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Redefining the Offshore ERD Envelope: Techniques and Technologies Necessary for an Expanding Frontier

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Abstract

Offshore drilling projects have expanded into ever-more challenging environments in recent years, from remote locations, to ultra-deepwater, to HPHT reservoirs, (and a myriad of combinations therein). Several operators have recently investigated the possibility of expanding their development plans to incorporate Extended Reach wells that would greatly exceed the industry’s current experience with long departure wells.

The authors discuss the design, equipment, and technology requirements of three “frontier” offshore projects currently being evaluated. Typical limitations and the solutions necessary to expand beyond the current ERD envelope are discussed. Three core philosophies are highlighted that reinforce the need for a “Systems Approach” for any ER well, but especially these frontier projects:

- **Design** Around the Issues
- **Combine** Complementary Solutions
- **Demand** Fit For Purpose Equipment

These philosophies not only enable much further reach than the industry has achieved to date, but also allow improved performance from standard directional and ER wells.

Introduction

In recent years, interest in pushing the envelope of known ER drilling experience has been increasing. Part of the explanation for surging interest lies with the high commodity price environment, which has made small satellite fields significantly more economical. Operators have reported substantial drilling and completion cost savings by exploiting offshore fields from a central drilling site in lieu of a subsea

solutions^{1,2}. This general tendency has been strengthened by the current cost environment; day rates for platform rigs tend to be substantially lower than MODU’s (Table 1).

Rig Type	Average Day Rate
Semisub >4000’ WD	\$234,055
Drillship >4000’ WD	\$226,700
Semisub >1500’ WD	\$199,221
Semisub <1500’ WD	\$138,950
Platform Rig	\$32,227

Table 1: Average rig dayrate from RigLogix database³

With ever-longer reach wells becoming more common, the authors have had the opportunity to evaluate several potential “ultra” ERD projects. Although each project is unique in their own right, all extreme wells have several unifying themes;

1. Standard equipment used for conventional wells is generally inappropriate for extreme ER wells, since standard equipment is (a) usually designed for a different application, and (b) introduces too much compromise
2. Standard well design methodology used for conventional wells is generally inappropriate
3. In any given area, the tipping point for radical design solutions tends to occur in a non-linear fashion (for example, solutions that work for 10,000’-20,000’ stepout well are vastly different than 25,000’ and then again at 30,000’ stepout)
4. Alternative materials offer major incentives, as they serve to a.) avoid expensive rig upgrades, and b.) improve operating margins
5. Combining complementary technologies tends to yield a step-change reduction in well complexity and risk

Much has been discussed in past years regarding the “limit” of ER drilling^{4,5,6}. In the context of the industry’s worldwide experience with long reach wells, there is clearly a “sweet spot” where most ER wells are drilled (Figure 1). The ultimate reach achieved to date is ±35,000’ (the famous Wytch Farm M16z well⁷). When only offshore wells are considered (Figure 2), the defining “envelope” of industry experience thins dramatically and the ultimate reach falls to ±27,000’. Several factors undoubtedly influence this phenomenon.