



Refreshing MWD Technology

Case Study

January 15th 2017

Reliable MWD Mud Pulse Signal Detection Keeps Well on Target

PROBLEM	SOLUTION	RESULT
MWD tools at 17,000+ MD ft. below agitators in Permian Basin struggle with mud pulse signal detection.	Deploy Noralis Surface System Technology as a secondary decoding system	Noralis improved decoding success by <u>321%</u> . Geology received accurate gamma readings to maintain target Inclination/Azimuth to TD.

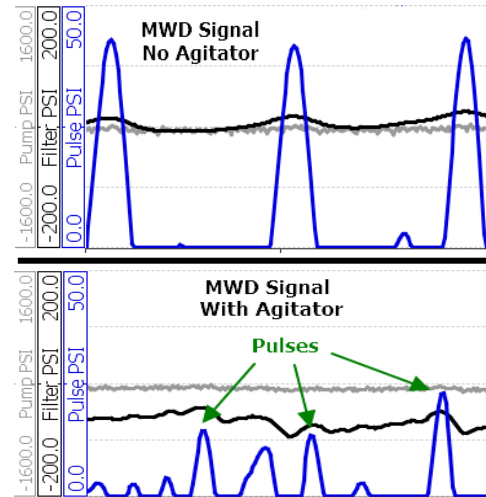
Industry Problems with Mud Pulse Signal Detection

MWD tools struggle with detection issues with obstructions in the drill string (agitators, stimulators, etc) leading to the following problems:

- Increased time spent off bottom relogging data
- Pump-cycling creating well-bore inconsistencies and increased risk of stuck-pipe
- False gamma readings indicating well is out of zone

Traditional solutions MWD service companies offer:

- Increase Pulse Width: (keep pulser closed longer)
 - 👎 Adds mechanical wear/tear on pulser components
 - 👎 Increases drill string pressure
 - 👎 Slows data rates
- Question the agitator setup
- Pull out of hole to inspect mechanical components



Rather than blame the agitator or pull out of hole to inspect components the client decided to mobilize the Noralis Pressure Decoding System. Client finished the last 1000' of the lateral with no re-logging required.

Case Study – Conventional Lateral (8,000' KOP, 10,000 Lateral)

- Agitator 2100' behind the bit
- Mud Weight 8.9 (Water Based)
- Pulse Height 25 psi
- Traditional MWD Tool with M-ARY decoding
- Outfitted with an improved pulser/mechanical combination to generate larger pulse signal
- MWD gamma readings indicated well-bore out of zone
- Stick-slip causing MWD tool to go in&out of rotation
- Directional Driller had increased difficulty sliding.



Well Data Results

Depth Range	Footage	Gamma Points	1.43 Total Gamma Points Per Foot.
18,020 - 18,730	710	1,020	

NORALIS DETECTION

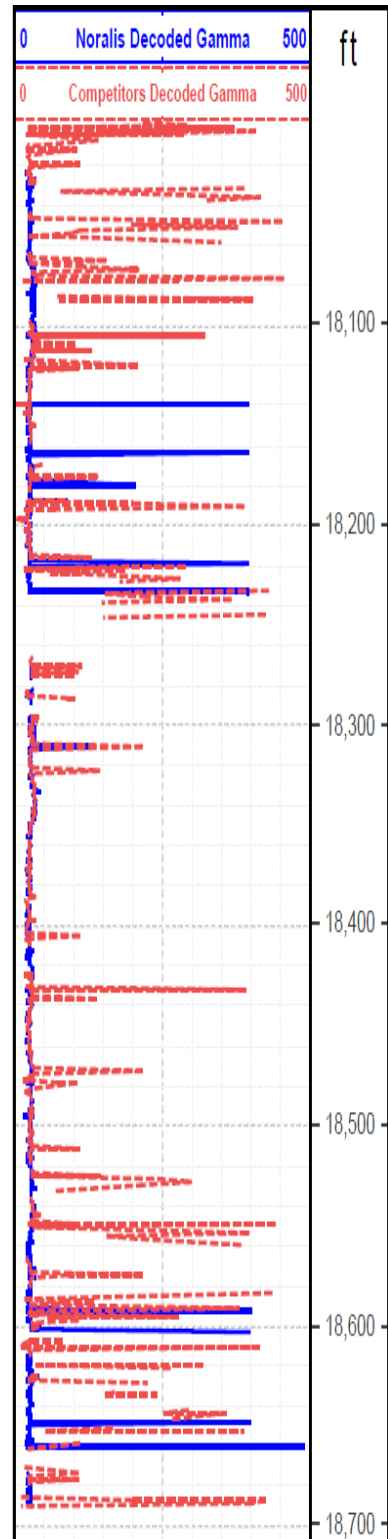
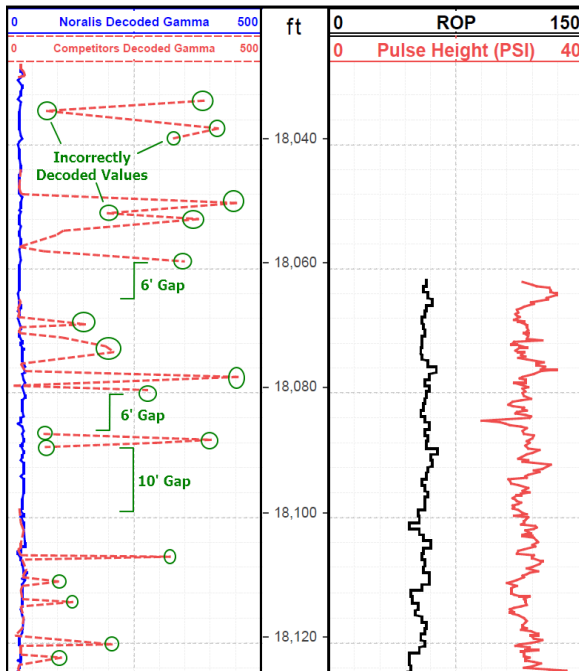
Gamma Points Detected	Gamma Points Falsely Decoded	1.38 Valid Gamma Points Per Foot
1,000	17	

COMPETITOR DETECTION

Gamma Points Detected	Gamma Points Falsely Decoded	0.43 Valid Gamma Point Per Foot
470	165	

The Noralis decoding system out-performed the competitor by

321%



High-quality real time data ensures clients are able to complete their projects on time. Noralis systems also save money by cutting the cost of decoding data by up to 70% off traditional retail cost.

Contact Noralis at sales@noralis.com to learn more. Visit the website at www.noralis.com