Introduction

Rotary steerable systems (RSS) permit downhole directional control whilst continuously drilling in rotary mode. At present, three classes of rotary steerable system exist:

- fully steerable systems, allowing downhole control of both inclination and azimuth;
- semi steerable systems, providing downhole control of inclination only (adjustable stabilisers)
- vertical drilling systems, that actively seek vertical

The aim of this document is to provide information on:

- the experience to date of rotary steerable systems
- available rotary steerable;
- technical, cost and usage data; and
- the perceived benefits and drawbacks of these systems

Advantages of RSS

The are several perceived benefits of RSS over conventional mud motor techniques

Firstly, due to the elimination of the need for slide drilling:

- Improved ROP, reducing drilling time;
- Improved hole cleaning / lower ECD;
- Reduced torque and drag, giving greater reach for ERD wells;
- Reduced axial stick / slip problems.

It is also believed that rotary steerable systems give:

- Smoother well bore, requiring less reaming;
- More controllable build rates;
- Improved bit life.

Since the need for a mud motor is eliminated, RSS also provides:

- The ability to geosteer, as sensors can be placed closer to the

When to use RSS

Types of wells that may benefit from rotary steerable technology include:

- ERD wells that are beyond current comfort zones;
- Designer wells where sliding limits achievable targets;
- Deep, hot, directional wells where motors have problems;
- High build rate, small diameter re-entry work;
- Wells where slide drilling causes high ECD's / well bore stability problems;
- Vertical wells where directional control is difficult;
- Deep wells to reduce torque and drag generated at surface

A possible selection process for using RSS could be*:*

Is a rotary steerable system necessary, or would a conventional motor system do the job more economically?;

Issues to consider when making this decision include:

- Torque and drag - is sliding possible ?
- Hole cleaning - are high ECD's / hole cleaning a problem ?
- Tortuosity - is tortuosity predicted to be a problem ?
- ROP - Is a large amount of sliding predicted to be necessary giving ver low ROP's ?
- Motor failures - do motor failures present a particular problem in the area of interest ?

Is both inclination and azimuth control required, or could the task be completed more economically with:

- An adjustable gauge stabiliser system (AGS); or
- An AGS in conjunction with a motor ?

Once the decision to use a RSS has been made, the most appropriate system must then be selected.

Factors to consider when choosing a RSS should include:

- Cost;
- Required hole size;
- Required build rate;
- Commercial experience and track record;
- Current MWD contracts;
- Possible operating constraints;
- Available data from comparison wells

Screening Criteria for the use of rotary steerable tools:

- Directional control essential;
- Formations with strong directional tendencies;
- Large ratio of sliding time to rotating;
- Beyond ability to slide;
- Multiple targets;
- Significant azimuthal turns at high inclination;
- Tortuosity in tangent section causes excessive torque and drag;
- Wells where deep directional work is avoided due to anticipated problems;
- Casing/completion running is difficult due to tortuous hole;
- Extensive reaming is required due to hole cleaning problems;
- Differential sticking is a concern;
- MWD failures occur due to motor vibration;
- Directional control takes precidence over making hole;
- Roller bits are used instead of PDC to improve 'steerability'.