Minutes of the 26th Meeting of the

Industry Steering Committee on Wellbore Survey Accuracy

and

SPE Wellbore Positioning Technical Session

Doubletree Hotel,
Anaheim, USA
November 15th 2007

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*** Chair**
**** Minutes**

1. Space Weather

Charles Chafer of Space Services Inc. listed the many activities, including downhole surveying, which are affected by space weather. He then described the expanding market for space weather monitoring services, and the increased involvement of the private sector in the provision of such services.

26th Anaheim\Space Weather.ppt

2. Multi-station analysis (MSA)

Erik Nyrness of StatoilHydro presented the results of a project, carried out in conjunction with Baker Hughes INTEQ, to define the minimum data condition requirements for valid MSA. StatoilHydro's interest in establishing such rules stemmed from their inability to validate their contractors' methodologies and thereby ensure consistently valid outcomes. Since the irrational application of MSA can degrade survey data, it is necessary to ensure that only rational analysis is applied.

The resulting recommended minimum requirements had been distributed to several contractors for comment, prior to this presentation. Erik stated that adherence to these minimum requirements should avoid the misapplication of MSA.

26th Anaheim\ Multi-station analysis.

26th Anaheim\ MSA_Min Requiremen

To place the requirements in the context of routine data acquisition and processing, Harry Wilson of INTEQ presented a flow diagram of the intended process.

26th Anaheim\MSA process diagram.ppt

Chris Barrett asked if the requirements acknowledged the difference between reference data corrected for crustal anomalies and reference data that are also corrected for disturbances in the external field. The authors replied that the requirements do not differentiate between the two, but that data that include significant external field effects will fail the requirements' noise test unless the reference field values are corrected for the disturbances.

3. Geodetic Integrity assurance

Robert Everts of Shell described the wide application of geomatics data in E&P projects, how easily integrity can be lost as data are moved around the organisation, and the implications of the resulting co-ordinate errors. He described an initiative aimed at improving the integrity of the mapping data used within Shell. Key recommendations are the proactive involvement of geodesists in projects, consideration of geomatics right from the start of a project, and a programme to increase geodetic awareness amongst non-specialists.

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Geodetic integrity ass

4. WITSML update

Darren Aklestad of Schlumberger provided a status report on the work of the geodetics and trajectory sub-teams of the WITSML SIG. It was agreed that the trajectory definition would now include information on the error model associated with each interval. It was also agreed that the Section should provide a standard set of error model term definitions. Darren requested that companies, which generate error models, forward the definitions of their Company specific terms to Steve Grindrod for inclusion.

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WITSML.ppt

5. Section Administration

5a. Web Site

Section Web Master Steve Grindrod reported on the issues affecting the Section's web site. SPE's transition to new software meant that the more recently posted content of our site had been lost. It is unclear how long it will be before the situation is corrected. Meantime all documents are available on the ISCWSA site hosted at Steve's own company's web site, Copesgrove.com. The old ISCWSA.org site redirects to this site.

The new SPE software allows SPE members to self register with the Technical Section, and to set up their own profile with respect to e-mail notifications, etc. We may start to use this site to make announcements. Unfortunately, the software cannot provide a report of who has registered.

Steve said that he doubted the suitability of the software's new shared document format for the storage and organisation of our minutes. Matthew Kirkman commented that, as an administrator, Steve should be able to reconfigure the site to better suit our needs.

26th Anaheim\Web
Site.ppt

5b. Constitution

Secretary, Harry Wilson, returned to the subject of the Section's constitution that he had raised in the previous meeting. He reiterated that the Section was failing to follow the current constitution, largely because parts of it were not suited to our needs. The Section officers had posted a revised version on the web site for consideration by the members, and that version was now discussed.

The problematic sections relate to the election and terms of the officers. The current constitution requires annual election of all officers, with a term limit of 4 years for each post. In order to improve continuity and reduce administrative burden, the current officers had recommended in the revised version that elections be held 4 yearly, but with the constraints that no officer can serve two consecutive terms in the same post, and no member can serve three consecutive terms in any combination of posts.

Discussion resulted in a consensus that 2 yearly elections were optimal. Matthew Kirkman argued that, since it is more common for there to be a shortage of volunteers to serve that a glut, there was no need for the limiting clauses. Better to rely on the bi-yearly elections to provide the opportunity for members to vote for personnel changes were desired. Matthew's argument was accepted.

Issues of continuity were then discussed. Suggestions of staggering the election of individual officers were not favoured since this would mean almost continual elections, counteracting one of the reasons for changing this part of the constitution. Instead, it was agreed that the Program Chairman should automatically succeed to the chairmanship, so serving a total of 4 years. This mechanism would prevent anyone from serving two successive terms as chairman, but not from continuing to serve if elected to another post.

A revised version, based on the discussion and agreements reached, is attached. It was agreed that the chairman, Angus Jamieson, should present this to the SPE for their consideration.

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Section Constitution [

Of the current officers, Angus was elected at the May '05 meeting and the others had all been appointed at the October '05 meeting. Therefore, even under the terms of the new draft constitution, elections are overdue for all posts. This includes the chairmanship, since Steve Mullin, the current program chairman, has already served in two posts consecutively and is therefore unwilling to become chairman, as required by the revised constitution.

There was little time to discuss how best to manage the transition. The officers discussed these issues after the meeting and agreed to make proposals for consideration by the membership prior to the next meeting.

Harry also pointed out that we have failed to meet the constitutional requirement to form a board of directors consisting of the officers plus 3 members of the section. Angus asked for volunteers before the end of the meeting.

6. Impact of Wellbore Position Uncertainty on Geosciences

Philippe Samson of Total stressed that position uncertainty does not just affect well collision risk, but also well productivity, field development plans and reserves estimates.

Philippe's presentation is too large to imbed in the minutes, but is available on the Section's web pages.

Total carried out an initial one well study of vertical uncertainty which demonstrated how wellpath uncertainty affects Geoscience's interpretation and analysis. A full field analysis, including lateral uncertainty, is required, but it is clear that wellpath position uncertainty should be integrated with geological uncertainties in the geoscience workflow. Reconciliation of multiple competing depths was identified as a high priority.

Philippe said that, at the beginning of projects, objectives are not specified well enough to identify all of the wellbore positioning requirements. Reservoir Engineers are often unaware of, or ignore, wellbore position uncertainty. Wellbore position uncertainty equates to rock volume uncertainty, and failure to take account of position uncertainty can also result in radical reworking of the geological model, and possibly over compartmentalisation.

Subsequent discussion resulted in general agreement that although contractors routinely provide position uncertainty estimates, these data do not always reach the G&G departments. It was also agreed that achievement of the required wellbore placement accuracy was often hampered by the fact that the performance of Drilling departments (the budget holders), is measured largely on ROP. Improved collaboration between drilling and geoscience, during well design (target definition, size) and while drilling, is key to achieving better well placement.

7. Directional Calculations

Overrun on the agenda meant that Steve Sawaryn of BP was unable to present SPE 110014 as intended. The paper's title is "A Compendium of Directional Calculations Based on the Minimum Curvature Method – Part 2", and is a sister paper to SPE 84246. Together, the two papers are intended to provide a consistent set of algorithms and expressions for the minimum curvature method of calculating wellpath trajectories.

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SPE110014 Mincurv.p

8. Geodesy Work Group

The newly formed group had met in Houston in April. Representatives of Exxonmobil, Shell, Total, Gyrodata, Halliburton, INTEQ, and Schlumberger had been present. Group leader, Noel Zinn of ExxonMobil, provided a report of that meeting.

Noel listed several reporting recommendations agreed by the group. One key recommendation is that the use of the terms *northing* and *easting* should be restricted to grid co-ordinates. Simple drilling co-ordinates, that are not fully corrected for geodetic effects, should be assigned *x* and *y* nomenclature.

Noel stressed that positional errors caused by failure to correct for geodetic effects undermined the validity of the ISCWSA error models, and that the Section therefore had a responsibility to guide the Industry towards better geodetic practices.

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Geodetic Corrections

9. Geospatial Integrity of Geosciences Software (GIGS)

Jon Stigant of Devon Energy described a joint Industry project aimed at improving the management of geospatial data within geoscience software, so that it better meets the needs of E&P companies. Currently these applications are outside the control of the user companies.

Devon, ExxonMobil and Shell initiated the project, but there are now 10 members of GIGS and further rapid growth in membership is anticipated. Software vendor cooperation is required and has been secured. Jon stressed that the resulting need for confidentiality was well understood and strong controls had been put in place to ensure it was achieved.

Matthew Kirkman asked if the project would encompass applications involving measured depth and its environmental corrections. Jon thought that it would, as long as it involved the applications software under review.

Jon's presentation is too large to be imbedded in the minutes, but is available on the Section's web pages.

10. Model Maintenance Sub-Committee – Status Report

Steve Grindrod updated the Section on the work of the sub-committee. Rev 2 of the ISCWSA MWD model has been checked and test data are available. Other tasks being worked on are facilitation of gyro model implementation, integration of the MWD and gyro models into a single super model, and generation of the set of error term standard definitions required by WITSML.

Steve reported widespread difficulty in implementing the complex gyro models. The original gyro model paper SPE90408 is to be rewritten for publication in SPE Drilling and Completions, which will allow the opportunity to provide more and clearer implementation instructions.

26th Anaheim\Error Model Maintenance R

Angus Jamieson added that there was still not consistent implementation of the more simple MWD model. He referred to the suggestion from the 24th meeting that Section member companies sponsor a standardization project. Subsequently 4 oil companies had offered sponsorship. The objectives are; a description of how the model works, a set of standard default coefficients for use in planning, an investigation of whether simplification of the model is possible, and a standard implementation of the model.

11. Collision Avoidance Work Group – Status Report

The Work Group had met the previous day, and Group leader, Harry Wilson, provided a summary of the progress made at the meeting and over the previous 6 months. Minutes of the Work group meeting are attached.

26th Anaheim\ Collision Avoidance _I

The educational phase of the project is complete, although the references will be updated annually. The group are now turning their attention to methods of quantifying probability of collision.

12. Minimizing the Risk of Well Collisions in Land and Offshore Drilling

Benny Poedjono and Wayne Phillips of Schlumberger summarised SPE 108279, which they recently co-authored. The paper describes the design and implementation of Schlumberger's anti-collision process, and gives examples of its application.

Benny described the process, including hazard analysis, and provided some examples of where the process has been successfully applied. Wayne then described Schlumberger's new anti-collision rule, referred to as the Oriented Separation Factor (OSF). OSF is intended to provide a simple number which bears a direct relationship to the probability of collision, independent of the orientations of the ellipsoids of uncertainty. The OSF is normalized such that a value of 1 is equivalent to two 95% spheres of uncertainty which just touch, i.e. $2.79 \cdot \sqrt{2}$ standard deviations, corresponding to a probability of about 1 in 27000.

Their presentation is available on the Section's web pages.

Andy Brooks questioned the benefit of reporting a ratio rather than the actual probability, especially since he doubted that a given OSF represented the same probability in all cases. The problem being 2 dimensional when wells are parallel, but only 1 dimensional when the offset well is approximately normal to the reference well. Wayne agreed that the method suffered from this limitation, along with all other commonly used methods.

Matthew Kirkman added that critical well to well proximities at shallow depth were probably often of the 2D type, but that, in such cases, a back-up rule employing an actual minimum separation distance helped manage the risk.

Angus Jamieson described a novel scalar method of quantifying proximity. In this method, the ellipses are expanded until they touch. The scaling required to achieve this is reported as the Separation Factor. Angus said that the advantage of this method was that it takes account of ellipse orientations, but avoids the known shortcomings of the pedal curve method.

13. Any Other Business

Angus Jamieson said that he had 3 nominees to serve as members on the board of directors; Bill Allen of BP, Dave McRobbie of Halliburton and Mark Michell of Devon. The members accepted all 3 nominations.

Angus then suggested Inverness (UK) as the venue for the next meeting and the majority of those present voted in agreement. The date will be announced later, but will be sometime in April. (Subsequently confirmed as the 23rd of April.)