

## Discussion Group P11/Panel Session: Subsea Pumps and Drivers

### Leaders:

- Bob Heyl (Chevron retiree)
- Pierre-Jean Bibet (Total E&P)
- Thom Eldridge (Shell)
- Thomas Kyander (One Subsea)
- Ron Adams (Sulzer Pumps)
- Roland Maurischat (Leistritz)
- Nickolas Necker (EagleBurgmann)
- John Byeseda (Cameron)
- David Harrold (FMCTI)

### Suggested Topics:

#### A. Applications:

1. What does the future of Subsea Seabed Pumping look like?
2. How does one decide what technology to use for an application? Separation and pumping, multiphase boosting, single phase boosting?
3. What is the most critical operating condition for a subsea multiphase pump seal?
4. How Pumps vendors and/or Operators mitigate risk of sand?
5. How long are the step-outs that are now in operation?
6. Industry needs cost effective subsea pumping solutions. What is a cost effective pumping solution? What are the constraints of having two MPP in series?
7. What are the constraints of a Brown Field application?
8. Redundancy Philosophy: "Wet Storage" or "Dry Storage"?

#### B. Pumps and Motors Themselves:

9. What maximum pressure differentials can they generate, for a GVF of let's say 60%?
10. What is the minimum suction pressure required for an MPP?
11. What size motors are being used today subsea?
12. What industry standards are used to design these pumps?
13. Expectation and limits of shaft power available – both, motor and electrical power supply?
14. What kind of mechanical seals are used and how do they function
15. Where are the absolute pressure limits for the mechanical seals in future, as the secondary sealing elements (O-rings) need attention?
16. What issues are encountered with HP/HT applications?
17. How does viscosity effect different subsea pumps?
18. Which mechanical seal arrangement and API 682 Flush plan is used for Subsea Pumps?
19. What kind of material is used for the mechanical seals?
20. What is the most sensitive (weak) equipment of a subsea motor/pump system?
21. Barrier fluid: oil or water/Glycol?

### C. Qualification Testing

22. What are the issues in qualification of boosting and pumping systems?
23. What kind of qualification test is carried out by the seal manufacturers?

### D. FAT and EFAT

24. What are the inevitable Acceptance Tests to be performed on a subsea motor/pump system?

### E. Monitoring and Control

25. Can we develop a 'normal' proximity probe for subsea applications, or is there another solution for condition monitoring?
26. How are the pumps controlled?
27. Can MPP be protected from big terrain slugs?
28. Do we need a fast acting minimum flow valve?
29. Do we need a Multiphase flow meter to protect the pump?
30. What are the pros and cons of minimum instrumentation vs. full blown condition monitoring?

### F. Interfaces

31. Can we standardize the interface between the pump and the subsea system (mechanical, electrical, hydraulically, control system)? (Not standardize the pumps, but the interfaces)?
32. What is clients experience with topside supply system installations?

### G. Asset Development

33. What do you see concerning the future of subsea pumping and asset development with the low price of oil these days? Delays? Scrapping?
34. How about other subsea applications, not only multiphase, how about water injection?

Attendees: Please come prepared by choosing your questions from the above prior to the time of the Discussion Group Session. At the very beginning of the Discussion Group Session a vote of which questions to discuss will be taken. Of course, spinoff questions on related topics will be entertained as well.