Minutes of the 32nd
Meeting of the

Industry Steering Committee on Wellbore Survey Accuracy

and

SPE Wellbore Positioning Technical Section

Firenze Florence

September 23rd 2010

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*** Chair**

**** Minutes**

Florence Italy SPE ISCWSA meeting 23rd September 2010

Simon McCulloch, Maersk - ISCWSA Chairperson: Opened the meeting.

Ellen Clarke, British Geological Survey, UK

Presented on: Estimating the geomagnetic field as a reference for wellbore surveys: accounting for all sources and uncertainties

Phil Harbidge, Schlumberger asked Ellen if we needed to use IIFR (interpolation in field referencing method) for ring current effect, affected locations?

Ellen answered yes.

Phil Harbidge also asked if locations in the Southern Hemisphere were affected by the lack of magnetic observatories in the Southern Hemisphere also?

Ellen answered yes and explained that this is true of any remote location and that it is accepted that there is a need to have a magnetic observatory close to the drilling location to enable crustal field map and IIFR data measurements to be made.

Benny Poedjono asked if the data just presented was published and expanded to ask if the equipment at the observatories mentioned were standard or all the same?

Ellen replied No. Ellen then explained that the standards of INTERMAGNET observatories is consistent with all observatories used by BGS and that the standard will ensure data quality is of sufficient quality for typical oilfield drilling requirements for example for the generation of IFR values and crustal maps.

Inge Edvardsen, Baker Hughes and Truls Hansen, Tromso Geophysical Observatory, University of Tromso, Norway

Presented on: Practical consequences of Earth's ring current and how to deal with them

Benny Poedjono, Schlumberger asked if the Ascension Island data had been used to validate the presented data?

Truls confirmed this was not done for this study.

Angus Jamieson, Tech21 Engineering Solutions

Presented on: ISCWSA ERROR MODEL, Has it become a black box?

Simon McCulloch, Maersk introduced Steve Mullen, Gyrodata to talk about the use of and reference to the ISCWSA models.

Steve Mullen, Gyrodata, presented a flyer for a gyro tool company and stated that the flyer referred to the gyro tool featured on the flyer used the ISCWSA model and Steve also referred to the flyer which suggested the gyro tool error model parameters had been approved by the ISCWSA. Steve also explained his concern that companies have done this without ISCWSA qualification actually being done.

Jaap Overschie, Imdex Technology, expressed his concern that a gyro service is defined by an error model and the ellipse size and stated that (survey) tool performance and industry focus is commonly based on error ellipse size. As a result there may be pressure on the service providers to improve error model performance and this may in fact compromise data quality control and standard operating procedures. Initial industry focus was on the survey and now the industry trend is to rely more on the error model.

Alan Thompson, British Geological Survey

Presented on: Global magnetic field modeling: recent advances and consequences of a future gap in satellite data

Benny Poedjono, Schlumberger asked Alan if quasi definitive data was to be released and if it was to be real time data?

Ellen Clarke, BGS replied yes.

Benny asked what business model this would use and if there would be a charge for the quasi definitive data?

Alan answered yes, and stated that a charge would apply.

Benny asked for information about the BGGM (British Geological Survey, Global, Geomagnetic Model) evolution and explained that he would like to know what will happen to the BGGM model?

Alan answered that charging for the data will happen and may be in the form of a change to the current charging system.

Ross Lowdon, Schlumberger asked if crustal data will need to be downgraded now as a result of the lack of satellite data over the next few years?

Alan agreed there will need to be a review and some data will be affected by this lack of satellite data.

Ross explained that Schlumberger had extensively used BGS crustal model data. Ross then mentioned that we were moving into the period over the next few years where the main field magnetic model is not as good as it was. Ross then asked Alan how we were going to build that into our estimation of how we model our crustal magnetic values?

Alan replied that during the impending gap between the satellite surveys that provide the highest quality models, BGS would be investigating the use of Kalman filter prediction for the field change, including magnetic observatory data assimilation. In tests carried out so far such an approach had been found to minimise the error in predicting the secular variation in the field (and this was in fact shown in Alan's presentation). Such methods should ensure that the BGGM would remain an important and reliable tool for the industry. Alan further commented that the magnetic field from the crust, that is strongest at the shortest wavelengths, is of course unchanging, and could therefore be estimated from existing data, from observatories and satellites.

Jerry Codling, Landmark

Presented on: Tail Heavy distributions and confidence levels

Angus Jamieson, Tech21 commented that probabilities quoted in industry are probably over optimistic and this blurs the application of using probability of collision in the industry.

Jerry agreed he thinks that they are also (overly optimistic).

Angus asked how do we define quality control the overall accuracy of declination corrections and BHA SAG correction for example? Angus also stated that practically we cannot just double the reported uncertainty values in the industry (error models) just because there are some errors in the data.

Jim Towle, Scientific Drilling

Presented on: Magnetic ranging used as a wellbore collision avoidance procedure

Youssef Amghar, Total asked how Jim had corrected the well position?

Jim told Youssef Amghar that he moves the top hole position to shift the well to the correct position.

Steve Grindrod, Copsegrove Developments

Presented on: The Error model committee minutes

Andy Sentence, Dynamic Graphics Inc.

Presented on: Target Erosion: What's (Left) in It For Me?

Benny Poedjono, Schlumberger

Presented on: Anti-collision and Risk Management Offshore Qatar

Anas Sikal, Total / Drillscan

Presented on: How to enhance wellbore trajectory if continuous survey is not available?

A directional step-by-step approach enables to address this issue

Angus Jamieson, Tech21 said he liked this work and stated he did not think that the minimum curve was a problem if enough survey stations are used the minimum curvature is sufficient to define the wellpath, in particular inclination of continuous inclination data. Angus mentioned a shift between weight on and off bit data and both can be used to better define the wellpath.

Anas agreed that continuous data will improve the wellpath definition.

Angus stated that some companies use slide sheets to determine the BHA DLS capability which gives you the curvature. Also using tool face orientation during the slide sections which gives you the length between tool face set intervals. Using the curvature, length and tool face data the well geometry can be represented. Angus also stated that this is one method for defining well geometry with no additional cost.

Benny Poedjono, Schlumberger stated that we can also provide continuous survey data.

Simon McCulloch, Maersk stated that perhaps a smaller error model could be applied if these methods were used.

Ian Mitchell, Halliburton stated that you may not take additional survey stations, but by reducing survey interval for example from 90 feet surveys to 45 feet or by taking continuous surveys this will reduce the TVD error.

Anas agreed with Ian and added that formation BHA effects will also determine the well trajectory.

Dwayne Bourgoyne, Colorado School of Mines summarized that there were two methods for defining the well. The first by minimum curvature method (using 90 foot surveys) and a second method

combining mechanical modeling to interpolate points and define the well. Dwayne added that you could also extrapolate this data to surveys in the well.

Anas agreed that the extrapolation method is possible and that he has looked at using extrapolation tables to define the well position.

Dwayne asked that when Anas studied the interpolation and extrapolation data, when the well was drilled past the extrapolated data position, did the extrapolated data match what was actually drilled?

Anas agreed yes it did match.

Dwayne summarized that he thought the DrillScan method would give better results for extrapolating well survey points.

Harry Wilson, Baker Hughes asked Anas to clarify what method Anas is proposing. Harry then asked if they were proposing to use near continuous surveys (multiple and small depth interval survey points) for inclinations and azimuths and applying the minimum curvature model to that data?

Ludovic Macresy, Drill Scan, stated that in certain circumstances extrapolation could not be done and he recommended doing both methods of extrapolation and using continuous surveys. In some wells the extrapolation will be valid and others it will not be and it is important to run the analysis after drilling the well to review all of the available data.

Simon McCulloch, Maersk wrapped up the discussion explaining that this is probably not the last we (the ISCWSA) will hear on this subject.

Harry Wilson, Baker Hughes

Presented on: Collision Avoidance Work Group progress report

Benny Poedjono, Schlumberger stated that risk assessment must be done to avoid collision.

Harry replied yes and said that we must risk assess and that mitigation and prevention measures may be the thing that differs between contractors and operators.

Harry then stated that there are three areas of work in the group and that mainly very little progress has been made on any of them over the last few meetings.

Steve Mullin, Gyrodata

Presented on: Removing the inclination limit from GWD

Phil Harbidge, Schlumberger asked if the hardware of the new GWD tool measured the Earth's rate differently and was there any difference in the way the tool quality controls the survey data from that of the sub 20 degrees inclination tool?

Steve replied no there was no difference.

Simon McCulloch, Maersk asked if the gyro would be affected by high angle east west problems?

Steve replied yes.

Shola Okewunmi, Chevron asked how the tool takes a survey.

Steve explained that the same command was used to take a gyro survey namely pumps on pumps off. Steve added that the tool could move into the multishot survey mode with respect to battery life.

Harry Wilson, Baker Hughes asked how efficient the Multishot survey mode was?

Steve explained that multiple battery packs could be added to the survey package to add to the survey capability and Steve explained that the tool was capable of about 60 hours of accurate survey time.

Phil Harbidge asked if the gyro toolface or gyro highside measurement was different from the previous (sub 20 degrees inclination tool)?

Steve replied no there is no difference.

Ian Mitchell, Halliburton asked about the GWD 70 tool and did it gyro compass at each survey station.

Steve replied yes the tool gyrocompasses at each survey station for the high angle surveys (GWD 70).

Jaap Overschie, Imdex Technology asked Steve if they had created an error model for the tool yet?

Steve replied that no they have not created an error model for the tool yet.

Roger Ekseth, Gyrodata, stated that an error model needs to be created from real data and explained that they could not create a model without getting the tool in the ground. To help create more data and to speed up the error model generation process the tool can be run in multishot mode running out of hole. The ongoing study of the tool will produce an error model for GWD up to 40 degrees inclination. To be able to create the error model for up to 70 degrees or higher, this would require more runs at higher angles.

Simon McCulloch stated that Maersk had recently run one GWD run at high angle and provided a high accuracy SDC casing gyro survey also which was made available.

Jaap commented that making the error model for multishot or continuous surveys would be very different from single survey data.

Harry asked for clarification from Steve on multishot gyro coming out of hole? Steve explained that it should be treated as a gyro single shot running out of hole.

Harry summarized that there was actually a robust model for the 70 degrees GWD tool.

Steve confirmed, yes that is correct.

Brett VanSteenwyk, SDC confirmed it would be a solid approach to get an error model out of the GWD 70 tool.

Stefan Maus, NOAA/NGDC & CIRES

Presented on: Quantifying the uncertainty in global geomagnetic models

Phil Harbidge, Schlumberger asked Stefan if we needed magnetic base stations at lower latitudes to measure and correct for the low lat electrojet filed movements?

Stefan replied yes, we probably do need a base station to be able to measure and correct these effects and added that the magnitude would be in the range of approximately 100nT and stated that this effect is less than is seen at higher latitude which are affected by magnetic disturbances.

Ian Mitchell, Halliburton, Sperry-Sun

Presented on: Calculating offsets in the local magnetic field parameters

Simon McCulloch, Maersk asked Ian where the magnetic accuracy value came from.

Ian replied that the 100nT came from the marine magnetic survey.

Angus Jamieson, Tech21 stated that the IFR survey is pretty accurate at surface and it was interpolated with depth downward continuation, and stated that this particular field Ian was describing there was uncertainty in that the magnetic field data had been quality checked at the surface. Angus also stated that in some locations around the world downward continuation error could be large and that the downward continuation magnetic data are not necessarily quality checked for.

Ian agreed with Angus's comments and stated that the example presented was not particularly deep. And Ian also stated that one of the requirements for the technique to be used is that there must be sufficient change in inclination and azimuth for the length of the well. Another consideration is that for wells at higher latitude may require less change in inclination and azimuth to get a good result.

Steve Grindrod, Copsegrove Ltd. added that he is familiar with this technique. He has worked on similar projects where non magnetic material was planned to be run in BHAs for the confirmation of magnetic values at deeper TVD depths in the field. Steve stated that however it has been a challenge to source enough non magnetic material for the wells.

Benny Poedjono, Schlumberger agreed that it was difficult to measure absolute magnetic values at depth especially the declination at depth.

Ian agreed you would probably need to run a gyro to confirm the declination of a location at depth.

Ross Lowdon, Schlumberger stated that he agrees that there is a problem to solve the problem and determine the reference value at depth. Ross stated that data from directional survey tools run in very clean (magnetically clean) BHAs could be used. And Ross stated that the clean BHAs would act like independent magnetic observatories providing magnetic data for locations deeper than the surface magnetic map.

Any other committee business

Robert Wylie, NOV

Presented on: The treasury update

Robert stated that there was some cash in the ISCWSA account and we have enough to cover an expensive meeting in the future which is a desirable situation to be in financially.

Robert suggested more papers could be produced from some of the smaller drilling companies.

Harry Wilson, Baker Hughes asked if we are to continue our affiliation with the SPE?

Harry mentioned that the technical sections could be deemed as not needing to be associated with the SPE however there could be some benefit from affiliation with the SPE.

Simon McCulloch, Maersk asked Steve Grindrod, Copsegrove Ltd. what he thought about the SPE website.

Steve Grindrod, Copsegrove noted that the ISCWSA information needs to be public domain as part of the constitution.

Robert Wylie confirmed that we have a website for storing the ISCWSA information and making it available publically. Robert also suggested that the ISCWSA could spend some of their funds on a website for hosting the ISCWSA information and documents.

Simon McCulloch closed the meeting.