Plug & Abandonment Forum (PAF)

Need for new and cost effective P&A technology
P&A Seminar 30 Oct 2014

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Topics

1. Well statistics in Norway
2. P&A costs and resource requirements
3. Can new P&A technology change this picture
4. Conclusion
P&A future in Norway?

- Choose English
- Fact Pages
- Wellbore Statistics

Source: www.npd.no
Wells drilled in Norway from 1966 – Oct 2014

• Total (23/10-14) 5496 wells

• Development (production, injection & monitoring) 3978

• Exploration (exploration + appraisal) 1518

• 1966 – 2 wells, yearly average next 48 yrs 114

• Yearly average of development wells the last 10 yrs: 144
# of wells for permanent P&A

- No available statistics at NPD’s fact pages as of today.
- Development wells 3978
- Temporarily abandoned wells 279
- Abandoned platforms (Frigg, Ekofisk,......) ??? 699
- Estimated # of wells to be permanently plugged 3000
- In this example – 15 rigs are assumed used full time for P&A
Time spent on P&A
20 – 60 days
(Note: This is using traditional P&A technology)

- This example - time per well: 35 days
- 1 rig will P&A 10 wells per yr: 350 days
- 15 rigs will P&A yr: 150 wells
- Time to permanently plug 3000 wells: 20 yrs
- New development wells in this period (144 per yr): 2880 wells
- Time to P&A 2880 wells at this speed: 19.2 yrs

- **Conclusion:** 15 rigs will do full time P&A for 20+19.2 yrs 40 yrs
• 15 rigs doing P&A for 40 yrs

• Resources (people and equipment)

• Costs (expensive)

• Are we seeing a new industry emerging?
Will we get a conflict of interest between P&A and development drilling?

- Source: Statistisk Sentralbyrå (Statistics Norway)

- Conflict, YES - Do nothing – 15 rigs for 40 yrs
Example of costs

- Rig rate/day: $300,000 x 6 NOK = 1,8 mill NOK
- Overhead: = 2,2 mill NOK
- Total rate (spread): = 4,0 mill NOK

- Yearly costs per rigg: 4,0 mill NOK x 365 dy = 1 460 mill NOK

- 15 rigs: 1 460 mill NOK x 15 rig = 21 900 mill NOK

- 40 yrs: 21 900 mill NOK x 40 yr = 876 000 mill NOK

- Conclusion: 876 billion NOK

- Oil fund (23 Oct 2014): 5590 billion NOK
Who is paying for all this?

- 876 billions in P&A costs
- 22 % license
- 78 % eller 683 billions – you and me
Any possibilities for cost reductions?

- Improve existing technology
- New and innovative technology
- Move P&A from rig time to smaller rigs to rigless P&A

- 30% technology gain is realistic

- Gain: \[ 876 \text{ billion Nok} \times 30\% = 263 \text{ billion NOK} \]
Can the gain be even more?

• With 30% technology improvement
• Save 30% of the time
• Will only need 10 rig instead of 15 rig for P&A over 40 yrs

• I.e: will release 5 rigs
• These 5 rigs can now be used to drill production wells

• Exactly what they were intended to do
New production wells?

• One production well 90 days
• One rig 4 wells/yr
• 5 rigs 20 wells/yr
• 40 yrs 800 wells
Production history

• Norway’s production history is 40 yrs
• 1974 – 18 development wells (from npd fact pages)
• 2014 - 3978 development wells
• 3978 development wells have created 5590 billion NOK

• Use the history to predict about the future (avoid guessing)

• 800 new wells is 20,1% of 3978 wells
• 20,1 % of 5590 billion NOK is 1123 billion NOK

• Assume new wells produce only 1/3 of previous wells
• 1123 billion : 3 = 374 billion NOK
Cost savings / gain

- Original cost estimate: - 876 billion NOK
- Savings using new P&A technology: + 263 billion NOK
- Incomes from new wells: + 374 billion NOK
- New cost estimate: - 239 billion NOK
Possible cost savings

- Possible savings due to new P&A technology and new wells over 40 yrs

- Savings \[876 - 239 = 637 \text{ billion NOK}\]

- 57% of the Norwegian national budget
  (1,114 billions i 2014 – total expenses)
• YES !!!!!

Invest in P&A Technology

Licenses
- JIP
- Individual Company technology development

Norwegian Research Council
- Petromaks 2
- Demo 2000
- OG21

Innovasjon Norge

Winn-Winn for licences and Norway (us)
Summary

• P&A in Norway may take 40 yrs w/15 rigs – large industry

• Costs using conventional P&A technology 876 billion NOK

• We, the taxpayers are paying 78 % of these P&A costs

• New technology could result in large savings 637 billion NOK
Goal

New P&A technology may easily save many «eldre milliarder» (billions).

But remember: Technology does not happen by itself !!!