

Increased Confidence in Wellbore Position

## OBJECTIVES

Increase Confidence in Well Bore Position:

- Determine spacing accuracy of FDIR vs Continuous Gyros
- Determine spacing accuracy of MSA vs Continuous Gyros
- Reduce Ellipse Of Uncertainty
- Define top Survey Accuracy method to optimize well placement
- Improve Optimize Frac Placement and Control Completions Cost

FDIR will give you the most accurate well spacing and improve production. It will also give you a more precise Geologic Model

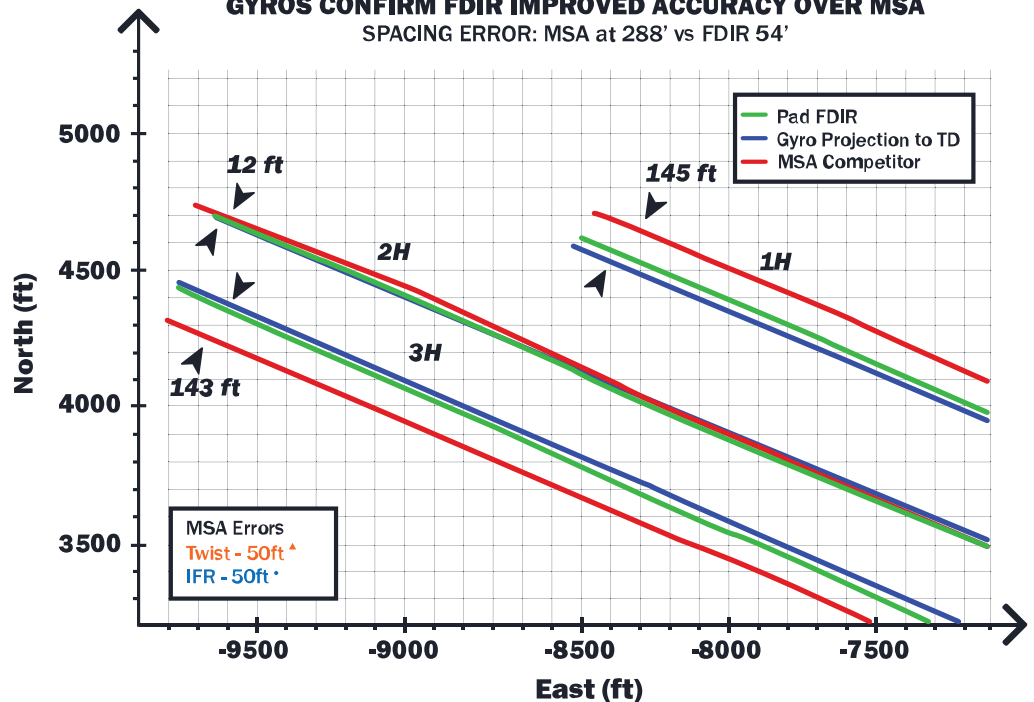
## SOLUTIONS

FDIR (Fault Detection, Isolation, and Recovery)

- The three continuous gyros were run post well at the same time.
- FDIR was run post well and Surcon was run real time to compare
- Then the declination error was removed and the spacing accuracy from FDIR and Surcon were compared to gyro
- FDIR takes into account all of the Surveys from the Vertical, Build, and Lateral Runs
- FDIR analyzes 27 potential error sources per Run and uses a 128 solution matrix in selecting the most appropriate corrective action. (~33,000 error combinations over 3 runs)

FDIR is the Industry Leading Automated Survey Correction Software

**GYROS CONFIRM FDIR IMPROVED ACCURACY OVER MSA**  
SPACING ERROR: MSA at 288' vs FDIR 54'



## VALUE

FDIR Value:

- Pad FDIR spacing error relative to gyros is:
  - 1H to 2H:  $(15+36)/500=10\%$
  - 2H to 3H:  $(19-15)/500=1\%$
  - 1H to 3H:  $(19+36)/500=11\%$
- MSA spacing error relative to gyros is:
  - 1H to 2H:  $(145-12)/500=27\%$
  - 2H to 3H:  $(12+143)/500=31\%$
  - 1H to 3H:  $(145+143)/500=58\%$
- FDIR Ellipse of uncertainty was improved by 60% over standard MWD surveys
- The Maximum well to well spacing error for FDIR was 55' vs MSA 288' or FDIR is 80% more accurate when comparing spacing errors to the gyro information in this case study.

The Maximum Well to Well spacing error for FDIR was 55' vs MSA 288' or FDIR is 80% more accurate

Past performance is not a guarantee of future results. Results may vary.