

Brownline



IS HAPPY TO MEET YOU AT THE
Underground Construction Technology
The Underground Utilities Event

**BOOTH
213**

Jan. 28-30, 2020 | Forth Worth Convention Centre | Forth Worth, Texas

The background image shows a construction site at sunset. In the foreground, there is a large piece of construction equipment, possibly a TBM cutterhead, on a flatbed trailer. A yellow excavator is visible in the background. The sky is a mix of orange, red, and blue, with a city skyline visible in the distance across a body of water. The text 'GYROSCOPIC NAVIGATION IN THE HDD INDUSTRY' is overlaid in white, bold, sans-serif font.

GYROSCOPIC NAVIGATION IN THE HDD INDUSTRY



**James Cloud, Jr.,
President**

Brownline USA, Inc./Slimdril International, USA

Over 29 years experience as surveyor and served as its president since 1998. Brownline is the leading provider Of Gyroscopic Navigation services.



Hans Blok, Business development manager, Brownline, Netherlands

Over 10 year experience in pipeline engineering.

Over 25 years manager of international HDD company.

Last few years working for Brownline, the service provider for Gyro steering.



Approximately 20 years ago I was invited to be part of a panel discussion, on the future of navigational technology in the Horizontal Directional Drilling Industry. It was at this DCCA panel discussion that the Gyroscopic Technology was mentioned. Some in the industry thought it would be the next "sliced bread" of our industry, and others thought that the Gyro Technology available at that time would never be viable in our industry. With my prior experience in the oilfield and some experience with Gyroscopic tools in the HDD industry, I too had doubts about the technology.

Since then the HDD Steering Industry continued with the use of magnetic tools, and did experience several technological advances including the High Res Tools, Software Advancements, AC Grid Tracking, and etc. Even as the Magnetic Steering Technology advanced, it seemed out paced by the demands of the Engineers and increasingly complex and difficult projects we encounter today.



We have all heard the saying "all the easy ones are done". Well this statement could not be truer. The Steering Industry has recently experienced an increase in the following.

- ***Tighter tolerances due to less easement space***
- ***More Complex Profile Drills***
- ***Less access to land for the installation of Wire Tracking Systems***
- ***Longer Reach projects***
- ***Increase in projects in very Pipeline/Utility congested areas.***
- ***Increase in high degree horizontal turns.***
- ***Increased monitoring of bore radius during drilling process.***
- ***No more "Buy the easement when we get to the other side."***
- ***Budget restraints on time to complete projects***

HIGHLY CONGESTED AREA – 0% WIRELINE TRACKING AVAILABILITY



HIGHLY MAGNETIZED IRON ORE MINE DRILL – MGS UNABLE TO TRACK OR MAINTAIN AZIMUTH



CROSSING UNDER NUMEROUS OVERHEAD POWERLINES NO ACCESS FOR TRACKING & HEAVY MAGNETIC INTERFERENCE

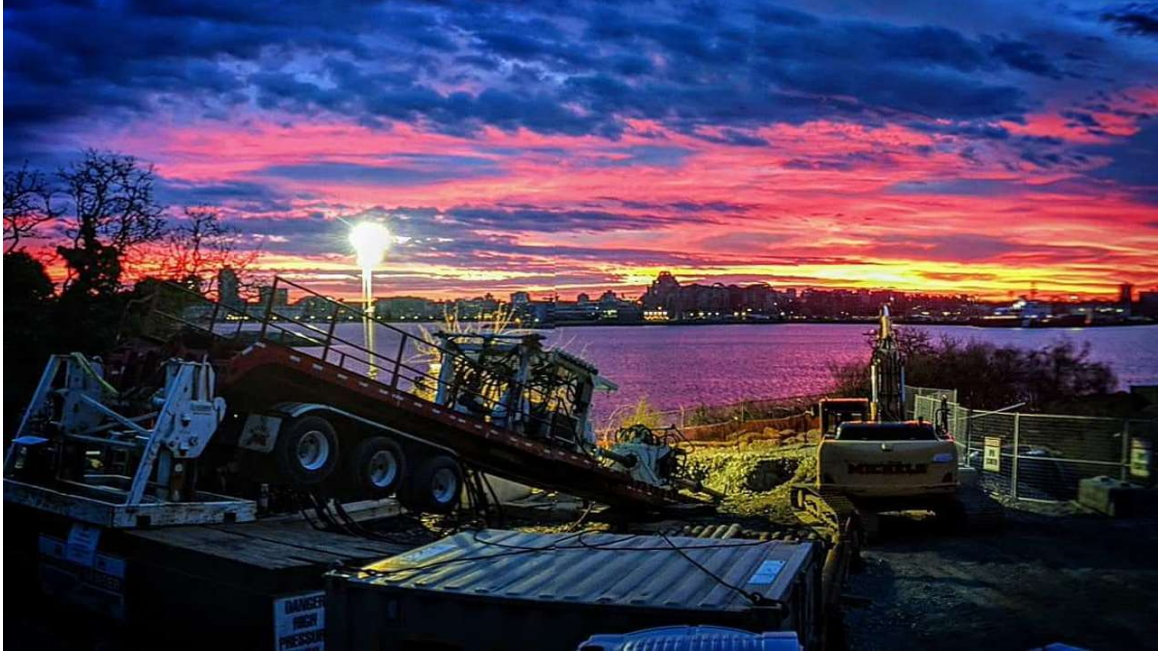


LIMITED LAND ACCESS & HIGH DEGREE HORIZONTAL TURN



4500m INTERSECT – LIMITED LAND ACCESS





With growth of the HDD market and the ever increasing demands of the Pipeline & Utility Owners; it was necessary for Steering Tool Manufacturers and Service Companies to provide a more precise and accurate steering systems. While Mechanical Gyroscopes have been available for decades, they were not considered a viable option for HDD drilling operations due to their inability maintain accuracy while withstanding the rigors of drilling and their inherent costs.

For these reasons the Drillguide Gyroscopic Steering Tool (GST) was developed. This was the first tool designed specifically for the use in the HDD industry. Brownline BV out of the Netherlands, introduced the Drillguide tool to the European market in 2005, and later to the U.S in 2007. Since its introduction, the Drillguide Gyro Steering tool has successfully completed over 20,000 HDD projects Worldwide.

As acceptance and demand for Gyroscopic Technology has grown, there have multiple other companies that have introduced their own Gyro Steering Tool to the industry with varying degrees of success. It is not our intent to leave any current tools out of discussion, however; for the purpose of this presentation the following GST's will be used for comparison.

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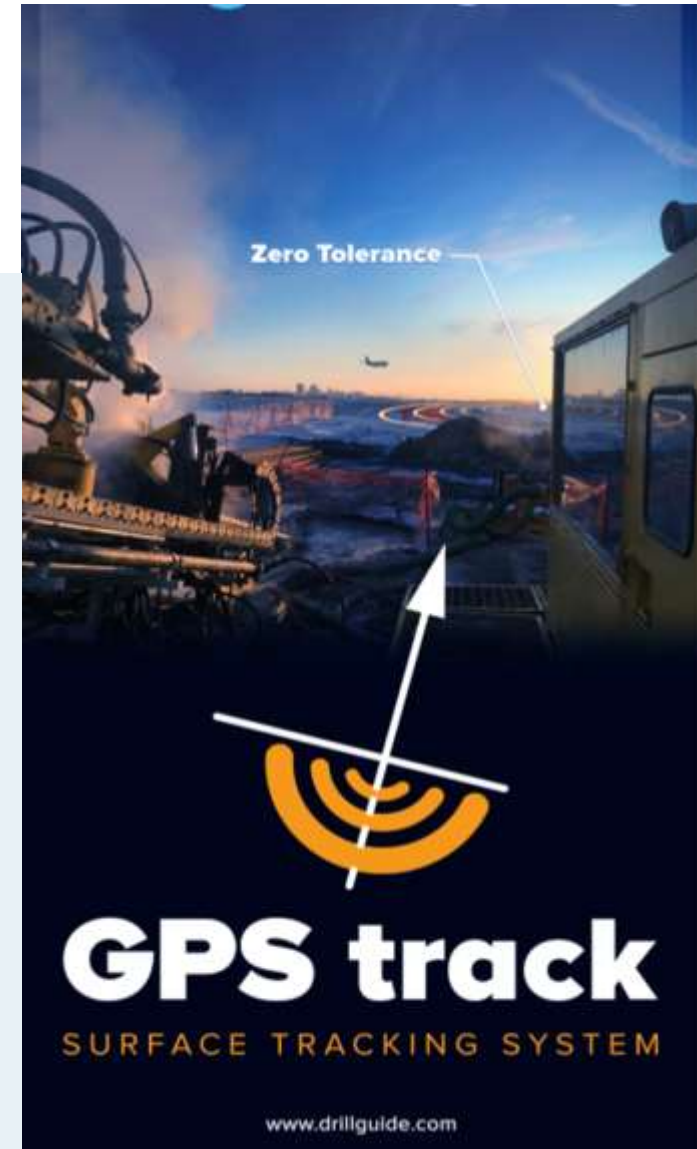
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Drillguide
by Brownline

TOOL BENEFITS

- ✔ Highly accurate
- ✔ Not affected by interference
- ✔ No need for magnetic fields or beacons
- ✔ Unlimited horizontal and vertical curves for every type of drill
- ✔ Short setup time
- ✔ Cost-saving through efficiency



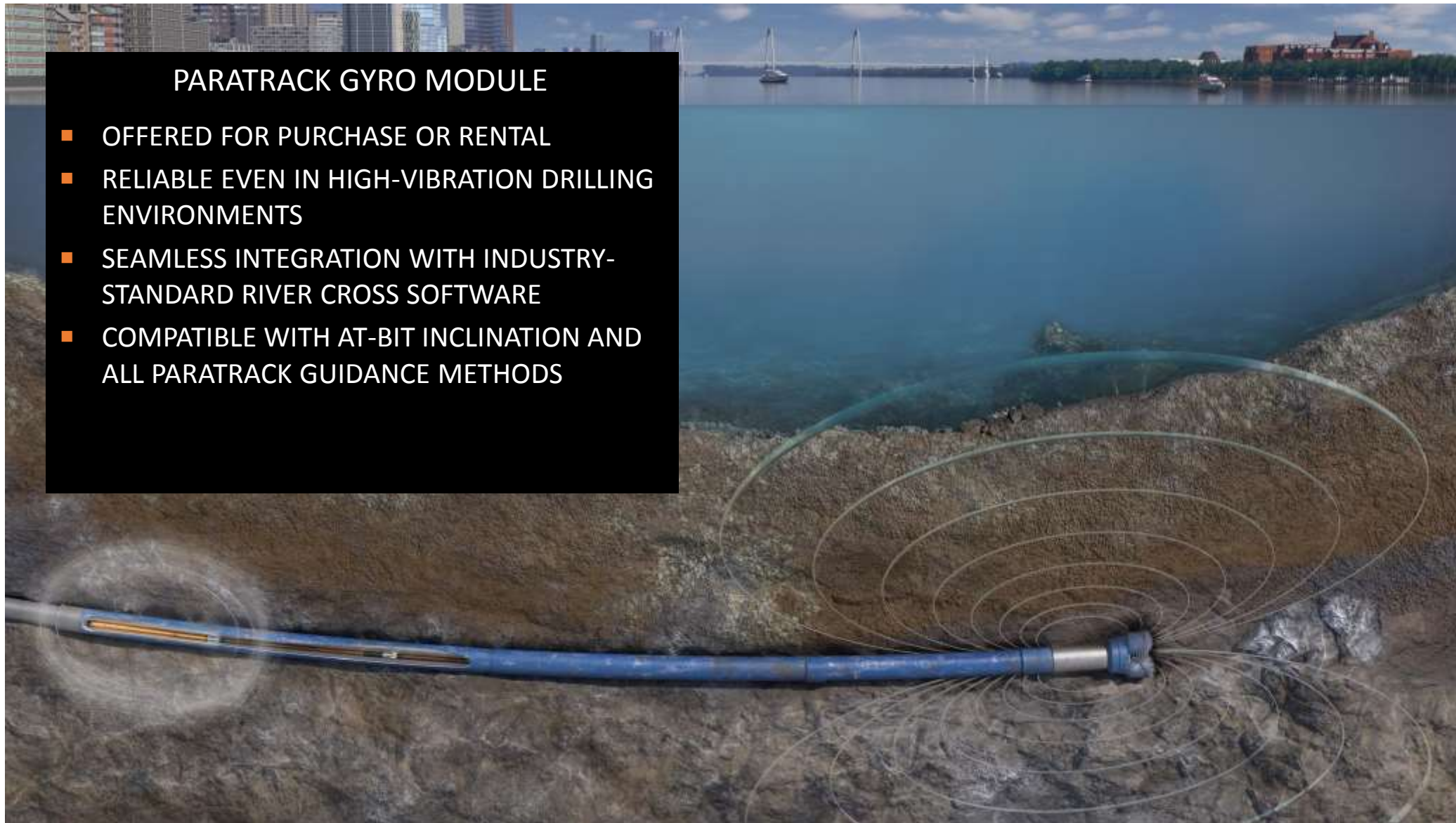


STATE OF THE ART, HIGHLY ACCURATE GYRO SPECIFICALLY DESIGNED FOR HDD.

- Gyro sensor unaffected by magnetic interference
- Integrated magnetic ShareTracker system provides secondary position confirmation
- 2 1/8" OD barrel compatible with customers' standard tooling, no special BHA required
- Easy setup and transport, tooling ships in hard cases
- Can be run in smaller 4 3/4" drill collar and larger
- Downhole pressure monitoring included
- Pressure barrel rated up to 12,000 PSI
- Proprietary fiber optic gyro design handles the harshest drilling environments

PARATRACK GYRO MODULE

- OFFERED FOR PURCHASE OR RENTAL
- RELIABLE EVEN IN HIGH-VIBRATION DRILLING ENVIRONMENTS
- SEAMLESS INTEGRATION WITH INDUSTRY-STANDARD RIVER CROSS SOFTWARE
- COMPATIBLE WITH AT-BIT INCLINATION AND ALL PARATRACK GUIDANCE METHODS



 SPECIFICATION COMPARISON			
Date of Introduction (US)/Netherlands	July 2007/2005	Jan-19	2017
Projects Completed (worldwide)	+20,000		100+
Pitch Angle Accuracy	+/- 0.01 degrees	+/- 0.10 degrees	+/- 0.02 degrees
Azimuth Angle Accuracy	+/- 0.04 degrees	+/- 0.15 degrees	+/- 0.10 degrees
Sensitivity to Magnetic Disturbance	Insensitive	Insensitive	Insensitive
Surface Access - over installation	Not Required	Not Required	Recommended for secondary verification on some bores
Pressure Monitoring	Annular & Internal	Annular	Annular & Internal
Communication	Two Way - Sensor to Surface & Surface to Sensor	Sensor to Surface & Surface to Sensor	Two Way - Sensor to Surface & Surface to Sensor
Data Acquisition & Recording	Real Time	Real Time	Real Time, not recorded
Continuous Monitoring of Inc. & Azm while drilling & rotating	Yes		Yes
Bore path Survey & Setup	No Additional Land Survey Work Required	No Additional Land Survey Work Required	No Additional Land Survey Work Required
Bore Intersect Capable	Yes - Active Ranging Technology	Intersect capability in development	Yes - multiple methods available including Active and Passive
North Seeking Capable	Yes - Minimum 12 Minutes every two hours	Yes - 4 minutes	North Seek performed per-shot as part of regular survey
Grid Wire Tracking Capable	No - Currently in R&D	Yes, Trutacker	Yes
Secondary Tracking Capable	Yes - Trackable from Stationary Receiver	Beacon system in development, not yet operational	Yes
Survey Time	2 to 4 Seconds	10 - 20 seconds	3 minutes
Multiple Surveys per Joint Capable	Yes - at any time	Yes	Yes - at any time
Power - Input / Output	110 or 220V AC / 56V DC	110 Volts	110 or 220V AC / 46V DC
Hole Size - Minimum / Maximum	7-7/8" to 17-1/2" (17 1/2" with Maxi Hsg.)	6 1/2" - 12 1/4"	7-7/8" and up. Smaller sizes with custom collar.
Minimum Pipe Size	3.5" Drill Pipe	2 7/8"	
Vibration Monitoring	Yes	No	Yes, Real Time
Minimum Radius	150m - 492'	110M - 328'	Function of customer assembly
Retrievable	No	Yes - Sharewell Proprietary System	no
Can be shipped in standard hard cases.	N/A	Yes	yes
Runs in standard collars, with standard BHA's.	BHA provided by Drillguide	Yes	yes

- **Gyroscopic Navigation is an emerging market within the HDD industry, and will continue to grow with it. It is believed that Gyroscopic Steering Technology will someday be considered the new standard for a major portion of the HDD Guidance sector of the industry.**
- **Gyroscopic Steering Technology will continue to expand and improve with even higher demands and the need for higher accuracy in any drilling conditions or design factors.**
- **Engineers, Owners, and Contractors need to have the correct information and to ask the right questions when specifying Gyroscopic Steering technology needed for their upcoming projects. As more steering companies enter the Gyro Steering sector, it will be even more important to know the exact specifications and project history, of the each tools being presented. As discussed and seen in this presentation, not all Gyroscopic tools are equal. Each has it own advantages and limitations.**
- **Pick Right be Right**

THANK YOU FOR ATTENDING QUESTIONS

JIM CLOUD



HANS BLOK