

GeoDrilling International



Piling & foundations

Can the piling industry be sustainable and if it can why should it care?

HDD

The increasing role of horizontal directional drilling in infrastructure projects

North America

People and projects driving the drilling industry in the US and Canada

GEOTEC

Drilling rigs for geothermal | geotechnics | water well



DEEP INNOVATORS, DEEP COMACCHIO.

Reliability, Wide Range, Customization, Safety, After-Sales Service:
we deeply innovate for your best performance.

Come see us at

 **CONEXPO
CON / AGG**

March 14-18, 2023 - Las Vegas, NV

H&S Diamond Lot Booth **D2227**

ICE Diamond Lot Booth **D1356**



Live the
experience on:

comacchio.com



COMACCHIO

Foundations for the future

We all know that foundations can be physical but they can also be metaphorical and I'm going to talk about both this month.

The physical side of things is quite obvious and it's a subject frequently discussed in *GDI* and this issue is no exception with details of new piling rigs, digital packages to aid piling and a look at the issue of sustainability in relation to the sector.

So what about the metaphorical aspect of building foundations for the future? Well, in the case of *GDI*, the foundations for this year's magazine have already been put in place. That all happened last year when ideas and plans for features were decided and agreed upon. But there is more to creating each issue than just deciding what goes in each month.

As I'm now approaching my fifth year in the editor's chair, I can look back on all of the industry relationships I've developed and how they've become the foundations of how the readership helps shape the future of *GDI*. And many of the discussions I'll be having this year with the magazine's reader, contributor and advertisers will be taking place face-to-face this year as I and the *GDI* team are out and about attending construction industry events such as CONExpo in Las Vegas, which we're previewing in this issue, and SaMoTer in Italy. No doubt I'll there'll be plenty of foundations both literal and metaphorical at these events and I look forward to continuing to build upon them.



DUNCAN MOORE, EDITOR

duncan.moore@aspermontmedia.com

For news and updates, follow me on Twitter: @GeoDrilling

"Foundations can be physical but they can also be metaphorical"

News	2
Features	
Picture of the Month	9
Opinion: FPS	10
Piling & foundations	12
Horizontal directional drilling	22
Special report: Enteq Technologies	30
Special report: Dam Safety Group	32
North America	38
Preview: CONExpo 2023	44
Classified advertising	47

Next issue

Infrastructure projects
Rotary drilling
Mineral exploration
Australasia

COVER

GEOTEC's ROTOMAX XL GT is a dual-head drilling rig which recently completed a job in south Wales. The powerful drilling rig, which was developed around specific customer requirements and produced in Germany with a total weight under 10t with an efficient diesel engine with power of 140kW and a feed retraction pulling force of 15t. The drilling rig is perfectly suitable for geothermal drilling, direct flush drilling and DTH hammer drilling nationwide.
www.geotec-bohrtechnik.de

Editorial

Editor Duncan Moore
duncan.moore@aspermontmedia.com
Group managing editor Chris Cann
Editorial enquiries +44 20 8187 2300

Social

@GeoDrilling
[linkedin.com/company/geodrillinginternational](https://www.linkedin.com/company/geodrillinginternational)
geodrillinginternational.com

Subscriptions and circulation

+44 20 8187 2299
mining@abacusemedia.com
Aspermont Media Ltd,
21 Southampton Row,
London, WC1B 5HA

Advertising

Head office
Aspermont Media, WeWork 1 Poultry, London EC2R 8EJ, UK.
+44 20 8187 2350

Rest of world Sales account manager Gabriella Kiss
+44 20 8187 2324 gabriella.kiss@aspermontmedia.com
North America Sales account manager Chad Dorn
+1 720 8553996 cdorn@miningadvertising.com

Digital and creative

Group digital & creative director Abisola Obasanya
Print management Print.management@aspermontmedia.com

Annual subscription – UK and Europe: £515 (€585 eurozone).
Australia: A\$875. US and rest of world: US\$655. Additional current copies are available to subscribers at £12 (US\$21) each

GeoDrilling International, ISSN 0969-3769 (USPS 001-430) is published monthly, except January and July, which are combined issues (Jan/Feb and Jul/Aug), by Aspermont Media, WeWork, 1 Poultry, London, EC2R 8EJ, UK.

The US annual subscription price is US\$655. Airfreight and mailing in the USA by agent named World Container Inc, 150-15, 183rd Street, Jamaica, NY 11413, USA.

Periodicals postage paid at Brooklyn, NY 11256

US Postmaster: Send address changes to AirBusiness Ltd, c/o Worldnet Shipping USA Inc, 155-11 146th Avenue, Jamaica, New York NY 11434, WN Shipping USA, 156-15, 146th Avenue, 2nd Floor, Jamaica, NY 11434, USA.

Subscription records are maintained at Aspermont Media, 21 Southampton Row, London, WC1B 5HA.

Air Business Ltd is acting as our mailing agent

Aspermont Media, publisher and owner of GeoDrilling International ("the publisher"), and each of its directors, officers, employees, advisers and agents and related entities do not make any warranty whatsoever as to the accuracy or reliability of any information, estimates, opinions, conclusions or recommendations contained in this publication and, to the maximum extent permitted by law, the publisher disclaims all liability and responsibility for any direct or indirect loss or damage which may be suffered by any person or entity through relying on anything contained in, or omitted from, this publication whether as a result of negligence on the part of the publisher or not. Reliance should not be placed on the contents of this magazine in making a commercial or other decision and all persons are advised to seek independent professional advice in this regard.

Aspermont Media
Information for Industry

© Aspermont Media 2023
ISSN 0969-3769

Nordmeyer GEOTOOL's new North American partnership

During Groundwater Week, in Las Vegas at the beginning of December 2022, Nordmeyer GEOTOOL (NGT) announced a new partnership with Mobile Drill International (MDI).

Under the new agreement, MDI will act as NGT's distributor handling all sales and service for the NGT product line in the US and Mexico.

Nordmeyer GEOTOOL is a specialist manufacturer of limited access geotechnical drills, covering everything from machines, tooling, accessories, and consulting, for soil investigation within the first 85ft. Machines like the #GTR 790 are sampling rigs, which stand out for their value, efficiency, and productivity.

Mobile Drill International is a leading American geotechnical drilling rig manufacturer, producing high-quality drills and tooling since 1947.

Talking about the agreement, Philip Weichbrodt, managing director Nordmeyer GEOTOOL, said: "We share Mobile's commitment to quality, customer service and product development making Nordmeyer



Nordmeyer GEOTOOL signed a distribution agreement with Mobile Drill International during Groundwater Week

GEOTOOL a natural fit for MDI's strategic plan for growth through expansion of its soil sampling/testing products and services. Particularly as it relates to the limited access and smaller footprint rig market including our soon-to-be-released B25 model.

"From being a cornerstone in the US geotechnical industry to the shared values of quality, product development and customer service, Nordmeyer GEOTOOL could not wish for a better partner. We are very much looking forward to working together."

DeepPower's R&D programme with the University of Oklahoma

DeepPower, Inc. the developer of a breakthrough geothermal drilling technology to access the Earth's unlimited source of clean energy, has announced that it has entered into a sponsored research agreement with the University of Oklahoma which will leverage the University's deep drilling expertise.

The goal of the research project, led by Dr Saeed Salehi, Associate Professor, Mewbourne Professorship in Petroleum Engineering, at the University, will be to develop a novel way to drill through extremely hard rock to tap Earth's source of unlimited clean energy.

Andrew Van Noy, CEO of DeepPower said: "We are thrilled to be able to enter into this relationship with a prestigious university such as the University of Oklahoma. The University's background in the

oil and gas industry is extensive. Their previous work in that industry formed a technical foundation that allowed their research team to transition into the geothermal industry where they are making great strides.

"When I first met Dr Salehi, I could tell he was passionate about changing the world by providing clean geothermal energy solutions. That passion coupled with his background was what led me to believe he would be a great partner in our joint quest to develop new geothermal drilling technologies. It has been a pleasure working with him thus far and we are excited to continue our relationship together."

The sponsored research agreement continues through June of 2024 and will allow the company to access the University's expertise and resources.

Salehi said: "I am very much looking forward to working with Andrew and the DeepPower team. They understand that inventing a new technology takes time and money. I appreciate their commitment to help solve the formidable energy problem that the world faces. The possibility that our research and development project could dramatically alter the world's source of energy gives my team and me all the motivation we need to help deliver a successful outcome.

"Current state-of-the-art drilling technology found in the oil and gas industry cannot drill deep enough to make geothermal cost-effective at a global scale. DeepPower is developing a suite of breakthrough drilling technologies to boldly go where no humans have gone before. The deeper we go the more energy we can unleash."

Upgrades and expansion at Austin's Indonesian facility

Austin Engineering, an Australian headquartered mining equipment manufacturer, has increased the production capacity and capability of its operations in Batam, Indonesia, driven by a rapidly expanding order book and strategic focus on the facility.

A combination of a new site lease and expansion of the company's existing facilities will see Austin increase its current Indonesian-based production capacity of 12,000m² by almost 100%. The business is also well advanced in employing another 150 production workers and has been strengthening its management team all year.

Over the last 12 months, Austin has almost completed a refurbishment of its existing Batam operations by reviewing and refining production systems to lift efficiency and product quality, particularly for truck trays and underground ore pass and chute assemblies.

The expanded, advanced manufacturing operations will be fully operational in early January 2023. As part of the facility expansion, Austin has leased approximately 10,000m² of purpose-built manufacturing factory space including laydown areas. The new facility is adjacent to Austin's existing, wholly-owned facility, which enables workforce and management flexibility. Lease rates for the new facility represent around 5% of the cost of a similar leased facility in Kewdale, Perth.



Austin's expanded facility in Indonesia

Staff changes at Robertson Geo

Since 2016, Robertson Geo Operational Services has seen significant growth under the management of Graham Comber, becoming the independent global leader in offshore wind geophysics.

Comber is stepping down from his management role, moving to a part-time role with Robertson Geo as its geotechnical adviser.

Ian Jones has been promoted to fill Comber's role as geophysical services manager. Jones began working for Robertson Geo straight from university, 14 years ago. Starting as a logging engineer and working up to geophysics supervisor in 2018, he has seen and gained experience in all aspects of the role and is ideally suited to manage RGS and lead its continued growth globally.

X-ROC

Drilling just got a whole lot faster

Introducing our new 115-millimeter X-Roc DTH drill bit that allows you to drill faster, deeper and with less wear than conventional DTH drill bits.

Tested on Scandinavian well and geothermal sites, X-Roc increased drilled meterage on each drill bit, saved on diesel and achieved operational time savings on each hole.

 **TerraRoc**
terrarocdrilling.com

Drilled 745 m with Vacpro, Finland
in abrasive and hard Granite rock

CASING ADVANCEMENT SYSTEMS | DOWN-THE-HOLE HAMMERS | CORE DRILLING

Epiroc launches new Epiroc DTH drill bits

Thanks to a new design and the use of the new Epiroc carbide, the newly launched Epiroc DTH drill bits improve productivity and profitability while ensuring better workdays for operators.

The all-new face design of the new Epiroc DTH drill bits means optimised flushing and handling of drill cuttings. The bits also have more buttons, which increase the overall energy when drilling, and there are three different shapes of button to choose from to tackle different drilling needs and types of rock: Epiroc Trubbnos, spherical and ballistic buttons.

The use of the new Epiroc carbide buttons, while not visible, is equally important for the overall effect. Add



Epiroc's new Epiroc DTH drill bits are said to improve productivity and profitability

that Epiroc DTH drill bits are produced with improved heat treatment and increased face hardness, and you get a

more durable, sturdier and robust bit, with increased service life.

Epiroc DTH drill bits benefit operators too. Longer service life means fewer interruptions and more undisturbed drilling, one of the most sought-after improvements. Epiroc states that with less time spent lifting and changing heavy bits, workdays will not just be more productive, they will be more convenient too.

Additionally, Epiroc DTH drill bits reduce the customers' footprints as they can drill more and still use fewer bits. As a result, less energy and raw materials are used to produce bits, and there is less transport and less waste.

Key team additions aid ECA Canada continued expansion

ECA Canada Company recently announced the addition of two key team members in its ongoing effort to serve its customers in eastern Canada and expand into western Canada.

ECA Canada welcomed account manager Kevin Sharp, based out of its new Vancouver branch, and Bauer trainer and aftersales support manager Jason Church, out of its Toronto branch.

Sharp comes to ECA Canada with a long history in the foundation drilling industry. His experience as president of Sharp Construction, general manager of Northstar Sharp's, and as a sales rep with Western Equipment Solutions and Traxxon Foundation Equipment make him a valuable addition to the ECA Canada team in Vancouver.

Sharp said what brought him to ECA Canada was the company's commitment to training and continuing

education. ECA Canada's focus on bringing strong aftersales support to its western Canada customers is another reason for Sharp's enthusiasm for the role.

Church, who was previously the service manager for ECA Canada from 2016-2018, returns to ECA Canada. With years of experience as a drill rig operator, Church comes tailor-made for the role, which will see him training rig operators across Canada, supporting the service department at the Toronto branch and managing customer after-sale support.

One of Church's best attributes in his new role at ECA Canada is his passion for teaching and instruction. "I've always liked and felt fulfilled by sharing my experience," Church said. "Whether it was making mistakes or overcoming challenges. I feel like this is an opportunity to feel this fulfilment all the time."

Junttan Oy has acquired Junttan UK

Junttan continues to strengthen local customer service and support in the UK and Ireland as Junttan UK has now been acquired by Junttan Oy.

Junttan UK, which is based in Newark, UK, has been Junttan's authorised distributor since 1996 and since 2009 the UK operation has been led by Mark Pritchard, who will continue to lead the local team with all his co-workers.

By combining the resources and expertise of the two companies, Junttan will have a strong team with high expertise. It will further develop its local operations to meet Junttan customers' needs.

Junttan now has 100% owned sales and service companies in Australia, Canada, the Netherlands, Sweden, the UK, and the USA.



WORLD CLASS ROCK DRILLING PRODUCTS



SCAN HERE
FOR OUR
PRODUCT
BROCHURES



**CONEXPO
CON / AGG**

MARCH 14-18 / 2023 / LAS VEGAS / NEVADA

BOOTH S60047

ROCK TOOLS TO SUCCEED

PDC BITS

TRICONES

DTH BITS

DRAG BITS

CABLE TOOL BITS

TRICONE HOLE
OPENERS

PDC REAMERS

DTH HOLE OPENERS

DIRECTIONAL
HAMMER BITS

MICRO TRENCHING
WHEELS



**INFINITY[®]
TOOL MFG.**

1-888-838-6657

| [+1] 618 439 4042

| infinitytoolmfg.com

Thiess launches NSW Training Hub

Thiess has officially opened its NSW Training Hub at Mt Arthur South, Australia, with a ceremony that was a celebration of the company's commitment to diversity and inclusion.

The new training centre has been established to better enable the Thiess New to Industry Programme, which aims to develop new workers from within the local community. It also has the additional goal of encouraging more Aboriginal, Torres Strait Islander, and women into the mining industry.

To mark the opening, a Smoking Ceremony was conducted by local Aboriginal Elder, Uncle Glen Morris, and Laurie Perry, the

CEO of the Wonnarua Nation Aboriginal Corporation, gave a Welcome to Country.

The participants of Thiess' New to Industry Programme come from a diverse range of backgrounds, ages, and life experiences, and over 12 months they learn and develop the skills of a production operator. They are given theoretical, practical and hands-on experience under the guidance of mentors and trainers which enables them to commence successful careers in the industry, though many of the participants continue on in roles with Thiess at the end of the programme.



IMDEX in binding agreement to acquire Devico

IMDEX has entered a binding agreement to acquire its main competitor, Devico AS, in a A\$324 million deal that will reinforce its market-leading position in mining technology and deliver increased market penetration.

The proposed acquisition of Norwegian-based Devico, a leading provider of advanced sensors and the leader in directional drilling technologies, is expected to be completed by late February.

IMDEX CEO Paul House said the proposed acquisition was a highly significant investment that extended IMDEX's core business in both geographical reach and technology capability.

The addition of Devico would strengthen IMDEX's position as the leading provider of advanced rock knowledge sensors and establish the business as

the number one directional drilling technology company globally. Devico's portfolio of rock knowledge sensors complements IMDEX's existing technology.

Through increased scale and market penetration, particularly in Europe and South America, IMDEX would further expand its presence on mine sites, opening further opportunities for its solutions to be delivered to established customers.

Devico services mining and civil industries globally and has world-class facilities located in a key hub in the Scandinavian mining market, and strong research and development capabilities. It has a track record of commercialising innovative mining technologies and a commodity-agnostic product offering which complements IMDEX's core business.

Sandvik signs €500m loan agreement

Sandvik has signed a €500 million loan agreement with the European Investment Bank (EIB).

The loan will support Sandvik's investments in research and development, which include advanced solutions in component manufacturing as well as solutions for electrification and automation in mining and infrastructure.

"We have a strong strategic focus on developing solutions that improve sustainability, productivity and safety in our core industries of mining, component manufacturing and infrastructure. The EIB cooperation will support our R&D initiatives and our aim to stay at the forefront and develop our technology leadership," Stefan Widing, president and CEO of Sandvik, said.



Shaft Area Profile Evaluator (SHAPE®)

- Quickly and economically determines excavation verticality, radius, and volume
- Data acquisition rate of approximately one scan per second
- Quick connection with Kelly bar or top mount winch system
- Available for wet and dry excavations

To learn more about SHAPE, visit www.pile.com.



 **CONEXPO
CON / AGG**
SOUTH HALL S62521

NOT ALL ROCK DRILLING TOOLS ARE THE SAME NEVER SETTLE FOR LESS THAN NUMA.

Stop playing games with inferior tools. Numa's dependable, Made in the USA DTH and HDD hammers, bits, and accessories deliver performance and dependability, all without sacrificing tool life. With a drilling range of 3½" to 50½" (89 - 1283 mm), we have the right rock tools for you. Contact Numa today.




HAMMERS AND BITS®



www.numahammers.com • 800.356.NUMA

hyperTunnel to collaborate with University of Birmingham

hyperTunnel and the University of Birmingham have signed a Memorandum of Understanding (MoU) to work together to progress completely new methods of underground construction, enlargement, monitoring and repair.

New automated construction methods being developed by hyperTunnel are designed to benefit the construction sector and society as a whole by reducing carbon footprint and building tunnels more than 10 times faster and at half the cost of conventional methods. At the heart of the concept is the use of robots to 3D print the shell of the underground structure, according to a digital twin. Using this method, the construction material is deployed directly into the ground.

Initially focusing on autonomous tunnelling technologies, imaging and digital simulations, the partnership



A partnership will see hyperTunnel working with the University of Birmingham on autonomous tunnelling technologies

between the two organisations is likely to include activities such as collaborative research, technology projects, joint publications, secondments, internships and education programmes.

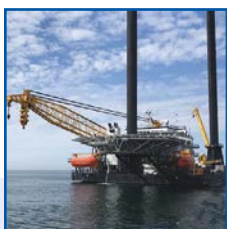
Key to the MoU is the University of Birmingham's National Buried Infrastructure Facility (NBIF), which is

part of the UK Collaboratorium for Research on Infrastructure and Cities (UKCRIC). UKCRIC is designed to stimulate research activities in the fields of infrastructure and cities through close collaboration between academia, industry and government. NBIF is currently leading research into areas such as soil/structure interaction, digital twinning, tunnelling and quantum-technology sensing.

"The University of Birmingham is one of the top 100 academic institutions in the world and NBIF is a world-class facility," hyperTunnel co-founder Jeremy Hammond, said. "Both our organisations are deeply involved in radically innovating underground infrastructure and use of underground space. It's really exciting to think about what we can achieve by combining our expertise like this."



PREMIUM geophysical
operational **SERVICES**
---EXPERIENCE FROM 1000'S OF
BOREHOLES GLOBALLY
PROVEN subsurface data



**No project is too small,
no project too large or challenging.**



www.rgeo-services.com



www.pslogger.com

PSLogger ^{Since 1979}

A registered Robertson Geo trademark product of over 40 years use, development, sales and manufacture. Routinely deployed for major civil engineering and offshore projects, the PS Logger® is the Industry reference go-to probe for determination of soil and rock strength.



PSLogger ^{Since 1979}



Production well drilling

The drilling team of SUPRA conducting a 12in production well drilling with a depth of 140m in Nusa Tenggara Barat, Indonesia, using the DESCO SP8000 top drive drilling rig.

Photo: SUPRA



The picture of the month showcases our readers best drilling-related snapshots. If you would like to see your picture featured here, please send it to duncan.moore@aspermontmedia.com with a description.

Looking back on 2022 with the FPS

John Chick, business leader at Expanded Geotechnical, looks back at 2022 from the point of view of his being the chair of the UK's Federation of Piling Specialists



Looking back over 2022 with the UK's Federation of Piling Specialists

Compared to the last few years, 2022 looked set to be a return to normality; following the many hurdles relating to the COVID pandemic, which left the construction sector facing more typical day-to-day challenges. Then came the tragic war in Ukraine which, aside from the humanitarian and security crisis, has led to inflationary pressures, escalating energy prices and the cost-of-living crisis that we are all currently facing. In addition, part of the post-Brexit world for the UK is a critical shortage of skilled labour and a shrinking skills pool. These challenges, together with the confusing and turbulent political landscape of recent months, have left us warily looking forward to what we hope will be a more stable and less challenging 2023.

Despite the many challenges, from the perspective of the Federation of Piling Specialists (FPS), things have been quite positive, with the year seeing considerable throughput of activity with its many committees and working groups being particularly busy.

One of the main projects of the commercial committee has been its work to produce a document on 'What the Construction Playbook means for Piling'. *The Construction Playbook*, published in September 2022, is hugely important because it provides UK government guidance on sourcing and contracting public works projects and programmes. It sets out the requirements of the construction sector, and in particular, how it must reform, building on infrastructure and projects agencies recently published flagship change programme *Roadmap to 2030*. With its emphasis on "...

getting projects and programmes right from the start", it also includes elements such as creating "sustainable, win-win contracting arrangements that incentivise better social, economic and environmental outcomes..." – critical if the sector is to meet its goal of achieving net zero greenhouse gas emissions by 2050.

Due early 2023, the document will identify key areas and policies within the Playbook and offer guidance on how these will impact the piling sector, with advice about what the sector can do to adapt and thrive with its involvement in public work.

The FPS technical committee has been reviewing sonic logging as a method of testing the integrity of piles constructed under support fluid. In addition to serious safety issues inherent in the method, the FPS has also been further investigating the continued efficacy of the method as a valid first-choice test for large-diameter piles in comparison with alternative methods now commonly available across the industry.

The first stage output from the FPS working group will be a report and guidance on when sonic logging is really not applicable and when it could still be considered.

In 2023 it is intended to undertake TIP testing of artificially introduced defects to piles in order to add to the body of knowledge surrounding the correlation between results from different testing methods.

The broad topic of sustainability by design has also been examined by the technical committee and during 2022 it has looked at the many aspects that this encompasses, such as,

whether more sustainable designs can be produced within the bounds of the existing design codes. This is a complex topic requiring a shift in mindset from many parties. While progress has been made, work will continue through 2023 with a view to publishing guidance. A common platform for sharing data will also be wrapped into sustainability by design, tying in with work being undertaken by the European Federation of Foundation Contractors (EFFC) and its call for standardising and sharing data. The FPS is looking to establish a working group, together with the AGS, to progress this quickly.

The FPS technical committee has also been working with the FPS operations committee with the energetic input of our associate member reinforcement suppliers, to progress the standardisation of reinforcement cages.

The FPS is working on the establishment of a common standard to cover the manufacture and supply of reinforced cages, which if adopted would allow an audit to be easily developed and conducted by the FPS, rather than by individual piling companies. The results of the audit would be shared among FPS members, reducing the number of audits that suppliers would have to submit, as well as reducing the number of audits that FPS members have to conduct. It will also facilitate a way of ensuring continuous improvement in standards. Of course, FPS members would always be free to use any cage supplier but having established standards would encourage members to use suppliers that meet these standards. Expect an update on this soon.

The FPS' *Sustainability Charter* will always be a work in progress, as it adapts and evolves to meet changes to legislation and the piling sector's drive to further reduce its carbon emissions. Some areas being examined are low carbon concretes and what future role they may have in piling works. While many groups are looking at this and other innovations, the FPS will be looking to pull all information and research available together and to work with those that actually put concrete in the ground, to explore any issues relating to its use and application.

Looking forward, is it clear that some of the challenges will remain, including continually raising awareness of piling and geotechnical engineering in schools and colleges so the great work being undertaken by the FPS Early Careers Group (ECG) will continue.

This year has seen the ECG present to many educational institutions, as well as providing support and mentoring to those early in their careers. The immediate shortage of labour and skills, however, can only be addressed through government intervention and the FPS will continue to support initiatives, such as those of Build UK, in its lobbying of the government to widen the criteria of those able to enter the sector from overseas.

From an FPS perspective, 2023 will get off to a good start and it will be great to see the many initiatives of 2022 being delivered and collectively making the sector ever more professional and safer. ♥



EUROPEAN
GEOPHYSICAL
SERVICES



Vital sub-surface data to help you make more informed decisions

European Geophysical Services provide geophysical logging, imaging and video surveying of boreholes, adits, shafts and wells for the water, environmental, geothermal and civil engineering industries.

From our company headquarters in Shrewsbury, we operate a fleet of eight geophysical logging units (7 with 4x4 capability) and 3 portable units, which allow us to work on even difficult and remote sites. As a business we employ geophysicist and instrument engineers, this providing a multi-disciplinary team to provide services customised to our client's requirements.

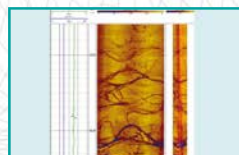
For more information, look at our website on the link below or give us a call on the number below to talk to us about how we can help with your latest projects.

- Worldwide project experience
- Imaging and video surveying
- Qualified logging engineers
- Reliable data and reporting

To find out
more visit our
website below



Follow us
on LinkedIn



Call: 01939 210 710

Email: office@europeangeophysical.com

Web: www.europeangeophysical.com

The latest Comacchio rigs complete the company's CH range

Comacchio enjoyed success at bauma 2022 with the CH 150 and CHF 900, which is its latest model of piling rig, marking the completion of the range, just seven years after the launch of the first machine in the series

The recently launched CH 150 is the smallest model in Comacchio's CH range of drilling rigs

The Comacchio CH range of piling rigs includes five models of multipurpose machines (in a weight range from 15 to 70t), that can be configured to cover a wide range of applications, such as bored piles with the Kelly system, CFA, DP (displacement piles) and soil mixing. The range also includes two models of dedicated CFA rigs, in the weight classes of 50t and 90t.

The concept of the range started from the idea of a common development for all models, driven by the uniformity of the base carriers, and by the

shared concept of hydraulic and electrical systems, electronically controlled through the CCS system (Comacchio Control System – a user-friendly control software entirely designed by Comacchio, controlling all drilling parameters and allowing for the complete management of the machine, including fault diagnostics). The advantages that this consistency offers are significant, both at the operational level and in terms of after-sales assistance.

THE CH 150

Presented for the first time in 2021 in Piacenza during Geofluid and then displayed at Bauma 2022, the CH 150 is currently the smallest model in the CH range.

The CH 150 was created to meet the growing demand for compact lightweight machines, able to operate in tight and difficult access spaces and/or low headroom conditions while achieving comparable performance to "conventional" piling rigs.

With a transport weight of 15t, the CH 150 is easy to transport and requires very little setup time.

Its design is based on the use of an excavator base carrier (in the 8-10t weight class) equipped with a modular drilling mast and a multipurpose rotary head. Using simple conversion kits, the CH 150 can be configured for Kelly drilling as well as CFA drilling.

The extended reach of the boom combined with the mast rotation movement ensures that the rig can be used to perform a wide variety of positions covering a large work area. The stability of the machine even at its maximum

reach (3600mm), is granted by the variable width undercarriage, allowing the width to be expanded to 2920mm.

The machine features two powerful winches (with 65 and 27kN pull) and a multipurpose rotary head designed by Comacchio providing up to 44kNm torque. The rotary can be operated in "constant power" mode, optimising performance thanks to the automatic adjustment between rotation speed and rotary torque. Alternatively, the same rotary can be managed with a manual gear change.

MODULAR DESIGN

The modular mast design allows the use of Kelly bars of up to nine elements and 3.5m in length to achieve depths of 27m. The Kelly has a 419mm diameter, but different diameters are possible on request, with minimal adaptations on the machine. In CFA configuration, the CH 150 can reach 12.1m pile depth, thanks to the use of a special extension. In addition to the Kelly and CFA set-up, the machine can also be configured for micropiles installation. Low headroom configurations are possible, too.

The cabin and the controls of the CH 150 are optimised to operate in confined spaces to guarantee great ease of use and manoeuvrability in any site conditions, with a view to achieving maximum comfort and safety for the operator. All of the controls are conveniently positioned on the joysticks. Through the use of sensors and the CCS system, the CH 150 ensures that the operator has a complete ►





Profession makes excellence

Wuxi Beilai Tube Co., Ltd. has advanced production equipment, testing equipment and its own technology research and development capability. Since 2000, it has been committed to the manufacturing of seamless steel pipes. The range of pipes is from 10mm to 406mm, annual production capacity is 70,000 tons. Our products are widely used in oil, gas, chemical, machinery, construction, geology and automotive industries.

With the problems of resources and environment becoming more and more prominent, scientific drilling and mineral exploration are constantly moving deeper to solve the above contradiction. Seamless steel pipes for wire-line core drilling is one of the main products of our company. In recent years, our company has been developing continuously. The billet used for manufacturing has high purity. Size tolerance, concentricity and straightness, which meet various special requirements of domestic and foreign geological exploration industries.

Main products used in foreign geological exploration industries are as follows:

Seamless steel tubes for Q and CQ series wire line coring drilling						
Specification		AQ	BQ	NQ	HQ	PQ
		ACQ	BCQ	NCQ	HCQ	PCQ
Outer Tube	OD (mm)	46.00	57.20	73.00	92.10	117.50
	ID (mm)	36.50	46.00	60.30	77.80	103.20
	WT (mm)	4.75	5.60	6.35	7.15	7.15
Inner Tube	OD (mm)	32.50	42.90	55.60	73.00	95.30
	ID (mm)	28.60	38.10	50.10	66.70	88.90
	WT (mm)	1.95	2.40	2.75	3.15	3.20
Drilling Rod QSeries	OD (mm)	44.60	55.70	70.10	89.00	114.30
	ID (mm)	35.00	46.10	60.10	77.80	101.30
	WT (mm)	4.80	4.80	5.00	5.60	6.50
Drilling Rod CQSeries	OD (mm)	44.50	55.60	69.90	88.90	117.50
	ID (mm)	36.50	47.60	61.90	80.90	108.20
	WT (mm)	4.00	4.00	4.00	4.00	4.65
	Joint ID (mm)	34.90	46.00	60.30	77.80	101.60



WUXI BEILAI TUBE CO., LTD.

Add: No. 88, Jinshan road, Xinan industrial park,

Qianqiao town, Huishan district,

Wuxi city, Jiangsu PR., China

Website: www.beilaitube.com

E-mail: sally.xu@beilaitube.com,

sally_beilaipipe@126.com

Tel: +86-0510-83212741, +86-0510-83217855



The weight of the CHF 900 can be reduced to 65.5t in transport configuration ▶ overview of the machine operations and is assisted in every step of drilling execution through a wide range of automatic functions. This system can be integrated with the ComNect remote fleet management tool, developed to provide customers with real-time information on the status of the machine and its performance and to offer the highest level of after-sales support. Not only that, but for greater safety of the machine and of the operator, Comacchio has chosen to equip the CH 150 with special electronic devices that detect the position and working angle of the machine allowing intervention on the operating parameters automatically, preventing the onset of any dangerous situations. These constructive choices allow the CH 150 to rank at the top of the segment in terms of safety.

THE CHF 900

The absolute novelty of the CH range, which made its debut at bauma 2022, was the CHF 900. This is a dedicated CFA drilling rig and is part of a larger project for the launch of a 90t class multipurpose machine, with which Comacchio aims to complete its range of piling rigs.

Like all Comacchio CH and CHF machines, the CHF 900 has been

designed to be self-erecting and it can be transported in one piece, minimising the need to disassemble some machine parts in transport configuration, therefore allowing for quick and easy rig-up, supported by automated rig-up systems.

LIGHTWEIGHT CONSTRUCTION

The extremely lightweight construction (86t operating weight) is the result of a careful selection of all materials and the use of high-strength, light steels and highly specialised mechanical processing. Thus, the machine weight can be reduced to 65.5t in transport configuration (removing the rotary and the counterweight), but the weight can be further reduced to 45.8t in case of special needs. The fully self-assembling modular counterweight has been designed to minimise the tail swing radius and ensure easy handling during loading/unloading operations.

The CHF 900 is mounted on an extendable undercarriage with a larger wheelbase, to ensure reduced dimensions during transport, less bearing pressure and greater stability. The configuration on display at bauma included a variable width undercarriage with 800mm track shoes, ranging in width from 2990mm with retracted side frames

(in transport position) to 4590mm in working position.

The choice of the Volvo engines allows Comacchio to manage the requests coming from various markets more flexibly, implementing Stage III or Stage V engines according to the required performance and current regulations, with minimal variations on the machine.

STAGE V

The version presented in Munich featured a Stage V engine with 345kW power, chosen by the customer with a view to reducing fuel consumption and emissions. A 405kW setting is also possible with the same engine. It is noteworthy that, with a view to reducing energy consumption, the air conditioning system of the cabin is powered by an electric battery, thus disconnecting the use of air conditioning from the use of the engine.

The use of parallelogram articulation allows a working radius ranging from 4000 to 4600mm. The set-up exhibited at bauma included a mast with a 26.8m stroke and a 6m auger extension, equipped with a 4th line pull system that allows for the construction of CFA piles up to 32.5m deep, using 27m long augers. The maximum diameter of the augers is 1200mm. The

“The concept of the range started from the idea of a common development”



CHF 900 offers an extraction force of 1120kN. An additional 150kN of crowd force on the auger can be provided through an additional pull-down winch on the rotary, available as an option.

Particular attention was paid to the development of the rotary head. This too is the result of a dedicated project for CFA drilling and is capable of delivering hydraulic power of 310kW, reaching 256kNm of actual torque (280kNm nominal torque) and a speed of 40rpm. The rotary can be operated in "constant power" mode, which automatically adjusts the rpm and torque according to operating conditions. It can also be equipped with an optional 150kN pull-down winch. The CFA configuration is completed by numerous accessories such as the auger guide and the auger cleaner (roller, brush or star-type).

A UNIQUE MACHINE

All this makes the CHF 900 a unique machine on the market. To achieve comparable performance, Comacchio's competitors offer larger machines, weighing about 110t.

Like all the rigs of the CH/CHF series, the CHF 900 is equipped with the HPE (High Power Efficiency) system which introduces an innovative approach to the management of the hydraulic

power delivered by the pumps, overcoming the concept of load sensing technology. The idea of this system is based on electronic pump control, which significantly reduces power dissipation that occurs on a "conventional" hydraulic system. As a result, fuel consumption is significantly reduced with more power available. The saving in litres of fuel per hour of work at full power is about 6.5l (equal to 7%).

Greater cooling efficiency and noise reduction are provided by the new cooling system concept. The engine cooling system, as well as the oil cooling, have been optimised by Comacchio to control heat dissipation, based on the actual operating needs of the machine. The speed of the cooling fan is adjusted through an electronically controlled system. This type of approach significantly limits the use of the fan, which comes into operation at full capacity only when the operating conditions require it, thus generating lower emissions, lower consumption and lower noise levels.

ERGONOMIC DESIGN

The cab project has also been updated by Comacchio. The new cab stands out for its ergonomic design and safety features,

offering a high level of comfort for the operator. The workspace is adjustable and uses capacitive levers and manipulators as well as a large 12in colour touchscreen display connected to the CCS system. The CCS system that equips the drilling rig can be integrated with a data logger for CFA parameters. The cabin meets the most stringent safety requirements, having obtained the TOPS and FOPS-1 certification. The rig is also equipped with a set of cameras, radio/CD player with Bluetooth system and a mobile phone charger.

The safety features of the CHF 900 comply with the strictest European regulations: the set-up includes a radio control kit for tracking, side walkways with handrails, rubber protections on the auger guide and load cells for the main and aux winches. ♥

"Fuel consumption is significantly reduced with more power available"

The CHF 900 Comacchio displayed at bauma 2022 featured a Stage V engine from Volvo with 345kW of power



Liebherr's digital solution for the deep foundation sector

With the creation of MyJobsite, Liebherr has introduced a digital package that allows the collection, consolidation, evaluation, and interpretation of data for a more efficient daily routine in deep foundation work

Particularly in deep foundation work, the requirements for standard-conform reports are very high. With MyJobsite, Liebherr has created a digital platform that significantly simplifies complicated data processing. The jobsite data collected every working day from the most various of sources can be consolidated, saved, individually prepared, and automatically split.

Construction machines from Liebherr move in a digitalised world and as a result of this, Liebherr has developed MyJobsite for deep foundation machines. It is a digital tool that allows a clear digital view and simplified documentation of data from the most varied of sources, as well as the processing, evaluation, and interpretation of these in relevant information (e.g., performance parameters, construction progress, machine

capacity). Based on this information, quality control of certain processes on the jobsite can be carried out. This creates the basis for the optimisation of working processes and ultimately for saving time and money.

VIEW JOBSITE PROGRESS

A list of all work processes can be stored in MyJobsite with the help of planning data. In this way, work steps can be systematically completed. Machine and process data can be called up live and are continuously updated making the view of progress available at the press of a button. Thus, the user always has a full overview of planned, active, and completed processes, as well as the current progress of the jobsite. In accordance with the international ISO 27001 standard, all collected data are enciphered and securely stored following

the highest security standards. The data can be completely deleted at any time upon customer request.

INTUITIVE INTERFACE

The software interface is attractive and the handling is extremely simple and intuitive offering clarity and user-friendliness. With the jobsite dashboard, the operators and contractors are always kept up-to-date. All relevant jobsite figures and machine data are clearly prepared. Thus, MyJobsite delivers information about progress, usage, actual events, and much more.

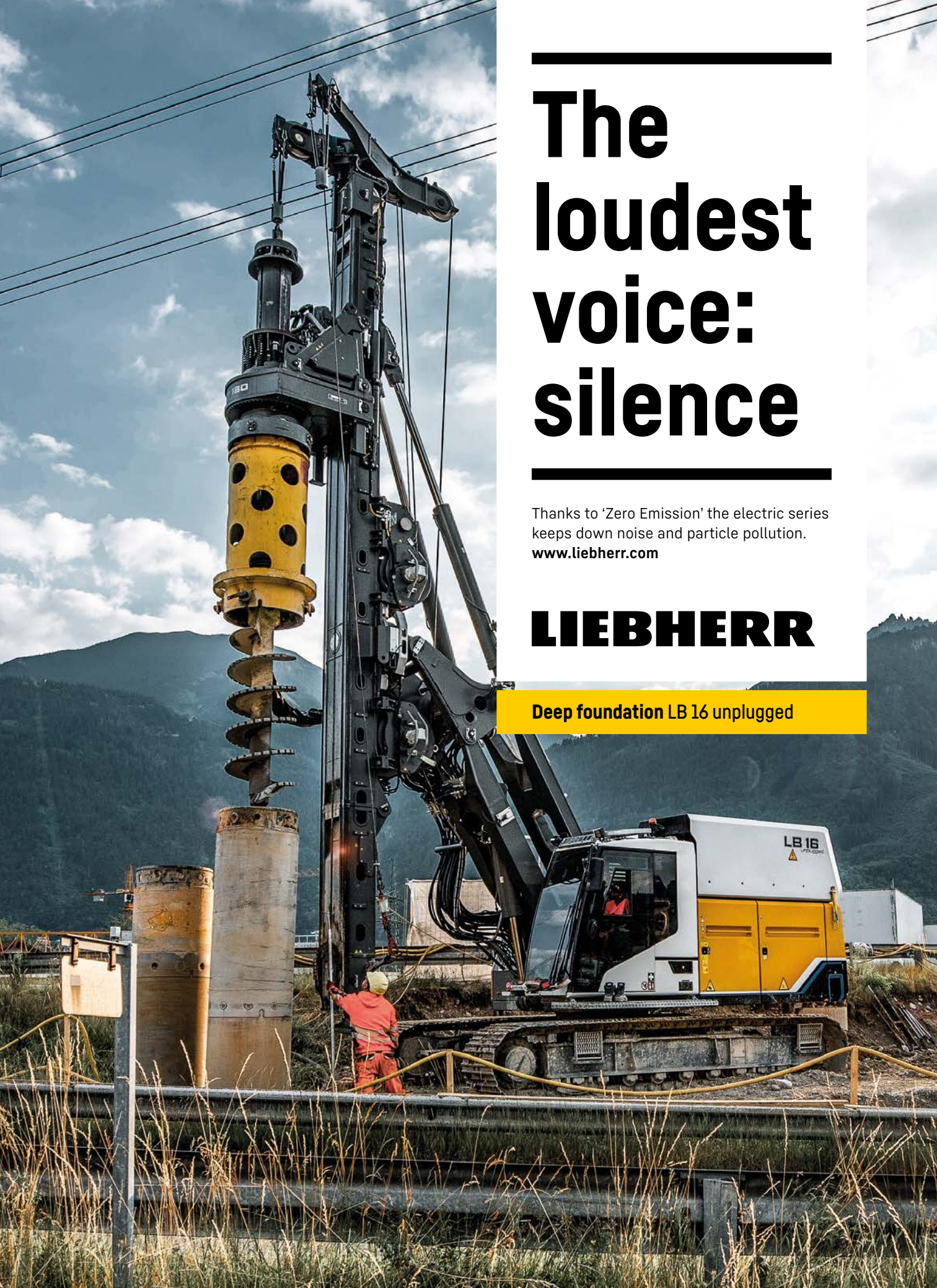
DOCUMENTATION

It is not only in the deep foundation sector that all performances must be documented for the client. However, precisely in this sector, most of the work results cannot be seen and inspected following completion, as they are below the surface and outside the field of vision. With MyJobsite the quality of all work carried out can be verified and documented in accordance with DIN 1536. Based on standardised protocols, all necessary documents can be quickly created with only a few clicks and entries. Furthermore, live emails or SMS messages inform defined persons about the actual progress of the jobsite.

Conclusively, MyJobsite is a very valuable instrument for quality control and documentation in the deep foundation sector. It contributes significantly to the transparency and efficiency of all jobsite processes. ▼

Using MyJobsite allows contractors to pool different data sources in one platform





The loudest voice: silence

Thanks to 'Zero Emission' the electric series keeps down noise and particle pollution.
www.liebherr.com

LIEBHERR

Deep foundation LB 16 unplugged

Sustainability in the piling sector

Following on from her recent piece about sustainability in pilings and foundations, Debbie Darling says it is apparent that further comment on the importance of sustainability within the sector is required

Many large – and indeed, small and medium – construction companies are developing sustainability teams and working groups, to highlight the importance of environmental considerations and to develop specific strategies and procedures to deliver in this important area. One key example is Bauer Technologies: a forward-thinking organisation, leading the way in the development of sustainability-focused practices and ethical business culture.

BES 6001 CERTIFICATION

Bauer Technologies is the only UK geotechnical contractor accredited with BES 6001 sustainability certification. Achieving the BES 6001 responsible (sustainable) sourcing certification gives Bauer Technologies' clients confidence and peace of mind, as the third-party certification clearly demonstrates the organisation's commitment to the long-term environmental impact on the sector.

Talking about the impact of the BES 6001 sustainability accreditation for Bauer Technologies and the geotechnical and wider construction sector in general: what it is, what it means and why

it is important, Michael Jones, managing director of Bauer Technologies, said: "In fact, maybe the above should read 'The impact of BES 6001 sustainability accreditation: what it is, what it means and why it should be important...'"

WHAT IS BES 6001?

The BES 6001 standard assesses an organisation's performance in three areas: Organisational Management Requirements; Supply Chain Management Requirements; and Requirements Related to the Management of Sustainable Development.

These pre-qualifications are increasingly important, demonstrating an organisation's environmental and sustainability performance; many main contractors now require evidence of this within primary prequalification tools – and without an audited system (the only system currently being BES 6001) companies will not receive enquiries for certain major projects.

BES 6001 is designed to ensure the responsible sourcing of construction products. Contractors are increasingly recognising the need to prove that their projects

are built with sustainability in mind. In support of this, the UK government is considering significant tax incentives to encourage it. Morgan Sindall (one of the UK's largest construction companies) announced some time ago that they will no longer deal with sub-contractors and suppliers who are not working in line with BES 6001 requirements and it is expected that other leading construction companies will follow.

WHY IS IT IMPORTANT

"BES 6001 has provided the framework needed for effective supply chain management, in terms of how we select and manage who we use. This includes reviewing where all our ingredients originate, and how our supply chain partners manage 'down-stream'," Jones said. "We always look for suppliers who are BES 6001 accredited, it makes our supply chain management more effective and offers demonstrable credibility. It can be difficult for any organisation to convince its supply chain partners to operate in accordance with BES 6001 and this can only be overcome if we are accredited with BES 6001 ourselves.

"BES 6001 challenges Bauer Technologies to consistently improve and so prompts frequent internal discussions about our procurement efforts, if we are not certain that suppliers have purchased as sustainably as we do, then we will encourage them to review their supply chain; failing this we will source alternative suppliers who can demonstrate the sustainability of their product.

"Sustainability is becoming a fully integrated part of what we do daily. Not only are these new procedures what is required by BES 6001, but they are now embedded at all levels on our



Can adherence to BES 6001 certification help the piling sector to achieve sustainability?

sites, including reducing waste and water use. BES 6001 has greatly assisted the organisation by providing a specific focus," Jones said.

WHAT BES 6001 MEANS

It is important to Bauer Technologies that all suppliers understand that sustainability is a critical part of the sector and as explained, the certification can support the process.

Key materials are usually made up of concrete and steel, so it is essential that sustainable options are purchased wherever possible. Many of the business' supply chain partners have begun their sustainability journey and some already have the BES 6001 sustainability certificate.

One key strand of Bauer Technologies' sustainability strategy is its 'Sustainability Working Group', formed in early 2022, to monitor sustainability innovations and requirements internally and identify opportunities for the business to continue the development of its sustainability practices and credentials. The multi-disciplinary working group has expertise and experience in a range of specialisms that have facilitated the expansion and enhancement of the company's sustainability strategies.

It is not enough, though, for a company to have a working group – or even certification – and believe that makes them 'sustainable'. Having identified the importance of embedding these principles across the company, every staff member can – and does – play a part, on several levels. Most staff are registered and are performing training with the UK's Supply Chain Sustainability School, of which Bauer Technologies has achieved Gold status. Staff are encouraged to cycle, walk, or use public transport to get to work if possible. Online meetings are encouraged and where face-to-face meetings are necessary, similar meetings in the same geographical area are arranged

for the same time, to prevent multiple journeys. The company makes allowances for staff to work from home as appropriate and encourages staff to vehicle share if possible. Bauer Technologies also reviews its suppliers' transport methods.

Bauer Technologies' project management procedures require every team member to make conscious decisions on site, in order to reduce errors and mistakes, and to reduce waste generated by its works, for example, its supervisors need to think about ordering of top up loads, how reinforcement is called off and how the company manages its sub-contractors, such as muckaway etc.

Another area being further developed by the organisation is the important, localised activity, being undertaken on-site. For longer-duration projects, PPE bins go to a recycling centre, where any items which cannot be recycled generate energy from waste; the thermal residue left from this process is put back into the construction industry.

THE REST OF THE INDUSTRY

Bauer Technologies is a great example of a company which takes its environmental responsibilities seriously, leading by example and delivering credible operational change to support the initiatives identified. Other organisations are also considering requirements and options.

An authority on the subject of sustainability and net carbon zero, Tim Chapman, director at Arup – Net Carbon Zero for Infrastructure, said: "The term 'sustainability' had at one point become overused and has held various implications and distinctions. Most recently, the key threat referred to has been climate change – and so reducing whole-life carbon has become one of the most vital challenges. But as the battle that must be fought against carbon becomes clearer, we now realise that many

other battles are probably equally important: the threats to biodiversity might wipe us out as a species before climate change and it is becoming clear that we can no longer pillage and plunder the earth for more and more natural materials without serious consequences. We urgently need to bring much greater circularity into our material usages – from construction material to high fashion.

"So once again, the broader concept of sustainability is coming back into vogue and threatening to recalibrate how all parts of the construction industry need to behave – and what should be valued even above cost. Against this backdrop, firms that install foundations need to think hard about the impact of their operations and especially ensure that they deliver the right value for society. The world will always need fresh foundations for new structures, but the purpose of those structures matters more and more, and the means of delivery needs to change radically – being much more careful about using scarce resources and carbon – and always being much kinder to nature."

Of course, sustainability is by no means a one-company issue and given the huge importance of the issue, ideas and solutions that can expedite the green journey for the entire construction sector should be shared widely. Trade associations, such as the Federation of Piling Specialists and the British Drilling Association are playing an important role in this sustainability journey, both having established working groups on the matter. In addition to providing guidance to its members, they both function as facilitators and forums for the exchange of initiatives and schemes for member companies for the benefit of all and the environment. Their role in this going forward will be critical to industry success. ▼

"It makes our supply chain management more effective and offers demonstrable credibility"



Keller brings RemediaClay to Europe

A treatment developed by Keller in the US to improve the stability of swelling clay soils has been trialled in France. If successful, it could open up a major new market in the country – and tackle a growing problem

Above: Keller rigs working on a narrow site between farmer's fields in France

Credit: C.REBIERE – Balloide-Photo Bayonne

Clay soils that swell and shrink due to moisture are a major cause of structural foundation damage. Although watertight membranes, drainage and the removal of nearby vegetation can provide initial protection, more drastic underpinning methods are often needed.

One common answer to the problem is micropiling, but a less well-known and potentially cheaper alternative involves injecting soils with a potassium and ammonium ion solution. This reacts with the clay, modifying its behaviour and making it less sensitive to swelling.

AN INNOVATIVE DISRUPTOR

The potassium and ammonium ion solution injection process was developed by Keller in the US more than 30 years ago but is not widely used outside of North America. However, that could soon change, as Keller has patented and branded the technology as RemediaClay for the European market and recently carried out the first trial on the continent.

This trial, organised by Cerema, the French government agency

responsible for urban planning, involved using RemediaClay on two 100m stretches of a small road.

"Historically, the clay remediation market isn't one we've been active in due to the high number of small competitors in micropiling," Serge Lambert, head of the Technical Department for Keller France, said. "But as climate change increasingly affects clays, causing more problems in roads and structures, it's becoming a more important issue in France. We believe that RemediaClay could be a disruptor for us in a market dominated by micropiling and soil substitution."

SHARING KNOWLEDGE

To prepare for the trial, the French team turned to colleagues in the US for help. Benoit Paineau, large project sales director, travelled to Fort Worth, Texas, to visit a job site using the process, while Roy Doumet, assistant project manager at the Keller Dallas branch was able to provide advice on batching the solution and driving the rods into the soils.

After passing rigorous safety and environmental tests to satisfy

European regulators, Keller France had just a short timeframe to prepare for the trial itself.

"It was a real challenge, but with US support and the help of our yard, we managed to develop the technique and prepare our equipment – adapting a multipurpose Liebherr LRB 125 rig with the right frame and device to drive the three rods into the ground simultaneously," Olivier Weinsanto, site manager, said.

PROMOTING THE BENEFITS

Although the trial ran smoothly, the results will not be known for at least a year. However, Lambert is hoping that if they are positive, they will pave the way for the wider introduction of RemediaClay, creating a competitive advantage for Keller France.

In the meantime, Keller is scheduled to take part in a second road trial with RemediaClay in another region of France, and also aims to start promoting the benefits within the construction industry. "It will take a while to fully develop this technology for France, but this trial is an important first step," Lambert said. ▼

"We believe that RemediaClay could be a disruptor for us"

*PASSION for
PROGRESS*



MASCHINEN



The BAUER Maschinen Group is the leading supplier of specialist foundation engineering equipment worldwide.



The why and how of horizontal directional drilling

Dan Vroom, industrial training manager at Vermeer, offers *GDI's* readers an insight into the basics of horizontal directional drilling and why it is frequently the preferred method for underground utility installations

Above: HDD is increasingly becoming the method of choice for installing underground utilities in the US

Right now, across the US, the horizontal directional drilling (HDD) industry is booming. Among the growing need to expand the world's high-speed fibre networks; upgrading existing infrastructure like electric, gas, water and sewer; and the need to relocate above-ground utilities underground, the demand for HDD is likely to continue growing.

Horizontal directional drill rigs and crews have become a common sight on the streets of communities across the nation. If you have not worked around these machines or been part of a utility construction crew, you may wonder why HDD is the preferred method for certain underground installations – and how HDD works.

WHAT IS HDD?

Of course, the obvious first questions are: What exactly is HDD, and why use it in place of open-cut methods? It involves creating a tunnel, or bore, underground to install utilities with pipe, conduit or cables that

place fibre, electrical, gas and water lines. This method was invented as an alternative to digging an open trench because it allows for miles of underground work to be done with minimal disruption to the surface and surrounding areas.

Experts explain that, although there are basic economics involved when deciding whether to use HDD or open-cut methods, such as equipment, labour and restoration costs, there are often additional factors contractors should consider. These factors include ground conditions, the diameter of the product, grade requirements, underground and aboveground obstacles, and location.

Urban and rural locations present different challenges and opportunities. In countries like the US, which have more developed infrastructure, HDD is usually the preferred installation method for small-diameter utilities in urban and suburban locations. Minimising restoration, avoiding traffic disruptions and keeping property owners happy are a few of the reasons why it is so often used in

populated areas. Boring a utility line is generally more cost-effective and takes less time because the bore goes under roads and sidewalks, not to mention other aboveground obstacles like fences and driveways.

In rural areas, since there is often less restoration and fewer obstacles to contend with, trenching and/or ploughing is typically faster and more cost-effective for a smaller-diameter product. However, the contractor still needs to account for existing utilities, type of soil, size of the product and required depth. For deeper installations or in rocky soil conditions, HDD may still be the best choice because less material must be removed during the installation process. And of course, trenchless technology should still be used for passing under roadways, rivers and other aboveground obstacles.

HDD EQUIPMENT

The success of the HDD method is based on certain key pieces of equipment. Understanding the

“You may wonder why HDD is the preferred method for certain underground installations”

capabilities and limitations of the equipment is vital to a successful project. Brief general descriptions of the required equipment follow.

DRILLING RIG

The two main functions of a drill rig are rotational torque (turning force) and thrust (pushing-and-pulling force). Together, these two functions work to turn and push the drill head and drill bit through the ground to create an initial hole or pilot bore.

As the drill is working, more drill rod is added so it can continue to create the bore. Once this pilot bore is made and the drill head is exposed above ground at the end of the bore, the product being installed is hooked up to the drill string and pulled back underground.

Each drill can be equipped with different tooling based on ground conditions. Obviously, there are various sizes of drills depending on the size of the product being installed, ground conditions and the distance of the bore.

TOOLING

"Tooling" typically refers to the actual drill bit/drill head, transmitter housing and drill rod.

The drill bit is a piece of solid, heavy metal that is angled appropriately to cut the ground and direct the installation. This drill head and bit move through the ground with twisting and pushing motions, cutting away at the soil to create the hole, or bore. Steering and pushing the drill head allows it to change direction and depth.

To accommodate drilling in harsh conditions, rock tooling – including air hammers, polycrystalline diamond compact (PDC) bits and economic rock tooling packages – are available along with a wide range of reamers, swivels, adapters and pulling eyes.

DRILLING FLUID

Drilling fluid is used to carry the soil cuttings out of the bore as the drill is working. It is mostly made up of water, but various drilling fluid products are generally added. The result is drilling fluid, usually referred to as "mud" by the crew.

Adding different products gives the water certain desired properties such as gel strength and lubricity. Importantly, it also forms a thin layer of material to help strengthen the hole and keep the mud inside.

VACUUM EXCAVATOR

Another important piece of equipment used on an HDD jobsite is a vacuum excavator or

hydro excavator. This machine uses high-pressure water with a special nozzle to cut the ground while simultaneously using a high-flow vacuum to suction the loose ground up. A vacuum excavator can create a hole in the ground, uncovering existing utilities, while reducing the chances of a utility strike.

Vacuum excavation is used prior to the drilling process to expose

ENGINEERED FOR SUCCESS

HEM ATTACHMENT WITH CAGE

TOOLING HANDLER

HEM ATTACHMENT WITH CAGE

TOOLING HANDLER

SKELAIR
SPECIALLY ENGINEERING IN ROCK DRILLING SOLUTIONS
STEPHEN GREATBANKS
UNITED KINGDOM
OFFICE: +44 477 539100
EMAIL: STEPHEN@SKELAIR.COM

BETONGAKUTEN
www.betongakuten.se
JOHNNY HANSSON
SWEDEN OFFICE: +46 0700 32 94 11
EMAIL: JONNY@BETONGAKUTEN.SE

STM
JONAS STAHLBAGE
SOUTH EAST ASIA
OFFICE: +65 8318 3139
EMAIL: INFO@STM-CE.COM

“HDD is a growing industry with a high demand for skilled trade workers”

▶ any existing utilities along the intended installation path. Vacuum excavators are also used to remove spoils (used drilling fluid) from the site to be disposed of at an approved dump site.

MIXING SYSTEM

A mixing system mixes the drilling fluid products mentioned above and supplies it to the drill so the drill can get through the ground efficiently. It also keeps the mixture agitated throughout the drilling process.

LOCATING SYSTEM

A locator is used to help guide the drill head underground by following its path. It is critical that the drill head stays on the pre-determined path so it avoids utilities and other potential obstacles underground. Once the drill and its transmitter are underground, the locator recognises and communicates with the transmitter signal and displays a position, pitch or angle, temperature of the transmitter, downhole pressure, and drill head depth. This information is used to help steer the drill head along the correct path.

With HDD replacing open-cut methods, lawns and parks and other public places can retain their condition

HDD BASICS

Before any work can begin on the site, the utility companies must be called in to locate their underground services. Those locates may be done by the utility companies, municipalities or a

third-party contractor. After those are completed, best practices require contractors to verify the locations of the utilities themselves. Many contractors will use their own utility locators to confirm that the flags and paint on the ground are correct. However, to ensure they do everything possible to avoid striking an existing utility or, worse yet, a cross bore, the exact location and depth need to be confirmed by actually exposing those utilities. Some contractors use mini excavators or shovels, but those methods risk inadvertently striking and damaging the lines they are trying to uncover.

A better way to expose the utilities is to use a vacuum excavator to soft-dig, or “pothole,” an area above the underground utility. Vacuum excavators use water or air to break up surface material while a suction hose immediately removes the spoils. Once the utility locations have been confirmed, the drill is moved on-site.

On a typical jobsite, there will be an operator running the HDD rig and a person using an above-ground receiver, called a locating system, tuned to recognise the transmitter, or sonde, in the transmitter housing connected to the drill string and drill bit. The locating system shows the position, pitch or angle of the drill head, and depth of the drill head. The locator is held by a member of the crew who is walking the installation path. That person uses a radio to communicate with the operator of the drill, informing them of the position of the drill head.

The HDD rig itself is a machine that holds multiple rods (or pipes) that connect to each other and push through the ground to make a bore. From aboveground, the rods enter underground by poking into the soil or through a small dug-out pit. The drill head and bit move through the ground with twisting and pushing motions, cutting away at the soil to create a hole, or bore.

Once the tooling reaches the desired end location – in the case

of installing conduit for fibreoptics, for example – a piece of tooling (usually a swivel) connects the conduit to the drill string and is pulled back to the entry side of the bore. Later, crews come back to blow fibre through the conduit and splice the lines together. This basic process applies to all kinds of pipe, conduit and other underground products.

To aid the bore, drilling fluid is used to carry the soil cuttings away. Besides the advantages mentioned earlier, the drilling fluid also helps provide coolant for the downhole transmitter (sonde) in the transmitter housing and reduces wear on tooling.

BOTTOM LINE

Since its introduction, HDD has benefited communities and neighbourhoods. For comfortable modern life, underground utilities are a necessity. And with HDD replacing open-cut methods, lawns and parks and other public places can retain their pristine condition. Significantly fewer linear feet of paved roads and streets need to be torn up by utility workers, making upgrades to infrastructure much less intrusive. As fewer feet of roadways are disturbed, even traffic can flow almost normally, even during an install.

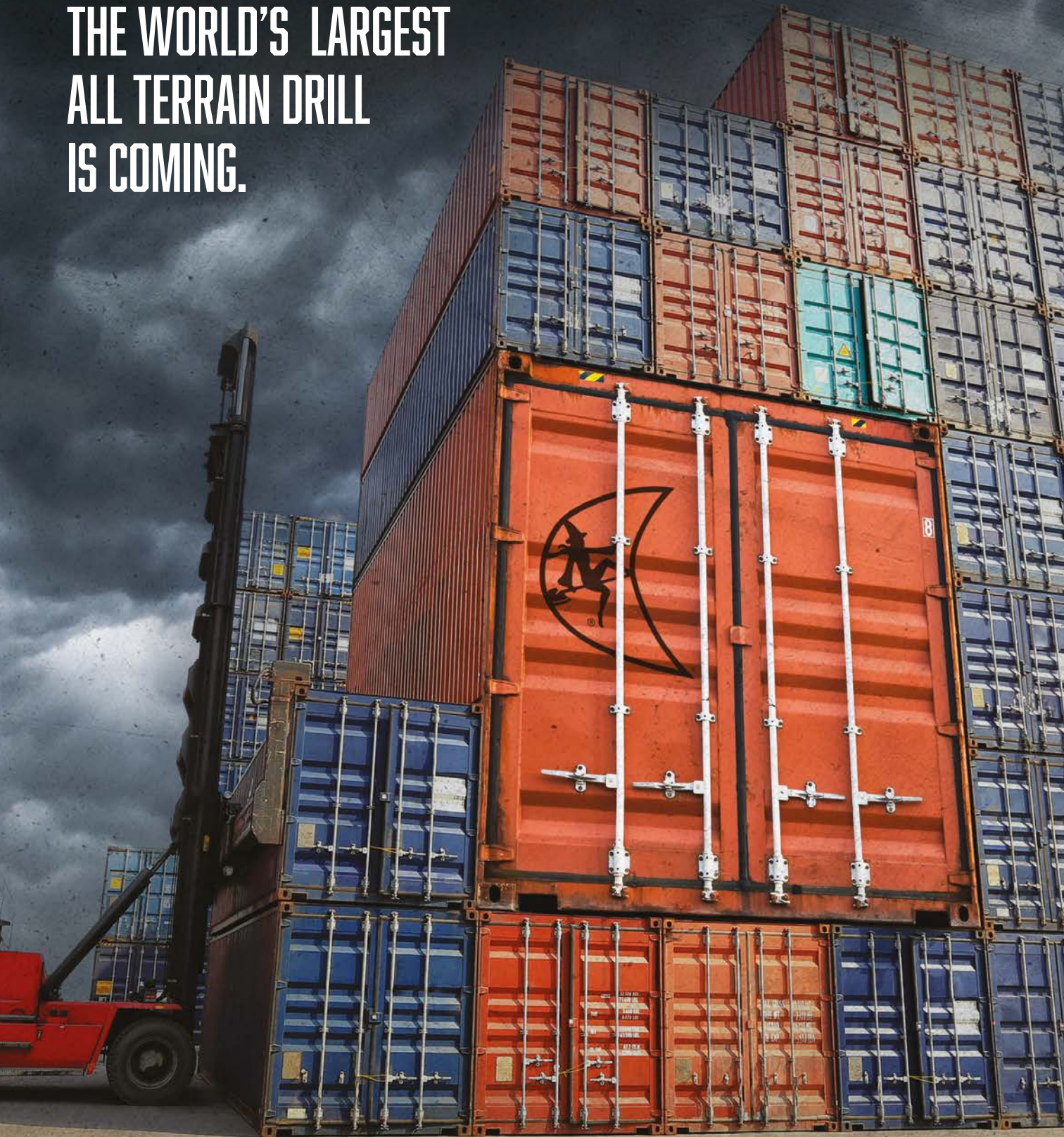
HDD is a growing industry with a high demand for skilled trade workers. Much like other sectors of the construction industry, HDD contractors are actively searching for the right people to train to become part of their teams.

Today the HDD industry is growing steadily with the high demand for fibre work, and for larger diameter work as well. It is no secret that the COVID-19 pandemic has put a strain on global broadband capabilities, which is leading many governments, including those in North America, to launch infrastructure improvement initiatives that include all types of underground utilities.

HDD will be in high demand for many years to come. ▼



THE WORLD'S LARGEST
ALL TERRAIN DRILL
IS COMING.



largestATdrill.com

Boring through hard rock

Three key considerations to help contractors bore through hard rock are put forward by Jeff Davis, HDD product manager at Ditch Witch

As demand for underground construction projects continues to increase, HDD operators are looking for ways to improve the efficiency, safety and profitability of the jobsite. However, the presence of hard rock often stymies the success of a variety of underground construction projects – until the advancement of HDD technology.

To keep up with industry demand and increase jobsite performance, OEMs, such as Ditch Witch, implemented key technological features to help contractors efficiently bore through tough terrain and improve efficiency and profitability. Jobsites that were once considered impossible due to the presence of rock were now possible with new HDD technology.

Ditch Witch's AT 40 is optimised for industry-leading performance and productivity when drilling in hard rock conditions

One key technology that changed the future of the HDD industry is dual-pipe drilling technology. Dual-pipe technology can help operators reduce the risk of inadvertent returns, improve boring and steering through hard rock and provides a small footprint for compact jobsites. This

means that mid-size drilling equipment now had the capability and power to push through rock.

However, no HDD installation can be made without the HDD tooling parts, such as downhole bits, drill pipe and backreamers. With the advancements in HDD technology, HDD tooling also evolved to provide better performance and functionality for contractors working in hard rock. For example, OEMs have designed rock bits made with high-performance components to help extend bit life in hard rock conditions and technology that improved cutting structure and wear resistance. Contractors who understand the benefits of the enhanced tooling parts can be better prepared to implement them on the jobsite.

Here are three things HDD operators should consider when selecting the best-enhanced HDD tooling parts to help them drill confidently, safely and effectively through tough ground conditions.

BIT TECHNOLOGY

When drilling into hard soils and rock, drill bit selection is crucial.

Using the appropriate tooling based on the ground conditions not only extends tool longevity but also helps operators stay productive.

In hard ground conditions, drill bits often wear down prematurely, increasing the difficulty of making steering adjustments. Choosing a drill bit that most effectively moves loose material out of the way will assist operators with steering and provide a clearer cutting path. To boost performance in these conditions, drill bits with a hard surface, such as carbide, help protect the tool from abrasive environments and extend their usability. Additionally, replaceable and angled carbide teeth can improve tool longevity and increase cut productivity.

Dual-pipe bit options include:

- PDC bits are a productive, low-cost avenue for dual-pipe drill operators when working in softer rock. With a fixed blade and replaceable cutter teeth, these bits are designed for use with dual-pipe drills in soft to medium-hard rock formations.
- Rotary bits with tungsten carbide inserts are the best all-around bits for dual-pipe mechanical systems. They are ideal for operators looking to increase drilling performance and productivity in hard rock formations, including solid, layered, chunky or cobble formations.
- Dual-pipe air hammers provide enhanced productivity and steering capabilities when drilling in the hardest solid rock formations. Often, these systems are used on a mechanical dual-pipe drill in place of rotary bits when those bits become less effective and production rates drop.



UTILISE A BACKREAMER

Backreamers and drill bits both have a critical role to play in HDD projects. For example, backreamers can make projects easier, subbing for drill bits during the installation of large-diameter product. Drill bits, on the other hand, can be used exclusively to create the smaller bore paths required for many feeder lines, which extend off the main fibre backbone. On these projects, many operators forego a backream. Instead, they shoot through the hole and out the exit and then pull the drill bit back as quickly as possible.

When installing product in rocky conditions, operators may or may not require a backreamer and enlarged borehole. For fast installation on hard rock projects that do not require an enlarged hole, operators will want to select tooling that is designed for direct pullback and connect directly to the drill pipes without

the use of connectors. However, if a project calls for an enlarged borehole, operators will want to utilise backreamers that are specifically designed for heavy and solid rock bores and feature replaceable cutters. These features help increase productivity, reduce costs and extend the life of the backreamers when working in challenging conditions.

SELECTING THE TOOLING

Tooling innovations continue to help contractors improve productivity in challenging terrain. It enables operators to keep the housing on the drill string when pulling back product and more easily swap out a drill bit for a swivel. This can speed up transitions – from roughly one hour to as short as five to 10 minutes – and increase uptime. The system also makes it possible to drill the pilot bore and expose the tooling with a smaller pit, which can

dramatically improve jobsite productivity and enhance safety.

ENHANCED TECHNOLOGY

As HDD contractors need to increase productivity, safety and profits to meet demand and successfully complete HDD jobs, it is crucial that they implement and utilise technological advancements such as dual-pipe technology and enhanced tooling.

When drilling in rock, contractors should remember that they should not just switch to rock tooling and proceed routinely. Rock drilling takes planning, practice and patience. Understanding the benefits of these advancements in technology and implementing them correctly on the jobsite can help HDD contractors efficiently drill through a variety of ground conditions. Ultimately, enabling HDD contractors to achieve success on every HDD jobsite. ♥

“Tooling innovations continue to help contractors improve productivity”

You want to discover our **latest technological developments?**
Meet us **in person?** Have a look at our **high-performance drill rigs?**
Just come around at the **following shows:**

GeoTHERM
expo & congress

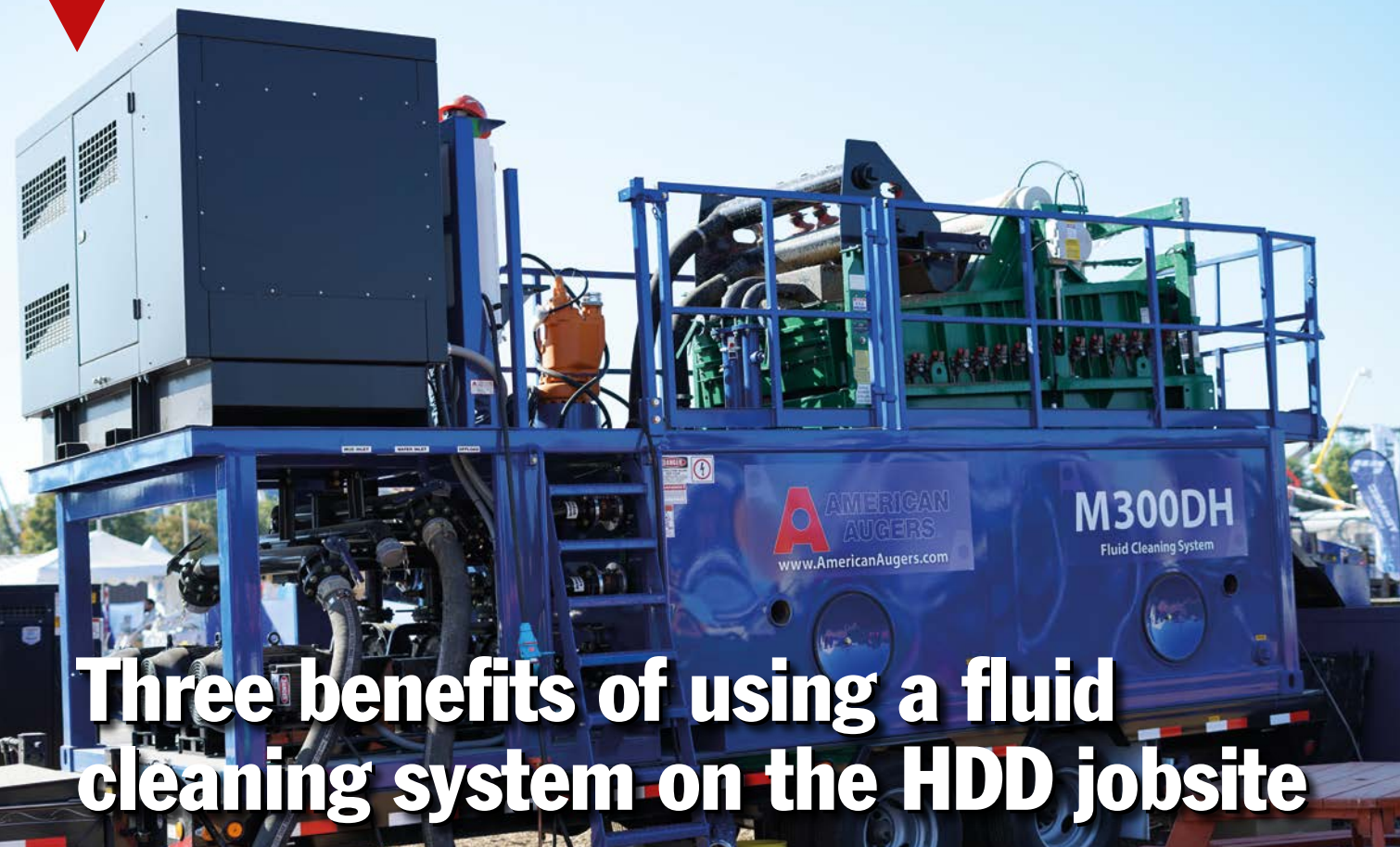


GeoTHERM
expo & congress
Messe Offenburg-Ortenau
(EDEKA-Arena)
2nd to 3rd March 2023
Booth 130
Exhibit: Hütte HBR 205-2

**CONEXPO
CON / AGG**

Conexpo-Con/AGG 2023
Las Vegas Convention Center
(LVCC)
14th to 18th March 2023
Booth D2519
and D2439
Exhibits:
Hütte HBR 608
and HBR 610





Three benefits of using a fluid cleaning system on the HDD jobsite

Richard Levings, American Augers product manager, provides *GDI's* readers with three benefits of using a fluid cleaning system on horizontal directional drilling jobsites

Above: American Augers' M300DH drilling fluid cleaning system is the first of the company's machines to feature the upgraded Hyperpool shaker from Derrick

Horizontal directional drill (HDD) operators know that having the right equipment is a key element to jobsite success. One integral piece of equipment that can help streamline operations and boost HDD uptime is fluid cleaning systems.

Fluid cleaning systems are designed to assist HDD crews with their drilling fluid by removing solids from the drilling fluid as quickly and efficiently as possible. This can help reduce wear and tear on tooling, pumps and other components, resulting in a cleaner, safer and more efficient operation.

From minimising inadvertent return to helping contractors reduce environmental impacts and minimise haul-off costs, fluid cleaning systems are a fundamental piece of equipment in any drilling operation. Here are three ways a fluid cleaning system can benefit HDD operations, improving uptime and maximising downhole production.

MINIMISE INADVERTENT RETURNS

Maintaining good fluid properties is proven to help facilitate a more efficient and cost-effective drilling programme for the operator. One universal fact of drilling is that drilling fluid will always follow the path of least resistance. When drilling goes according to plan, the borehole created by the operator will always be that path of least resistance. However, if there is a different path of least resistance, then inadvertent returns can happen. In other words, when an inadvertent return happens, drilling fluid surfaces through a path that HDD contractors did not intentionally create. This can happen in a variety of different ways. From solids settling in a borehole to natural intrusions such as ground conditions, tree roots and pre-cut trenches, any encroachment to the bore path could increase the risk of an inadvertent return.

To reduce this risk, HDD operators leverage fluid cleaning

systems. These systems help manage the fluid flow and ensure solids are brought out of the hole efficiently. This is done by slowing down the drilling speed and increasing fluid velocity so solids can stay suspended in fluid and not risk falling or settling in the hole.

With the help of a fluid cleaning system, operators can monitor if solids begin to move too slowly, which can cause solids to fall and create a dam. If build-up in the hole occurs, the fluid will find another path to the surface and cause an inadvertent return. Ensuring operators have a fluid cleaning system will help maximise downhole production and improve jobsite productivity.

PROMOTE CLEAN DRILLING

As environmental, social and governance (ESG) regulations grow, and the industry looks to the future, environmentally friendly drilling practices are on the rise. The modern driller needs to

understand how to minimise environmental risks while protecting and improving the bottom line.

HDD contractors know that some underground construction projects require thousands of gallons of drilling fluid to complete a bore successfully. Without a fluid cleaning system, contractors are constantly spending time and money disposing of used mud and mixing new clean drilling fluid. Some areas have tightened restrictions on dumping mud at the jobsite, which means contractors are required to contain and dispose of the used drilling fluids at approved waste facilities. As a result, contractors are spending more time disposing of fluids and less time where it really matters – on the jobsite.

The costs associated with containing and disposing of used drilling fluid can be significant. These costs include the need to buy or rent containment equipment, transportation and disposal fees and the cost of fuel. And the hassle does not end with disposal costs. Since used drilling fluid is being removed from the jobsite, HDD contractors must prepare more with additional water and additives, resulting in further expenses and downtime.

However, many of these costs can be reduced by incorporating a fluid cleaning system. A fluid cleaning system helps operators remove solids from the drilling fluid, cleaning the water and allowing it to be reused. As a result, HDD contractors can cut disposal costs and reduce the environmental impact because less waste is created. In addition, by reusing the fluid instead of disposing of it, contractors can spend less time preparing a new drilling fluid for a cleaner, more cost-effective operation.

INCREASE HDD UPTIME

There are a few key aspects of the fluid cleaning system that determine a machine's dependability. One of the most integral aspects, however, are the shaker screens. Shaker screens are the first line of

defence. They remove solids on the first cut and can dispose of them before going into the fluid cleaning system. When working together, shaker screens and fluid cleaning systems can promote HDD uptime and boost jobsite efficiency.

In one example, an Oklahoma contractor was experiencing high sand content in its HDD operation. In fact, the contractor saw 11% of sand content in its unprocessed slurry, which could be detrimental to their equipment and 1340ft bore project. As a good rule of thumb, sand content should remain under 1% to ensure it can be efficiently pumped back downhole or further processed through a centrifuge.

To help achieve their goal of 1% sand content during the entire pull, the contractor implemented a fluid cleaning system with a high-performance shaker and innovative screen technology. The drilling fluid was pumped from the pit to the shaker, and the first screen panel provided the primary separation. The fluid and undersized solids flowed through the screen to the first tank below the shaker. From this tank, the fluid was pumped over the second screen panel and finer screens were run on the second and third screen panels to dewater the underflow, essentially acting as a mud cleaner. The cleaned fluid then flowed

into the second tank, which was pumped back downhole.

While back reaming from a 12in to an 18in hole, 213t of solids were produced. By utilising a fluid cleaning system with a three-shaker screen panel, the contractor was able to process 100% of the fluid from the hole, in a span of two days. As a result, the contractor was able to reduce haul-off costs due to drier discard piles and minimise the quantity of abrasive sand-size particles, helping reduce equipment downtime and ensure an efficient operation.

The evaluation proved the ability of a compact, single-deck mud recycling system with a high-performance shaker and innovative screen technology to provide value-added savings by way of reducing the dilution needed and the quantity of abrasive sand-size particles.

A WINNING TEAM

Fluid cleaning systems are the flux capacitor to the HDD jobsite. However, implementing a fluid cleaning system with a shaker screen can help contractors do more with less. This is especially important as environmental regulations continue to increase. With this winning combination, HDD contractors can reduce costs associated with haul-offs, minimise downtime caused by inadvertent returns and ensure a clean, efficient and safe jobsite. ▼

“A fluid cleaning system will help maximise downhole production”



A fluid cleaning system helps operators remove solids from the drilling fluid

Geothermal drilling: Designing for high-temperature environments

Andrew Law, CEO, Enteq Technologies, contemplates the future of geothermal drilling and the need to go deep using techniques developed in the oil and gas sector to get the necessary energy to meet Net Zero targets globally

Iceland is one of the locations which is considered to be among the World's geothermal 'goldilocks' zones

The IEA estimates that roughly 3.6 GW of new geothermal electricity generation capacity must be added per year globally from 2021 through 2030 to stay on track for 'Net Zero' by 2050. With that context in mind, it's concerning that 2020 only saw about 200MW of geothermal capacity added worldwide – a 2% fall on the previous five-year average.

Clearly, much more geothermal capacity is needed. However,

traditional geothermal technology relies on abundant and accessible hydrothermal resources such as can be found in Iceland or California. There aren't many of these goldilocks 'just right' locations in the world, and that has stunted the growth of the sector.

Of course, if you go deep enough, you can tap into all the heat you'll ever need from anywhere on the Earth's surface. This is precisely the goal of newer

enhanced and advanced geothermal systems (EGS and AGS). However, new methods entail new engineering challenges to be solved if they are to deliver on their potential in a commercial manner – and no small number of these challenges fall under the category of drilling.

HOW HOT IS HOT?

To understand the implications of geothermal projects for drilling, we need to understand the



temperatures at play. Traditional flash plants, such as those found in Iceland, typically require water temperatures of around 200C, though newer binary plants can successfully generate electricity with water temperatures as low as 100C.

These are not extremely high temperatures to a drilling engineer. For context, a high-temperature well in the oil and gas sector is typically understood to have a downhole temperature of around 150C.

This 150C figure is significant: at that temperature and with an average well depth of 4.3 miles the US Department of Energy's 2019 GeoVision study estimated 5157GW of geothermal electricity generation capacity to be possible – around five times the country's installed capacity.

In other words, there is abundant geothermal energy to be had using temperatures well within drilling engineering's regular ballpark – but the problem is the nature of the drilling required.

EGS, AGS AND DIRECTIONAL

With a couple of centuries of practice and technology development under its belt, the oil and gas sector has been responsible for transformative advancements in drilling technology. When it comes to simple, vertical wells, high-pressure high-temperature (HPHT) environments are no longer a challenge.

Directional drilling, however, is another matter. In wells where horizontal or extended reach drilling (ERD) is required, there is a substantial increase to operational risk and smarter engineering is needed to ensure that there is correct weight on the bit. If the drilling system is unable to handle high temperatures, it can lead to short runs, downhole tool failures and poor drilling rates, as well as high overall wellbore construction costs.

In the context of scaling geothermal energy, this is crucial. EGS projects work by drilling

both an injection and a production well. Fluids are then injected into the earth at high pressure, creating fractures for the water to pass through before collection at the production well. This is, essentially, fracking – a by-now familiar process to the oil and gas industry. However, it is done at greater depth and temperatures than the shale industry is used to. Once again, if these were simple vertical wells that would be one thing, but in reality, directional drilling is essential to ensure precision.

AGS is an even newer approach and is distinguished from EGS in that it uses a 'closed loop' system. There's no fracking here, and no fluids injected or extracted into the earth itself – rather a heat-exchanging fluid is circulated within sealed pipes. An example of this is the Eavor-Lite demonstration project by Eavor, in Alberta. This consists of two vertical wells, joined by multilateral legs 2.4km below the surface. This is a demonstration project but serves to illustrate the need for reliable HPHT directional drilling technology if this category of geothermal is to reach commercial scale.

RETHINKING RSS

To date, the pinnacle of directional drilling technology has been the rotary steerable system (RSS), variations of which have been in use for decades, but which have historically struggled to perform reliably in HPHT environments.

More recently, the introduction of the Steer-At-Bit Enteq Rotary (SABER) Tool has represented a radical evolution in RSS design, capable of precise control with greater uptime and reliability thanks to a more mechanically simple design, which achieves steering force via internally directed pressure differentials.

The SABER Tool has the potential to transform the feasibility of geothermal projects from a directional drilling perspective for three main reasons. First, the greater uptime and reliability



Andrew Law,
CEO Enteq
Technologies

improve the project economics – important in oil and gas applications; critical in geothermal where capex is higher and the reward is less immediately lucrative.

Second, drilling deeper brings harder rock, and the inherent design of the SABER Tool decouples the internal platform and electronics from strong torsional vibration effects induced by the bit for improved reliability.

Third, the SABER Tool has been developed with the vast HPHT expertise accumulated by Enteq through its measurement while drilling (MWD) downhole technology development and deployment, meaning it has been designed from the start to be reliable in the HPHT environments typical of geothermal applications, with a specified max temperature of 175C.

At the time of writing, US president Joe Biden has recently signed into law the Inflation Reduction Act which, despite the name, could prove an incredibly significant piece of energy legislation, with as much as US\$350 billion in loans and loan guarantees for energy and automotive companies – with the help of engineering developments such as the SABER Tool, a slice of that could transform the geothermal energy landscape and put the sector back on track to fulfil its potential contribution to Net Zero. ♥

"The potential to transform the feasibility of geothermal projects"

The importance of wireline logging for dam safety

The objective of dam safety is to avoid dam failure whereby the cost of inspection and subsequent geotechnical investigation is minor when compared to the potential cost of catastrophic failure



Evening view of the Hoover Dam in Boulder, Nevada, US

Dams have been an essential part of the development of human civilisation for centuries and operate mostly with quiet efficiency for a variety of purposes. They are often compound structures with complex ownership models operating within diverse regulatory frameworks.

DAMS THROUGH TIME

The earliest building of dams is attributed to Mesopotamia and the Middle East for control of water levels, with the oldest known being the Jawa Dam in modern-day Jordan circa 3000BC. The use of dams gradually spread across the ancient world to Egypt, India, Yemen, Turkey, and China. By the second century AD, the Romans had taken the concept of dams a stage further by creating reservoir dams that would retain permanent water supplies for population centres, aided by

their development and widespread use of concrete and waterproof hydraulic mortar.

Early uses for dams also included providing hydropower for raising water and milling. By the 12th century AD, the Netherlands had begun a programme of dam building to manage water levels and to provide protection from seawater ingress in their low-lying country.

In the 19th century advances in materials and the application of mathematical techniques allowed for the construction of masonry and subsequently concrete arch dams.

Population expansion in the 20th century saw the proliferation of large dams throughout the world with notable examples being the Aswan Dam in Egypt (1902) and the innovative Hoover Dam (1936) in the US. Currently, it is estimated that there are over

800,000 dams worldwide with around 58,000 being classified as large dams (usually over 15m in height).

CLASSIFICATION OF DAMS

The purpose of a dam is to store or restrict water, wastewater, or liquid materials for any of the following uses: flood control, water supply, irrigation, energy generation, containment of mine tailings, recreation, inland navigation and pollution control. The classification of dams is important, not only for statistical purposes but also for the potential impact on funding available for investigation and rehabilitation. Dams can be classified in three categories: function, structure, and construction materials.

There are four basic types of dams based on function: storage, diversion, detention, and cofferdams. Storage dams are the most common type and are used to store seasonal rainfall for water supply. Diversion dams have a low head and are used to divert water often into canals and ditches for irrigation. Detention dams are used for flood control by retarding downstream flows. Cofferdams are temporary structures designed to hold back water usually on construction sites. Dam structure can similarly be defined by four types: gravity, arch, buttress, and embankment. Gravity dams require solid foundations and are large structures which use the weight of the dam itself to resist horizontal water pressure and are often found in low, wide valleys. Arch dams require solid foundations and sidewalls and are the most spectacular, using curvature to direct forces into steep valley

sides. Buttress dams come in many variants, but they all comprise a sloping deck supported by buttresses. By far the most common type of structure is the embankment dam, which is constructed from natural materials, often sourced locally. For construction materials, the three dam types are masonry, steel and timber, with the majority of dams of interest being masonry, which includes the use of rock, concrete and earthen materials.

SAFETY AND MAINTENANCE

The expected life of a dam is often measured in decades or centuries during which time many changes can occur which affect its reliable working. Gradual and rapid changes may push the dam beyond its design limits and in the worst case can lead to complete failure. Ultimately, the responsibility for maintaining a safe dam and avoiding catastrophic failure rests with the owner.

Inspection and maintenance of all dams is essential to avoid failure. Risk assessments, which may be a legal requirement for large dams, bring into focus the consequences of catastrophic failure which may include the potential loss of life, destruction of property and disruption to businesses, urban areas and agriculture.

To maintain the efficient and safe operation of dams, operators and owners should conduct regular inspections using approved dam safety specialists. The level and frequency of these inspections will be in accordance with any local regulations, and as a minimum will include a comprehensive visual inspection looking for changes that have occurred since the previous inspection. Depending on the size and complexity of the dam there

may also be regular data collection, sometimes automatic, monitoring water levels, flow rates, structural movements and seismicity. Early identification of the pre-cursors to failure is essential.

The records kept by owners for their dams should include a documented routine inspection and maintenance plan, with data and results forming a legally binding part of a dam history file. In the event of a failure, these records will come under scrutiny, whereby deficiencies may have severe legal and financial consequences.

Routine maintenance and inspections can identify potential problems and drive the need for further investigation including geotechnical methods. Geotechnical engineers, civil engineers, hydrologists and hydrogeologists now have an array of investigative tools at their disposal, many of which were not available when the dam was built.

In addition to further assessment due to potential hazards identified from routine monitoring and inspection, there are many other reasons why a geotechnical assessment may be required. Old dams may have little or no data available and further assessment may be a pre-requisite for proposed rehabilitation. Following an event or incident leading to a near miss or from a risk assessment a need for data may be identified. Change in usage or increased local risks as well as non-local effects from climate change or seismicity may also drive the need for a geotechnical investigation. The resulting data can then be added to the assessment of the dam's stability and its hydrology and hydraulic characteristics. ▶

Eijkelpkamp

North America



SCAN ME



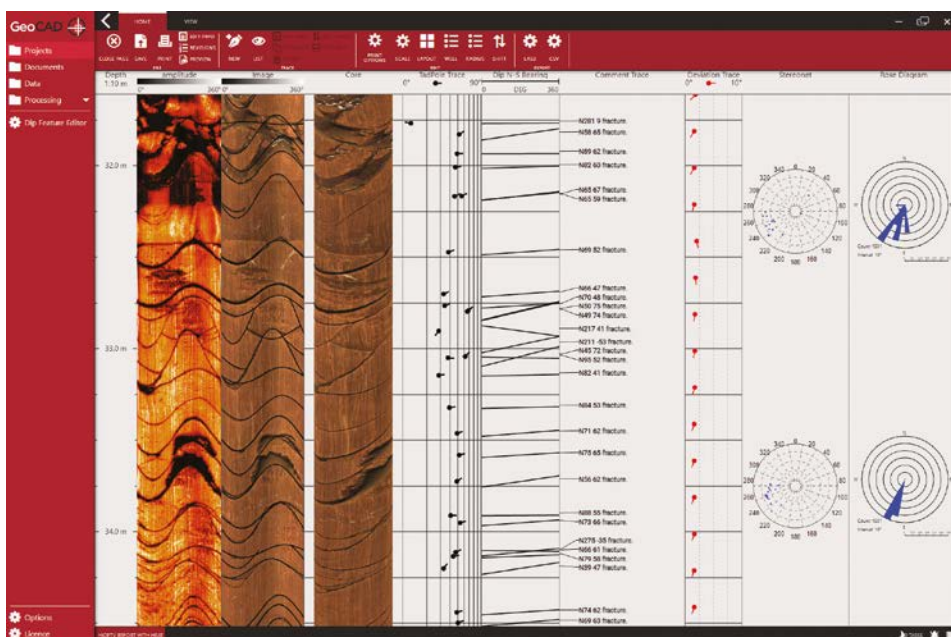
- Meet the MRS Mito 25!**
- Innovative and powerful
 - Perfect for civil engineering and foundation work
 - World-class safety, stability and reliability



Find us at the ConExpo-Con/Agg 2023
Diamond Lot D2527 | March 14-18



Eijkelpkamp North America T 800-603-5708
Wilmington NC 28405 E info@eijkelpkamp-usa.com
United States I royaleijkelpkamp.com/en-us



GeoCAD output ► FAILURE MODES OF DAMS

showing oriented features that can be obtained using HI-OPTV and HRAT televiewers down a borehole

Dam failure can be defined as the collapse or movement of part of a dam or its foundation so that the dam cannot retain water and the avoidance of dam failure is the primary goal of any dam safety programme. By understanding and analysing the potential risks to a dam, measures can be put in place for mitigation. Potential failure mode analysis (PFMA) is a common methodology used for this purpose. The benefits from PFMA may include recommendations for changes to monitoring programmes, identification of previously unconsidered failure modes, identification of potential failure modes due to misoperation or human factors and identification of additional data required for the analysis of potential failure modes.

The most common failure mode is overtopping, which occurs when the water level exceeds the top of the dam which can be a precursor to complete dam failure. Water levels can exceed design parameters due to excessive rainfall, flooding and from storm effects caused by wind and waves. Inadequate spillway design or maintenance issues such as blockages may also lead to overtopping.

For embankment dams, a common cause of failure is due to seepage. This can occur beneath the dam structure and cause problems due to erosion (piping) or heave from uplift due to the hydraulic pressure. Piping can also occur through the body of embankment dams caused by backward erosion of construction materials. Hydraulic fracturing can also occur if seepage takes place in supposedly impervious materials due to hydraulic pressure.

For all dams, structural failure can be catastrophic and may be the result of poor design, use of substandard materials, poor workmanship or lack of supervision and maintenance. Structural failure can occur during normal operations but is more likely to result from a specific incident such as flooding, storm damage or seismicity or even during the construction phase or at the time of the first fill. As a dam ages settlement and the gradual deterioration of materials can increase the risk of structural failure.

WIRELINE LOGGING

Globally, most dams were built before the widespread availability of wireline logging for geotechnical investigation. Any significant

new dam construction should include a programme of drilling and wireline logging for geotechnical and hydrogeological analysis. For any civil engineering project, the ground conditions represent the single biggest unknown which is especially relevant for dams due to the creation of artificial hydraulic pressures and the consequences of catastrophic failure. Wireline logging can provide valuable ground characterisation data for the design process and will form a permanent record of conditions before the dam was constructed.

ROUTINE INSPECTION

Once a dam becomes operational, routine inspection and maintenance of it and its associated structures will be necessary to ensure its ongoing safety. This is applicable for all dams, though the level and frequency of inspection may be dictated by the size or criticality of the particular dam. Whether identified from routine inspection or in response to changes it may be necessary to conduct detailed ground investigation including drilling and the collection of wireline-derived data to determine risk or aid rehabilitation. Any engineering assessment of a dam should include geotechnical analysis, as it is estimated that 70% of concrete dam failures are due to geology and 40% of embankment dam failures are due to foundations.

Wireline logging can provide unique data sets in three key areas of ground characterisation for dams, pertaining to structure, strength and hydrogeology.

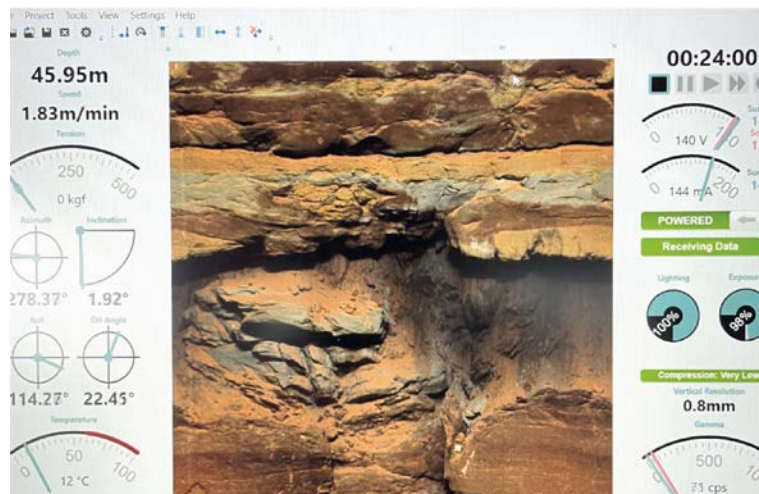
For structure, televiewers produce orientated images of borehole walls with geological features, notably bedding planes and fractures, delineated in terms of dip angles and direction.

Potential hazards can be identified such as thin shear zones, weak or continuous joints, weathered bedrock, solution features, fault zones, bedrock profiles and volcanic rocks.

If there is a lack of historical information regarding how foundations were constructed, or if problems with foundations are suspected, televiwers can provide permanent records which are informative and legally binding. For concrete and masonry dams test boreholes can be drilled into parts of the structure to allow for video inspections to detect cracks or other signs of deterioration.

Ground strength can be determined by measuring P and S wave velocities using a sonic probe, and by combining this with density measurements small strain moduli can be calculated in formations and foundations. A borehole geometry probe with x-y callipers can be used for stress analysis which can be useful for characterising hazards such as shear zones or shrink/swell.

Understanding the hydrogeology beneath and in the vicinity of dams is vital to ensure stability, as the artificial hydraulic pres-



The clarity of the Hi-OPTV as illustrated in this image can clearly identify fractures, voids, bedding, and the changing geology at given depths below ground level

ures can induce detrimental effects such as uplift or unwanted seepage and erosion.

Hydrogeologists have an array of probes available to them to characterise the subsurface conditions including electric probes to measure resistivity, neutron probes to measure porosity, NMR probes to measure

porosity, permeability and transmissivity, temperature/conductivity probes and flowmeters to identify flows and video inspections to investigate ducts and cavities. A combination of these probes can be used to characterise potential hazards including solution features, shrink/swell potential, settlement, and slide potential. ►

DRILLING HEADS FOR UNDER WATER APPLICATIONS

**CUSTOMISED
INNOVATION**



Drop us a line or call: sales@eurodrill.de
+49 2763 21 228-41 | www.eurodrill.de

- Due to sometimes complex hydraulic pressure profiles, any drilling programme conducted in the vicinity of a dam needs a comprehensive risk assessment to be conducted by a competent body to consider the potential for drill-induced problems such as artesian blowout, hydraulic fracturing, erosion, contamination, and heave. This should also include recommendations for drill completion and grouting once the borehole investigation is finished.

RESOURCES AND FUNDING

The construction of large dams raises complex financial questions regarding who will pay the costs. There is no single model for the financing and most commonly each dam will involve a unique approach. Depending upon the scale and impact of the proposed dam many stakeholders may be involved including government, local government, banks, including the World Bank, friendly foreign governments, corporations, and private businesses. In all cases, once constructed, the dam will have an owner who is thereafter responsible for the ongoing safety of the dam.

Ownership of dams lies in the hands of many types of organisations, from national governments through to private individuals. There will be national differences in regulatory frameworks and classifications which may affect

what resources are available for dam rehabilitation. So how do dam owners find out how to access potential funds available?

For the largest of dams, defined as over 15m in height or between 5m and 15m in height with a capacity over 3 million cubic metres, they will most likely be registered on the International Commission on Large Dams (ICOLD) database. ICOLD has affiliated national committees in over 100 countries, 40 of which have their own websites. ICOLD and these national sites provide useful information and links to partner organisations concerned with dam safety and funding.

The level of grants available for dam safety and rehabilitation will usually be a government decision, though the allocation process can be complicated with allocations often through government and local government organisations and programmes. The qualification for funding may require specific classification, risk analysis and the drafting of an emergency action plan. The need for rehabilitation is often identified by routine inspections by qualified dam safety experts and appointed engineers. These personnel may be able to advise on funding available. In most cases, the national or local government and regulatory authorities would be a good place to commence enquiries about funding.

US dam owners seeking funding for dam safety improvements and rehabilitation should initially contact their state government's dam safety office for advice. The Association of State Dam Safety Officials (ASDSO) also provides information and guidance on funding.

With 90,000 dams in the US and an average age of 60 years, the need for federal assistance for rehabilitation has been recognised with funding being made available through the Bipartisan Infrastructure Law. The package is worth US\$1.2 trillion over five years, but the amount available for dams remains unclear, while awards will likely be on a project-by-project basis. ASDSO has estimated that the cost of rehabilitation of the nation's non-federal dams is US\$76 billion. Over the next five years, the Federal Emergency Management Agency (FEMA) will award US\$733 million through the Bipartisan Infrastructure Law in dam safety grants to states and territories to enhance dam safety and rehabilitate or remove ageing dams.

An ongoing allocation of grants available to states is through the High Hazard Potential Dam Rehabilitation programme (HHPDR) administered by FEMA. High Hazard Potential is a classification standard for any dam whose failure or misoperation will cause loss of human life and significant property destruction. This programme provides technical, planning, design and construction assistance in the form of grants for the rehabilitation of eligible high-hazard potential dams, with US\$22 million awarded in 2022.

The Dam Safety Group (DSG) brings together a group of member companies, both instrument OEMs and service contractors, ideally positioned to use proven geophysical technologies, services and products for dam site investigation and monitoring together with seismic monitoring via earthquake early warning and evaluation systems. ▼

*National project
Polavaram
Dam under
construction on
the Godavari
river, Andhra
Pradesh, India,
in 2018*



FUTURE OF MINING AUSTRALIA

ACCELERATE YOUR ROADMAP
TO ZERO HARM, ZERO ENTRY
AND ZERO EMISSIONS

SYDNEY 20 - 21 February 2023

Sydney Masonic Centre

PERTH 18 - 19 September 2023

Pan Pacific Perth

 **#FOMAustralia**

australia.future-of-mining.com

REGISTRATION IS NOW OPEN!

VISIT [AUSTRALIA.FUTURE-OF-MINING.COM](https://australia.future-of-mining.com) FOR MORE INFORMATION

UNPARALLELED MINING REPRESENTATIONS FROM 100+ COMPANIES CONFIRMED TO ATTEND INCLUDING:



BHP



GLENCORE



RioTinto



Brought to you by:



Minjng Magazine



Aspermont Limited
Information for Industry

Geoprobe – all about taking care of people

While many manufacturers like to shout about themselves, the team at Geoprobe has always kept a low profile allowing the quality of the drill rigs it manufactures to do the talking. However, during Groundwater Week 2022, in Las Vegas, Duncan Moore, *GDI*'s editor, had the opportunity to sit down and talk shop with the company's president Tom Omli

Tom Omli, Geoprobe's president, is surely one of the most unassuming characters in the drilling industry. For example, when *GDI* met him at Groundwater Week in 2022 he referred to himself as a simple farm boy who is blessed to be part of a talented team. However, to take that statement at face value is to severely underestimate the company's collective accomplishments, as today Geoprobe is not just one company but two as it incorporates Drillmax, too, and is a major player in the international drill rig market.

The history of Geoprobe dates back to 1987 when the business

was founded by two engineers – Mel Kejr and Tom Christy – who were focused on designing innovative environmental equipment and making sure customers were taken care of. However, it was another five years before Omli became involved with the operation. He took up the story: "I was a farm boy in central Kansas when I got involved with Geoprobe. It was very small back then, like 10 people helping out the two founders.

"And back in those days, we all did everything... And then as things started growing in the '90s, I typically was focused on taking care of customers on the sales and service support side."

That focus on the business' customers permeates Geoprobe. Over the years, Omli accepted responsibilities in various areas of the company until he developed into his current role as president. For him, the job titles may have changed but his focus remains the same. "At the end of the day, my current role is still just taking care of people. And that means taking care of our employees, our customers and our vendors."

GROWTH

As part of that "taking care of people" Omli has always spent time attending industry events. Over the years he would frequently meet other vendors and among them was Donnie Wood, the general manager of Drillmax. When Omli learned that Ron Owens, Drillmax owner, was looking to retire they started having conversations about the possibility of the two companies working together.

"And it was two or three years of conversations. Then in 2017, Geoprobe, acquired Drillmax and we became one," Omli said. "And we started a process of moving Drillmax manufacturing to Salina, Kansas, from Florida and investing Geoprobe engineering, marketing, and business systems into a new line of water well equipment."

It is at Geoprobe's Kansas facility that the two companies' rigs are now designed, developed and manufactured. The same – albeit larger – engineering and manufacturing facility that introduced some of the first direct-push hammers.

"Geoprobe designed, tested, and manufactured percussion hammers coupled with innovative direct push technology systems. That created a whole area for us in the environmental direct push world that we really became the pioneers in," Omli said.

"If you look at the first 20 years of our company, probably 75% of our engineering efforts were some offshoot of that direct push. So that was a big deal. And then we started incorporating rotary head options on our rigs in the mid- to late-'90s. That was another big thing.

"Then we started creating these combination machines that allowed our customers to do multiple things with one small machine. So those were some of the things that were big difference makers for us while we were still a very young company."

COVERING ALL BASES

That willingness to listen to customer requests and then act

The Drillmax DM650 offers a 28.5ft stroke, 40,000lb pullback, and 8000ft-lb torque to handle deeper wells along with the weight of the steel casing



on them has led Geoprobe to be able to cover a wide range of drilling disciplines.

"We serve environmental, geo-technical, water well, geothermal, cathodic protection, exploration," Omli explained. "And we keep working on products in every segment. And we're always looking at how can we invest in those segments and we also consider other segments we may want to start investing in."

"What we've seen is some of our customers will also start working in multiple segments, which is really neat because we might be working with Mr Smith, say, of Atlanta, and they used to be all in one segment. And now they're in two or three. And they wouldn't be able to get into those other segments if we weren't already providing the equipment and supplies for different applications."

The ever-modest Omli then went on to say: "You develop a customer base who calls you because they trust you to make a good product and service it. Then you start getting calls from people, who you just never imagined would call you, who ask you to build them what they need to do something. We have sonic machines for that very reason. We got calls from people who own sonic equipment and they said: 'Look, would you please make sonic for us?' and so we did."

NEW DEVELOPMENTS

The latest development from Geoprobe is the DM650 which was the centrepiece of the company's display during Groundwater Week. This latest offering is a large water well rig for geothermal and cathodic protection.

"We're pretty excited about that. That's a new thing. We've been working on it for two years," Omli explained. "It's definitely an exciting product for us."

The willingness to take on customer requests and develop new products is one of the strengths of Geoprobe and it is able to do so because it has a

strong in-house engineering team. As Omli noted: "We're strong with in-house engineering and strong in-house service support."

Just how Geoprobe has achieved success is an issue that Omli likes to play down. "Generally speaking, we're a bunch of farm boys who focused on making drilling equipment."

However, he then added proudly: "A lot of industry leaders come to us for solutions now. And it wasn't that long ago, we were the little boys. In many ways we still operate as a small company, providing personal attention with tools-in-ground field demonstrations and product training, but we have the engineering, manufacturing, and business systems of a much larger organisation."

SERVICE IS EVERYTHING

But what was the turning point for Geoprobe? When did it go from being "a bunch of farm boys" to an industry leader?

"I think at the end of the day, it's really good product," is the answer from Omli. "We're known for really, really good service. So, who we sell to is a lot of what I call Mr Smith, Mr Johnson operations – smaller companies, and they realise pretty soon after we meet and spend time together that we really care about them. And we don't want to just sell them equipment, we absolutely want to support them and help them become better."

"When their machine does break, and it will someday, they know we are as serious about fixing it as we were the day we sold it to them. I just don't think that's common anymore, and they really appreciate it. Once they start working with us, they stay with us. A very high percentage of orders in 2022 was repeat business."

"You start working with them, and you just get more business. And it's pretty fun. They absolutely trust us. I know that's an overused word in marketing. But, in our case, we depend on it. But I think that trust is based on really good product and then really good



Tom Omli, president of Geoprobe and Drillmax, has served the company in a variety of roles during his tenure

service and support from people who truly care. And that's not just me. We have a lot of people who truly care. If you're a customer of ours, and your machine was broken, we all treat it like it's our machine you're using. Our farm boy heritage has engrained in us what it means to depend on a piece of equipment for your livelihood which spurs a real urgency across the company to get them up and running quickly."

That sense of family values and shared ownership that runs throughout Geoprobe even extends to those in the industry who are not yet customers. "I think that those who take care of people still win, right? That's what you want to do right, take care of people? It is what we want to do. We're passionate about taking care of people, and I would just invite anybody from anywhere in the world to come to visit us. We've got a lot of rigs, tooling, and technology to show people. We like to introduce not just our products but also our people and service support systems when people want to come see our rigs in action." ▼

Geoprobe engineers are expected to get dirty – in the shops building equipment or in the field testing the latest innovations for an array of drilling applications, such as the new DM650 rig, which the company debuted during Groundwater Week



Finding success in foundation repair

Joe Haynes, president of Little Beaver, tells *GDI* how the Big Beaver became one company's standby for repairing foundations

The Big Beaver drill's flexible positioning allows users to get close to structures

The strength of a structure lies in its foundation. Without a strong base, the building is at risk. And even though a house may have initially been built with a sufficient base, foundation repair is occasionally unavoidable.

Eddie Zansler, the owner of North Dallas Foundation Repair, has been in the business for 24 years. He knows how important it is to have a hardworking crew and perhaps even harder-working machinery on a jobsite. When it comes to installing concrete piers, Zansler swears by the Big Beaver earth drill from Texas-based company Little Beaver.

Foundation problems are most commonly a result of soil conditions, which is evident in clay-filled Texas. Expansive clay soil affects structural support, often leading to foundation cracking over time.

"The north Texas dirt we're known for shifts over time," Zansler says. "It contracts and expands, depending on the weather. We're very familiar with its effect on properties' foundations."

When a foundation begins to shift, the entire property can show signs of damage. Visual indicators on a house include misaligned doors, cracks in sheetrock and brick separation. Other signs include warped framing, plumbing breaks and tilting chimneys.

"It's a good idea to call in a contractor or inspector when you first spot signs of damage," Zansler says. "Catching a problem early on can help reduce the cost of having your entire foundation repaired. There are several different approaches to the process and some of that decision comes from how far along the damage is."

While there are many practices and methods of foundation repair, one thing is certain: if not done correctly, it can cause expensive problems down the line.

"Concrete piers are an economical solution"



A METHOD TO THE MADNESS

There is no one-size-fits-all approach to repairing foundations. There are upwards of 10 methods of foundation repair, and they often go by multiple names. In the most common method, contractors will use some version of a steel or concrete pier support to minimise stress on foundations.

Steel piers – also called push piers and helical piers – are gaining popularity because they result in minimal landscape interruption and can be installed faster than other methods. These screw-like steel shafts are driven into the ground and are commonly used for new construction. However, concrete piers can be a more effective option, as they can withstand higher load capacity and are often less expensive.

"Concrete piers are an economical solution for a lot of customers," Zansler says. "They're also sometimes the only choice, as steel piers aren't usable in all locations or soil conditions."

When it comes to installing concrete piers, the 6in round concrete sections are pushed directly into the ground. This is done with a hydraulic ram that is secured to the slab of the

structure that needs to be lifted, and then it is lifted until a certain resistance pressure is established.

There are many ways to remove dirt to prepare for foundation repair. A manual process — hand-digging holes — results in little landscape interruption, but is much harder on the workers. Large equipment options like a mini excavator are less labour-intensive but can result in a torn-up yard and increased project costs.

For residential foundation repair, which makes up the majority of Zansler's projects, larger equipment is seldom the best choice. These projects often involve tight spaces and finished landscaping, which can present challenges. For these cases, Zansler and his crew turn to the Big Beaver drill from Little Beaver. The auger drill rig is used for environmental test wells and soil sampling, but contractors nationwide also favour it as a reliable machine for foundation repair.

"The confined spaces and the landscaping make it hard to use an excavator or oversized equipment," Zansler says. "The Big Beaver is ideal for those situations."

FOUNDATION REPAIR

No matter which method is used for installing piers, there is no doubt that they require a considerable amount of manpower, machinery and time. When installing a drilled concrete pier, hard-working employees are key, but so is finding pieces of machinery that are perfect for the job.

To install the concrete piers, Zansler and his crew must first dig a 2ft square hole in front of the foundation, then they dig 2ft down below the foundation, followed by an additional foot underneath the home. After these holes — called boxes — are established, they bring in the Big Beaver.

Crews use the 12in auger to drill a hole anywhere from 12 to 15ft deep. Depending on the structure and soil conditions, the angle of the pier can range from 10 to 15 degrees, which makes the Big Beaver's ability to align in any position from vertical critical to the installation process. The drill's flexible positioning allows users to get close to structures.

Once the hole is drilled, Zansler's crew places a steel rebar cage down the hole and secures it to another cage for the box. Once these are in place, they then fill the hole and the box with concrete. Once the concrete has dried, this gives them the platform they need to lift the structure.

Zansler attributes the company's efficiency and time savings to the Big Beaver. Besides those benefits, he has noticed reduced worker strain and improved employee retention.

MINIMISING LABOUR

The Big Beaver requires less manpower than alternate methods, and less worker fatigue means fewer safety issues and overall happier employees.

"With smaller handheld augers, you have to lift up on the auger head itself, which really strains my men," Zansler explains. "Whereas with the Big Beaver, all of the lifting is done by the machine. Because it is hydraulically driven, the up and down movement of the auger is

controlled by simply pushing and pulling a lever. The rotation of the auger for forward and reverse is done with a separate lever. Because the Big Beaver uses continuous flight augers, this brings all of the soil cuttings to the surface where they can easily be removed with a shovel."

By the end of an eight-hour, 100-degree workday, it is natural that workers experience complete exhaustion. But with a Big Beaver, it does not matter what time of day it is or what the temperature is; the machine is always ready to tackle a project.

In an industry where physical labour plays a huge role, making the work easier for employees makes all the difference. Zansler says they have added motorised wheelbarrows and dump trailers, among other equipment, to help ease the physical strain on workers. "We want them to utilise the equipment," Zansler says. "Not their backs."

Keeping workers safe and uninjured is key to avoiding the dreaded employee turnover. Providing easy-to-use equipment like the Big Beaver is key, according to Zansler.

"The machines are straightforward," he says. "Some of my guys have been working for me for 22 years, so they know the machines like the back of their hands."

IF IT AIN'T BROKE, DON'T FIX IT

The Big Beaver has been Zansler's number-one piece of equipment

for more than 12 years. With the combination of safety and high-quality work they can provide with it, he says they will continue using it.

"With the Big Beaver, we're able to reach the maximum depth possible, and penetrate rock if we hit it," he says. "It's so powerful when drilling the holes, which results in a much higher-quality pier."

The Big Beaver's power comes from its Honda engine, which delivers 690ft-lb of torque to bore through any soil type.

"Its power is incredible," Zansler says. "The rpm when it penetrates the soil is considerably faster than other augers. I would say it's a 15-20% increase in speed."

He estimates that he has used the Big Beaver to drill thousands of holes for foundation repair around the north Dallas area. With increased power and speed, Zansler and his team can complete more projects per week than they would be able to with an alternate method.

Overall, Zansler credits the Big Beaver with saving him hours or even days on a project. Without it, he would have exhausted employees and put more time into projects and had lower-quality results. Just like a house needs a strong foundation, a contractor needs strong equipment, and the Big Beaver works to support both. ♥

"We're able to reach the maximum depth possible"



The Big Beaver's power comes from its Honda engine, which delivers 690ft-lb of torque to bore through any soil type

Canada's drilling sector set for growth in 2023

Having spoken to key players in the Canadian drilling industry, Eugene Gerden has concluded that the geotechnical sector is set for growth in 2023, despite high inflation and recent generally negative forecasts for the country's economy

As with the majority of Western countries, Canada has been faced with the worst consumer inflation outbreak since the "Great Inflation" of the mid-1960s to early '80s in 2022, which has had a negative effect on the majority of the country's industrial production, including geodrilling. This in turn has led to significant growth in processing and other costs for the majority of local and foreign players in the sector.

Traditionally, a significant part of the Canadian geodrilling and mining activities have been based around Ontario, Canada's most populous province and the second-largest province by total area. In recent years, the volume of such activities within the territory of the province has significantly increased despite the consequences of the pandemic and complex business environment. Ontario remains Canada's leader in mineral exploration expenditures, accounting for roughly 30% of all mineral exploration expenditures in Canada. Ontario is also Canada's second-largest mineral producer, generating around C\$10.5 billion worth of minerals, accounting for

24% of the country's total mineral production.

Graeme Laberge, an official spokesman for the Ministries of Mines and Natural Resources and Forestry of Ontario said in an exclusive interview for *GDI* that in 2022 Ontario exploration spending increased which resulted in an increase in exploration metres drilled. Analysts from the Ministry expect that the same trend will continue to be observed in 2023.

INVESTING IN ONTARIO

Laberge also added that the authorities of the Province continue to support exploration and geodrilling activities in Ontario. "Ontario is investing C\$24 million over three years in the Ontario Junior Exploration Programme. The commitment includes C\$12 million for a critical minerals funding stream that will encourage early exploration, mineral development and mine construction throughout the sector. The support for junior mineral exploration is a priority for the province and Ontario will continue to support this vital part of the minerals sector to create a

'made-in-Ontario' supply chain for battery technologies and EVs," Laberge said.

In general, drilling activities in Ontario have been growing steadily since 2019, both in terms of total holes drilled and metres of drilling intervals tested. High mineral prices and the ever-growing electric vehicle market will contribute to the further growth of such activities in years to come. This will ensure a stable demand for labour, particularly for experienced drill workers. Probably the biggest such demand is expected to be observed in the groundwater sector of the country.

GROUNDWATER DEMAND

In contrast to some other developed nations, which have been faced with the problem of groundwater depletion the situation in Canada is significantly better, which is also due to the low demand for groundwater to date.

David Rudolph, a professor of earth and environmental sciences at the University of Waterloo, believes that Canada's dependence on groundwater as its primary drinking water resource realised a significant spike between the years 1970 and 2015, with an increase of about 10 to 30%. According to his data, today, about 10 million Canadians daily depend on groundwater as their primary source of fresh water, and this dependency is expected to grow. In Ontario, for example, about 40% of the population relies on groundwater while the entire province of Prince Edward Island is dependent on the resource.

This means that Canada will have to pay more attention to better assessing the use of its groundwa-

DEEP is a Saskatchewan privately held corporation with a mission to develop Saskatchewan's geothermal resources for power generation



ter reserves, creating conditions for their development. A part of these plans is better management of water use, which will help to avoid excessive declines in groundwater levels and thus will not be associated with the need for drilling deeper wells. According to Canadian analysts, it is planned that more active drilling of recent water wells will help to support irrigated agriculture.

Most analysts expect groundwater demand in Canada to continue to grow in years to come to address shortfalls in water from surface water sources. The only problem associated with this is the high threat of contamination of groundwater with hydrocarbons, taking into account that there are more than 700,000 oil and gas wells, and more than 20,000 injection wells in Canada, confirming the status of the country as being among the world's largest oil producers.

In the meantime, in addition to groundwater, particular attention will be paid to the further development of geothermal energy, given that Canada has enormous geothermal energy resources, varying in quality, across the country.

GEOTHERMAL DEVELOPMENT

According to the Canadian government, while the majority of Canada's population is connected to a regional electricity grid, this is not the case for most communities and industrial sites in Canada's North, which typically rely on diesel for heat and power. Due to the current energy crisis in the world in recent months, the use of such energy resources has become very expensive for most Canadians living in these regions.

In addition, the use of these hydrocarbon technologies has significant environmental impacts. In this regard, the unlocking of Canada's geothermal potential could be considered one of the ways to solve the existing problem and cover the existing energy shortage in the northern provinces of the country.

In Canada, hydrothermal reservoirs are found in volcanic rock in British Columbia and the Yukon, and in sedimentary basins in the Prairies and parts of the North.

Last year Jonathan Wilkinson, Minister of Natural Resources, announced a C\$5 million investment in Novus Earth, a Canadian company, responsible for developments in the field of geothermal technologies, to execute a front-end engineering design (FEED) study for the Latitude 53 geothermal energy project in the community of Hinton, Alberta.

In the case of the Yukon region, despite its status as the smallest and westernmost of Canada's three territories, it can become one of the centres of geothermal energy production in the country in years to come. According to a recent report by the Canadian CBC News newswire, the region could have laws in place that govern the extraction of geothermal energy put in place for the first time.

According to experts, the initial data suggests that the kind of heat in the crust in Yukon could be comparable to that seen in Nevada and Utah in the US – the areas that are already producing upward of 30% of all geothermal energy globally.

As of now, there's at least one geothermal project in the works in the territory. A couple of years ago, the Little Salmon Carmacks First Nation entered into an agreement with an Alberta-based company to get at reservoirs beneath its land.

CRITICAL MINERALS

However, there is a possibility that such a situation will change. As part of the plans by the Canadian authorities includes taking measures for further reducing red tape and regulatory burdens in the industry this year, as well as creating conditions for the increase of production of such critical minerals as nickel, copper, zinc, platinum group elements and cobalt, as well as tantalum, caesium, as well as REE.

Historically, the Canadian mining and geodrilling sectors remain still within the sphere of interest of global mining companies and equipment suppliers. In recent months, many of them have announced plans to accelerate expansion in the local market. One of them is Swedish-based Epiroc AB, which in recent years has significantly expanded its portfolio of Canadian-based assets and completed the launch of some new products in the market.

Peter Walsh, national sales manager Exploration Capital Equipment, in an exclusive interview, said: "Epiroc introduced the CS160 Smart surface rig at the PDAC trade show in June of 2022. We will soon release this machine for sale in the Canadian market in 2023."

According to him, in general, Canada remains a key target market for exploration development for the company and "a benchmark for exploration trends globally".

Nicolas Tremblay, a senior manager at SMA Équipements Inc., an official dealer for Comacchio in Canada, said the Italian drill rig manufacturer is ready for further development in the Canadian market in 2023, while its range traditionally enjoys big demand among local customers.

"The Comacchio product is a well-established product, very well known in the geotechnical industries. Our extensive presence in the market will the better serve the industry and fortify the presence of Comacchio in Canada," Tremblay said. "We had the chance in this industry to see growth during the pandemic period as infrastructure was only going higher and faster. It is now taking a turn to slow down after all the positive waves we have seen over the last two years."

Most of the market players and analysts interviewed for this feature expect further growth and development of the Canadian geodrilling and mining sectors this year, although much will depend on the ongoing economic situation in the country. ▼

"Ontario is investing C\$24 million over three years in the Ontario Junior Exploration Programme"

What's new in construction?

During CONEXPO-CON/AGG 2023, the international trade show for the construction industries, more than 1,800 exhibitors will be showcasing new products and technologies at the Las Vegas Convention Centre in Nevada, US, on March 14-18. Here, *GDI* highlights some of the drilling equipment and solution providers exhibiting at the show

American Augers

www.americanaugers.com

Main business sector: HDD

At the show, we will be

launching: The reimagined DD240T – a mid-size directional drill that features an upgraded CAT engine and industry premier Gardner Denver fluid pump, maximising power and uptime on any HDD jobsite.

The DD240T features a Tier 4 Final Stage 5 CAT engine that meets the emission standards for engines in Europe. By reducing jobsite emissions, the new engine allows HDD contractors to take on even more jobs. The 536hp engine also brings powerful drilling capabilities to a mid-size drill to maximise jobsite productivity.

The DD240T also features a new onboard fluid pump from Gardner Denver, which has a rating of 450gpm. However, to improve the machine's longevity and increase performance and uptime capabilities the DD240T is set to run at just 300gpm. This allows crews to work efficiently without pushing their drill to its limits every time it is turned on.

Additionally, the DD240T has a redesigned cab to boost operator comfort. With an improved air conditioning system and a taller cabbed unit, contractors can stay cool and comfortable, increasing productivity.

American Augers will also use CONEXPO to introduce the M300DH.

Stand number: S60207

Brunner & Lay

www.brunnerlay.com

Main business sector:

Rock drilling tools

At the show, we will be

exhibiting: The Arrow Drilling System which was developed to

enhance the ability of modern, high-powered rock drills in both surface and underground applications to produce precise holes in the modern mine and quarry site.

The Arrow provides less bending stress on the drill string and reduces hole deviation to improve the service life of the string, thus saving fuel and wear and tear on the drill itself. Improved blasting reduces fly-rock, back-break and the string delivers intended fragmentation to reduce the need for secondary drilling and breaking, greatly benefitting the operational bottom line.

Available in T38, T45, T51 and B60 thread.

Stand number: South Hall #62517

ChemGrout, Inc.

www.chemgrout.com



The ChemGrout CG-680 High-Pressure series is a high-pressure, high-capacity, skid-mounted colloidal grout plant

Main business sector:

Construction/industrial grouting equipment manufacturer

At the show, we will be

exhibiting: The ChemGrout Colloidal Grout Plant CG680, the CG550 Rugged, and the CG500 High Pressure.

Stand number: Silver Lot, #6817

Drill King International

www.drillking.com

Main business sector:

Manufacturers of rock drilling tools mainly for foundation construction and water well sectors.

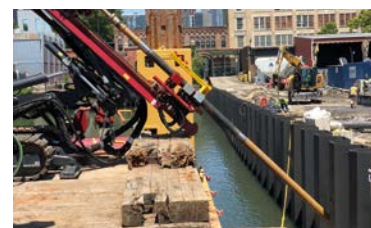
At the show, we will be

exhibiting: A complete range of DTH hammers, bits, shock absorbers and related products and also launching the new King Wing casing driver system.

Stand number: S-64921

Eijkkelkamp North America, Inc.

www.royaleijkkelkamp.com



A barge-mounted example of a Fraste MITO 25 drill rig supplied by Eijkkelkamp North America

Main business sector:

Manufacturer of drilling equipment

At the show, we will be exhibit-

ing: Several foundation drilling rigs – both sonic and conventional, and we will be demonstrating our remote-control rod handling arm that can be attached to any rig.

Stand number: D2527

Epiroc

www.epiroc.com



Epiroc's T25 R rig is suitable for quarrying applications and construction projects

Main business sector: Mining and infrastructure

At the show, we will be

exhibiting: A wide range of new and existing products from Epiroc.

Stand number: C31348

Geoprobe and Drillmax

www.geoprobe.com



The 3126GT geotechnical drill is one of the newest options from Geoprobe

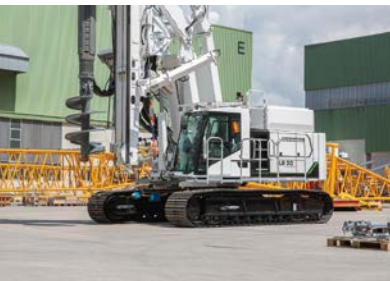
Main business sector: Drilling industry – geotechnical, environmental, exploration, water well, geothermal, cathodic protection.

At the show, we will be exhibiting: The Geoprobe 7822DT rotary and direct push drill rig and Drillmax DM250 water well and geothermal drill rig.

Stand number: D-1043

Liebherr-Werk Nenzing

www.liebherr.com



Liebherr has expanded its 'unplugged' line of battery-electric plant with the introduction of the LB 30 unplugged drilling rig

Main business sector: Deep foundation machines, crawler cranes, and duty cycle crawler cranes.

At the show, we will be exhibiting: Over 30 machines from seven of our product segments and these will include our expanded portfolio of rigs for deep foundation applications.

With the introduction of the LRB 23 piling and drilling rig, which will be on display at CONExpo, Liebherr is closing the gap between the LRB 16 and the

long-established LRB 355. Additionally, the battery-powered drilling rig LB 30 unplugged, which has the same performance specifications as the conventional version but with zero emissions, will also be on show in Las Vegas.

In addition, Liebherr will also be showcasing its new crawler cranes the LR 1400 SX and LR 1110.1 and new digital

options including MyJobsite – a digital solution for deep foundation work that makes it possible to record, display, analyse, manage and evaluate relevant process, machine, construction site and position data and LIPOS, the company's positioning system for deep foundation machines.

Stand number: Festival Area, Booth F9253 ►



casagrande

DRILL DEEP



AND GROW



casagrandegroup.com



The LSGT+HDA allows for precise and easy-to-operate drilling for standard penetration test and soil sampling

Lone Star Drills

www.lonestardrills.com

Main business sector: Soil sampling, water well drilling and geotechnical testing.

At the show, we will be exhibiting: The LSGT+HDA tracked unit and other drilling rigs.
Stand number: S61548

Mincon

www.mincon.com

Main business sector:

Rock drilling systems

At the show, we will be exhibiting: Our 2023 product line, including the next-generation range of DTH hammers for all applications – from blasthole drilling to large-diameter foundation pile drilling.

Alongside the DTH hammer range, Mincon will also showcase the latest successes achieved with its Spiral Flush geotechnical systems, which boast patented air-control features that allow for safe drilling in sensitive ground conditions or near existing structures.

Finally, for the North American market, Mincon will show off its turnkey drilling solutions for the solar installation market.

Stand number: South Hall, First Level, S60151

Numa Hammers & Bits

www.numahammers.com



Numa will have its range of hammers and bits on display at CONExpo

Main business sector: Rock drilling products, DTH hammers and bits, HDD hammers and bits.

At the show: Numa will be exhibiting their 'Made in the USA' rock drilling hammers and bits, capable of drilling in a wide range of rock formations and conditions. A special spotlight will be on the Super Jaws overburden bits used for simultaneously drilling and

casing 5-1/2in to 48in holes in hard rock and unconsolidated ground conditions of overburden, boulders, or bedrock. With its unique design, Super Jaws utilises wings that extend out to drill a full-diameter hole while in the drilling position. Upon completion of drilling, the wings retract back into the guide body for extraction of all tooling to the surface while leaving the casing in place. There is no reverse rotation required, nor any expensive rings left in the hole.

The company will also feature its Casing Ring Bit Systems for simultaneously drilling and casing vertical or horizontal holes in piling, foundation, anchoring, geothermal, and other casing applications. The system consists of a pilot bit, casing shoe, and heavy-duty ring bit and is available in a wide range of sizes for drilling holes 16in to 48in in diameter. Options are available for both drill-through and non-drill-through applications requiring the installation of casing into bedrock. It is a complementary product to Numa's highly successful Super Jaws and Impact Ring Bit Systems.
Stand number: South Hall Booth S62521

ROC Equipment

www.rocequipment.com

Main business sector:

Foundation drilling

At the show, we will be

exhibiting: Grabs, rotators, oscillators, and casing.

Stand number: Diamond Lot — D2735

TEI Rock Drills Inc.

www.teirockdrills.com

Main business sector: Rock drills, attachment, limited access in civil construction.

At the show: TEI will be showing its Electric TD100, HCC20X and its HEM drilling attachment.

Stand number: S60029

Vanair Manufacturing, Inc.

www.vanair.com

Main business sector: Mobile power solutions to include drill compressor modules, abovedeck hydraulically driven air compres-

sors, PTO underdeck air compressor systems, engine driven air compressor systems, electrified power equipment, engine starting systems, and welding.

At the show, we will be

exhibiting: The DR310 drill compressor module, Viper gas rotary screw air compressor, Cap-Start heavy-duty engine starting system, Air N Arc, and our patented line of EPEQ electrified power equipment.

Stand number: S62217

Vermeer Corporation

www.vermeer.com



Vermeer's crawler-mounted D550 HDD rig offers class-leading torque and advanced telematics

Main business sector:

Horizontal directional drilling

At the show, we will be

exhibiting: The Vermeer 550,000lb D550 horizontal directional drill (HDD) with its class-leading 100,000ft.lb of torque, advanced telematics, smart onboard technology and diagnostic information. This crawler-mounted drill can deliver a steady, ultra-slow speed control for working in challenging hard rock, as well as rotation speed for boring in challenging clay conditions.

Stand number: D1214 – Diamond Lot

XCMG

<http://en.xcmg.com/en-ap>

Main business sector: Cranes, excavators, drill rigs, loaders, road rollers, pavers, graders, aerial work platforms, dump trucks, and folk lifts.

At the show: XCMG will showcase 50 models from its crane, excavator, drilling, loader, road roller, paver, grader, aerial work platform, dump truck and folk lift ranges, with a 108% increase on the presented models, compared with CONExpo 2020.

Stand number: F9413 ♥



A selection of hydraulic excavator mount drilling attachments will be displayed by TEI Rock Drills

BITS

MGS +44 (0) 1359-271167
ROCKBIT UK LTD (see under Equipment)



TRICORE LIMITED
Woodburn Road,
Blackburn Industrial Estate,
Kinellar, ABERDEEN
AB21 0RX, Scotland
Tel: (01224) 790338

ROCK BITS FOR THE DRILLING INDUSTRY
SPECIALISTS IN THE SUPPLY AND REFURBISHMENT OF ROCK
BITS FOR THE WATERWELL DRILLING INDUSTRY.
LARGE DIAMETER ROCK BIT RENTAL
www.tricore.co.uk

DRILL RIG REPAIRS

ROCKBIT UK LTD (see under Equipment)

DRILL RIGS (ROTARY)

ROCKBIT UK LTD (see under Equipment)

DTH HAMMERS & BITS

ROCKBIT UK LTD (see under Equipment)

GeoDrilling International

Read specialised reports on every aspect of
drilling in soils and rocks – wherever you are

Visit

www.geodrillinginternational.com

BOREHOLE PUMPS

GEQUIP WATER SOLUTIONS LTD Tel +44 (0) 1473 462046
www.gequipwatersolutions.com. Borehole Pumps,
Downhole CCTV, Wellmaster Rising Main, Starter Panels,
Compression Fittings
PROQUIP DIRECT LTD Tel: +44 (0)20 8712 5982
www.proquipdirect.com. Franklin Borehole Pumps, SS and
PVC Wellheads, I-GON Iron Bacteria Remover, QUAD 4 Joint
Kits, BORELINE Flexible Rising Main
ROCKBIT UK LTD (see under Equipment)

CASING & ANCILLARY EQUIPMENT

MGS +44 (0) 1359-271167
ROCKBIT UK LTD (see under Equipment)

CORE BARRELS & ANCILLARY EQPT

MGS +44(0) 1359-271167

TECSO, S.A.
DRILLING EQUIPMENT

TECSO is one of the manufacturers
leaders in the drilling industry.
We produce in our modern
facilities: Core Barrels, Rods,
Casings, Diamond, Carbotec
& T.C. Core Bits, Samplers,
Wire-line Equipment and
Accessories for Mining,
Geotechnia, and
Civil works.

www.tecso.es - comercial@tecso-sa.com - +34 918 701 547

DRILLING FLUIDS

MGS +44(0) 1359-271167

DRILL PIPES, RODS & TUBULARS

MGS +44 (0) 1359-271167
ROCKBIT UK LTD (see under Equipment)

DRILL RIGS FOR HIRE

ABI EQUIPMENT LTD +44 (0) 1604 586960 www.abi-eqp.com.
For ABI and Delmag rigs and attachments (see under
Drill Rigs (Rotary))
ROCKBIT UK LTD (see under Equipment)

Rockbit uk
Drilling Equipment Designed and Manufactured in the UK

- Full Range of Cable Percussive Tooling
- Fabrication Services & Bespoke Design
- Casing, Shoes, Drive Heads, Adaptors
- Wildbore LoopMaster & GroutMaster
- Mud Pump & Mist Pump Sale & Hire
- Drilling Rig Sale, Service & Hire
- Drilling Rods, Polymer & Foam
- Drill Bits, Ridgid Hand Tools

T: 0191 2636432 E: sales@rockbit.co.uk W: rockbit.co.uk

**GeoDrilling International**

Print - Online - Tablet - Mobile - Newsletter



www.geodrillinginternational.com

GEO THERMAL EQUIPMENT & MATERIAL SUPPLIES

MGS +44 (0) 1359-271167

OVERBURDEN DRILLING SYSTEMS

ROCKBIT UK LTD (see under Equipment)

WANTED**DRILLPLANT LTD.**
DRILLING RIGS & ACCESSORIES**Wanted**

Used Drilling Equipment
Drilling rigs any year/make
Compressors, Mud pumps
Drill pipe, Casing, bits etc

Email: info@drillplant.com

Tel: Sean

(+353) (0)868115128

LOGGING**GEO EXPERTISE
INDEPTH**

Borehole Logging & Video Surveys

T: +44(0) 1939 210 710

E: office@europeangeophysical.com
www.europeangeophysical.com**PUMPS****HYDRAULIC DRIVE MUD PUMPS****Small & Lightweight Aluminum Model:**

7.5"x10" duplex pump fits in place of a 5"x6"
and weighs half as much. Pumps 300 gpm at up
to 800 PSI. Mono and triplex pumps also available.

CENTERLINE
MANUFACTURING
903.725.6978
www.centerlinemanufacturing.com

**WELL REHABILITATION**

PROQUIP DIRECT LTD, Tel: +44 (0)20 8712 5982
www.proquipedirect.com. Franklin Borehole Pumps,
SS and PVC Wellheads, I-GON Iron Bacteria Remover,
QUAD 4 Joint Kits, BORELINE Flexible Rising Main

**Geophysical
Logging
Specialists****ROBERTSON
GEO**

Unlocking Your GeoData

UK: +44 (0) 1492 582 323
USA: +1 (559) 456 1711
ASIA: +852 650 33486

No project is too small, no project too large or challenging

www.robertson-geo.com**SITE INVESTIGATION**

STRUCTURAL SOILS LTD, The Old School, Stillhouse Lane,
Bedminster, Bristol BS3 4EB, UK.
Tel: +44 (0) 117 947 1000 E-mail: ask@soils.co.uk
www.soils.co.uk

GeoDrilling International

Read specialised reports on every aspect of
drilling in soils and rocks – wherever you are

Visit

www.geodrillinginternational.com**Mining Magazine**

Mining Magazine is the mining
industry's leading magazine

Print • Online • Tablet • Mobile • Newsletter

www.miningmagazine.com



**DYNAMIC
POWER.**

KR 805-3GW

Geothermal Drilling Rig

Engine power: 160 / 175 kW

EU Stage V / EPA Tier 4f

Control architecture: performance level C

Energy Efficiency Package (EEP)

Weight: 19.5 t

UNSTOPPABLE!

GeoTHERM
expo & congress

March 02 - 03, 2023
Offenburg, Germany

KLEMM drilling equipment stands for the latest, most sophisticated drilling technologies made in Germany. Because every detail is thought through and designed in a particularly robust way our systems stand for a unique, unstoppable DYNAMIC POWER! Benefit from excellent reliability and performance with the lowest total cost of ownership (TCO). We'll tell you how we can make you unstoppable – give us a call: **+49 2761 705-0**

www.klemm.de

KLEMM
Bohrtechnik

POWER OF KLEMM



3126GT Geotech Rig

▶ geoprobe.com/3126GT

Engineered and Supported to Make Geotechnical Drilling

Faster. Easier. Safer.



“It’s more convenient. It’s helper friendly. It has all the power you need and you don’t have to manhandle things as much. It can handle auger and rotary work and then switch to air. It’s easy to set up and run and the size makes it convenient for environmental even though it’s a geotechnical rig.

— Shawn Mathers, Operations Manager and Driller
Mathers Environmental Drilling, Texas



- **ENGINEERED EFFICIENCY:** trim time between applications with all head functions and winches along centerline head side shift (*above*)
- **ENHANCED EASE AND SAFETY:** maintain steady power for rotation and fluids with separate mud pump hydraulic circuit; reduce strain of rotary work with hands-free rotation and feed
- **ELEVATED PRODUCTIVITY:** maximize rig utilization and effectively compete in multiple revenue streams — mud rotary, air rotary, rock coring, drive and wash, HSA, SPT, CPT, and direct push



SCAN TO WATCH

HOW 3126GT SIMPLIFIES GEOTECH JOBS

geoprobe.com/3126GT

CONTACT GEOPROBE®
785-825-1842

to discuss options best suited for your unique challenges.