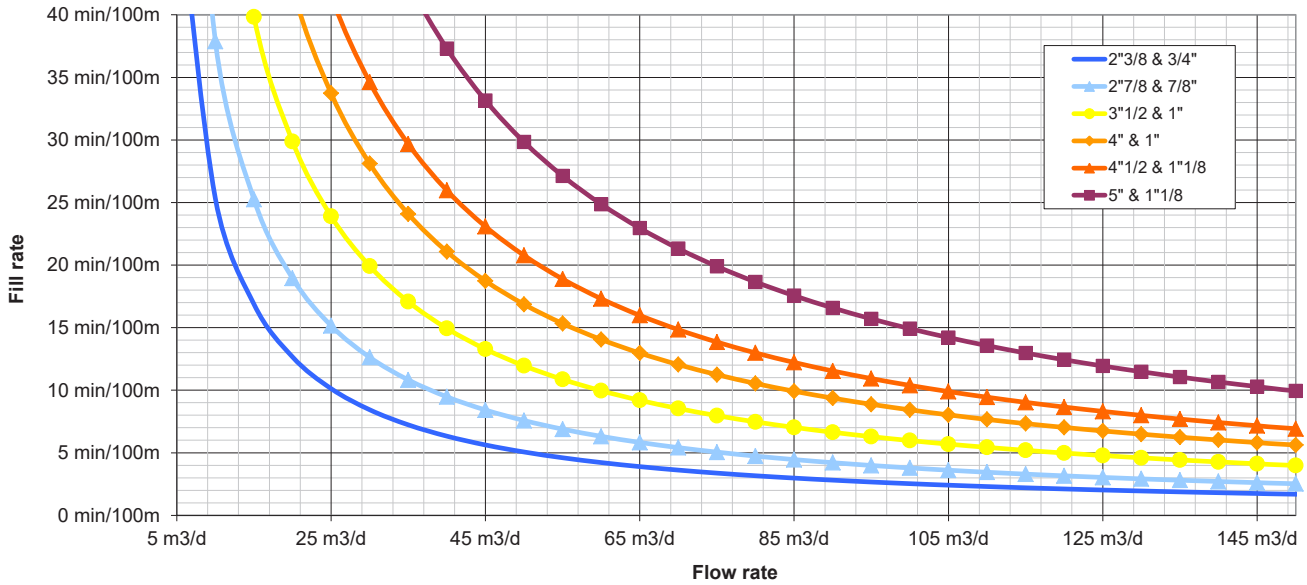
PCP production equals perforation inflow.

Notes:

If PCP production > Perforation inflow then fluid above pump is going down

If PCP production < Perforation inflow then fluid above pump is going up

ANNEX C - TUBING PRIME SPEED



EXAMPLE:

Fluid level of 500 m, Tubing 4"1/2 with rod 1"1/8, 65m3/d of production

→ Prime velocity correspond to 13 min for 100m

→ Fluid should reach surface after 5 x 13 = 65 minutes

» ANNEX D - PCP WELL OPERATIONS SCHEDULES

DAY	MONITORING (torque, speed, current)	FLUID LEVEL	PORTABLE WELL TEST	OPTIMIZATION
1 - Start up	X	X	-	X
2	X	X	-	X
3 & 4	X	X	-	-
5	X	X	-	X
6 to 9	X	-	-	X
10	X	X	X	X
11 to 19	X	-	-	-
20	X	X	-	X
30	X	X	X	X
45	X	X	-	X
60	X	X	X	X
Monthly	X	X	X	X