



Minutes of the 24th
Meeting of the



**Industry Steering
Committee on
Wellbore Survey
Accuracy**

and

**SPE Wellbore
Positioning Technical
Session**

San Antonio, USA
September 28th 2006

Attendees:

Name	Company	E-Mail
Chuck Asfahl	APS	casfahl@houston.rr.com
Andy Brooks	Baker Hughes	andrew.brooks@bakerhughes.com
Robert Estes	Baker Hughes	Robert.estes@bakerhughes.com
Harry Wilson**	Baker Hughes INTEQ	harry.wilson@inteq.com
Aubrey Holt	Bench Tree Group	Aubrey.holt@benchtree.net
Jim Downie	BHP Billiton	Jim.j.downie@bhpbilliton.com
David Kerridge	British Geological Survey	djk@bgs.ac.uk
Bill Calhoun	Chevron	wmca@chevron.com
Steve Grindrod	Copsegrove	steve@copsegrove.co.uk
Mark Michell	Devon Energy	Mark.mitchell@dvn.com
Jon Stigant	Devon Energy	Jon.stigant@dvn.com
Ludovic Macresy	Drillscan	ludovic.macresy@drillscan.com
John Barlow	Geolink	jbarlow@alumni.rice.edu
Roger Ekseth	Gyrodata	rogere@gyrodata.com
Steve Mullin	Gyrodata	stevem@gyrodata.com
John Weston	Gyrodata	westonj@gyrodata.com
Timothy M. Allen	Halliburton	Timothy.allen@halliburton.com
Chris Barrett	Halliburton	Chris.barrett@halliburton.com
David Chen	Halliburton	David.chen@halliburton.com
Dave McRobbie	Halliburton	dave.mcrobbie@halliburton.com
Tanja Mojsin	Halliburton	tanja.mojsin@halliburton.com
Dave McRobbie	Halliburton	dave.mcrobbie@halliburton.com
Stuart Sargeant	Halliburton	Stuart.sargeant@halliburton.com
Carol Mann	Dynamic Graphics	carol@dgi.com
Continued...		

Katrine Wienberg	Maersk Oil Qatar	kwi@moq.com.qa
Bob Joyce	Microtesla	bjoyce@microtesla.com
Robert Wylie	National Oilwell Varco	robert.wylie@nov.com
Andy Kurkjian	OTNA	kurkjian@otna.us
Jim Stolle	P2 Energy Solutions	jstolle@P2ES.com
Doug Gilmour	Paradigm	douglasg@paradigmgeo.com
Stein Harvardstein	Paradigm	steint@paradigmgeo.com
Leon Ceh	Pathfinder	Leon.ceh@pathfinderlwd.com
Carlos Contreras	Pathfinder	Carlos.contreras@pathfinderlwd.com
Ken Hamlin	Pathfinder	ken.hamlin@pathfinderlwd.com
Alan Heath	Pathfinder	Alan.heath@pathfinder-ltd.co.uk
Herb Illfelder	Pathfinder	Herb.illfelder@whes.com
Graham McElhinney	Pathfinder	mcelhinneygraham@hotmail.com
Allan Rennie	Pathfinder	Allan.rennie@pathfinderlwd.com
Kevin McClard	PDT	Windsurv3d@sbcglobal.net
Ken Braud	Quantum Drilling Motors	kenbraud@quantumdm.com
Darren Aklestad	Schlumberger	aklestad@slb.com
Jane Li	Schlumberger	jli@houston.oilfield.slb.com
Wayne Phillips	Schlumberger	phillips3@slb.com
Benny Poedjono	Schlumberger	poediono1@slb.com
Irina Shevchenko	Schlumberger	lshevchenko.slb.com
Vai Zenzin	Schlumberger	vzenzin@slb.com
Dieter Goetze	SEG	Dieter.goetze@SEG-riegel.de
Roel Nicolai	Shell	Roel.nicolai@shell.com
Erik Nyrnes	Statoil	erik.nyrnes@ntnu.no
Torgeir Torkildsen	Statoil	totor@statoil.com
Angus Jamieson*	TECH21	T21es@aol.com
Simon McCulloch	TECH21	simon@tech21.co.uk
Philippe Samson	Total	Phillippe-marc.samson@total.com
Regis Studer	Total	Regis.studer@total.com

* Chair

** Minutes

1. Welcome and introduction

Chairman Angus Jamieson welcomed everyone and introduced the other office holders: Steve Grindrod - webmaster, Steve Mullin - vice chairman, Harry Wilson - secretary, Robert Wylie - treasurer.

Angus restated the objectives of the Technical Section, which are: *"...to further the objectives of the Society in the free discussion of matters relating to (wellbore positioning), to establish consensus on industry best practice and to promote those practices widely."* He also reminded everyone of the SPE Applied Technology Workshop taking place on 16-19 October, titled "Multidisciplinary Wellbore Positioning". Applications are officially closed and the limit for the number of attendees had been achieved, but Bill Calhoun said that there might be one or two seats still open due to late cancellations.

2. Membership

Harry Wilson described what membership of the Technical Section entails.



Membership_wilson.ppt

Steve Grindrod emphasised that SPE members must provide him with up to date and exact membership details so that he can register them with the Technical Section area of the SPE web site.

3. Improved BHA Sag Calculation and Uncertainty Evaluation

Regis Studer presented SPE102088 which he had presented at SPE ATCE a few days earlier. The study described in the paper has implications for the ISCWSA MWD model, and this is being discussed with the model maintenance committee. It may be necessary to increase the SAG term value and change its weighting function in the generic MWD model, as well as consider fully the horizontal misalignment term. Clearer implementation procedures about multi leg management are also required.

Angus Jamieson asked if rock elasticity was accounted for in the study and Benny Poedjono asked if wellbore spiralling was included. Regis answered that neither effect was included, but could be.

Harry Wilson requested that some of the BHAs used in the study be shared with contractors to run through their Sag calculation programs and compare results with those obtained in the study.

Bill Calhoun showed some of Chevron's BHA sag data which supported Total's finding that the Sin Inc weighting function of the current sag error term does not reflect actual sag behaviour.



SPE Paper
102088_BHA Sag_stu

4. Survey QC Work Group Update

Group leader Roger Ekseth reported that the work of the group has been written up as two SPE papers:

- SPE 103734, to be presented at the 2006 IADC/SPE APDT, 13-15 November in Bangkok,
- SPE 105558 to be presented at the 2007 SPE/IADC Drilling Conference, 20-22 February in Amsterdam.

The first paper describes the need for comprehensive QC of survey data to prevent inappropriate use of error model estimates, and goes on to detail the set of internal QC tests that can be applied to surveys. It identified the need for more extensive QC checks than is possible with internal tests alone.

Roger then ran through the draft presentation for Bangkok, the Conclusions of which are:

- Uncertainty estimates are invalid without proper QC
- Present QC practices are normally not rigorous enough to assure survey reliability
- Internal QC can provide a significant degree of reliability
- Multi-station QC is the most powerful internal QC
- Internal QC alone cannot assure survey data reliability
- Additional QC is required for high integrity wellbore positions



QC draft
103734_ekseth.ppt

Roger also ran through the rough draft for the second paper which presents the external tests, and describes how comprehensive QC tests can be used to validate the error model as well as validate the survey data.



QC draft
105558_ekseth.ppt

5. Well Collision Risk in Congested Environments

Benny Poedjono presented SPE 101719, a paper describing Schlumberger's experience in the Western Hemisphere over the last 4 years, having implemented a new collision avoidance policy and associated well planning procedures.

The study included 11 thousand wells of which about 30% required the Operator to give dispensation against the Schlumberger policy. About 25% of those dispensations were for offset wells that represented an HSE risk.

Angus Jamieson commented that it is important to establish and agree the rules for dispensation prior to the start of drilling operations.

6. GPS vertical accuracy

Steve Grindrod presented a light hearted report of an experiment he had performed to test the accuracy of a hand held GPS device in determining elevation.



GPS
Accuracy_grindrid.pp

The serious point of Steve's presentation was that there is increasing use of such devices in our Industry, that they are often operated by non-experts, and that this leads to gross errors in both horizontal and vertical position.

7. Error Model Maintenance Work Group Update

Steve Grindrod, the group leader, described how the group's efforts to define a combined MWD/gyro model had not been very productive so far. The task was surprisingly difficult, partly due to inconsistencies between the two SPE papers.

Actions arising from the group's meeting on the previous day were:

- Rev.0 and Rev.1 MWD test data - limited response back.
- Investigate random propagation of misalignment terms (instead of systematic).
- Post updates to web site
- Andy to review Rev.1 results. Redo gyro with different depth stretch terms
- Update Table B2 in gyro paper (XYM1 and XYM2 - S/R)
- Steve G and to discuss Gyro Model with Ann H
- Need Full set of test data with all terms.
- Multiple Legs - SPE36863
- Survey spacing >100 ft - errors in tangential assumption. MWD paper - statement not true - can't quantify. Slide-rotate needs solution. (Separate sub-group) Update in paper.



Maintenance Work
Group Update_Grindr

8. TVD Surveyor

Simon McCulloch described how the proposed inertial navigation MWD system, which was presented at the 21st meeting in May 20004, had subsequently experienced implementation problems, largely due to the dimensions of the gyros. A proposal to rework the device as an accelerometer only tool is now being pursued. The tool is intended to provide accurate determination of TVD,



TVD
Surveyor_mcculloch.p

9. Benefits of a common implementation of a simplified Error Model

Bill Calhoun asked the Section to consider the need for a simpler model; arguing that the problems described by Steve Grindrod in his update of the Model Maintenance work group resulted in an undesirable lack of standardisation, and a situation in which very few people fully understood the new models. Bill suggested that the Section investigate the feasibility of developing a simpler version of the model.

Katrine Weinberg said that Maersk had preferred the simplicity of the old Wolff and De Wardt model. Harry Wilson pointed out that a simpler model would necessarily return more conservative uncertainty estimates. Bill responded that his proposal was to develop a simpler model for general use, but retain the original model for situations in which its precision was beneficial. Angus Jamieson said that once a simple model was developed it would dominate and probably displace the current model completely. Torgeir Torkildsen, one of the gyro model's authors, said that Statoil supported Bill's call for a simpler model and would be willing to work on such a project.

Kevin McCaird said that he felt that the answer to the complexity problem was for the Section to produce a definitive version of the integrated model and make it available in a form suitable for upload into any software platform. Harry pointed out that this might impose a liability and long term maintenance commitment on the Section that was not desirable, but agreed that this was otherwise a good solution to the problem.

No decision was taken with respect to committing the Model Maintenance work group to this task or to forming a separate work group, but there is obviously significant interest in Bill's proposal and it will be discussed again at the next meeting.

Harry also asked if any further thought had been given to seeking Industry funding for the work of the Model Maintenance work group, so that faster progress could be made; something that had been discussed at an earlier meeting. Bill said that he was prepared to recommend to Chevron that they help fund such work and also that of the Collision Monitoring work group. No other Operator representatives present made a similar offer.

10. Collision Monitoring Work Group Update

Harry Wilson, group leader, reviewed why the formation of the group had been proposed at the last meeting in March; i.e. the development of this subject was seen as a logical next step after the Section's work on error modelling and survey QC. The group met for the first time on the previous day (27th Oct 06), and the main purpose of that meeting had been to agree the scope of work for the group.

It had been agreed to limit the scope to probability of collision, which was consistent with the Section's remit, and not to deal with consequences of collision and resulting risk, which were probably beyond the Section's remit.

The group had decided to work through 3 steps:

- Education regarding current practice
- Recommendation of best practice from current common practice
- Review of newer methods and, if possible, recommendation of best practice.



Collision Avoidance
WG_wilson.ppt

It was commented that for all of the Work Groups to be productive, they must attempt to meet and work outside of the biannual main Section meetings.

11. Any Other Business

Jon Stigant showed a copy of a Geodetic Manual that he had prepared for distribution at the upcoming SPE ATW on Wellbore Positioning mentioned earlier, and said that it might be possible to make it available on the Sections web site.

12. Close

Angus thanked everyone for their participation and reported that Shell have offered to host the next meeting, which will probably coincide with the SPE/IADC conference in the Netherlands at the end of February.