



Minutes of the 29th  
Meeting of the

**Industry Steering  
Committee on  
Wellbore Survey  
Accuracy**

and

**SPE Wellbore  
Positioning Technical  
Section**

Hilton Hotel,  
Amsterdam, Holland  
March 20<sup>th</sup> 2009



Attendees:

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Attendees continued...

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\* Chair

\*\* Minutes

**1. Admin** Angus Jamieson, (Tech21/ Weatherford)

After Chairman Angus Jamieson's welcome, he presented the days agenda. Robert Wylie, (NOV) requested that all meeting attendees use the online registration if not already done so and he told the audience that registration for future meetings will be by this method.

Robert Wylie asked the audience if they could sponsor the SPE wellbore positioning meeting, and if they can, please contact a member of the committee. Harry Wilson, (Baker Hughes INTEQ) suggested that the meetings be aligned with the autumn IADC industry meeting. Robert Wylie agreed and stated that members company facilities have been used in past where Shell and Landmark and Halliburton hosted the meeting in the past.

**2. Joint Industry Project update (JIP),** Angus Jamieson, (Tech21/ Weatherford) and Steve Grindrod, (Copsegrove Developments Ltd)

See PowerPoint presentation below; double click to view the presentation:



ISCWSA JIP Update  
Mar-09

Angus Jamieson stated that the start up of the project was delayed due to finalising the contract. Angus Jamieson stated that the project will include writing a wellbore surveying / wellbore positioning e-book. Angus Jamieson asked the meeting attendees if they could review the suggested e-book chapter headings (A-Z below) and send any suggested changes or additions to Angus Jamieson (Angus.Jamieson@tech21.co.uk) where they will be peer reviewed and feedback provided.

- A. Coordinate Systems and Geodesy
- B. Changing from one map system to another
- C. True North, Grid North and Convergence
- D. The Earths Magnetic Field
- E. Principles of MWD
- F. In Field Referencing
- G. Interpolated In Field Referencing
- H. Survey Calculation Methods
- I. Survey Frequency
- J. Principles of Gyro Surveying
- K. When to run gyros
- L. Principles of Inertial Surveying
- M. Correcting for Sag
- N. Correcting for Magnetic Interference
- O. Multi Station Analysis
- P. Correcting for Pipe and wireline stretch
- Q. Human error v measurement uncertainty
- R. Common Human errors
- S. Understanding error models
- T. How errors propagate
- U. Anti-collision techniques
- V. Planning for minimum risk
- W. Basic Data QC
- X. Advanced Data QC
- Y. Tortuosity
- Z. Some guidelines for best practice

Angus Jamieson said that a hard copy version of the e-book has been requested by the project sponsors, Angus also confirmed that a hard copy version will be provided.

### 3. **Obsolete Tools' Models**, Anas Sikal, (Drillscan)

See PDF of PowerPoint presentation below; double click the link to view the presentation:



Error Model Obsolete  
Tools

Anas Sikal presented on what has been done for the obsolete directional survey tools project. Anas Sikal told the attendees that there was missing data for some of the older or historical tools. Anas Sikal described that the group has compiled a list of all known tools and the uncertainty has been defined and documented for each tool. Anas Sikal described that the project objective was to provide guidance on how to apply an adequate error model to obsolete tools. Anas Sikal described comparison results for Photomechanical model1 and Photomechanical model2, Wolf and DeWardt with ISCWSA MWD for existing survey tools and uncertainty results. Anas Sikal described that uncertainty results from applying different models to the same tool data produced different calculated uncertainty values. Anas Sikal stated that the Wolf and DeWardt model was not always the most conservative model. Anas Sikal described that in some cases, results from comparing specific tool error models, Wolff & De Wardt and ISCWSA showed that Wolff & De Wardt error model was too conservative and the ISCWSA error model was not appropriate for the tool.

Anas Sikal concluded that using the unconservative Wolff & De Wardt model and the inappropriate use of the ISCWSA model could both lead to too optimistic results and this would lead to underestimating the collision risk and expose drilling operations to a risk of collision. Anas Sikal highlighted the requirement for correct quality assurance and quality control, (survey data QA/QC) to be applied to survey data in order to allow for the appropriate tool to be defined for the survey data. Anas Sikal posed the question what QA/QC information is available for survey data?

Before closing his presentation, Anas Sikal concluded his presentation by making the following statements:

There is a need to gather all error models used for known obsolete tools (IPM files); All error Models should be analyzed in order to detect anomalies and specify the requirements to use each error model, discuss / validate specific error models by the ISCWSA (MWD & Gyro industry models)

Anas Sikal suggested that the group classify the tools into different categories, and that the group propose a specific error model for each category because there is a need for standardisation of the ISCWSA tools and models. Anas Sikal said that the Industry is drilling in many mature fields and there are lots of obsolete tool and old well data sets.

Youssef Amghar, (TOTAL) and Ross Loudon, (Schlumberger) suggested that there was a need for applying conservative or pessimistic positional uncertainty models where tool type and quality assurance and quality control is not known.

Robert Wylie, (NOV) suggested that some tool models were categorized as obsolete but were still widely used in the industry and gave an example of the Totco tool which is still in widespread use within the industry, Robert Wylie also stated many survey tools are described as MWD where the tool performance is substandard and no standard operating procedures followed, he also stated that non industry approved survey tools are used, yet still ISCWSA MWD positional uncertainty model assigned to their survey data.

John Thorogood, (Drilling Global Consultant LLP) recommended that a system should be used where a new model is used which incorporates a combination of the appropriate model parts of existing industry published models to match the new tool performance.

Patrick Knight, (Halliburton Sperry Drilling Services) suggested that the industry problem caused by using the wrong models for historical well data, is born from the fact that there is a misunderstanding of how to fit historical tools with the current ISCWSA model system.

Robert Wylie confirmed that parts of the model could be used from the current ISCWSA model to describe both obsolete and new tools.

Angus Jamieson, (Tech21/ Weatherford) added that the joint industry project current scope of work is to record comparison data which can be used to identify the comparison results from applying the different error models to the same data. Angus Jamieson stated that the next step would be to go back to originator (the directional survey data service provider) and justify what the correct model is to use rather than change or move to more conservative tool model.

John Thorogood suggested that there is a need for more transparency on tools performance (transparency of the industry directional survey tool performance data).

Benny Poedjono, (Schlumberger) added that there is a need to use a model if no other information on tool data is available.

#### **4. Software Results Comparison, Shola Okewunmi, (Chevron)**

See PDF of PowerPoint presentation below; double click the link to view the presentation:



Shola Software  
Results Comparison

Shola Okewunmi stated in his presentation that there is an increase in awareness of the effects of the ISCWSA terms 01, 01prime and 02 after testing has been done. Shola Okewunmi stated that various gyro service companies are working on resolving problems with the gyro ISCWSA model terms. Shola Okewunmi said that the software results were made by comparing ISCWSA models using different well profiles, complex and simple profile wells in 2007.

Shola Okewunmi described that there were quantified results issues and listed them as follows:

- A. MWD / gyro misalignment terms Rev 0 or Rev 1
- B. Symmetric vs bias terms (AMID, DST)
- C. Ellipse scale (how many sigma)
- D. Ellipse projection (N-E or highside – lateral)
- E. Surface location uncertainty / ellipse start depth
- F. Fixed or floating rig platform
- G. North referencing (declination, convergence)

Shola Okewunmi described how the study used data from three different service companies software and that three test profiles were used. Shola Okewunmi described how ellipse of uncertainty axes errors for both ISCWSA rev 0 data and rev 2 data compared well, with the data plot curves overlapping for the CAPTAIN test profile, where the other profiles did not compare as well. Shola Okewunmi explained that major and minor ellipse size results show substantial differences. Shola Okewunmi recommended that depth stretch should not be applied due to the risk of applying a correction that is wrong. Shola Okewunmi explained that after reviewing the data, there were some minor software features identified but in general differences in the data outputs were acceptable. Shola Okewunmi concluded his presentation by stating that the project members discussed and posed the question whether depth terms should start from zero where the software ellipse start depth is set to below zero measured depth (before sea bed or ground level).

Youssef Amghar, (TOTAL) suggested depth terms need to be tied onto surface zero depth. Youssef Amghar suggested that we need to educate users of the model how to correctly define the tie on depth when using the ISCWSA model.

Shola Okewunmi agreed with Youssef Amghar's statement and suggested TOTAL educate their service providers on correct tie on methods.

Ludovic Macressy, (Drillscan) suggested that there is a need for consistent performance results from using the same model and tool type in the different industry softwares.

Ross Lowdon (Schlumberger) confirmed that clients do not want to get different results for the same tool data when they use different service companies.

Angus Jamieson, (Tech21/ Weatherford) confirmed that there is a need to document all different methods used in the industry and that further testing is to be done by Steve Grindrod, (Copsegrove Developments Ltd).

Benny Poedjono, (Schlumberger) suggested that we need to be able to output (tool uncertainty data) with data comparing well and consistently. Benny Poedjono suggested that there is a need to compare the outputs and there is an industry need for standard outputs from the models.

5. **Collision Avoidance Sub-Committee – Update**, Harry Wilson, (Baker Hughes, INTEQ)

See PDF of PowerPoint presentation below; double click the link to view the presentation:



CA WG Status  
AMS-09

Harry Wilson presented on the progress of the Collision Avoidance Work Group. Harry Wilson stated that the meeting held on the 20<sup>th</sup> March 2009 is possibly the penultimate meeting for the work group and the minutes of each work group meeting are available on the SPE ISCWSA Section web site, (Collision Avoidance Work Group, Process Management Team and Probability Team minutes). Harry Wilson stated that the Collision Avoidance Work Group will revise and publish the three updated collision avoidance documents, [#1 Bibliography, #2 Lexicon, #3 Collision Avoidance Calculations, Common Practice], each year. Harry Wilson asked the meeting attendees to send any articles that they want to be included in the bibliography to be sent to Harry for review ([harry.wilson@inteq.com](mailto:harry.wilson@inteq.com)).

Simon McCulloch, (Maersk) suggested that the bibliography should include magnetic ranging documents and papers, as appropriate.

Harry Wilson apologised on behalf of Bill Allen (bp) for his absence. Harry Wilson stated that no significant progress has been made by the Process Management Work Group but a draft document has been started which is hoped to be ready for the next meeting in October 2009.

Harry Wilson asked Andy Brooks, (Baker Hughes INTEQ) to report on the Probability Team Progress.

Andy Brooks presented the Probability Work Group progress.

Harry Wilson asked Andy Brooks to confirmation that heavy tail distribution takes more time to process than Gaussian distribution data using a personal computer.

Andy Brooks confirmed that there was no more time taken for a PC (personal computer) to calculate a heavy tailed method than a non heavy tailed calculation.

Harry Wilson raised that Hugh Williamson's method uses a point to point method for collision analysis.

Andy Brooks proposed that Hugh Williamson's method does not use distinct interval testing method and suggested the audience refer to the meeting minutes document, click on the link below:

[http://copsegrove.com/Documents/Collision\\_Avoidance\\_Minutes\\_06\\_19-Mar-09.pdf](http://copsegrove.com/Documents/Collision_Avoidance_Minutes_06_19-Mar-09.pdf)

6. **BGGM Accuracies, Susan Macmillan, (British Geological Survey)**

See PDF of PowerPoint presentation below; double click the link to view the presentation:



Macmillan SPE119851

Susan Macmillan stated that there are four error terms associated with any magnetic field, such as Earth's magnetic field. Susan Macmillan stated that there are three main magnetic signals, and these are convection, crustal and electric currents and the time varying changes to the external field, which are driven mostly by the sun. Susan Macmillan said that it was assumed that errors in the magnetic model are normal, as this is assumed of many errors of many datasets in the industry. Susan Macmillan stated that magnetic model errors are not normal and we should not model the magnetic errors as normal distributions. Susan Macmillan showed examples of magnetic model errors, (declination, dip and Btotal) each with limits at 6 different confidence levels and stated that these are seen to be not normally distributed. Susan Macmillan stated that the variation of the uncertainties of model, (BGGM, British Geological Survey Global Geomagnetic Model) is released every year by BGS, (British Geological Survey). Susan Macmillan stated that daily events and night time sub-storm activities cause large errors in our magnetic models, and that month time scale events cause large errors in our magnetic models. Susan Macmillan stated that the equinox is the best alignment time, with this period having the lowest effects from magnetic storms on the magnetic model. Susan Macmillan stated that the new table of error terms will be published in BGS website and the ISCWSA webpage. Susan Macmillan also suggested using this table to adjust the magnetic tool error models. Susan Macmillan listed the improvements from reduced BGGM model as reduced ellipse of uncertainty size for magnetic tool models and a reduced error for the estimated external magnetic field value. Susan Macmillan stated that the improved estimates are combined for core, crustal and external magnetic field inputs.

Robert Everts, (Shell) asked if the BGS Magnetic observatory data has been, and will be published.

Patrick Knight, (Halliburton Sperry Drilling Services) stated that the presentation showed that errors are not non Gaussian and that ISCWSA assumes all errors are Gaussian with a normal distribution.

Andy Brooks, (Baker Hughes INTEQ) stated that inputs were calculated as 2 standard deviations. And these are then reduced to 1 standard deviation to input into the ISCWSA model.

Angus Jamieson, (Tech21/ Weatherford) asked if this difference means that current ISCWSA model is conservative.

Susan Macmillan agreed that it, (ISCWSA model) was conservative because of this reduction from 2 to 1 standard deviations.

Steve Grindrod, (Copsegrove Developments Ltd.) agreed that the current day ISCWSA model is considerably more conservative. Steve Grindrod stated that estimates were less conservative in 1993 with underestimated error values and that in 1999 the data studies overestimated these error terms and in 2009 we now know that the current ISCWSA model includes overestimated magnetic error values and that a table of corrected values is offered by the BGS.

Harry Wilson, (Baker Hughes INTEQ) suggested that the values could be scaled up increasing the error for safety critical applications and that the values could be scaled down for non critical applications.

Simon McCulloch, (Maersk) suggested that there was a need for the software to have the ability of outputting at 1 sigma, 2 sigma, 3 sigma or another required output.

Andy Brooks, (Baker Hughes INTEQ) added that there is a difficulty if we are working with probability and that the error will blow up in certain orientations.

Angus Jamieson, (Tech21/ Weatherford) stated that ultimately we will probably come up with a compromise between the correct solution and something that fits closely with the Gaussian error distribution and Angus Jamieson and Susan Macmillan agreed with the statement that current software (the industry directional survey software) all use Gaussian error distribution.

Patrick Knight asked if we need a new table for each new BGGM model update. Others offered the suggestion that changing the BGGM model itself could be a method to accommodate this known error.

Susan Macmillan added that the BGS have no plan to change the BGGM software to be able to accommodate this new error estimate in the near future and that a table is offered as a solution until the BGS software is modified.

Bjoern Bruun, (StatoilHydro) asked if the crustal values are included in the new error estimate.

Patrick Knight asked if we could separate out the different error terms and produce a separate error estimate for each of the three main magnetic model components.

Torgeir Torkildsen, (SINTEFF) asked for Susan Macmillan to confirm that most of the error is from the external field.

Ludovic Macressy, (Drillscan) proposed using three sigma then divide by three as this would give a conservative error estimate. Ludovic Macressy (Drillscan) suggested that if we are using 2 sigma to start with then the output from the software after calculating the corresponding 3 sigma estimate will be less conservative.

Harry Wilson added that if drilling at high latitude then this would have a significant effect on your error and that mid and low latitude wells would have less error effect on tool data.

Shola Okewunmi (Chevron) asked what actions would be next. Susan Macmillan said that she hopes that the lookup table numbers will be used by the error model team and incorporated and automated into the software.

7. **Error Model Maintenance Work Group update**, Steve Grindrod, (Copsegrove Developments Ltd.)

See PDF of PowerPoint presentation below; double click the link to view the presentation:



EMMSC Mar-09

Steve Grindrod explained that the MWD Gyro Model, Depth and QA/QC papers have all been written. Steve Grindrod stated that the next work group action is to bring them all together (MWD Gyro Model, Depth and QA/QC) papers.

Youssef Amghar, (TOTAL) stated that TOTAL have suggested a misalignment and sag management system as stated in the presentation today.

Steve Grindrod responded that there is a need for the team to review all offered methods and that more data is needed from further testing of these methods.

Shola Okewunmi, (Chevron) asked what MWD Rev 1, 2 and 3 depth terms were corrected.

Benny Poedjono (Schlumberger), asked if there was a standard system for the error model transferring.

Steve Grindrod confirmed that the team objective (Error Model Work Group Team) is to create a WITSML transfer system for error models between softwares.

Andy Sentence, (DGI) suggested that terms could be listed alphabetically.

Steve Grindrod suggested that the terms could be grouped by function, for example group all the MWD terms together, and group all the Gyro terms together.

Steve Grindrod asked the audience for any objection for the work group to proceed and use the proposed terms grouped by term function for the comparison work.

There were no objections from the audience in continuing with the method proposed by Steve Grindrod.

Steve Grindrod asked the audience if they had any objection to the Error Model work group testing the pseudo toolface vs random toolface table test data.

There was no objection from audience for the Error Model work group to test the pseudo toolface vs random toolface table test data.

Steve Grindrod stated that within the Error Model workshop group team meeting on the 19<sup>th</sup> March 2009, the team had voted to not use the drillstring interference Bias term.

Steve Grindrod asked the audience if they would vote to leave in model the option to apply drillstring interference Bias term or not as required.

The audience proposed to add to the recommended practice for applying the drillstring interference Bias term into the e-book.

Andy Brooks asked for confirmation that the Bias term, (the term for drillstring interference Bias) will be included in the WITSML database.

Steve Grindrod confirmed that the drillstring interference bias term will be included in WITSML database.

Shola Okewunmi, (Chevron) said that he was concerned about having default software settings and how the settings could handle and manage the depths values for ellipses to start, (calculating and applying uncertainty) verses an option for starting uncertainty calculation at the well reference point.

Steve Grindrod stated that no default method would be recommended by the team.

Harry Wilson added that there should be a recommended method for start of ellipse and tie-on depth systems.

Steve Grindrod agreed that there was a need to document the different scenarios and recommend the best practice for managing tie-on and ellipse start depth.

Steve Grindrod asked for the audience to vote on if they wanted the Error Model Workshop Team to write a recommendation document using only BGGM with the ISCWSA model.

Harry Wilson responded that it is up to the user to make sure that the correct mag reference model is being used. Harry Wilson also said that it is up to the user to then manage the fact that they are using a non BGGM model and manage this effect on their data.

Kevin McClard, (PDT) suggested that there is a small difference between BGGM and IGRF models and that the IGRF model could be used for lower latitude jobs.

Patrick Knight, (Halliburton Sperry Drilling Services) suggested that there is a need to review the BGS (British Geological Society) provided tables with respect to crustal, external and core magnetic effects.

Harry Wilson suggested that there is a need for a better process for the model maintenance team to review all proposals for the terms, and that the terms should be properly evaluated and then presented before being reviewed and then voted on by the team. Harry Wilson also suggested that the team should post all proposals submitted to them on the error model website for review.

## **8. Welcome of new chairman, Angus Jamieson, (Tech21/ Weatherford)**

Angus Jamieson introduced Simon McCulloch (Maersk) as new ISCWSA chairman. Angus Jamieson asked the attendees to contact Shola Okewunmi, (Chevron) with nominees for the next Chairman position to serve as the successor to Simon McCulloch.

Simon introduced himself and confirmed the elected Officers  
Program Chair, Simon McCulloch, (Maersk)  
Secretary, Phil Harbidge (Baker Hughes INTEQ)  
Treasurer, Robert Wylie, (NOV), (incumbent)  
Steve Grindrod, (Copsegrove Developments Ltd.), (incumbent)

9. **HSE Down Hole Collision Risks**, Phil Harbidge, (Baker Hughes INTEQ)

See PDF of PowerPoint presentation below; double click the link to view the presentation:



Angus Jamieson, (Tech21/ Weatherford) said that it is important for us all to step back and look at the HS&E risk from activities we are involved in within the industry.

10. **SAGD Relative Error Model**, Graham McElhinney, (Pathfinder)

See PDF of PowerPoint presentation below; double click the link to view the presentation:



After completing his presentation, Graham McElhinney proposed to the audience that there is a need to create a new relative error model for passive magnetic ranging services using magnetised casing.

11. **P7 format revision update**, Angus Jamieson, (Tech21/ Weatherford)

See PowerPoint presentation below; double click the link to view the presentation:



Angus Jamieson asked the audience for a volunteer to work with Angus in the P7 sub-team with for reviewing the P7 format.

None of the meeting attendees offered their services for reviewing the P7 format. Angus left open the opportunity to review the P7 format and if they wish to join the P7 subcommittee please contact Angus Jamieson with their intention.

12. **There was no other business discussed.**

13. **The date of the next meeting is yet to be confirmed but will be sent out when the venue and date has been finalised.**