

Magnitude and Type of Well Integrity Issues

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The loss of production and the investment for remedial operations due to well integrity issues are enormous. Several studies present statistical data, however especially US data are often difficult to assess and inconclusive with respect to cause, severity, or potential impact. Varying criteria as to what constitutes a loss of well integrity exist. Also most data tends to focus on incidents in the early life of a well, with little data available on the occurrence of well integrity issues over a longer period of time.

- A comprehensive 2015 worldwide study from Davis et al.¹ concludes that well barrier and integrity failure is a reasonably well documented problem for conventional wells (Figure 1). Note that data do not differentiate between ‘barrier failure’ and ‘integrity failure’. Highest failure rates (>50%) are reported from conventional on- and offshore wells, while unconventional onshore well data show failure rates of <5%.

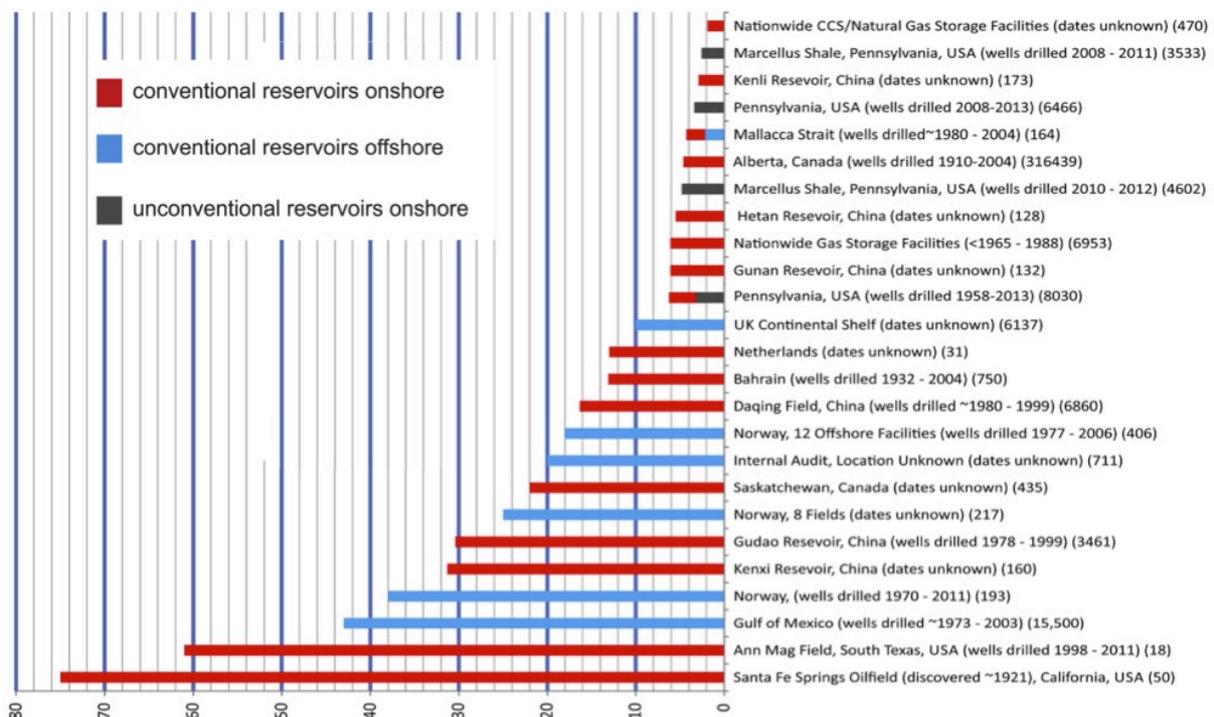


Figure 1: Percent of Well Barrier and Well Integrity Failures¹

- US Minerals Management Service survey², 2004 reported 6,650 out of 14,927 active wells had sustained annular pressure in Gulf of Mexico (GOM). Data from 22,000 offshore wells located in the GOM indicated that SCP issues raised with the age of the well (Figure 2). Wells older than 15 years had a barrier failure rate of 50% and larger. Meanwhile many of them have been abandoned because of economical reasons.

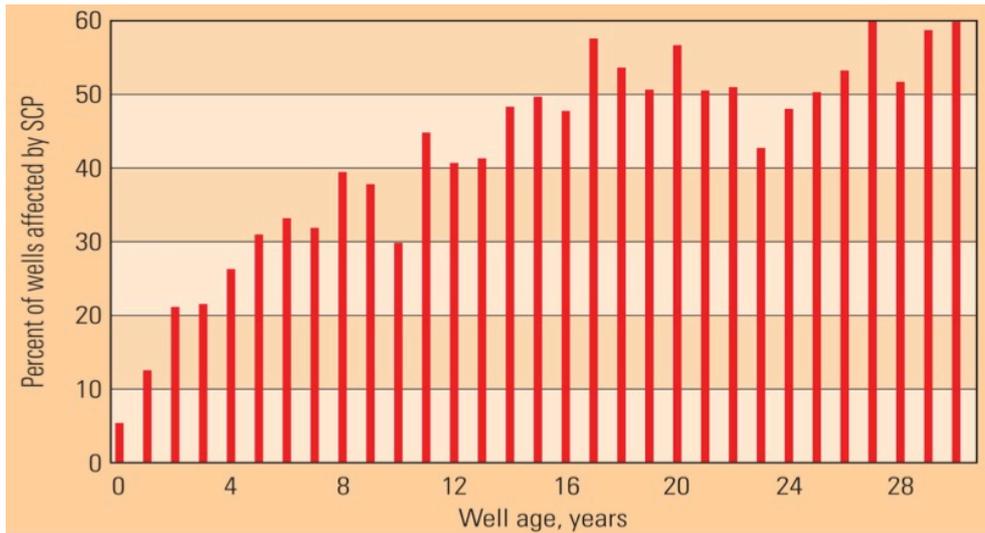


Figure 2: SICP Depends on Age of Well²

- The trend of high barrier failure rates for offshore installations can also be confirmed for European North Sea offshore wells: 35% (1,600 out of 4,700) wells drilled in the UK sector³ and 18% (73 out of 406 representative wells) drilled in the Norway sector of the North Sea⁴ having integrity issues. Note that in the Norwegian Sector 7% of wells have been shut-in because of well integrity issues when the report was published in 2006.
- A closer look (Figure 3) into the source of Norwegian offshore barrier issues shows that most integrity problems were identified in such barrier elements as tubing (40% out of 73 cases, mostly corrosion and leaky connectors), annulus safety valve (ASV, 12%), casing and cement (22%), wellhead and packers (10%).

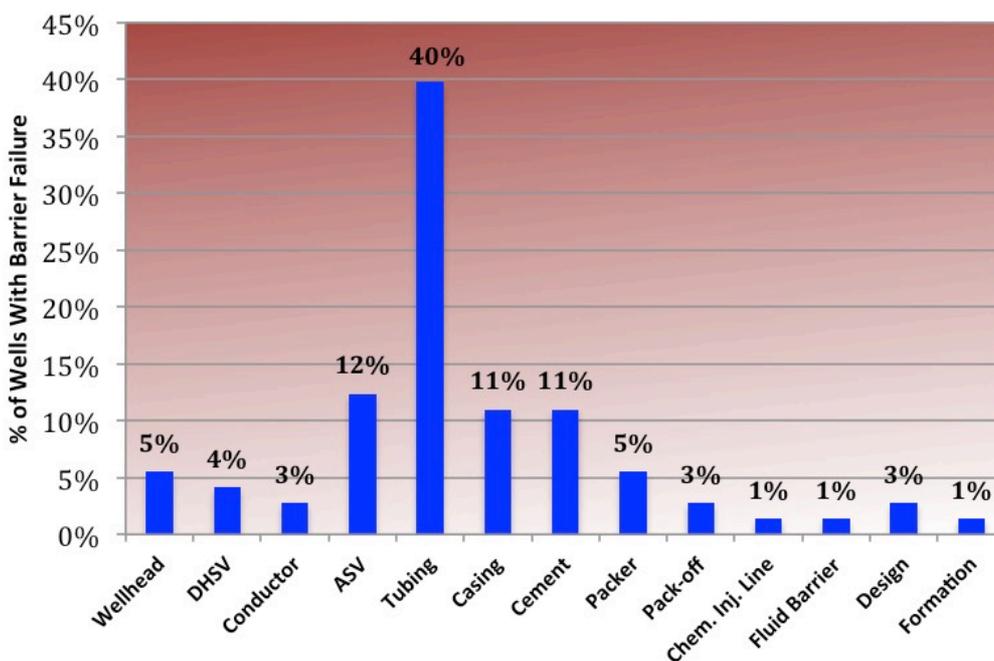


Figure 3: Source of Barrier Failures, Data From 73 Norwegian Wells⁴

- The loss of production resulting from well integrity issues and the investments to be taken for work-over are enormous. Worldwide it may account for as many as half of all well shut-ins and nearly half of all work-overs in mature fields⁵. The cost to the oil and gas industry, in terms of lost production alone, has been estimated at 1.09 billion USD a day⁶.
- Lloyd's Register Group estimates that from 2009-2015, work-over on well integrity failures have cost US operators in excess of US\$75 billion⁷.
- The scale of the integrity challenge was highlighted at an Abu Dhabi Well Integrity Conference where, as an example, it was estimated that half of the wells in the Middle East have integrity issues, with 10-15% of these being critical⁸.
- Over 1224 wells (30%) are due to be plugged and abandoned (P&A) alone in the UK Continental Shelf over the next decade⁹, at a cost of about US\$11.5 billion. Survey results show that half these projects can be related to the low oil price situation. For the Norwegian Continental Shelf it is estimated 7000 wells that will be or need to be P&A'd by 2050. P&A costs ranging from US\$ 5 (platform) to US\$ 14 million (subsea) per well.

References

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