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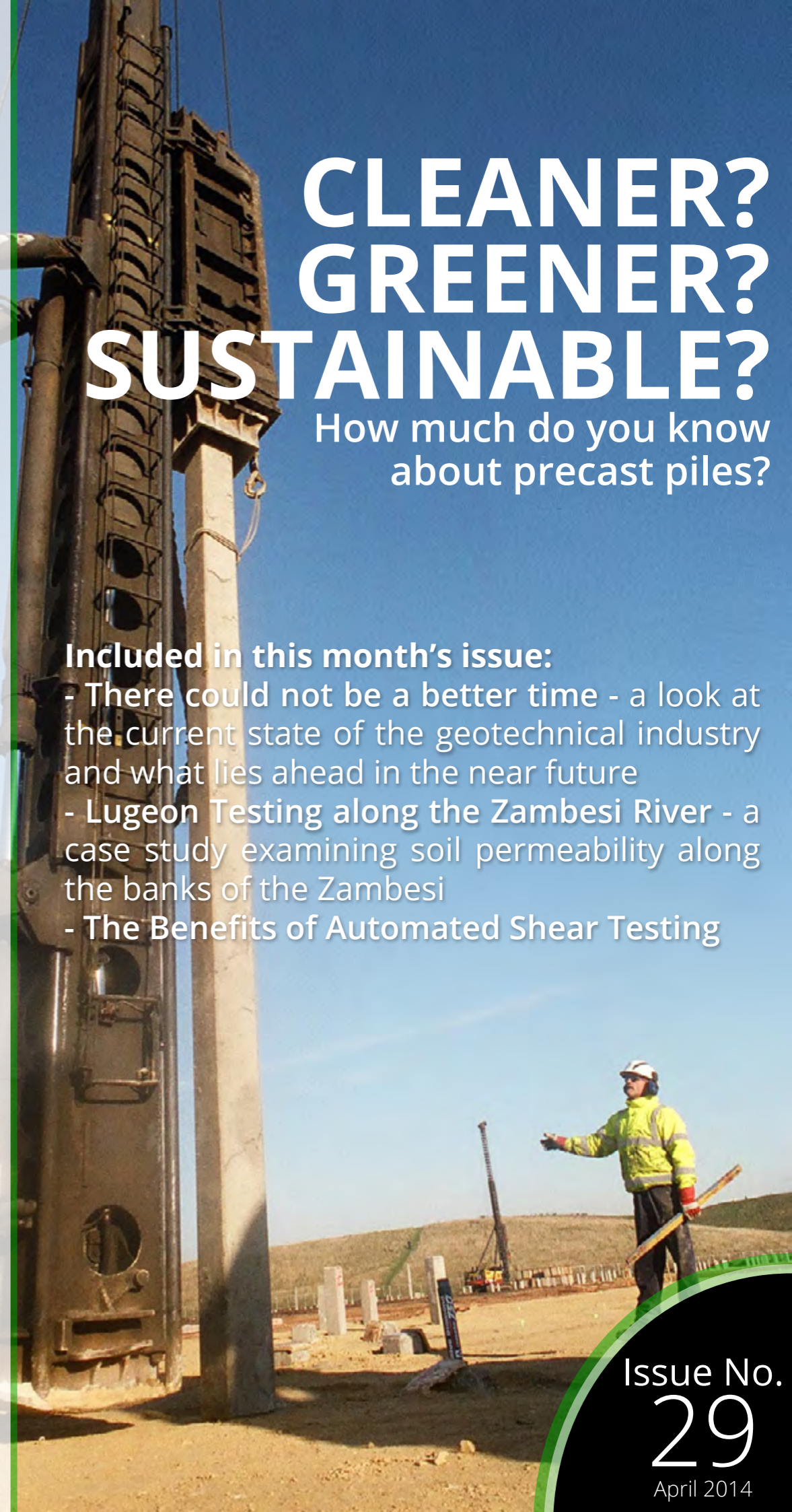
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Included in this month's issue:

- There could not be a better time - a look at the current state of the geotechnical industry and what lies ahead in the near future
- Lugeon Testing along the Zambesi River - a case study examining soil permeability along the banks of the Zambesi
- The Benefits of Automated Shear Testing

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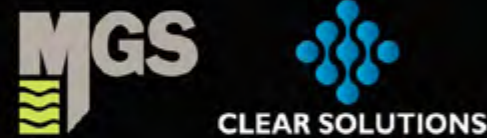
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Writing for theGeotechnica this month is Pete Reading, Part-Time Lecturer at Brunel University and Consultant for Equipe Training Ltd. This month Pete looks at the current state of the geotechnical industry and whether we are prepared for the high influx of work coming our way in the near future.

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Welcome

Welcome to the 29th Edition of **theGeotechnica** - the UK's fastest growing online geotechnically focussed e-magazine.

This month, once again, we have a fantastic line-up of insightful and informative articles that make for a must-read.

Our first article is also our cover article. Penned by Chris Primett, Managing Director of Aarsleff, the article focuses on Aarsleff's use of precast piles. Thought to be more environmentally friendly, the piles are created using a portion of recycled steel, as well as the majority of by-products also being put to good use after the piles have been created and implemented. These 'cleaner and greener' piles are part of a conscious movement within the construction industry to make all works carried out more sustainable and environmentally friendly.

Following on from Chris Primett is Peter Reading, now a part-time lecturer at Brunel University. In this month's issue of **theGeotechnica** Pete looks at the current state of the geotechnical industry and whether we are prepared for the high influx of work coming our way in the near future. Although the upturn in work and profitability in the geotechnical industry can only be seen as a good thing, Pete discusses what needs to be done to make sure that this workload is managed successfully as well as responsibly.

The third article in this month's issue comes from Amedeo Valoroso, CEO of DAT Instruments, an Italian company that specialises in the design and production of advanced foundation instruments and software. In this article Amedeo carries out a case study on Lugeon tests carried out along the Zambesi River which have been used to determine the soil permeability of the banks which house the Zambesi itself. The article is a great insight into the various works which are carried out and used to help determine permeability.

Finally the fourth article for this month's issue.

Continuing on from his colleague Adrian Rose's introduction to automating certain laboratory tests, as well as his own contribution in last month's issue, this month Qusai Al-Qudah returns to explain the benefits of automating shear testing.

As with every new edition of the magazine, the Editorial Team here at **theGeotechnica** will be on the lookout for even more new, original and interesting content from all corners of the sector, and would actively encourage all readers to come forward with any appropriate and relevant content - whether it be a small news item or a detailed case study of works recently completed or being undertaken. If this content is media rich and interactive, then all the better. We are looking to increase the already large readership of the magazine through better social media integration and promotion, as well as improving content month on month.

Finally, for any content that is submitted we will ensure that an advertising space, proportionate to the quality of content provided, is reserved should you wish to place an advert in that single edition of the magazine. We hope you enjoy this month's edition of the magazine and are inspired to contribute your own content for the coming editions of **theGeotechnica**.

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theGeotechnica

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PRECAST PILES - A CLEAN, GREEN AND SUSTAINABLE CHOICE?

*Precast piles are a relatively new introduction to the construction sector, and something that not too many in the geotechnical industry are aware of. In his first article for **theGeotechnica**, **Chris Primett**, Managing Director of [Aarsleff](#), explains why precast piles could be a cleaner, greener and more sustainable choice for the future.*

Continuing to grow, across all sectors, precast concrete piles typically offer favourable environmental benefits compared with other piling techniques, yet recognising where these benefits come from is often overlooked. Per Aarsleff (UK) Ltd., together with Centrum Pile Ltd., its wholly owned pile manufacturing subsidiary, has long been innovating to bring a sustainable and environmental edge to its piling solutions. Hidden away from view is the steel that gives the reinforced concrete pile its inner strength. A good proportion of the reinforcing steel used in their production is from recycled sources and as raw material costs head only in one direction – up – the amount of scrap / recycled steel will continue to increase.

Excess concrete or 'waste' as it is known also has applications and is not discarded. Centrum

Pile Ltd, for example, casts the 'waste' into blocks which are sold as a by-product for use in farming. Waste steel reinforcement is also recovered, after being sold and recycled by local plants, which further extends the life cycle of the materials of manufacture.

Use of cement, that essential ingredient in the concrete mix, has also been reduced through Centrum's use of heat curing.

"There is always a fine balance between the use of heat, instead of cement, as a method of curing..."

There is always a fine balance between the use of heat, instead of cement, as a method of curing as concrete cures through a process of hydration, which is an exothermic



chemical process, and too much heat reduces the final concrete strength. Centrum Pile Ltd has been able to fine tune the balance to ensure optimum strength, whilst allowing considerable savings on cement use. A reduction in the use of cement also delivers significant environmental benefits too.

Concrete technology has

not stood still and the use of Centrum's self-compacting concrete (SCC), where the addition of a super plasticiser and stabiliser significantly increases the ease and rate of flow during the manufacture of piles. Consequently, SCC does not require vibration, which means practically no noise compared to traditional concrete for quieter manufacture.

"Centrum Pile Ltd has its own batching plant for concrete production adjacent to its factory..."

Centrum Pile Ltd has its own batching plant for concrete production adjacent to its factory, as do other precast

piling manufacturers / contractors, recognising the benefits of not requiring concrete delivery vehicles and all the CO2 this would entail. Of course, incidental waste is controlled through the entire process of pile manufacturing and is segregated for recycling where possible, with very little going to landfill. Off-site pile manufacture has also been recognised ►►

as offering a number of environmental benefits, not least in just in time deliveries minimising disruption to the local neighbourhood.

The environmental and sustainable benefits for brownfield and urban redevelopments are quite appealing to clients too. Take a typical precast driven pile; dependent on geology, it will typically mobilise higher values of shaft adhesion, often allowing the use of shorter piles than those of a similar section size, formed using wet concrete placed in the ground. This brings considerable material savings especially on large developments and an associated CO2 saving from cement manufacture and from the associated reduction in fuel use through less on-site

“This benefit may well be even higher when the variation in acceptable design factors of safety is taken into consideration.”

machine-hours on-site. This benefit may well be even higher when the variation in acceptable design factors of safety is taken into consideration. In addition, precast concrete piles displace soil as they are driven, so there is no bore spoil to handle and remove from site. Not having to remove bore spoil from site saves a considerable amount of CO2 from a reduction in traffic to and from site.

For heavily contaminated

ground, there is often a perceived risk that piles will create preferential pathways down the pile shaft, but driven piles densify the soil, as it is displaced laterally. The high soil stresses set up during driving will inhibit groundwater flow in the fill and superficial deposits. In permeable soils, the densifying effect will set up high soil stresses that improve the soil/pile shaft contact rather than reduce it by creating gaps. The benefits are the same for gaseous vapours venting to the atmosphere – there is no considered risk with driven concrete piles.

Noise can be as much a pollutant as any physical contamination, and often the cause of much public opposition to construction. Whilst most construction

processes have intrinsic noise and vibration, the use of hydraulically activated drop hammers can reduce overall noise emissions. Fall height and frequency of hammer drop can also be controlled to eliminate any secondary bouncing of the dolly in the helmet if sophisticated control systems are used. Fall height can and should also be adjusted to a practical minimum compatible with a reasonable rate of progress, thus minimising the

adverse effects of noise and vibration.

“Reducing the carbon footprint and the environmental impact of all building elements is essential...”

Reducing the carbon footprint and the environmental impact

of all building elements is essential if a construction project is to be considered sustainable, which includes the foundation works. Whilst cost is always going to be an important factor behind the choice of any construction product or technique, knowing and understanding the environmental benefits will allow an informed decision to be made, which may well be green too! ■

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THERE COULD NOT BE A BETTER TIME!



Writing for *theGeotechnica* this month is Pete Reading, Part-Time Lecturer at Brunel University and Consultant for Equipe Training Ltd. This month Pete looks at the state of the geotechnical industry.

With the prospect of a significant amount of geotechnical work on the horizon there could not be a better time to be working within the geotechnical industry - however this promise of as boom does not come without

“At last, after almost a decade of decline, the geotechnical market is about to rise to pre-recession levels.”

its problems. At last, after almost a decade of decline, the geotechnical market is about to rise to pre-recession levels. What is driving this increase in demand and is the industry prepared for this volume of activity?

The increase in activity is headed by the long awaited site investigation works for HS2, together with a number of other significant geotechnical works which the project will require. However this is not the only source of the increase in workload. The renewed confidence in the financial market and government initiatives to drive commercial and housing development is sparking a significant revival. Analysts suggest that this may inflate the current geotechnical market value by anything between 50% and 150% depending on which one you talk to. So is our industry ready for this long awaited increase in workload?

It is of my opinion that whilst there is an excitement at the prospect of this deluge of work, few are really prepared to take on the challenge.

Why you might ask? A number of reasons.

Firstly we need to look at the capability of the UK market to carry out this expected volume of site investigation. Unfortunately the site investigation section of the geotechnical industry has suffered considerably from lack of investment over many years - even before the recession investment was piecemeal and rather reluctant. Throughout the recession there has been very little investment in equipment and new techniques, with the rare exception notwithstanding. This does not put the site investigation industry in a good

position to carry out all the work which is potentially on the horizon. There is an old saying that in order to accumulate one needs to speculate: Now would be a good time for the site investigation industry to adopt

“It will take a great deal of investment to bring the drilling and sampling rig fleet up to required levels...”

this adage. It will take a great deal of investment to bring the drilling and sampling rig fleet up to required levels and I believe companies should be looking at this right now if we are to satisfy the impending demand. Similarly we should be looking at the capacity of our laboratories to carry out

testing which will be required. This will also follow onto the materials laboratories who serve the construction section of our industry.

Investment in kit is futile unless we have the right people to use the equipment and carry out the works. In my view this is where the real problem lies. For close to a decade the numbers working in the geotechnical industry at all levels has declined. Many of the skilled operatives have moved on or have simply retired. This, coupled with the number of youngsters wanting to work on drilling rigs declining due to the very physically demanding nature of the job means that there are fewer operatives available. Too often I have heard “there are better ways to earn a living”. For many

companies even if they invest in the rigs they will struggle to find the drillers suitably skilled to operate them.

“... we have also seen a significant decline in the number of engineers either staying in the industry or coming into it straight from university.”

Further up the process we have also seen a significant decline in the number of engineers either staying in the industry or coming into it straight from university. There was also a significant exodus of trained engineers to other countries who were crying

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out for well-trained individuals and were prepared to pay for them, and although a few have drifted back many have set down roots and will not return. This has given rise to a big gap in the middle range of engineers – unfortunately these are the ones who would be in a perfect position to manage the works that are approaching on the horizon.

So what is the solution for this shortfall in expertise? Some have suggested we should recruit from Europe as there are potentially skilled individuals who would perhaps migrate here to fill this gap; however this is not a long term fix if our industry is to survive.

Personally, I feel that we as an industry need to do more to entice youngsters into this

“Personally, I feel that we as an industry need to do more to entice youngsters into this very rewarding part of the construction industry.”

very rewarding part of the construction industry. This is a drive that needs the backing of all parts of the industry, from companies who need to get involved with local schools and colleges to advertise the industry; to universities who need to cater for the industry; and also for the industry bodies to drive awareness amongst potential education establishments and perhaps be proactive in overseas

recruitment.

This is not the end of the process. We still need to re-establish a training regime which will satisfy the demand of industry and also be compliant with Eurocode (BS EN ISO 22475 Parts 2 and 3).

There are commercially available courses and study groups such as those provided by Equipe and other training bodies as well as the excellent Geotechnical Academy. (See the Academy website for further information).

In conclusion, with the right focus I believe that we can provide and develop the expertise required by this upturn in workload, but there is no doubt that we need to act as soon as possible. ■



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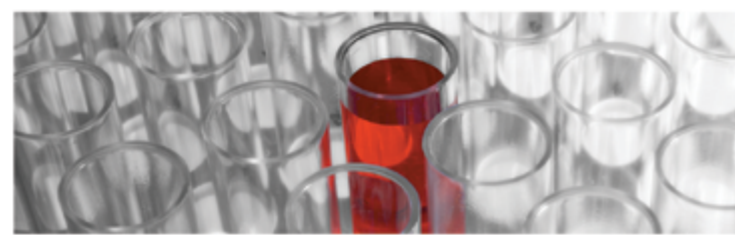
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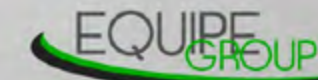
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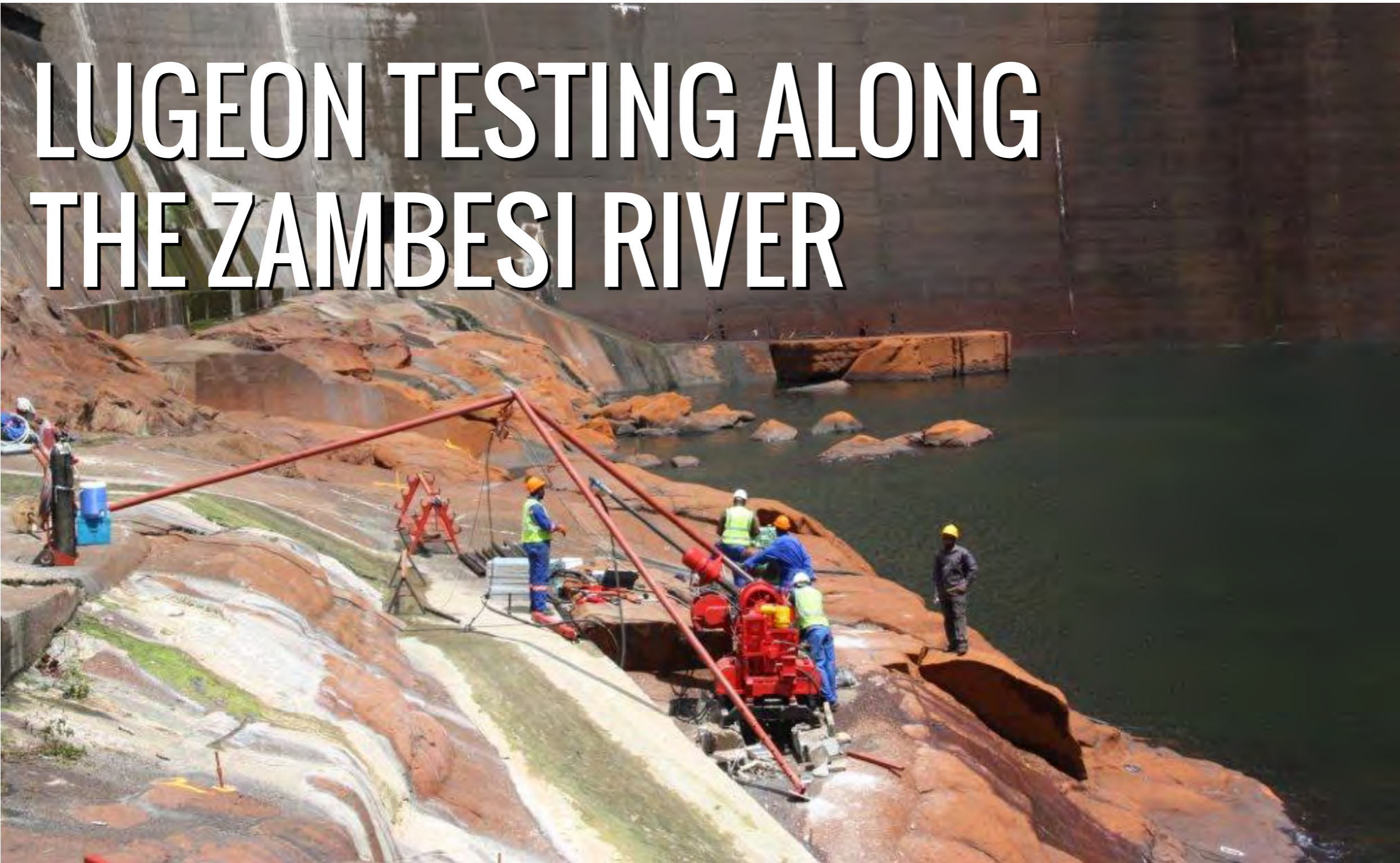
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LUGEON TESTING ALONG THE ZAMBESI RIVER

Writing for *theGeotechnica* for the first time is **Amedeo Valoroso**, CEO of **DAT Instruments**, an Italian company that specialises in the design and production of advanced foundation instruments and software. In this article Amedeo carries out a case study on Lugeon tests carried out along the Zambesi River.

The use of data logging instrumentation for Lugeon testing near the Kariba Dam has been used to obtain information on the soil permeability on the Zambesi river banks, between Zambia and Zimbabwe.

The Kariba Dam is a hydroelectric dam built on the Zambesi river, between Zambia and Zimbabwe. Designed and built by Italian companies, it

is one of the biggest dams in the world. The dam is 128m high, 579m wide and provides 1,320MW of power to the two African countries.

A lithological project was recently started in this area, with the purpose of understanding the phenomena of the alteration of rock (fracturing, disintegration, etc.), related to the weather and river activity.

Another part of this research analysed the geotechnical parameters of the soil. The Lugeon tests were performed with a DAT Instruments JET DSP 100 / IR datalogger, to record water pressure and flow parameters in real time.

International studies and geotechnical investigations

The Zambesi River Authority

nominated Coyne et Battier (Tractebel Engineering France) as consultants for the engineering studies of this project and for future collaboration of the further geotechnical surveys. The project managers for the works were "Prinsloo Drilling Namibia", a company with expertise in surveys for large dams. The goal was to identify the soil characteristics, in

terms of fracturing, alteration, hardness, abrasiveness, strength, deformability and permeability.

The lithological study has been performed using rotary drilling techniques, in situ tests, collecting samples of rock and laboratory analysis. Boreholes were drilled to depths of 150m on both banks. The boreholes in soft ground had a minimum diameter of 76mm, and the boreholes in rock

"The holes were drilled without the use of stabilising to keep the holes as natural as possible."

had a diameter of 48mm. The holes were drilled without the use of stabilising to keep the holes as natural as possible. Permeability tests were performed using single packers isolating the base of the hole to a depth of 5m below the packers. The permeability tests were conducted in this lower section of each borehole.

Electronic data recording

In recent years, the use of data logging instrumentation has allowed us to display and record Lugeon tests parameters in

"These instruments measure the values of flow and pressure at regular time intervals..."

real time. These instruments measure the values of flow



and pressure at regular time intervals; they display data on an LCD screen and allow the data to be downloaded onto a PC which enables the analysis to be carried out and plots of the results obtained throughout the test.

“Through a hydraulic separator and a pressure sensor the datalogger allows the operator to visualize real time parameters...”

Through a hydraulic separator and a pressure sensor the datalogger allows the operator to visualize real time parameters and to use a wide range of settings within the

software and data printing options. Water pressure has been measured with an electronic pressure sensor placed in the borehole; the digital display allowed the operator to have control over pressure and flow rates. An electromagnetic flow meter was used and installed between the pump and the borehole.

The test procedure

Before the test, the static level of groundwater is measured. Immediately after the drilling of the test section, the hole is washed with pumped water until the water returns are clean; the packer is then placed in the correct position and the distance between the borehole and the hydraulic separator is measured. The water is then pumped in the borehole

and for each test there are 5 pressure stages, 3 stages with a progressive increase of pressure, followed by two with decreasing pressures.

“Every change of pressure lasts 15 minutes after reaching a consistent water intake rate. The water intake rate is controlled every 2 minutes.”

Every change of pressure lasts 15 minutes after reaching a consistent water intake rate. The water intake rate is controlled every 2 minutes. The variation must not exceed 0,1 l/sec. The increases in pressure depend on soil characteristics

and on the depth of the tested section the pressures used are dependent on the specific purpose of the test. During the test all of the details are recorded on the test report. The results of this test show the loss of water related to pressure, the Lugeon Value.

Data logging systems for Lugeon tests

Along the Kariba dam, DAT Instruments JET DSP 100 / IR instrumentation enabled the measurement of pressure, flow and volume of the test,

to be visualized directly on the datalogger display in real time.

“They could then download the recorded data to a PC, for the creation and printing of summary sheets...”

They could then download the recorded data to a PC, for the creation and printing of summary sheets, for quick and easy retrieval of all the test information in a Microsoft

Excel spreadsheet.

It was found to be a bonus that when the system is connected directly to a PC the Lugeon graphs can be viewed in real time.

DAT also manufacture equipment for automated grout injection, these use pre-set parameters or the GIN number to control the process. The JET 4000 AME / I. and JET S 104 can be used for processing, storing and printing of data. for injection of cement grouts. ■





THE BENEFITS OF AUTOMATED SHEAR TESTING

Writing for *theGeotechnica* for the second time is [VJ Tech's Qusai Al-Qudah](#). In his latest article Qusai continues the series on automating lab testing, this week focussing on the benefits of automated shear testing.

The traditional method of Shear Testing involved a Load Frame fitted with a Shearbox containing the sample to be sheared and a lever arm with hangar for adding weights to apply Vertical Load as and when required, to consolidate the sample. Some form of mechanisation moved the top half of the Shearbox after Consolidation to shear the sample. A load ring with mechanical dial gauge was used for Horizontal Load measurement and mechanical dial gauge transducers were

used for measuring Horizontal and Vertical Displacement change.

Consolidation and Shear readings were taken on a periodic basis which required the laboratory technician to be on hand with a clipboard and datasheets to record the different Shear data when required throughout the Test

Semi-Automation The VJ Tech Shear TEST took Shear Testing to a new level. A stepper motor accurately

controls movement and has a control box on the Load Frame enabling the laboratory technician to set speeds and rates of movement and carry out other functions (such as Transducer calibration).

“ Additionally, new hardware was developed that assisted the laboratory technician in many ways.”

Additionally, new hardware was developed that assisted the laboratory technician in many ways. A Load Cell replaced the Load Ring (for Horizontal Load)

and LSCT or Potentiometric Transducers replaced Mechanical Dial Gauges for both Horizontal and Vertical Displacement measurement.

“The advances in computing power meant that software could be developed to control the different stages of the Shear test representing a huge step forward.”

The advances in computing power meant that software could be developed to control the different stages of the Shear test representing a huge step forward.

VJ Tech Electronic Data Loggers enabled Horizontal Load, and Horizontal and Vertical Displacement measurements to be recorded as specified and then sent to the computer via an RS232 connection.

The renowned Clisp Studio csShear software module running on the computer is able to;

- Conform to all major international geotechnical standards
- Set up individual tests based on the Client, Job, Borehole and Sample
- Set up and Control the different Instruments and Transducers used in the Shear Test
- Calibrate the Transducers when required
- Input Specimen details and automatically calculate related Dimension and

Moisture details

• Set the Consolidation stage starting conditions, data logging parameters and the stopping conditions

• Set up the Shear stage starting conditions, data logging details and stopping criteria

• Display live views of sensor readings and status

• Display live data views, graphs and tables as the test progresses

• Provide complete results data which can be exported to external data processing packages for further manipulation if required

• Produce a number of predefined presentation reports summarising all salient geotechnical results

Although a large part of the Shear testing procedure was automated, the laboratory technician was still required to intervene to add weights to the hangar, when an increase in Vertical Load was required. Obviously, there was, and still is a need to remove the holding pins from the Shearbox before starting the shear stage of the test.

Increased Automation and Other Advances

The introduction of the ShearTEST Advanced obviated the need for a Datalogger because the Control Box has 4 analogue input channels, enabling load and displacement data to be logged and then forwarded to the computer. However, there is still a need for weights to be added manually.

When VJ Tech introduced the ShearSCAN 2 to the market, automation was markedly

increased by utilising the pneumatic loading concept for applying the vertical load to the sample when carrying out shear testing. This eliminated the need for the numerous weights used in dead weight systems thus freeing up laboratory space and improving health and safety. Because the ShearSCAN 2 is a self-contained table-top model, the purpose built support stand enables the system to be wheeled around the laboratory easily if required.

“Now the shear test can be fully automated (except for removal of the Shearbox holding pins), making the laboratory far more efficient...”

Now the shear test can be fully automated (except for removal of the Shearbox holding pins), making the laboratory far more efficient and freeing the technician to perform other duties while the test is running.

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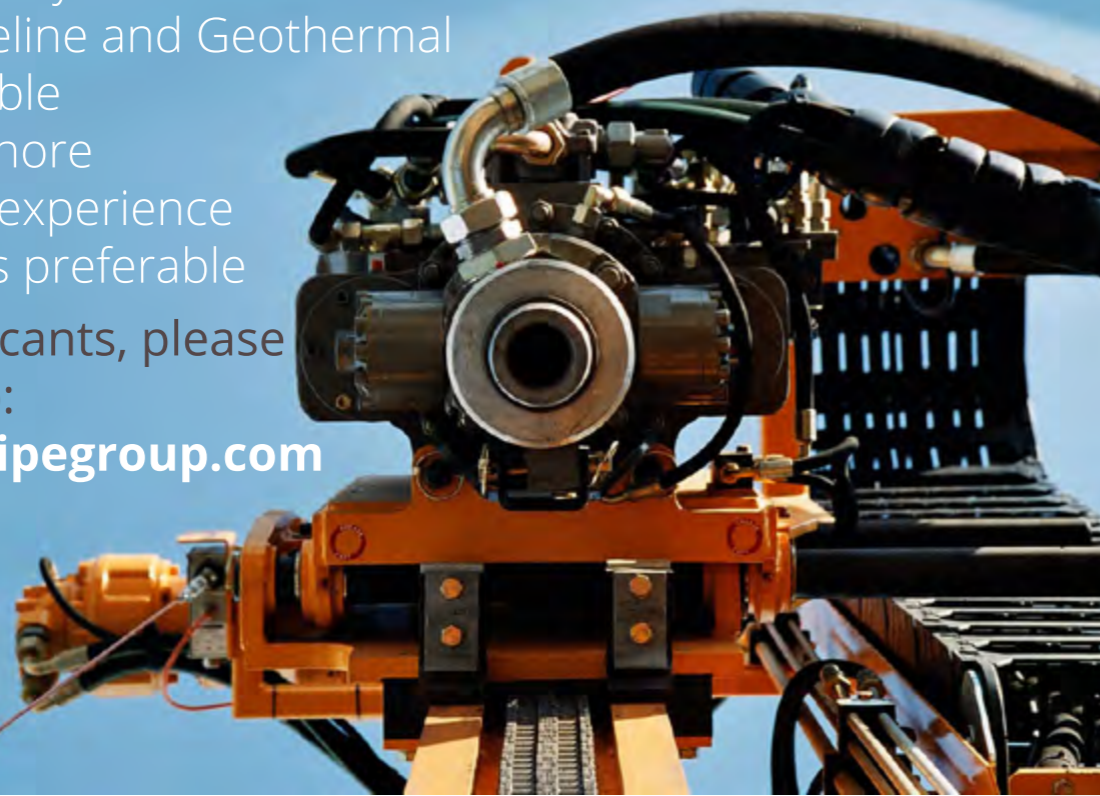
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South West Geotechnical Ltd

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SWG require a drilling manager to oversee our 3 drilling crews and sub-contractors. At least 5 years' experience as a lead driller is essential with all relevant qualifications, NVQ etc. Full clean driving license required with towing capability, HGV license holders preferred but not essential. The successful candidate would also be required to occasionally carry out drilling duties, site visits, arrange crews, equipment, hire in plant and maintenance schedules for drill rigs and vehicles.

Some travelling and occasional working away will be required but the position is mainly office based in our depot at Taunton, or offices / laboratory at Tiverton.

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