ELLIPSE OF UNCERTAINTY

SCIENTIFIC DRILLING'S ISCWSA ERROR MODELS

Well Location: **GULF OF MEXICO** [FISH HOOK WELL]

Well Profile: 1st Section [1097.28 m] Build at 2° DLS to 32° Inclination and 2° Azimuth
2nd Section [1,767.84 m] Turn at 3° DLS to 60° Inclination and 220° Azimuth
3rd Section [944.88 m] Hold 60° Inclination , 220° Azimuth to 3819.14 m

ERROR MODEL	SEMI MINOR AXIS [m]	SEMI MAJOR AXIS [m]	ELLIPSE AREA [Sq m]	ACCURACY COMPARED TO THE SDI KEEPER
SDI KEEPER GYRO	**2.83**	**5.64**	**54.24**	**n/a**
SDI DROP KEEPER GYRO	2.87	7.74	69.56	1.4 x less accurate
STANDARD GYRO	4.91	11.77	181.29	3.6 x less accurate
MWD+IFR+SAG+MS	6.07	10.70	204.00	4.1 x less accurate
STANDARD MWD	6.92	19.71	430.17	8.6 x less accurate

All survey error models calculated at 2-sigma

Well Location: **NORTH SEA** [EXTENDED REACH WELL]

Well Profile: 1st Section [5,400 m] Build at 2° DLS to 90° Inclination , 75° Azimuth
3rd Section [2,600 m] Hold 60° Inclination , 220° Azimuth to 8,000 m

ERROR MODEL	SEMI MINOR AXIS [m]	SEMI MAJOR AXIS [m]	ELLIPSE AREA [Sq m]	ACCURACY COMPARED TO THE SDI KEEPER
SDI KEEPER GYRO	**14.5**	**49.5**	**2,249.6**	**n/a**
STANDARD GYRO	14.1	99.8	4,420.8	2 x less accurate
MWD+IFR+SAG+MS	15.9	93.8	4,687.4	2.1 x less accurate
STANDARD MWD	19.3	168.8	10,207.7	4.5 x less accurate

All survey error models calculated at 2-sigma

Well Location: **BASS STRAIGHT** [DESIGNER WELL]

Well Profile: 1st Section [1,700 m] Build at 2.5° DLS to 50° Inclination , 0° Azimuth
2nd Section [1,150 m] Drop at 2° DLS to 0° Inclination , 0° Azimuth at 2850 m
3rd Section [10,170.6 ft.] Build at 15°DLS to 110° Inclination , 193° Azimuth to 4030 m

ERROR MODEL	SEMI MINOR AXIS [m]	SEMI MAJOR AXIS [m]	ELLIPSE AREA [Sq m]	ACCURACY COMPARED TO THE SDI KEEPER
SDI KEEPER GYRO	**3.7**	**6.1**	**71.6**	**n/a**
STANDARD GYRO	7.1	11.0	244.8	3.6 x less accurate
MWD+IFR+SAG+MS	9.5	13.7	406.9	4.1 x less accurate
STANDARD MWD	14.0	25.4	1,120.5	8.6 x less accurate

All survey error models calculated at 2-sigma

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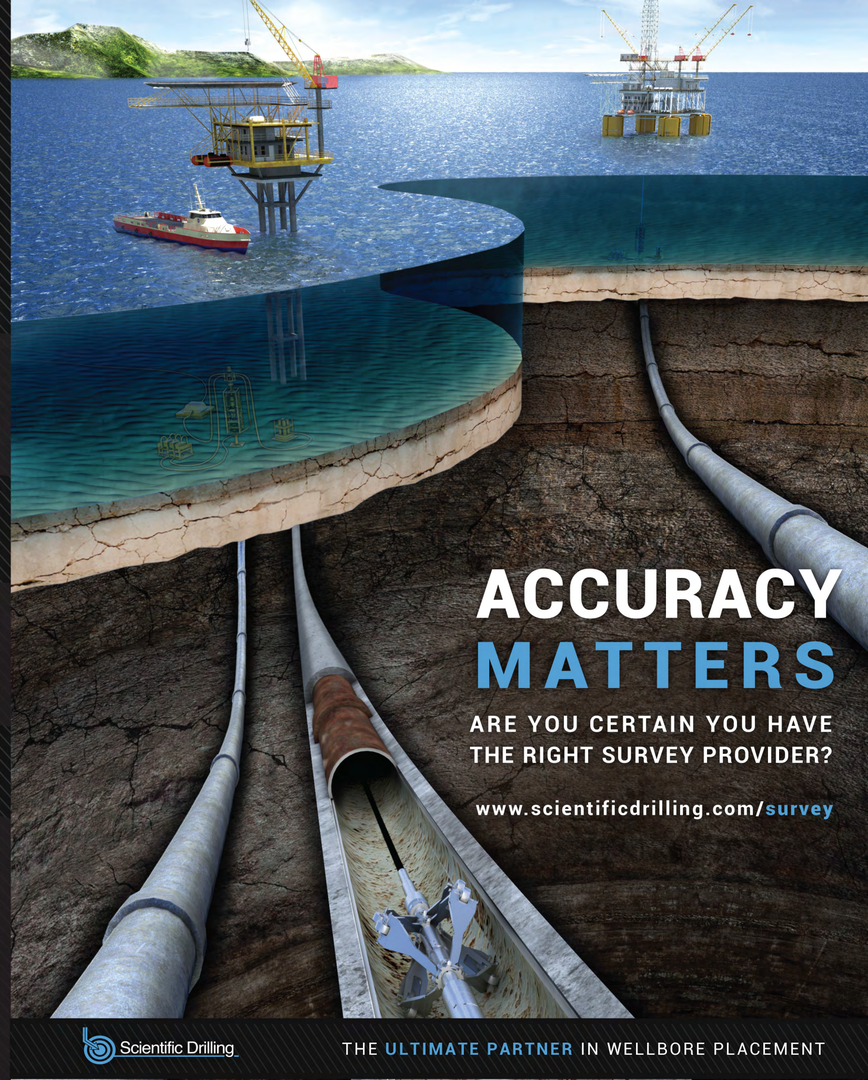

ACCURACY MATTERS

ARE YOU CERTAIN YOU HAVE THE RIGHT SURVEY PROVIDER?

www.scientificdrilling.com/survey

Scientific Drilling

THE **ULTIMATE PARTNER** IN WELLBORE PLACEMENT

THE TOP 10 QUESTIONS YOU SHOULD BE ASKING YOUR SURVEY PROVIDER

Scientific Drilling is dedicated to survey accuracy to ensure safe and efficient operations - yielding the optimal recovery, and ultimately impacting your bottom line.

To learn more about our commitment read our responses to key surveying questions.

01 HOW DO YOU CALIBRATE YOUR GYRO SENSORS & HOW OFTEN IS THIS DONE?

Scientific Drilling's gyro survey instruments are calibrated using a rigorous process at our manufacturing facility. The calibration process involves development and validation of a "personality file" for the tool taking around 75 hrs to complete. The file contains over 50 parameters, which model the physical behavior of every tool component. Many of these parameters are temperature-dependent, which means that they are modeled over our entire operating range with a complex formula, containing dozens of coefficients.

02 HOW DO YOU DETERMINE IF YOUR SENSORS REQUIRE CALIBRATION?

Each District Office contains precision gyro calibration check stands that are accurately aligned to true north. Before and after each job each tool is checked in these stands to verify tool performance across its entire operating temperature range.

Once onsite, pre and post job field calibration checks ensure key sensor parameter are still within acceptable ranges. If any parameter is found to have drifted from the personality file value, the tool is returned to the manufacturing facility for recalibration.

03 WHAT ARE YOUR QA/QC MEASURES?

[FIELD CALIBRATION, TOOL TEMPERATURE, IN-HOLE, INRUN/OUTRUN]

There are several QA/QC measures in use by Scientific Drilling's gyro survey system:

FIELD CALIBRATION
The most important QA/QC measure is the pre/post job field calibration check. This check ensures that the tool personality file is valid, and that there have been no performance shifts in the tool.

TOOL TEMPERATURE
The gyro is a sensitive instrument, and it is carefully calibrated over a temperature range. In order to perform to SDI's exacting standards, the tool must only be run in its calibrated range.

IN-HOLE QA/QC
There are over 20 different in-hole QA/QC parameters that apply to the various operational modes of the tool. These parameters measure the performance of the sensors, as well as the operation of the tool.

INRUN/OUTRUN
When conditions permit, an InRun and separate OutRun are performed for every survey. This provides two separate measurements of the well, with independent initializations where possible.

04 DOES YOUR GYRO MEASURE EARTH RATE, IF SO, HOW IS IT COMPUTED?

SDI's Keeper tools do measure Earth Rate, during its north-seeking operation. Earth Rate can be computed using the formula 15.041 * cos (latitude).

05 HOW DO YOU KNOW IF YOUR TOOL IS WORKING PROPERLY ON LOCATION

The QA/QC measures mentioned above ensure that the tool was working properly, and enable the surveyor on location to verify the accuracy of the survey, or call a misrun immediately if something went wrong.

06 WHAT LEVEL OF EXPERIENCE AND TRAINING DO YOUR SURVEYORS HAVE

SDI surveyors undergo a comprehensive training program – including an intense school conducted at a test well in various locations around the world. Many of our surveyors have been running tools for decades and have operated survey tools of various types since they were invented. In addition to learning how to operate the tools and perform quality checks on surveys, our surveyors are fully trained on the theory and mechanics of gyroscopes and our other technologies.

07 HOW ACCURATE IS YOUR SURVEY TOOL AND HOW IS THIS VERIFIED?

The accuracy of Scientific Drilling's gyro tools are dependent on a variety of factors, and is modeled in the standard ISCWSA format. Our Keeper gyro is the most accurate tool available, and can generally be counted on to measure heading to within 0.1°.

[See Back Cover for the Ellipse of Uncertainty illustrations]

08 DO YOU HAVE AN ISCWSA ERROR MODEL FOR YOUR SURVEYS?

Yes, and in fact Scientific Drilling has different models depending on how the tool is run such as wireline survey, drop gyro, etc, in order to ensure accuracy. SDI is a proud founding member of ISCWSA, and played a key role in the development of the original models.

09 WHO VERIFIES YOUR ERROR MODEL & HOW IS THIS ACCOMPLISHED?

SDI uses several methods for validating its error models. First, the models are subjected to mathematical validation, where specific parameters are derived using scientific analysis of the tool performance. Next, these parameters are validated through regular analysis of the tool calibration records. Every tool that comes through the factory contributes to the validation of Keeper error models. And finally, we have run hundreds of test surveys in wells around the world to show repeat performance of our system to within our error models.

10 WHO MANUFACTURES YOUR SENSORS & WHAT APPLICATIONS ARE SUPPORTED?

SDI manufactures our own accelerometers and gyroscopes at our Applied Technology Center located in Paso Robles, California.

SDI was founded by a group of experts from the aerospace industry, who designed and built missile guidance systems for the US military during the cold war. They used their experience to develop a new gyro that met the specific needs of downhole surveying. This sensor eliminated dependency on government missile contracts, and enabled SDI to design sensors that met the downhole need perfectly.

The sensors are designed and built only for use in SDI's Keeper and not adapted from some other use. This ensures optimal performance in the downhole environment and allows us to constantly measure the quality of our final product.