

# 2007 Zhao Dong Drilling and Completion Performance

## Introduction

Drilling and completion performance results for 2007 are discussed in this summary using both internally and external compiled data. External data is provided by Rushmore Associates, an independent UK based benchmarking organization that has collected data on over 20,000 wells from 67 Operators in 65 Countries and to which Roc pays to participate. Rushmore stringently audits operator's input data prior to publishing and the data herein should therefore be considered validated and normalised, thus providing "apples to apples" comparisons with other operators as well as past year's performance.

## Summary of Results

2007 drilling and completion performance by nearly every metric was the best ever at Roc Zhao Dong. When compared to other benchmarked operators in Bohai Bay, Roc Zhao Dong stands clearly ahead as the performance leader. When compared globally to all other operations in the world, Roc Zhao Dong continues to be one of the most efficient drilling operations in the world. There should be no doubt that Roc Oil must be considered an 'Operator of Choice' based on this high level of demonstrated performance.

2007 performance efficiency was outstanding with many tracked indicators being the best on record. The following chart shows two key benchmarks where all time records were eclipsed this year (blue) and two which significantly improved upon last year's results (red).

Chart 1 – Overall Performance Numbers

Year	New Wells	Avg Depth Drilled (m)	Drilling Only ROP (m/hr)	Total Well ROP (m/day)	Drilling Only Cost (\$/m)	Total Well Cost (\$/m)
2004	14	2800	37.4	353	595	853
2005	11	3428	31.6	314	673	956
2006	10	2897	28.7	319	711	1230
2007	13	2267	42.4	355	679	1067

Other significant achievements included:

- All work done safely with no environmental or lost time accidents
- Costs were largely flat versus the industry trend of significant cost increases due to market forces
- Overall performance continued to show improvement in most categories
- Operational efficiency was excellent despite significant unplanned program changes
- This was Roc's first full year as Operator after the Apache transition

## Plan vs. Actual

Roc drilled 13 new wells versus 15 wells originally planned - only 10 of these were actually completed due to unexpected geologic results.

- Seven were completed as multizone producers (versus 4 planned)
- 3 as horizontal producers (versus 3 planned)
- There were no injectors completed (versus 6 planned)
- There was no multilaterals completed (versus 1 planned)
- There was no dual completion wells completed (versus 1 planned)

Thus actual completion costs must be viewed in this light as production completions, particularly multizone completions, are significantly more expensive than injectors to complete.

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## Factors Affecting Performance

There was a considerable amount of “change of scope” encountered during the year. This amounted to 14.9% of total time spent and was the second highest percentage ever at Zhao Dong after the startup year. Scope changes (such as unplanned geological sidetracks and changes to completion type) have significant impact on operational efficiency as they are by definition not pre-planned. They also stress the logistics and operational organisation of Roc and its Service Contractors often leading directly to delays and lost time.

Completions this year were extremely efficient with only 4.4% NPT. This was a focus area from the previous year and the additional effort was rewarded. Drilling NPT increased to 17.7% (versus 7.9%) although a single event caused a shutdown of 12 days where only limited operations could be carried out. This under warranty failure of the main pinion gear on the top drive represented the vast majority of drilling NPT and excluding this incident, drilling NPT was within acceptable limits.

Other factors affecting performance included:

- Several key service contractors were replaced prior to beginning 2007 operations
- Final budget approval was received very late relative to previous years
- There was a complete turnover of Tanggu warehouse/logistics personnel over the 2006/07 winter
- Several unexpected overpressured zones were encountered while drilling resulting in kicks and in one case the demobilization of non-essential personnel from the platform
- A significant reduction in surface hole ROP was required due to collision avoidance techniques
- There were problems with drill pipe washouts early in the year

## Drilling Rates

Drilling ROP and average meters drilled per day are at their highest levels ever for Zhao Dong. This is against the backdrop of 2006 where drilling performance was considered to be very high.

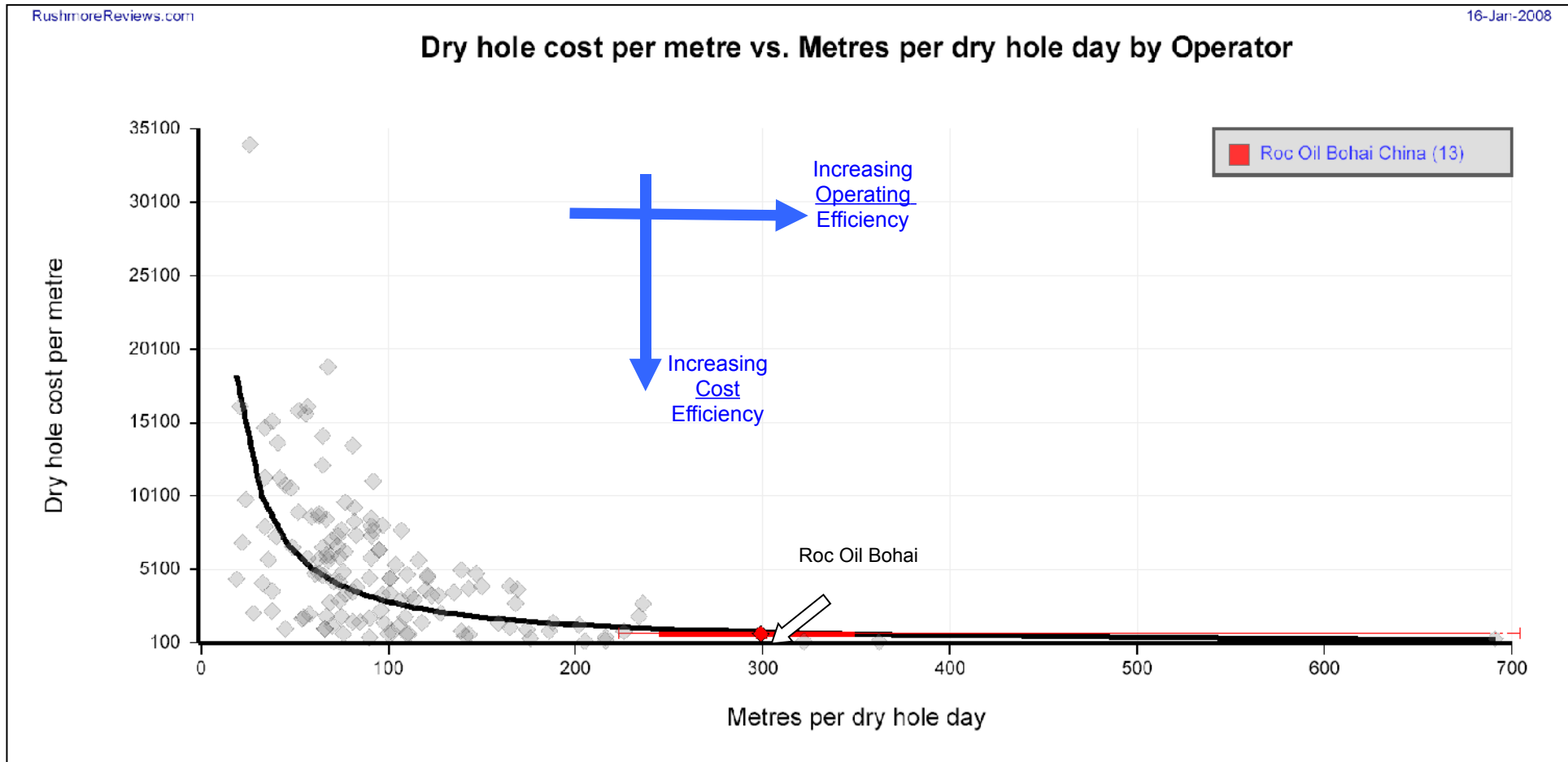
Several factors directly contributed to this success. There was a significant focus by both the drilling and subsurface teams to target wells based on the geology rather than “drilling to points on a map”. This change more than any other enabled higher ROP's and more efficient drilling compared to previous years.

Several key technological enablers were also introduced into operations

- Roc's investment in a high power AC Top Drive unit
- Conversion to 5-½ ” high torque drill pipe
- Use of metal stator mud motors exclusively
- Use of the Drill String Control System (DSCS)

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2007 Comparison with Every Operator in the World, Every Well in the World, No Filter



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