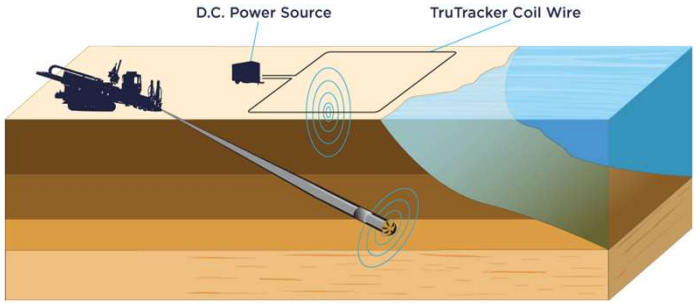
Small Gyro for Small Rigs

Matthew Patterson, President – Sharewell HDD
J. Darrell Jones, North American Operations Manager – Sharewell HDD

Guidance Methods for Small Rigs (24k to 100k)

Walkover

Magnetic



Gyroscopic

Walkover Guidance

Advantages

- Cost effective
- Acceptable for most shallow bores with minimal obstructions
- Simple to set up and use

Disadvantages

- Less accurate as you get deeper (+- 5% depth)
- Susceptible to interference from existing utilities or obstructions

Magnetic Guidance

Advantages

- Less expensive than gyro
- More accurate at greater depths than walkover
- Communication not affected by existing obstructions

Disadvantages

- Less accurate as you get deeper (+- 2% depth)
- Magnetics can be affected by existing utilities

Gyro Guidance

Advantages

- Not affected by magnetic interference
- Depth has no effect on accuracy
- Communication not affected by existing obstructions
- Minimal surface verification needed

Disadvantages

- More expensive than both walkover and magnetic guidance systems
- Tool azimuth and inclination bias can become an issue on longer bores

Small Rig: Potential Operational Advantages

- Decrease overall footprint
- High Accuracy for complex designs
- Reduced fuel costs
- Decrease rig mobilization costs
- Reduce crew size

Small Rig: Potential Operational Advantages

Rig Comparison Summary			
	60k Rig Class	80K Rig Class	440k Rig Class
Site Set Up	660 Sq Ft	875 Sq Ft	1,910 Sq Ft
		33% Increase	118% Increase 80k to 440k 189% Increase 60k to 440k
Equipment Cost	$1,090,000	$1,365,000	$3,646,000
		25% Increase	167% Increase 80k to 440k 235% Increase 60k to 440k
Fuel Consumption	26 GPH	42 GPH	67 GPH
		62% Increase	59% Increase 80k to 440k 158% Increase 60k to 440K

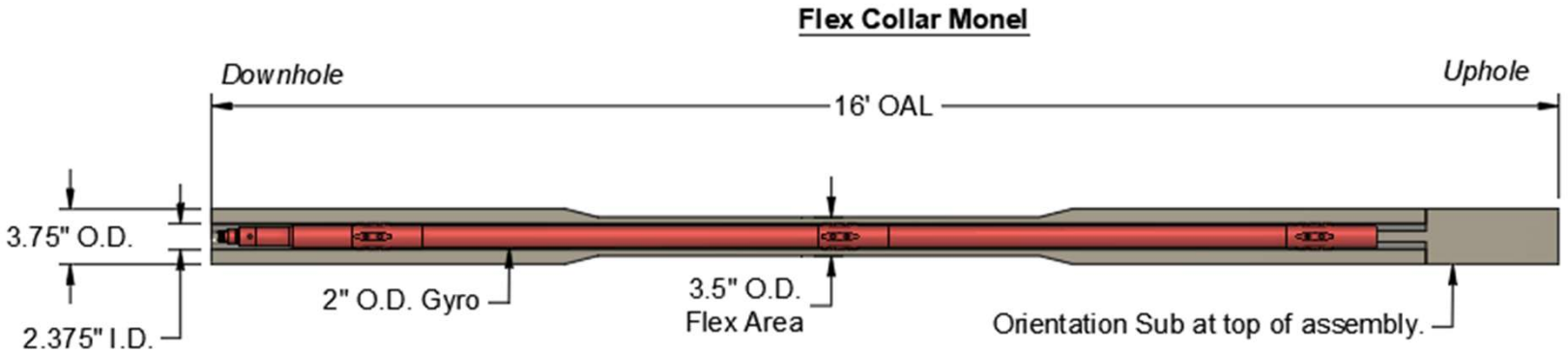
Why Aren’t Gyros Run on Small Rigs?

- Lack of knowledge on wireline operations
  - Perception that "Wireline is just for big rigs"
- Unaware of the gyro technology
- **Large tooling requirements**
  - **Typical collar size for a gyro is > 5” O.D.**
- Increased costs
  - Can be offset by substantially higher rates


Potential Twist Off Point

What Is A Possible Solution?

- Small Diameter Gyro
- Flex Collar Monel



Small Rig Guidance System Operation

Step 1: Arrive On Site

Tool arrives on site

pre-loaded into monel and

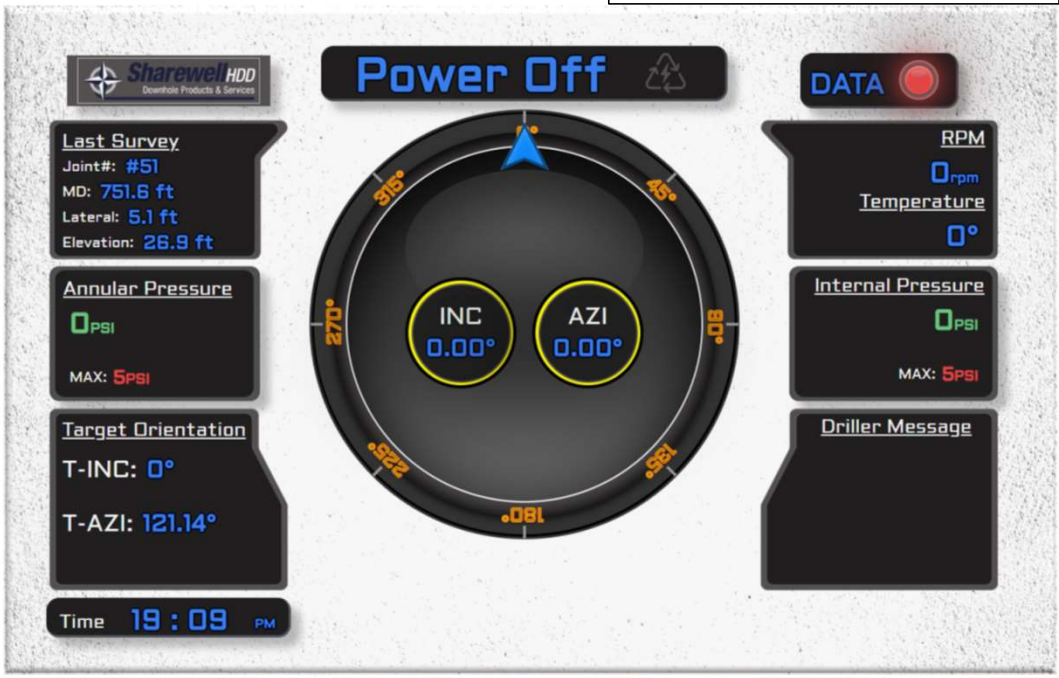
ready to be loaded onto drill

rig

Step 2: Load Data into Software

- If coordinate data for entry and exit points are not provided, then land survey is completed with GPS.
- All data and reports are compiled using software

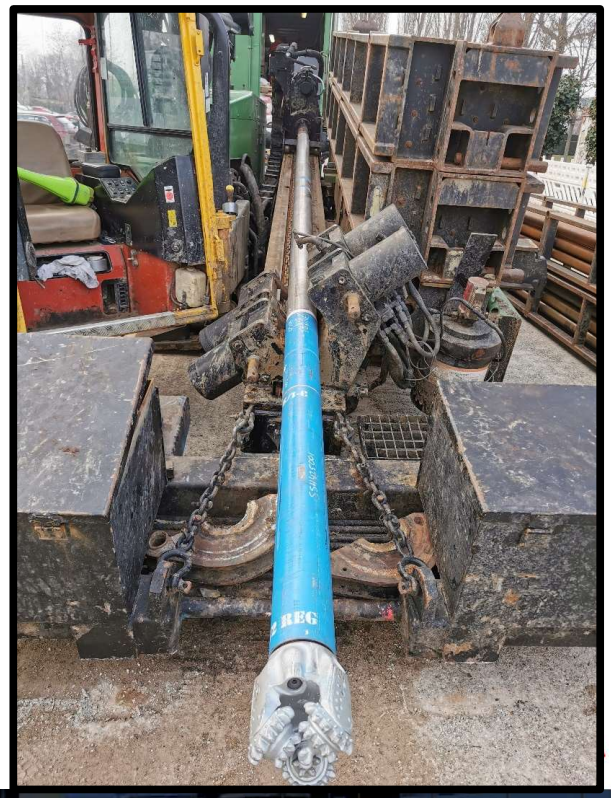
Driller Display



Step 3: Begin Drilling Operations

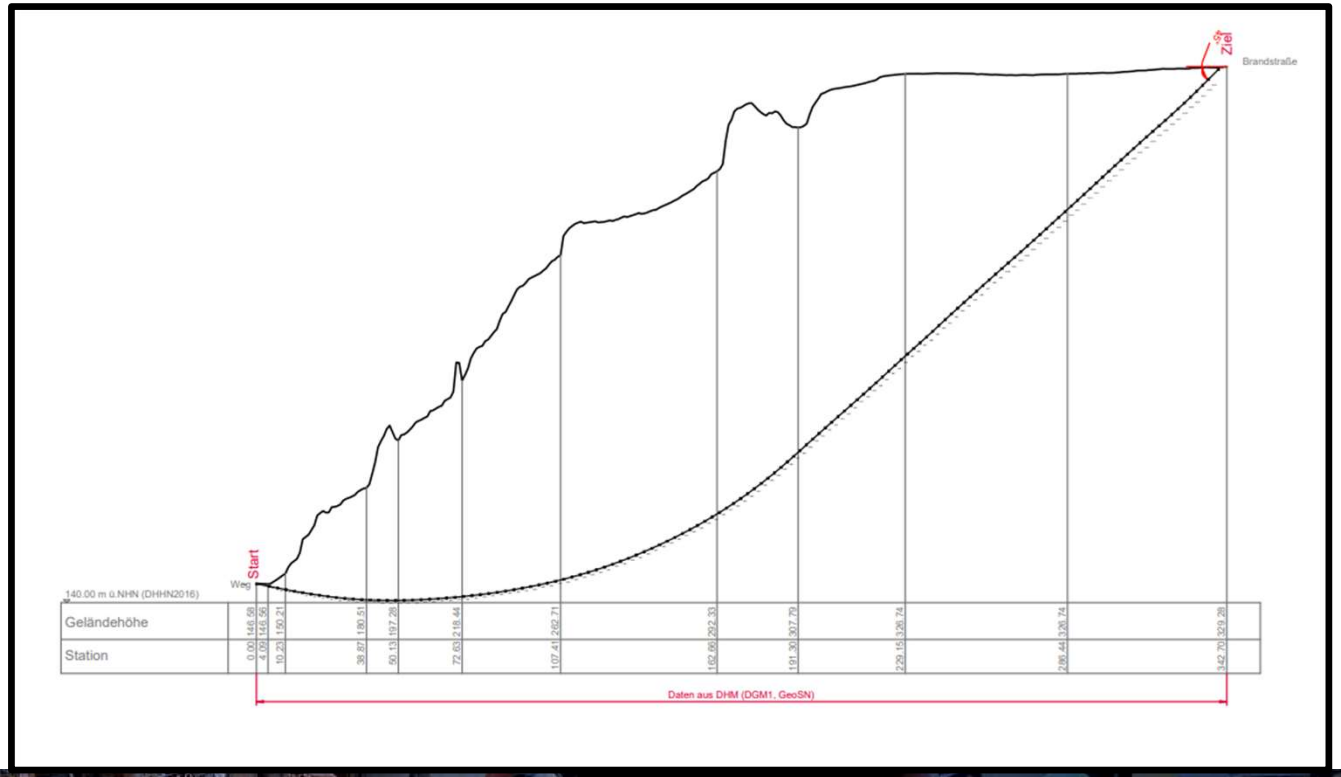
- **Load Monel Onto Rig**
- **Complete 10-Minute Gyro Alignment**
- **Begin Normal Drilling Operations**

Total Setup Time: Approx. 1 hour



CASE STUDIES

Porschdorf, Germany



Porschdorf, Germany

- Monel: 3 ¾
- Mud Motor: 3 ½”
- Rig: Tracto Technik TN 28
- Distance: 340m
- Elevation Change: 185m
- Result: Accurate 45 Degree Exit

Porschdorf, Germany

- Limited Access & Large Elevation Difference
- Small Tool Compatibility
- High Pressure
- Successful Completion

Westlake, LA

Westlake, LA

- Monel: 3 ½”
- Rig: JT 60
- Distance: 537 ft
- Challenge: No Secondary Verificiation

Westlake, LA

- The job was bid with the Opti-Trac gyro in mind
- Customer was new to using gyro
- Ran with a 3.5” drill collar
- Concern for steering in soft formations.
- Took only two days to complete
- Dive team was deployed to recover the tool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Indianapolis, IN

Indianapolis, IN

- Monel: 3.75”
- Mud Motor: 3.5”
- Rig: Vermeer 24 x 40
- Challenges: Highly Congested Area & No Secondary Verification

Indianapolis, IN

- Tight work zone
- Road crossing made gyro necessary
- Rock conditions required mud motor
- Small drill collar worked out great

Questions ?

Matthew Patterson: mpatterson@sharewellhdd.com

J. Darrell Jones: djones@sharewellhdd.com

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