Minutes of the First Meeting of the

Industry Steering Committee on Wellbore Survey Accuracy

BP Exploration, Dyce
21 December 1995

Those present:

Hugh Williamson (Chairman and Minutes)	BP Exploration
Graham McElhinney	Halliburton
Frank Innes	Halliburton
Alasdair Macrae	SDC
Fred Watson	SDC/Applied Navigation Devices
Brett Van Steenwyk	SDC/Applied Navigation Devices
Martyn Greensmith	Gyrodata
Koen Noy	Gyrodata
David Roper	Sysdrill
Leif Jensen	Statoil
Steve Davidge	Geoservices
Gordon Shiells	Sperry-Sun
Wayne Phillips	Anadrill
Harry Wilson	Baker Hughes INTEQ
George Halsey	RF Rogaland Research

1. Chairman's Introduction

Hugh Williamson welcomed those present. He stated that the meetings of the Group were open to all interested parties, and that the minutes would be distributed freely. He explained that the Group was formed following the SPWLA Topical Conference on MWD, held in Kerrville Texas in October, at which it was agreed that the MWD industry required better techniques for predicting and evaluating positional uncertainty than those currently generally available.

2. Starting Points

Hugh Williamson summarised some of the resources currently available to the industry. These included:

The Group itself
The Wolff and de Wardt analysis
Industry organisations (API, SPE, IMS, SPWLA etc.).

He then summarised a conversation he had had with Robin Hartmann of KSEPL regarding the work of the Group. KSEPL had unfortunately been unable to send a representative to the meeting. They have completed the following work and will be submitting SPE papers to the 1996 conferences in Denver and Milan:

- A classification of all survey tools into six generic classes, including inertial, gyrocompassing tools, continuous gyro tools and solid state magnetic tools, and a general error model for each covering a variety of tool configurations, running configurations and data processing methods.
- A system for predicting, monitoring and analysing the performance of solid state magnetic surveying devices.
- A means of identifying the systematic errors present in a survey by comparing it with one or more other surveys run over the same interval.

KSEPL will make available to the Group their new Borehole Survey Manual, a more detailed description of the above work and the abstracts submitted to the SPE conferences.

Action: Robin Hartmann and Hugh Williamson to arrange distribution of this material to members (Feb).

Hugh Williamson stated that BP Exploration had further generalised it's modification to the Wolff and de Wardt analysis in order to incorporate vendor models. He distributed a document "Survey Instrument Performance Part 1 - Survey Error Propagation" which described this work.

Action: Members to review this document for discussion at the next meeting.

Leif Jensen described Statoil's work in survey uncertainty. They have a set of validated parameters for use in a modified Wolff and de Wardt analysis, but have recognised the inapplicability of the method to extended reach and horizontal wells. They plan to complete a new error propagation analysis in a 1-2 year time-scale.

Harry Wilson described INTEQ's work in survey uncertainty. They have developed a set of error models for each of their tools, again based on a modification of the Wolff and de Wardt analysis. The models have geographic sensitivity for both gyroscopic and magnetic tools.

Koen Noy stated that Gyrodata have been working on identifying systematic errors from survey data in their own tool. This work is based on system diagnoses rather than external comparison.

3. High Level Objectives

Each member was asked to comment on the high-level priorities for the Group.

David Roper listed the four necessary items needed in the definition of error models:

- a mathematical model
- a classification of tools
- an error budget for each class of tool
- a protocol for development of error values

He stressed the need for absolute clarity in the description of error models and their application.

The Group agreed with the above classification, but many commented that a major objective was the demonstration that the predicted level of performance is indeed achieved in the field.

There was a discussion on whether error models should be class-specific, model-specific, or tool-specific. There were advantages to all systems, and it was agreed that a similar analysis could incorporate all three options.

George Halsey stressed the need for continual improvement in tool performance, for demonstration and verification of a tool's capabilities in terms all can understand, and in a need for standardisation across the industry.

Martyn Greensmith stated that the industry needs a means of resolving the discrepancies between MWD and gyro tools which frequently occur in the field.

Leif Jensen stressed the need for a technique for combining all the survey data obtained in a well to generate the best possible final survey.

Wayne Phillips was keen that the Group develop a methodology which builds confidence the Industry in the performance of MWD tools.

Gordon Shiells requested that the Group consider itself the industry standard body regarding wellbore survey accuracy. He suggested that a primary aim for the Group was to produce and maintain standards for the industry relating to wellbore survey accuracy. He also stressed the importance of the Group's advertising its existence to the industry.

Actions: Hugh Williamson to:
- seek publicity for the Group in SPE publications via John Thorogood (15 Jan)
- inform the SPWLA of the formation of the Group via Ken Weeks (15 Jan).
- enclose a letter describing the Group with these minutes.

Action: Group members to circulate the above letter to district managers etc. and to seek publicity for the Group in company publications.

Action: Gordon Shiells to identify further opportunites for publicising the Group in the industry literature. (15 Jan).

4. Affiliations

Hugh Williamson described the work of the Advanced Wells Forum, a group of oil companies aiming to co-ordinate and jointly fund reseach work. The AWF is considering initiating a project in directional survey error modelling, the early stages of which will cover much of the same material as the Group.

The Group agreed with the objectives of this proposal, and further agreed to offer to work with the AWF in helping to achieve them.

Action: Hugh Williamson to make the above known to the AWF contact for this proposal, Mike Pollard of Saga Petroleum. (15 Jan).

David Roper suggested forming an API working group which would enable the creation of standards or recommended practices. The Group felt however, that this should not be considered until some concrete progress had been made and results had been published.

The Group felt that it should not be primarily associated with a body exclusively concerned with MWD, and that the proper authority and credibility for the Group could best be achieved through the SPE via publications in their journals. It was felt that the papers which described the Group's work would stand a good chance of acceptance for publication.

5. Starting Points

Hugh Williamson described a proposal which had arisen from a meeting with INTEQ and Halliburton in Houston. The proposal was to impact the Petroleum Engineer International (PEI) MWD comparison tables due for re-publication in May.

The Group supported the principle of the proposal, and agreed the tables should contain the following:

- A measure of sensor package accuracy expressed in terms of inclination and azimuth errors.
- A list of environmental error sources, possibly with some discriminating question attached to each for each tool.
- An article to accompany the tables describing the sensor accuracy measure and the environmental errors which it ignores.

The Group felt that the present unspecified inclination, azimuth and toolface errors should be omitted from the tables.

Action: Tim Curran (INTEQ) and Robert Wylie (Halliburton) to propose a suitable measure for sensor accuracy for distribution to the Group (end Feb).

Action: Harry Wilson to determine the latest date for submission to the PEI tables.

Harry Wilson reports: The closing date for submissions is 10th March. PEI obtain the materials for the tables from the International MWD Society (IMS). Given the need to reach agreement on the measure of sensor accuracy and to circulate this to MWD companies not represented at the meeting, this deadline appears unachievable.
Resulting Action: Harry Wilson and Hugh Williamson to draft an article describing the limits which environmental factors impose on MWD accuracy. This article to be circulated to Group members for comment and submitted to the IMS for publication with the comparison tables (9 Feb).

6. Any Other Business

The Group agreed to be known as:

"The Industry Steering Committee on Wellbore Survey Accuracy"

7. Next Meeting

The next meeting will be held on Monday 11th March at the offices of RF-Rogaland Research in Stavanger, Norway.

Action: Hugh Williamson and George Halsey to organise this meeting.

8. Distribution of Minutes

These minutes will be distributed, in the first instance, to meeting attendees and in addition, to:

John Thorogood, BP Exploration (SPE)
Kamal Jardaneh, BP Exploration
Alewyn van Asperen, KSEPL
Steve Page, Geolink (IMS)
Ken Weeks, KRW Associates (SPWLA)
Mike Pollard, Saga (AWF)
John Turvill, Halliburton
Steve Mullin, INTEQ