

**GEO THERMAL  
SOLUTIONS**  
Comprehensive  
Capabilities



## Highly Productive Tools. Time Saving Efficiencies.

With our **GEO**THERMAL tools, we deliver significant operational benefits and reduce risks for our customers.

# GEO THERMAL Solutions

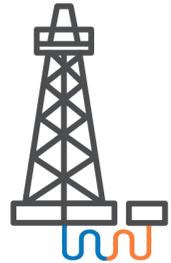
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Wellbore Integrity Solutions (WIS) provides high-temperature products and services for geothermal development worldwide by offering a complete range of capabilities and when necessary, forging strategic alliances with others in the service industry. From concept studies to completion of your geothermal well, Wellbore Integrity Solutions draws on more than 50 years of geothermal experience, reliable equipment, and specialized technologies to safely and efficiently tap into this clean, renewable energy source.

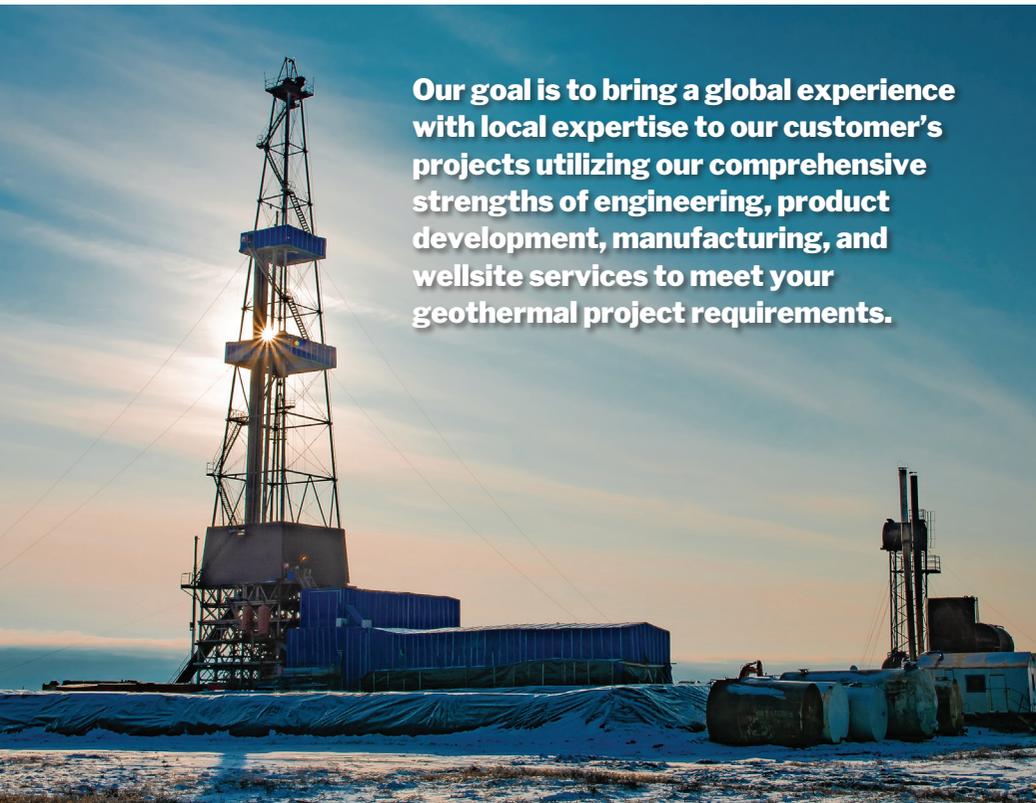
## **Our comprehensive products and services portfolio delivers reliable and predictable performance every time.**

Our technology solutions overcome many industry issues when delivering geothermal projects on time and on budget. We design and test our products to work within the severest of well conditions, such as those found within geothermal environments. We strive to ensure all our customers have the utmost confidence in the tools we place in their wells and at WIS, we take pride in delivering customer satisfaction on the most challenging projects.

**Wellbore Integrity Solutions**  
is ready for all your  
**GEO THERMAL** requirements.



**Our goal is to bring a global experience with local expertise to our customer's projects utilizing our comprehensive strengths of engineering, product development, manufacturing, and wellsite services to meet your geothermal project requirements.**





# TrackMaster Select\*

The TrackMaster Select whipstock system has the widest array of configuration options on the market today, each tailored to specific customer requirements.

Each configuration option offered is the result of continuous engineering improvements and experience gained over many years. It is an engineered solution to provide customers with a stronger, faster, and more reliable sidetracking system.

## Applications

FOUR categories define the configuration options for the TrackMaster Select system:

### Geothermal

- High temperature anchor
- Mill design and cutting structures for high UCS formations

### Conventional Sidetracks

- Single casing
- Hard formation
- Extended rathole
- Elongated window

### Advanced Sidetracks

- Heavy wall, high strength casing
- Corrosion resistant alloy casing
- Lowside exit
- Dual and triple casing

### Specialized Sidetracks

- Custom multi-lateral junctions
- Flow by access configurations

## Features

### Mills

- Bi-mill, tri-mill and quad-mill configurations

### Whipstocks

- Unique multi-ramp profile offers rapid cut out and extended full gauge window

### Anchors

- Hydraulic, mechanical, retrievable packer, permanent packer
- All anchors secure the system in the wellbore and prevents movement

## Benefits

- Application specific configuration options
- One-trip solution saves time and cost
- Comprehensive planning process
- Increased durability and reliability
- Improved milling efficiency in a broad range of casing and formations
- Ability to set in low-flow and total loss environments



# GEO THERMAL Solutions

## CHIMERA Wellbore Cleanout Tools

The CHIMERA portfolio of wellbore cleanout tools offers efficient solutions for a wide range of applications. The value of a clean wellbore is well recognized in our industry. The adoption and use of wellbore cleanout tools has demonstrated significant operational benefits along with reduced operational risks.

### Casing Cleaning

The modular design platform of these tools offer component interchangeability and are easy to maintain. These tools are rugged, non-rotating solutions to ensure thorough cleaning of the casing and tubing internal diameters after drilling out a scale plug.

- **CHIMERA Uni-Blade\* Scraper**
- **CHIMERA\* Brush**

### Debris Management

The Debris Management portfolio includes a range of magnets, filters, and catchers suited to a wide range

of applications. The magnets used are “rare earth” type that provide a high carrying load and a strong resistance to demagnetization.

- **CHIMERA Uni-Mag\***
- **CHIMERA Heli-Mag\***

The CHIMERA Heli-Mag and the CHIMERA Uni-Mag are ideal for steel cutting debris management in milling applications such as sidetracking with the **TrackMaster Select System** or section milling with the **ProMILL\*** and **ProMILL Duo\*** Systems.



Figure 1

Figure 1 Photo Credit: Effect of Mineral Scaling on Geothermal Wells, Ullas Rajvanshi, TU Delft Repository, Thesis, 2022.

## DRILCO Tubular Solutions

### Inspection and Repair in the Field or the Shop

Periodic inspection, which is important for prevention of drill string failure, is available from DRILCO at the **rig site** and at **DRILCO service centers worldwide**.

We offer API-approved inspection services for drill collars, drill pipe, Hevi-Wate™ transition drill pipe, and other premium downhole tools through a worldwide network of service centers established to ensure **global coverage**.

### Inspection Services

- Complete thread inspection (API-TI)
- Visual inspection (VT)
- Dimensional inspection (DI)
- Magnetic particle (MT)
- Liquid-dye penetrant (PT)
- Ultrasonic inspection of rotary shouldered connections (UT-RSC)
- Ultrasonic inspection of high-stress areas and tube upsets (UTEA)
- Electromagnetic inspection (EMI)
- Full-length ultrasonic inspection (FLUT), available at select DRILCO locations



# Not all requirements are alike.

## TECHNOLOGY PARTNERS

### Well-SENSE

Together WIS and Well-SENSE offers FiberLine Intervention (FLI) tools and services globally for geothermal applications. FLI is a low-risk wellbore surveying solution, which rapidly delivers high quality insights. It is often employed in surveys where other options prove unsuitable due to well accessibility, location, cost, application challenges, data requirements, temperature or speed of response.

FLI uses fibre-optic technology to capture distributed temperature and distributed acoustic profiles along the length of the well in real time. It provides key measurements, pinpoints areas of interest and monitors changing conditions, irregularities, anomalies or events in a single well or set of wells simultaneously.

Intervention cost and run-times are dramatically reduced compared to other forms of well surveillance. Surveys can be completed in around two hours from arrival, requiring only one person at the wellsite. The equipment is hand-portable, compact and lightweight with a tiny wellsite footprint. The FLI probe and fibre are single-use and sacrificial so can be left in the well at the end of the survey.

### WHAT IS FLI?

- Probe — A single-use, weighted probe is launched from a pressure containing package at the wellhead and free-falls into the well
- Sensors — One or more bare optical fibres, acting as distributed sensors, unspool from the probe as it falls. Additional electronic sensors can also be included in the probe.
- Data — A surface acquisition system immediately records and processes the data gathered by the sensors.

### Benefits

- Speed — FLI is a rigless system and takes only a few hours to complete a project, from rig-up to rig-down, which translates into substantial savings.
- Tiny footprint — FLI uses very little space and few services at the well site.
- Data rich — Fibre-optics are highly sensitive and provide quality data. Speed and simplicity do not come at the expense of capability.



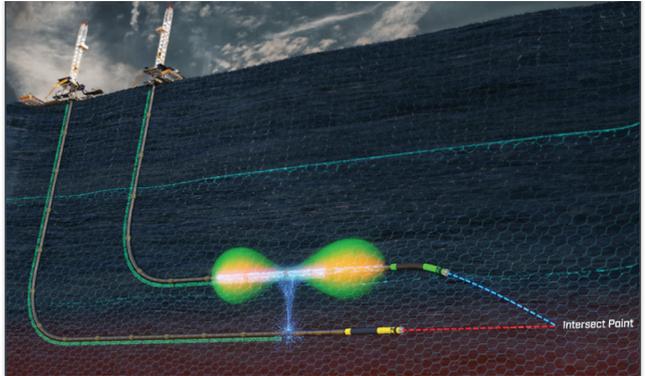
*Technology Partners' photos are courtesy of Well-SENSE, Gunnar Energy Services and ML Technologies.*

## Gunnar Energy Services

Wellbore Integrity Solutions in partnership with Gunnar Energy Services, delivers high-end relative wellbore positioning service often required for closed-loop geothermal applications.

We provide customized fit-for-purpose magnetic ranging solutions for precise first-attempt wellbore intersections. Our team of technical experts has been at the forefront of ranging technology and application since its early stages. We have been involved in the first geothermal closed-loop construction in history, and are now offering the new generation of the most robust ranging technology suitable for harsh geothermal drilling environment.

The technology ranges from conventional rotating magnet method to ranging-while-drilling system based on formation current injection for most efficient simultaneous drilling and ranging operations.



*New generation Active Magnetic Ranging-While-Drilling concept for simultaneous drilling operations in closed-loop geothermal applications.*

Our measurement probes are based on solid-state high-temperature sensors that are tolerant to extreme vibrations common in geothermal formations.

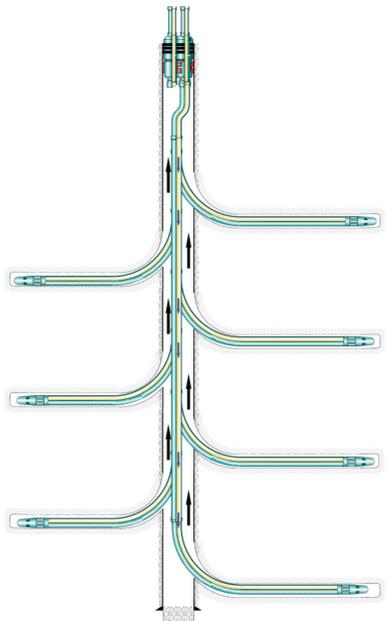
## ML Technologies

ML Technologies and WIS offer a new approach to multi-lateral drilling for geothermal operations, whether the type of well is a re-entry, new drill, or a combination of both.

The new multi-lateral technology, designed for simple interventions, has been globally field-tested and provides up to 40% cost savings for drilling. The ML Technology tools are ideal for operating in high-temperature wells for both open-hole and cased-hole wells. The system is also particularly suited for increased high-pressure rates during fracturing operations.

### Benefits:

- Reduces risk exposure
- Removes rig site errors
- Requires a minimal/no space out
- Self-aligning tools
- Allows index from one lateral to another without POOH
- Requires no ID restrictions for new well drills



# GEO THERMAL Solutions



For more wellbore departure information,  
contact your local WIS representative:

**[wellboreintegrity.com/geothermal](https://www.wellboreintegrity.com/geothermal)**



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**DRILCO**

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