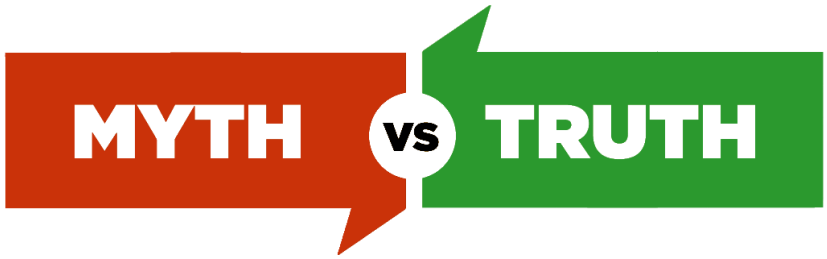
keep it moving

PCP MYTHS & TRUTHS (PART 1)

Paul SKOCZYLAS

OUTLINE



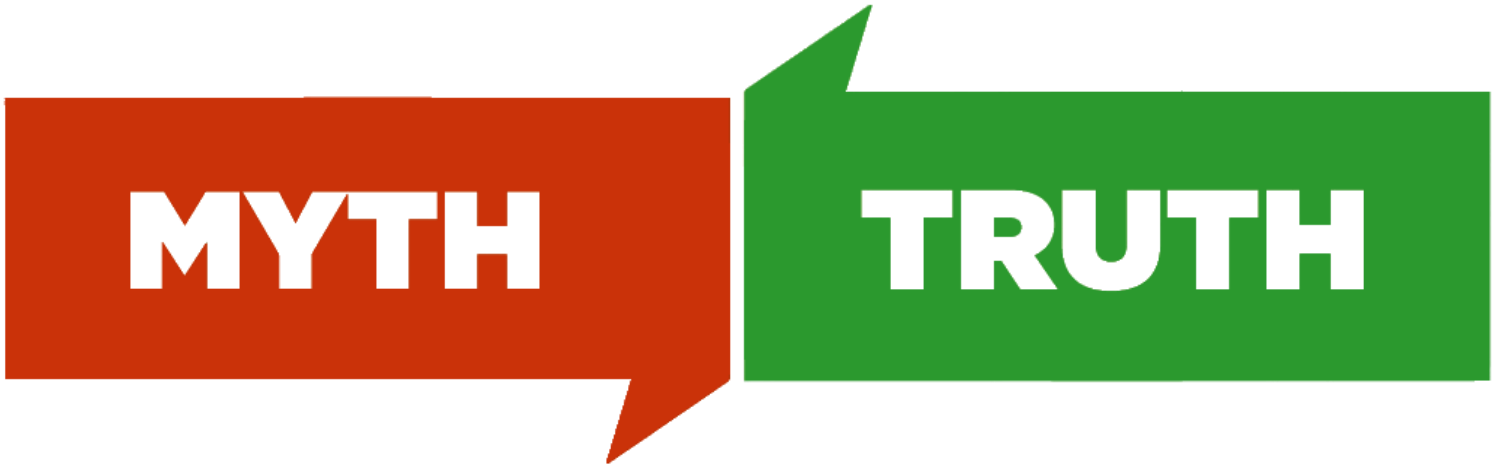
#	TOPIC	STATMENT
1	SPACE OUT	Need 1 ft space out for every 1000 ft of rod
2	AMPCP	AMPCPs cannot pump water
3	EFFICIENCY	Low volumetric efficiency while operating in the well is always bad
4	GAS	PCPs do not gas lock
5	ROD	No backspin after a stop = parted rod
6	LIGHT OIL	PCP is not a good choice for pumping high API oil
7	EXPLOSIVE DECOMPRESSION	Slow STOP & POOH will reduce risk of explosive decompression

NEED 1 FT SPACE OUT FOR EVERY 1000 FT OF ROD

1 FT SPACE OUT FOR EVERY 1000 FT OF ROD - MYTH

- Space out depends on the pump model, the pressure the pump will operate at, and the diameter of the rods
- Most PCP companies can provide charts or tables for calculating space-out requirements
- Many fields have a recommendation for extra safety factor that is required above the minimum space-out requirement
- **Examples:**
  - PCM 6E2000 at 15000 kPa: 150 mm per 1000 m with 1” rods, 200 mm with 7/8” rods (2-3” per 1000 ft)
  - PCM 185E1500 at 15000 kPa: 650 mm per 1000 m with 1.5” rods (8” per 1000 ft)
- Space-out may be less if the intake pressure is high—these are worst case

AMPCP CANNOT PUMP WATER



AMPCP CANNOT PUMP WATER – MYTH & TRUTH

- In general, AMPCP efficiency is less than that of elastomeric PCPs due to the need for a positive clearance between the rotor and stator
- How low the efficiency is depends on the fluid viscosity and on the design of the AMPCP (different vendors construct their AMPCPs in different ways)
- In many SAGD applications (at high temperature, and with produced water as well as the oil), the fluid viscosity is similar to that of water at room temperature, and the AMPCPs are used successfully
- PCM Vulcain™ AMPCPs are tested in water and should have ≥55% volumetric efficiency at 300 RPM and full head, although this will reduce over time in operation due to wear

LOW PCP VOLUMETRIC EFFICIENCY WHILE OPERATING IN THE WELL IS ALWAYS BAD

LOW PCP VOLUMETRIC EFFICIENCY WHILE OPERATING IN THE WELL IS ALWAYS BAD - MYTH

- We're talking about efficiency in the well here, not on the bench test.
- Volumetric efficiency that is too high (more than 85-90%) may be bad in some cases.
  - High friction, wasted power, extra heat being generated, shorter pump life
- How low can the volumetric efficiency go before it is "bad"?
- **The key question is:** Is there enough liquid passing through the pump to remove all the heat being generated internally (e.g. by friction)?
- Depends on:
  - Friction torque
  - Pump Speed
  - Elastomer's maximum allowable temperature
  - Fluid temperature
  - Fluid type (water, oil, free gas)
  - Internal temperature/pressure distribution inside pump

PCPS DO NOT GAS LOCK

PCPS DO NOT GAS LOCK- TRUTH

- When a pump “gas locks”, all flow ceases, even though power is still being supplied to the pump.

- This is a problem that can occur in both reciprocating rod pumps and electric submersible pumps

- In a rod pump, under certain conditions, if the space between the travelling and standing valves is filled with gas, it won’t compress enough on the down stroke to generate enough pressure to open the travelling valve, and it won’t expand enough on the up stroke to allow the standing valve to open.

- An ESP is a centrifugal pump—these generate “head”, and not “pressure”.

  The difference between the two is the density of the fluid. An ESP that can produce 1000 m of head will be able to produce ~ 10 MPa of pressure when it has water in it, ~8 MPa when it has oil in it, but less than 1 MPa with gas in it. But if the tubing is filled with water or oil, the ESP with a gas slug in it cannot produce enough pressure to move the liquid in the tubing up, so flow stops.

- A PCP does not have either of these problems. The progressing cavities open and close in such a way as to capture and move gas from the intake to the discharge.

NO BACKSPIN AFTER A STOP = PARTED ROD

NO BACKSPIN AFTER A STOP = PARTED ROD - MYTH

- The myth says that if no backspin is observed at surface during a shutdown, the rods must be broken.
- While broken rods will certainly not backspin when the drive is shut off, there may also be other reasons that there is no backspin.
- Some examples:
  - **A hole in tubing, or broken tubing** (or the presence of an automatic drain valve) – if the fluid drains through the hole (or valve) instead of the pump, it won't turn the rods backward;
  - **A very loose fit pump—or a pump that is badly worn or has suffered severe damage to the elastomer**—if the fluid can drain through the pump without forcing the rotor to turn, there won't be backspin at surface
  - **A very high static fluid level (or a very tight pump)** – if there is not enough hydrostatic pressure to overcome the pump's friction, the fluid will not drain through the pump, so no backspin

NOTE: *some of these causes will show a few turns of backspin, but much less than there would normally be.*

Always *be cautious of retained torque, even if you think the rods are broken.*

PCP IS NOT A GOOD CHOICE FOR PUMPING HIGH API OIL

PCP IS NOT GOOD TO PUMP HIGH API OIL - MYTH

- Certainly, high API is often not the first choice for PCPs. PCPs have their greatest advantages in other applications. But the low cost and high efficiency of a PCP, combined with its ability to avoid gas locking mean it can sometimes be the right choice in these wells.

- The problem with high API and PCPs is usually the presence of aromatic hydrocarbons (BTEX = benzene, ethylbenzene, toluene, xylene), which are often more likely to be found in high API oils; these aromatics can be damaging to PCP elastomers

- However:
  - There are some high API fields which do not have high levels of aromatics; PCPs can do well in these fields
  - The elastomers available today are not all the same as we had 30 years ago when this myth started. Many PCP suppliers can provide options that can work with some aromatic content in the oil

SLOW STOP & POOH TO REDUCE RISK OF EXPLOSIVE DECOMPRESSION

SLOW STOP & POOH TO REDUCE RISK OF EXPLOSIVE DECOMPRESSION - MYTH

- This is a good theory, but it fails in practice.
- It can take several days for the bubbles to appear in a stator—a few hours of time to stop and pull the pump will isn't long enough to allow most of the gas to escape the rubber in a controlled way
- Keeping stators stored under pressure after pulling is not recommended due to safety concerns

› CONCLUSION

CONCLUSION

- There are a lot of beliefs about PCPs in the industry. Some of these may be based on fact, but are over simplified. We need to be very careful in how we interpret them and make decisions based on them.

- Please restrict questions today to the topics in today's webinar. I will be happy to talk to you offline about any other topics you like, or you can send me an email.

- Tune in next time for Part 2, when we'll continue looking at another list of PCP Myths and Truths:

    1. A PCP cannot run past 90°
    2. A good PCP is between 60-80% on the bench test
    3. You must run a torque anchor
    4. Choke the tubing to control gas at the pump intake
    5. When the rotor enters stator (during installation), the rods will rotate at surface
    6. Use pony rods to reduce problems in high DLS

CONCLUSION

For further information, please contact us or visit our website

pskoczylas@pcmals.com

www.pcmals.com