DENMARK

Offshore Windfarm project to generate electricity to power up to 300,000 homes.

SAUDI ARABIA

Nuclear Magnetic Resonance Javelin Max probe training in Riyadh.

USA

Atlantic Shores - leading the way in OWF development in the USA.

ROBERTSON GEO®

Unlocking Your GeoData

GeoUnlocked©

GLOBAL GEODATA NEWS

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Antarctica

Robertson Geo equipment used in drilling boreholes and collecting wireline data along the east coast of the Antarctic Peninsula on the Larsen C Ice Shelf.

Image courtesy of Bryn Hubbard

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FIELD MAINTENANCE
Inspection and maintenance for wireline geophysical operations

ANTARCTICA

Logging on the Larsen C Ice Shelf

Dr. Katie Miles and Professor Bryn Hubbard from Aberystwyth University organised an ambitious expedition to drill boreholes and collect wireline data on the Larsen C Ice Shelf as part of a research project RiPIce (Rift propagation for ice sheet models). Named after Captain Carl Anton Larsen, the Larsen Ice Shelf extends along the east coast of the Antarctic Peninsula with Larsen C being the largest of eight ice shelves.

Equipment Used

The Robertson Geo equipment used to log the boreholes comprised:

- RGeo-eye® downhole camera
- High Resolution Optical Televiewer (Hi-OPTV)®
- Electric Log
- Full Waveform Triple Sonic
- 600m Winch
- Micrologger 2

RiPIce Project Rationale

Ice shelves are the floating extension of ice sheets that reach the ocean, holding back the land-based glaciers that feed them and losing mass through iceberg calving caused by the opening of large cracks or rifts. Such icebergs can be sizable , e.g. Iceberg A-68, which calved off Larsen C Ice Shelf in July 2017, was a quarter of the size of Wales. In extreme cases, rift propagation can lead to ice shelf disintegration (e.g., Larsen A in 1995 and Larsen B in 2002). The response of land-based ice to the loss of buttressing ice shelves is a large uncertainty in projections of Antarctic ice mass loss and sea-level rise.

Antarctic ice shelves are not materially homogeneous; instead they are formed of alternating flow-parallel bands of cold, hard 'meteoric' ice supplied from inland glaciers, and warm, soft 'suture zone' ice, formed by ice accretion onto the ice shelf base in the ocean cavity below. While rifts travel quickly through meteoric ice, they are halted (temporarily or permanently) in suture zone bands. Despite this important role, little is known about either the material properties or the mechanical processes involved in rift propagation. One of the RiPIce project aims was therefore to characterise the physical properties of the suture zone ice and its impact on rift propagation.

Image courtesy of Dr. Katie Miles

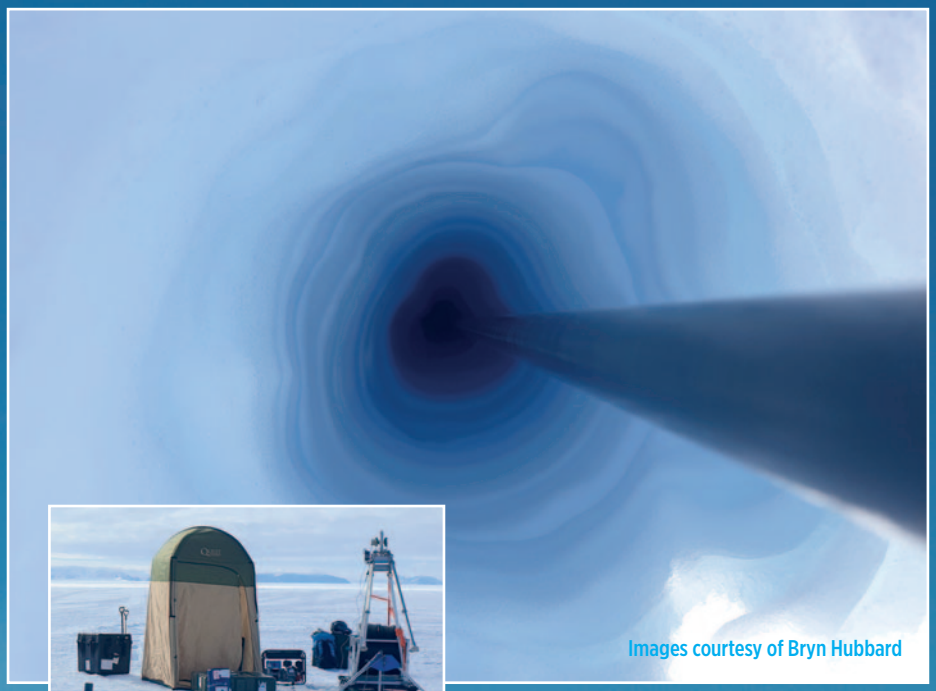
Drilling and Logging Operations

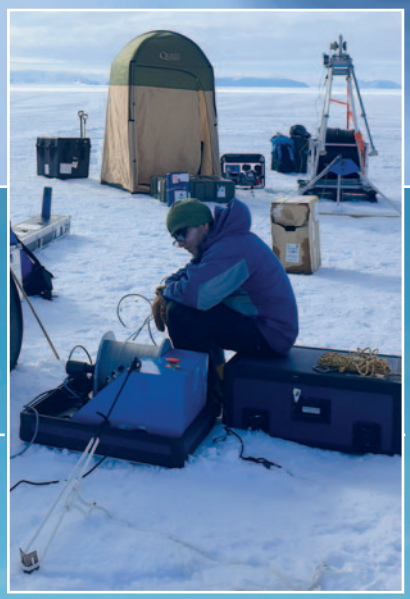
In December 2022, three boreholes were drilled by hot-water into Larsen C Ice Shelf, Antarctica - two into a suture zone band and one into a meteoric ice band. One suture zone borehole was logged to 120m depth with the RGeoEye®, High Resolution Optical Televiewer (Hi-OPTV)®, Electric Log, and Full Waveform Triple Sonic probes, with the intention of characterising the ice properties as fully as possible. The meteoric ice borehole was logged to 160m depth with the Hi-OPTV®.

Challenges

Working in the Antarctic is always challenging not least because, even in the Antarctic summer (December), air temperatures are typically sub-zero putting pressure on both equipment and staff safety. Variable borehole width due to layers of differing ice density in the upper ice shelf, meant that some probes couldn't be centralized.

As soon as drilling finished, the boreholes began to refreeze, so the challenge was to log the borehole with all the probes before refreezing meant that one could get stuck!





Images courtesy of Bryn Hubbard

Busy Times for In Situ Engineering and the PS Logger®

Washington State and neighbouring Oregon, on the northwest coast of USA, lie on a network of faults making this an extremely active seismic zone.

In particular, the explosive economic growth in Seattle has led to an ever-increasing density of towering buildings being erected at a breakneck pace, as well as the transit infrastructure that is needed to support them. The PS Logger® has become a go-to probe for geotechnical testing in these areas of high earthquake susceptibility where concerns exist over the next "big one".

The PS Logger® was developed in 1979 in Japan by the OYO Corporation for earthquake engineering with development, manufacture and distribution being managed by Robertson Geo since 2010. The PS Logger® is designed to measure shear and compressional wave velocities in hard formations and in soft unconsolidated formations from a single borehole.

In Situ Engineering acquired the PS Logger® over three years ago and since then it has seen near constant field deployment on a variety of projects from large scale dam design, bridge replacements, mass transit projects, below water foundation designs, and new and old high-rise buildings. States like Washington and Oregon are at the forefront in requiring seismic geotechnical testing on nearly all major infrastructure projects and the Robertson Geo PS Logger® has performed well, enabling In Situ Engineering to meet the requirements of project mandates.

For In Situ Engineering the PS Logger® can be used alongside other downhole geotechnical testing services such as the electronic pressure meter to maximize the amount of data a single borehole can give. This can save a project time and money by reducing the amount of drilling needed and increasing the efficiency of testing from a single mobilization.

MARINE GEOTECHNICS
New market sector launched at Reuters

Robertson Geo attended the second Reuters 2023 Offshore Wind show held in Boston, US, to launch its Marine Geotechnics segment which focuses on global marine projects.

At the conference, Robertson Geo representatives met other like-minded companies looking to enter the marine borehole drilling segment in North America and looks forward to developing its services capabilities to support companies in this fast-growing market.

Robertson Geo provides marine geotechnical ground investigations for various applications, including offshore windfarms, bridges, tunnels, piers, land reclamation studies and sea defences. Serving government bodies, private companies and some of the world's most prestigious service providers with global logging services, rentals, equipment supply and professional training.

Using geophysical logging tools such as the PS Logger® has become increasingly popular in marine geotechnics, allowing engineers to obtain accurate measurements of soil and rock properties without coring. The tool has revolutionised the field, providing engineers with a wealth of information that can be used to design safe and reliable offshore structures. As the field of marine geotechnics continues to evolve, the use of geophysical logging tools will become even more widespread.

Aflandshage Offshore Windfarm, Koge

DENMARK

The Aflandshage Offshore Wind Farm is a 286MW offshore wind power project situated in the Baltic Sea, south of Copenhagen. The windfarm project plans 26 turbines spread over an area of 44km^2 each with 11MW nameplate capacity.

The project should generate enough electricity to power up to 300,000 homes around the Øresund region and will be a major contribution to Denmark's goal to reduce CO2 emissions by 70% by 2030.

Robertson Geo were contracted to Danish company GEO Subsurface Expertise to conduct wireline logging on the Sound Prospector jack-up vessel as part of the geotechnical survey. Mobilising from Malmo in Sweden, five 35m boreholes were logged over a two-week period. The geology encountered was mainly chalk/limestone.

The Robertson Geo probes selected for this geotechnical survey were chosen to provide structural information (High Resolution Optical Televiewer® and High Resolution Acoustic Televiewer®) and to enable stiffness parameters to be calculated (PS Logger® and Formation Density). The resulting data was processed in situ by the logging engineer and then QC checked at the Robertson Geo head office.

PS Logger®

The PS Logger® probe measures P (compression) and S (shear) wave velocities in a single borehole without the need for external energy sources, making it simple and quick to deploy. Full waveforms are recorded digitally at acquisition time across six channels at a predetermined sample rate as low as 2.5µsec. Using the acquisition software, the waveforms can be displayed, scaled and filtered to allow for the picking of the first arrivals at each receiver.

P wave and S wave velocities are automatically calculated from the picks and, when combined with bulk density values, small strain moduli (Young's, Shear and Bulk) are calculated using simple formulae.

Formation Density

The Formation Density probe is calibrated using known density jigs and uses the principle of Compton Scattering to calculate bulk density between the calibration reference points. The Caesium 137 radioactive source emits gamma radiation into the formation surrounding the borehole. These gamma rays are scattered by electrons within the formation, some of which are returned to the probe's sodium iodide detectors.

As the electron density within the formation increases (i.e. the density) the scattering effect is increased and gamma ray counts decrease. The derived density values are seen in real time as the probe is being logged.

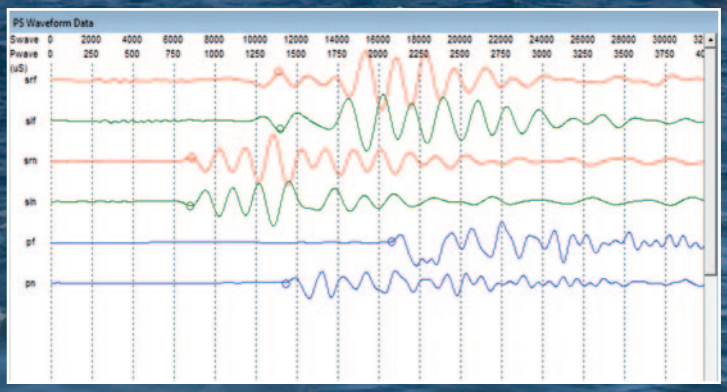
Optical and Acoustic Televiewers

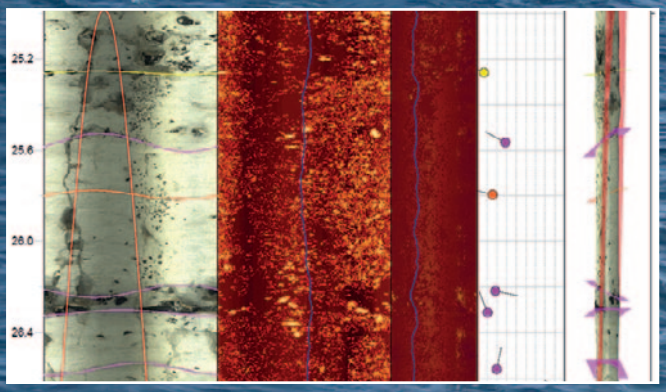
For the High Resolution Optical Televiewer® a fisheye lens is used to record a 360° slice of the borehole simultaneously, illuminated by a ring of LED lights. The borehole image data is combined with orientation data to produce an 'unwrapped' image of the borehole.

The High Resolution Acoustic Televiewer® produces a similar image but uses a high frequency sound pulse whereby the return pulse from the borehole wall is recorded as an arrival time and an amplitude.

Televiewers characterise features intersecting the borehole wall, including bedding, drilling-induced/natural fractures and faults and integrated orientation data allows the inclination and azimuth of features to be calculated.

Examples of PS Logger® and Televiewer data results.





Robertson Geo were asked to provide a five-day training course to Technical Development Solutions Co. (TDS) in the installation, operation, and maintenance of the Nuclear Magnetic Resonance (NMR) Javelin Max probe supplied by Robertson Geo partner Vista Clara Inc. from Washington State. The training course was held at their new training facility in Riyadh using their newly drilled test survey borehole.

Javelin Max training in Riyadh

SAUDI ARABIA

TDS started out initially operating in well logging and water well services, but has since added water exploration, geophysics, hydrogeological studies, and wireline surveys in recent years.

In an exciting addition to their recent history, they are now undertaking geotechnical surveys along the proposed route of NEOM's revolutionary urban living project, 'The Line'. Utilising the NMR alongside their existing suite of Robertson Geo tools they will be able to provide a detailed report on the ground conditions for a project that will provide an unprecedented urban living experience for thousands of people.

Borehole NMR is a technique that measures fluid volumes and the distribution of those fluids as a function of pore geometry enabling detailed characterisation of the storage and flow capacity of subsurface formations. The Javelin Max probe is the ideal choice of tool for larger and deeper wells as it can provide up to three simultaneous diameters of investigation in wells up to 18 inches in diameter. This not only speeds up investigation time, but it will also ensure the desired sensitive zones of the formation are measured while avoiding zones disturbed by drilling.

The training course was broken down into four sections: theory, physical assembly/disassembly and maintenance, Robertson Geo led NMR borehole surveys and finally customer led NMR borehole surveys. Attending the course were experienced geophysicists, new field engineers and electronic engineers, so going through the course in this manner allowed TDS to get familiar with the new tool and be confident to run it independently by the end of the week. On the brink of the summer season, logging conditions were tough working under the 40°C Arabian sun, however the course proved to be a great success with each of the engineers completing a successful borehole survey using the NMR probe leaving them confident to operate it independently in the field.

ROBERTSON GEO
Unlocking Your GeoData

Field Maintenance
for Wireline Geophysical Operations

Robertson Geo was founded in 1979 and since 1980 have been pioneering the development of digital logging systems, almost a decade before the competition.

From 1990 the digital surface data acquisition unit was designed to work with a laptop computer. The Micrologger series of compact digital surface acquisition units, launched in 1997, followed this paradigm and still sets the standard to this day. All Robertson Geo probes digitise their data within the probe itself and the winch system transmits only digital data. These digital systems are now extremely robust and can provide years of reliable and repeatable data with relatively little maintenance.

Apart from a few exceptions most probe repairs are best left to the OEM or their agents who have the requisite test and calibration equipment. Winches however require more routine inspection and maintenance. Here we will be considering routine inspection and maintenance that should keep the equipment in optimum working order.

Use of jetwash for cleaning probes.

Commissioning, Training and Support

For equipment sales, on-site commissioning by Robertson Geo or their local agents will be available if required, though this may not be necessary for more experienced clients. Commissioning at a client site will usually be combined with hands-on training from experienced logging engineers. Basic care and maintenance of probes and equipment, covering calibration, cleaning, transport and storage, will be covered these cases. Where commissioning is not taken up engineer training is still available via local agents, on-line or from the company YouTube channel. Post sales support is available through local agents, the Robertson Geo website and via a central support desk.

The Organisation of Maintenance

The degree to which maintenance needs to be organised will vary depending on how much equipment is in the logging team, the frequency of use and the harshness of logging conditions. As a minimum, for all logging jobs, a full systems test, including the logging laptop, should be conducted prior to mobilisation and probes should be cleaned after logging. This simple expedient should pick up most problems back at base before mobilising to site. Most probes also need to be calibrated regularly and this represents a good opportunity for a more detailed inspection of the condition of the probe. If there is a large pool of equipment, then regular calibration and inspection schedules should be put in place. Feedback from engineers regarding problems or potential problems should be actively encouraged. Probes with caliper arms and winches, i.e. equipment with moving parts, require the most attention.

Resources required to enable calibrations, inspections and routine maintenance to be conducted include tool kits and basic spares ('O' rings, grease etc.), manuals, and for large pools of equipment checklists and schedules. Attention should also be given to the transport and storage of equipment to avoid damage in transit and to ensure equipment is properly cleaned before being stored.

Land Based Operations

Land based operations fall into two categories, vehicular based and portable or sometimes a combination of the two.

Vehicle based systems usually have the winch and surface units securely fastened into the vehicle which is good for weather protection but may make inspection and maintenance more difficult, to the point where it can be easily ignored. Probes are usually well protected inside dedicated tubes for transport.

For portable systems there are additional hazards from moving and transporting the equipment after every borehole, having the equipment lying on the ground in poor weather and exposure to dirt. It is important to keep all the surface equipment as dry as possible, with laptops being especially vulnerable to water ingress.

Offshore Operations

The marine environment presents challenges for all equipment, wireline systems being no exception. Robertson Geo have been continually improving the construction materials used throughout their systems to minimise corrosion and in 2017 launched a marine version of their 2,000m

winch specifically for offshore operations. In parallel the PS Logger® probe, popular for OWF work, has also been upgraded with more corrosion resistant materials.

Near-shore work on barges and small jackup platforms operates much like land operations with the added hazard of salt water. Even high-grade stainless steel can corrode if left exposed to a saline environment for anything other than a short time. Saltwater ingress into the cablehead, probe head and winch needs to be carefully controlled by cleaning the probes and electrical connections and checking they are sealing correctly.

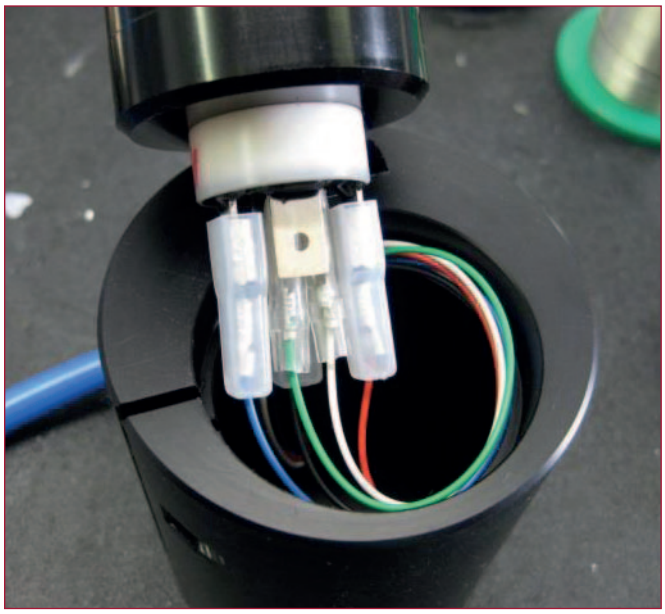
Drill ship and accommodation jackup working, typically for OWF, puts additional pressure on good housekeeping and maintenance. Often working far from shore, it is imperative that everything needed, including spares, is fully checked and tested prior to embarkation as running to port may be cost prohibitive in the event of equipment failure. For drill ships the winch is usually emplaced on the rooster box while the logging operation takes place whereby it may be exposed to salt spray and rain. As the drill ship is in 24/7 operation this makes maintenance difficult, emphasising the need for equipment planning. Tailored spares kits for the Marine Winch and PS Logger®, specifically for offshore operations, are available on request.

Winch Maintenance

Robertson Geo winches are designed to be as free from maintenance as possible with most components over specified for normal functioning. Checking the winch, cleaning it, and lubricating moving parts with an approved moisture repellent lubricant will suffice for most components. In addition, certain key components should be regularly inspected and those that may be adjusted or repaired easily will be detailed in the manual or on training videos. Common maintenance tasks that can be tackled in the field are noted in the manual.

The cablehead is arguably the hardest working component of the winch system as it is repeatedly opened and then submerged and relies on being packed with grease to maintain electrical isolation. As part of the full system check prior to mobilisation the cablehead should be inspected carefully and the double 'O' rings removed for cleaning and regreasing if necessary. Periodically, the cablehead should be opened and repacked with fresh grease as water can slowly penetrate the cablehead over time. Engineers should always carry sufficient spares and tools to be able to replace a cablehead in the field if necessary. When replacing a cablehead the opportunity should be taken to inspect the top 20m or so of the cable for damage, kinks and wear and cut back if required.

The slip ring assembly provides electrical connection between fixed wires and the rotating drum. This will need to be disconnected to check electrical resistance (mega-testing), for repair or for replacing corroded connections. There are different procedures for 4-core and for coaxial cable types.



4-Core slip ring connections.

Depending on the workload and operating environment the slip ring assembly should be taken apart for inspection periodically.

The junction box provides Elog capability and connects the Micrologger to the winch. For 2,000m winches this also houses connections for depth and tension. This unit should be relatively maintenance free but should be opened periodically to check that the seals are good and there is no water ingress.

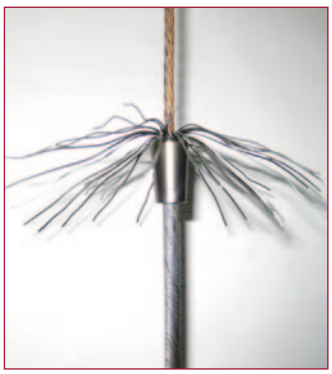
2,000m winches use a drive chain to connect the gearbox to the drum. An approved chain lubricant should be applied regularly to maintain smooth operation. Although relatively maintenance free, the chain may lose tension over time and can be adjusted quite easily. The toothed drive belt on these winches should also be inspected for wear and cracking.

Bearings on the winch used to support the drum (and depth wheel on 2,000m winches) are fitted with a grease nipple for adding fresh grease. As the bearings are sealed it is only after long periods or use in harsh conditions, such as a marine environment, that this should be necessary.

The DC motors used on winches are extremely robust and need only be kept clean to allow the cooling fins to work and the brushes should be checked periodically.

The depth wheel, whether integral with the winch or separate on a tripod head, should be kept clean to ensure correct depth measurement. The depth encoder unit is sealed for life and in the event of failure needs to be replaced.

Stages in the remaking of a 4-Core Cablehead.



On 2,000m winches an optional tension device may be fitted. This comprises a load cell, tension box and a cable to connect to the junction box. The pulley block that actuates the load cell should be checked for smooth movement and connections should be inspected. Components need to be replaced if faulty.

Power cables, data leads and depth cables should be inspected regularly for wear or damage and should be replaced if necessary.

Winch controls should be checked to ensure they are operating smoothly and are fully functional and guards should be securely in place.

A winch continuity check should be performed periodically or in the event of a problem. The procedure for this is detailed in a specific workshop video which should assist with isolating where in the winch system the problem lies. If help is being sought from the support desk for winch issues then a documented continuity check will be most useful for diagnostics.

Probe Maintenance

The field maintenance of probes is generally confined to inspection and cleaning. The opening up of probes should only be undertaken when the requisite knowledge, tools, test gear and ability to check conformance is in place and is usually best left to the OEM or their agents.

Probes need to operate under extremes of pressure and temperature and visual checks should include the condition of the body tube, tightness of joints and any moving parts. Check also for water ingress and blackening around the pins of the probe head.

The use of a small jetwash is recommended for cleaning probes in the field and back at base. When working in drilling mud, clays or other fine formations it is important not to let mud dry on the probe if possible. Probes with caliper arms are susceptible to the arm mechanism becoming seized in muddy conditions. Care should be taken when using the jetwash as unpressurised 'O' rings may not be properly seated and water from the jetwash can be forced past the 'O' rings. The jetwash head should not be used closer than 30cm to prevent this.

The PS Logger® probe uniquely comprises five or six sections which are assembled in the field. A single 'O' ring is used to prevent water ingress between each section and in a marine environment these should be removed, cleaned and regreased after every borehole, as saltwater left in the 'O' ring groove can cause pitting. The source hammer springs should also be inspected after every job and replaced where damaged or worn.

Cameras and televiewers should have their optical windows cleaned with screenwash before every borehole to obtain the best images. On the acoustic televiewer the end cap, used as part of pressure equalisation, should be removed and thoroughly cleaned.

Water probes need to be kept meticulously clean to ensure smooth operation and to prevent contamination within water wells. Impeller flowmeters should have the impeller protected from air motion if carried externally on a vehicle to prevent excessive rotation of the impeller.

Other Maintenance

Surface logging equipment requires little maintenance save for checking that connections and cables are in good condition. Centraliser locking collars will gradually stiffen up over time and should be periodically stripped down, cleaned and lightly lubricated. All cables should be visually checked especially close to the connectors. Generators are vital to provide a clean power source and should be regularly serviced by professionals. Sheave wheels should be cleaned and lubricated after every job.

PS Logger® source stripped for spring replacement.

Conclusion

Routine cleaning and checking of equipment should be sufficient to enable equipment to perform well over long periods of time. If equipment is showing faults or not working the diagnosis of the problem can be difficult. Assistance may be sought from the local agent or from the OEM and it is important to document any testing done, such as a winch continuity test, and supply this information to the support desk. Where problems exist that affect the data collected, raw data files should also be submitted to aid diagnosis. Robertson Geo provide a package of resources to assist their clients with the maintenance of their systems from sales support, through commissioning and training to the provision of a support desk, with videos and guides being available on the company website.

Graham Comber
Robertson Geo - Geotechnical Adviser

ATLANTIC SHORES

Offshore Development

The Atlantic Seaboard region is currently leading the way in OWF development in the USA, with the Atlantic Shores developments being a key contributor.

Atlantic Shores is a 50:50 joint venture between Shell New Energies US LLC and EDF-RE Offshore Development and when complete will deliver 5+GW of energy to New Jersey and New York, enough to power 700000+ homes, with the first power scheduled for production from Atlantic Shores 1 in 2027.

Robertson Geo PS Logger® and 3-Arm Caliper probes have been on hire with Fugro USA for over 12 months for their Atlantic Shores OWF geotechnical investigations. After encountering some difficult ground conditions Robertson Geo Services engineer Mark Scarisbrick joined the team to support the existing staff for four weeks, logging some of the difficult boreholes and assisting in the training of Fugro USA engineers.

Two Fugro vessels were working in conjunction to complete borehole drilling operations with Robertson Geo engineer Mark living aboard the HOS Browning. The first two boreholes logged had PS Logger® as a deliverable, the second two boreholes required both PS Logger® and 3-Arm Caliper.

Multiple runs of the PS Logger®, using both PS Logger® filter tubes (1m and then 2m) with variable sample windows, were conducted to confirm the highly variable lithologies of the area. Unconsolidated sand beds, gravelly coarse sand and high strength clay were all observed.

Training covering the PS Logger® software, settings, data confidence and data processing was provided. Routine maintenance training, important in the harsh marine environment, was also given for the 2,000m Marine Winch, PS Logger® and 3-Arm Caliper probes.

Services Engineer Mark Scarisbrick with Fugro USA Engineers.

Robertson Geo are pleased to announce that Michael Yimer, CEO of Maziv Engineering signed up in June to the Robertson Geo global agent network to promote and sell Robertson Geo geophysical wireline equipment.

Maziv Engineering are based in Addis Ababa, Ethiopia and have recently opened a new office in Zambia. Already an established engineering company in Ethiopia, Maziv currently supply laboratory equipment and production engineering products as well as submersible pumps for water wells and resistivity and seismic acquisition equipment.

With extensive contacts throughout the region, Maziv are looking to extend their portfolio of products and will be supplying the full range of Robertson Geo equipment, particularly into the groundwater, geothermal and minerals sectors.

Gavin Rowlands, Global Business Development Manager at Robertson Geo said:

"We are excited to add Maziv Engineering to our agent portfolio as we recognise the importance of having in-country agents who understand their local market sectors. We will be supporting Maziv with direct and corporate marketing and look forward to raising the profile of Robertson Geo in the region."

The main contact point at Maziv will be Agostino Siccardi, Technical Department Manager.

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maziv engineering plc

New Robertson Geo Agent in Ethiopia and Zambia

Maziv Engineering

Michael Yimer.

Agostino Siccardi.

Training at Cidade Universitária

RIO DE JANEIRO BRAZIL

Following an equipment purchase, a five-day training programme was delivered to Professor Dr. Marco Braga and a group of his students at the Cidade Universitária, Ilha do Fundão, Rio de Janeiro. Kyle Owen, Senior Logging Engineer with Robertson Geo Services, travelled to Rio to undertake the training.

Robertson Geo equipment was purchased by the University to collect data pertaining to mineral exploration, with a particular interest in iron mining as Brazil produces high volumes of some of the highest quality iron ore grades found anywhere on the planet.

The training goals included familiarization with safety matters, logging procedures, data acquisition, preventative equipment maintenance and data processing.

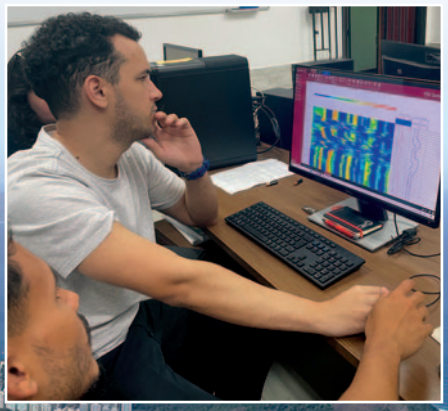
Students were trained on the following equipment:

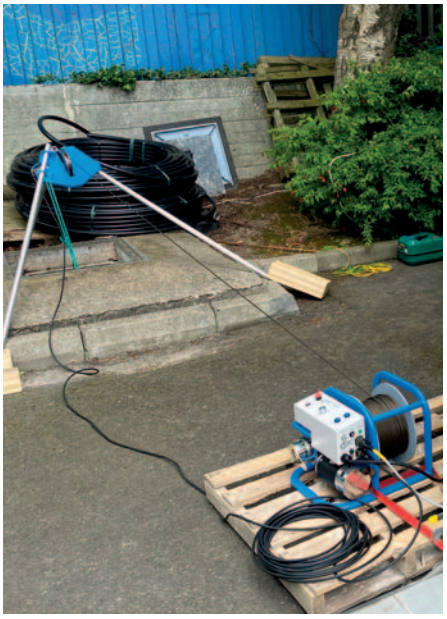
Equipment	Function
Mini Winch	Wireline delivery
Micrologger 2	Surface acquisition unit
High Resolution Acoustic Televiewer®	Unwrapped oriented borehole imaging
Iron Ore Density probe	Extended range bulk density measurement (to 5g/cc)
3-Arm Caliper probe	Natural gamma, borehole diameter and QC
Full Waveform Triple Sonic probe	P and S wave velocities
GeoCAD® software	Processing software

The first part of the training related to good logging practice in data acquisition covering safety, to both the logger and the equipment, securing the winch, tripod usage, correct centralisation of probes, depth setting and the use of radioactive sources. This training was conducted using the University's onsite borehole giving the students first-hand experience of a logging operation.

The second part of the training covered routine and preventative maintenance with special attention being given to cablehead replacement and slip ring maintenance. Basic diagnostic procedures were also covered to enable troubleshooting of routine problems so that fixes could be applied in the field thereby reducing downtime to a minimum.

Finally, using the data acquired at the onsite borehole, students were guided through the full processing sequence using the GeoCAD® software. This included simple log curves, televiewer processing, semblance processing and the derivation of small strain moduli (Bulk, Shear and Young's) from the density and velocity data.

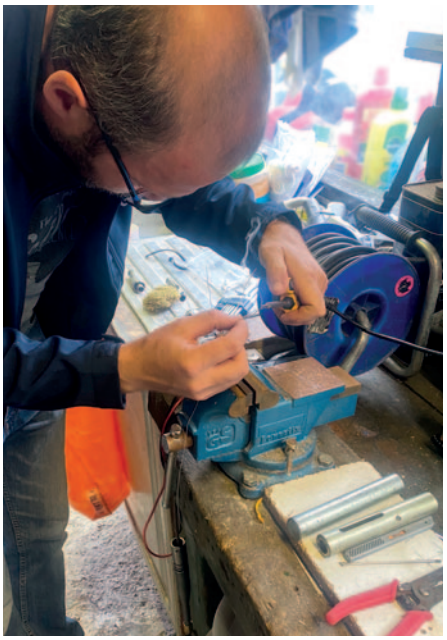




Robertson Geo Services can provide comprehensive commissioning and training to help customers old and new at our purpose-built training facility in North Wales. Alternatively, our training can be adapted to fit client needs at any location globally, on or offshore.

Commissioning for Geological Survey of Northern Ireland (GSNI)

BELFAST



GSNI recently purchased a full suite of tools for geothermal water applications including: High Resolution Optical Televiewer®, High Resolution Acoustic Televiewer®, 3-Arm Caliper, Temperature Conductivity, Electric Log, Focussed Electric Log (Guardlog), Impeller Flowmeter, Heat Pulse flowmeter, Full Waveform Triple Sonic, two winches (Mini Winch and 500m Winch) and all the associated surface equipment.

Upon delivery of the equipment, one of Robertson Geo Services logging engineers travelled to Belfast to provide three days of in-depth training.

With day one running through health and safety, the operating principles of each probe, the data provided and appropriate user maintenance (to get the best out of their tools for years to come), then moving on to running surface tests and calibration routines for specific tools.

On day two a tripod was erected over a test borehole at Queens University Belfast and a sample log of each tool was run. This enabled GSNI personnel to get firsthand experience with the tools, surface equipment and software in a real logging scenario.

The morning of the final day was spent going through further in-depth preventative and reactive maintenance of the tools and winches and how to rebuild a cable head. The afternoon was spent talking through processing in GeoCAD® using different software modules to pick data, export and present data to the client's needs.

If this sort of training could be of benefit, please contact the local Robertson Geo sales agent for details.

AT ROBERTSON GEO we have an ongoing engineering programme to introduce innovative products that enhance geophysical data acquisition for our customers. Follow our regular blog to keep updated on the latest developments ***www.robertson-geo.com/blog***

Get your free copy of GeoUnlocked and our regular direct marketing newsletter to your inbox - ***subscribe here***

William Dunne

Hello, my name is William Dunne, (known as Bill), I have recently joined the Robertson Geo Services logging team. I am originally from Ireland but have lived in North Wales since the age of 11. I have just completed my studies at Bangor University obtaining a BSc in Geological Oceanography.

From 18-21 years of age, I worked in the food retail industry, and worked my way up to management. I enjoyed working in food retail and engaging with customers, in so developing my customer relation skills and people management, although I knew I wanted something different as a long-term career. At 21 I decided to go back to university to study geological oceanography as I have always been interested in geology and the processes of the Earth.

I have been warmly welcomed by the team at Robertson Geo, and have thoroughly enjoyed my first month, with no one day being the same, from working on a job in Teignmouth in my first week to being in Burton practicing and developing my logging skills in my third week. The team are great and have a fantastic emphasis on learning and developing skills. I look forward to what the future has in store for me at Robertson Geo.

Robertson Geo beat the Three Peaks Challenge

14 members of Robertson Geo began the challenge on Saturday 12th August at 5pm, starting with Ben Nevis in Scotland before taking on Scafell Pike and finishing with Snowdon, - all before 5pm the next day!

All agreed that Scafell was the most challenging as it was climbed during the night, after a maximum of two hours sleep. Gaz and Tim were tasked with the driving from Conwy and took the responsibility of getting the climbers to their peaks in good time.

The team decided to take on a fundraising challenge after sadly losing two colleagues in a very short space of time this year. Their fundraiser will be in memory of Ralph Whiteley and Joe Cox who are both sorely missed by all the team. The generous team are not only fundraising for Conwy Mind but also another local charity St David's Hospice. All money raised will be split equally between both charities which is hugely appreciated!

There's no denying that doing the Three Peaks was physically challenging but on top of that, it was very mentally challenging. Participants had to remain positive, stay motivated and really encourage one another over the 24 hours.

Well done brave 'Peakers' who all worked hard to train and prepare and have sacrificed a lot of time and money to undertake the walks for such great causes and have smashed their target – to date raising over £4,000 for their chosen Charities.

Ralph Whiteley.

Joe Cox.

BACK ON THE ROAD AGAIN

At Robertson Geo we have always had good representation at the most important Geophysical based exhibitions and conferences worldwide.

This year our program continues with attendance at the following exhibitions:

Near Surface Geoscience 2023
Edinburgh, UK
3rd - 7th September 2023 | Booth: 60

Mining & Metals Central Asia
Almaty, Kazakhstan
20th - 22nd September 2023 | Booth: 9-21

ADIPEC 2023
Abu Dhabi, United Arab Emirates
2nd - 5th October 2023 | Booth: 10104

ICEG 2023
Al Ain, United Arab Emirates
16th - 19th October 2023 | Booth: B4

48th Annual Conference on Deep Foundations
Seattle, Washington, US
31st October - 3rd November 2023 | Booth: 504

Groundwater Week 2023
Las Vegas, US
5th - 7th December 2023 | Booth: 1506

Watch our events page at www.robertson-geo.com/upcoming-events/ and as always - new and established clients alike - *"we're looking forward to seeing you"*. Our direct marketing messages allow you to follow an easy enrolment procedure if you are coming.

Cliff stability project in TEIGNMOUTH

During winter, around the country plans are drawn up with the aim to start site work come summer, taking advantage of the favourable weather. For Robertson Geo Services, spring tends to be a busy period with site investigations beginning and borehole geophysics often essential to those plans.

As an engineer in these busy periods, you can be guaranteed two things, lots of mileage and a mountain of coffee cups. For example, this April I was assigned to a cliff stability project in Teignmouth (Devon), which required numerous visits before heading over to Northern Ireland for a proposed motorway bypass. From a business perspective it can be difficult navigating the logistics of having engineers, vehicles and equipment assigned up and down the country.

We have alleviated these pressures by putting an emphasis on training our newer engineers to the highest standards, myself included. Our services department is focussed on sharing knowledge, valuable lessons and experience gained to everyone's benefit. Working in teams of two on jobs, placing an experienced member of staff with a newer member, has been pivotal to this hands-on teaching. We are not constrained by demand and have an excellent team ready to meet client needs.

I have taken great pleasure in leading some of my first projects and appreciate my colleague's teachings on the path to proficiency.

Jakob Lee
Logging Engineer with Robertson Geo Services

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