



### «GEO-STEERING AND M/LWD», 5 days

#### COURSE OBJECTIVE:

Professional development in sphere of geo-steering, M/LWD technics (telemetry, inclinometry, logging, images), geological monitoring, and horizontal wells drilling efficiency assessment, geophysical interpretation while drilling, geo-steering modeling, application of reaction and proactive geo-steering methods.

#### ACQUIRED ABILITIES:

- Estimation of applied geo-steering technics efficiency and quality;
- Analyze the consistency of drilling commands of geological department;
- Monitoring of telemetry process for better well construction control and cut of nonproductive time;
- Apply acquired knowledge for high quality geological monitoring;
- Provide express-assessment of telemetry station performance and directional drilling including quality of logging, images and inclinometry in real time;
- Competence in data density, log interpretation, correction for each logging technic.

#### COURSE CONTENT:

Module Name	Content
Geo-steering	Introduction to geo-steering. Key uncertainties while geo-steering, reduction technics, preliminary modeling. Geological modeling efficiency assessment. LWD technics. GL, SER and NDL methods. Well log reading principles. Geo-steering technics. Methodology evolution, proactive and reactive methods. Differential scanning calorimetry features and performance. Physics description of images, cartographer, pros and cons for each method, case studies.
Inclinometry	Coordinates and cartographic projection. UTM and Gauss-Kruger projection. Survey calculation. Correction procedure exercises. Magnetic and gravity measure. Operation concept of survey tool and magnetic meter. Azimuth error and ellipse of uncertainty.
Telemetry	Signal of telemetry. Mud channel, principles of signal formation. Data coding. Modulation types, content and frame variety. Signal detection and filtration. Signal/noise ratio. Signal issues and its detection. Signal attenuation factors. Depth tracking. Block & tackle system, elements and principles. Tool measure and GL rerecord, measures in case of

	GL mismatch. Data density. Methods of data density identification. Data density factors. Exercises.
Gamma logging (GL)	Gamma-ray, rock natural radioactivity. Gamma-detector configuration.
Specific electric resistance (SER)	Physics of SER measuring. SER instrumentation features, phase change and amplitude losses. Logging depth and vertical resolution, 4 rules. Reasons for resistivity curves separation. Physics and identification of these reasons. Exercises.
Neutron-density log (NDL)	Physics of density, PEF, porosity measure. Features of NDL instrumentation. Images. Image geometry, use and limits. "Angle X". Density and porosity corrections.