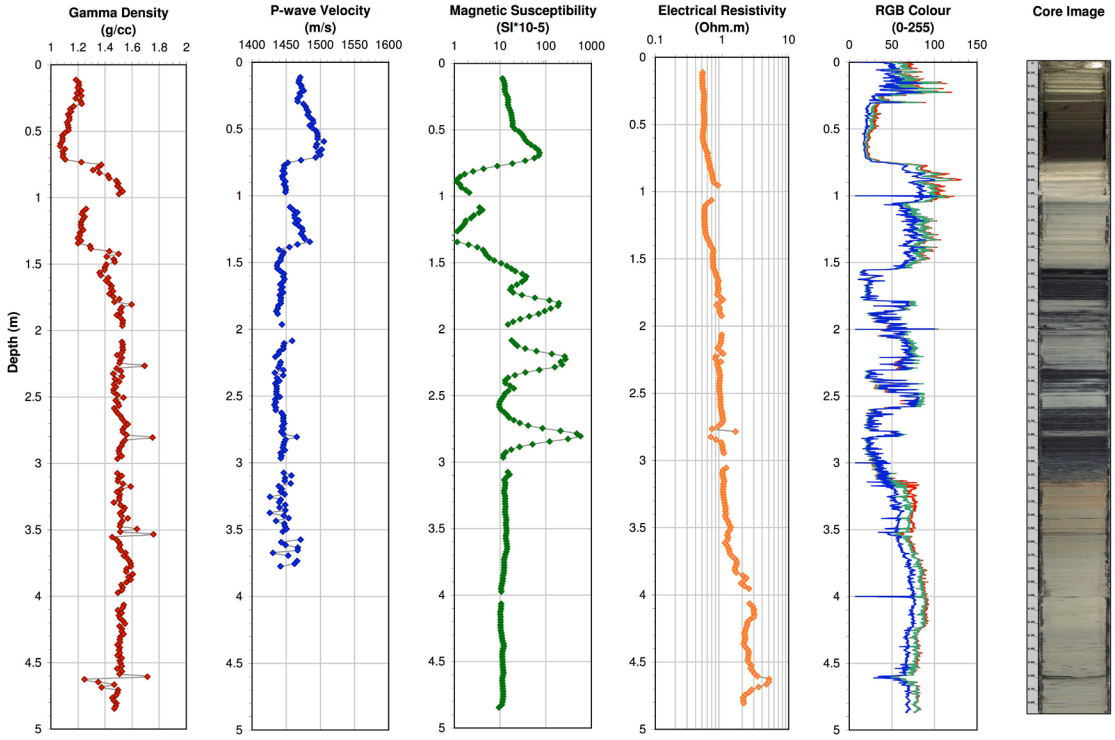
GEO TEK

MULTI-SENSOR CORE LOGGING (MSCL) AND X-RAY RADIOGRAPHY CORE LOGGING SERVICES

IF CORE'S WORTH TAKING, IT'S WORTH LOGGING

MSCL APPLICATIONS

Any core material collected for a science or engineering objective can benefit from detailed non-destructive multi-sensor core logger (MSCL) analysis. The MSCL is an automated core logging platform that acquires physical properties of core samples through metal and plastic core liners, or on exposed core surfaces. This technique provides our clients with a continuous down-core dataset ahead of destructive laboratory testing programmes or visual logging.



Multi-parameter stratigraphy with RGB colour spectrophometry and linescan image

GEOTECHNICAL

- Identification and quantification at core heterogeneity
- Improved and informed laboratory test planning
- Non-destructive quantification of geotechnical properties
- Correlation with downwhole wireline data

GEOHAZARD

- Identification of geohazard features such as: gassy sediments, high salinity profiles, cemented-horizons, or sand/clay-rich layers
- Parametric characterisation of geohazard features within the core, such as: mass movement deposits, nodules/gravels, erosion surfaces
- Improved lateral correlation between core locations

GEOPHYSICAL

- Calibration of velocity profiles to improve depth-time conversion
- Generation of synthetic seismograms

OIL AND GAS/UNCONVENTIONAL

- Spectral natural gamma (K, U, Th) and P-wave velocity measurements for core to downhole log correlation
- High-resolution visible and ultraviolet linescan photography
- Chemical stratigraphy for elemental and mineralogical determination
- Identification and quantification of core heterogeneity

MINING

- High resolution magnetic susceptibility, X-ray fluorescence and near-infrared logging to identify target horizons and corroborate geophysical survey results
- Parametric quantification of geological units and stratigraphy

ENVIRONMENTAL

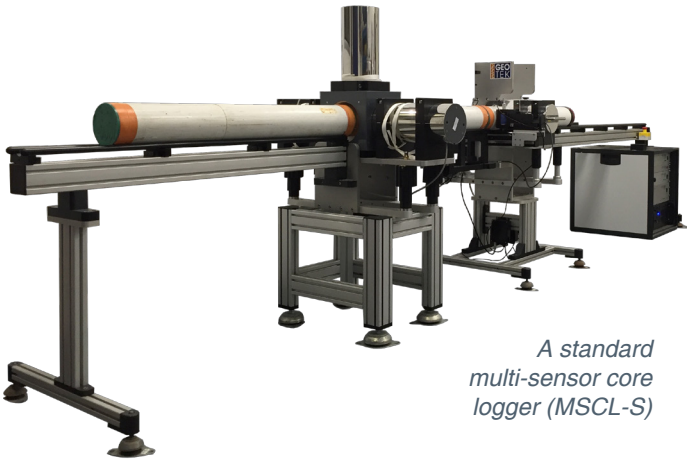
- High resolution XRF to identify contaminated horizons
- UV linescan photography to identify hydrocarbons

MULTI-SENSOR CORE LOGGER - MSCL

A variety of sensors can be added to the MSCL systems depending on the requirements of the project. A typical core logging services project would use attenuated gamma density, P-wave velocity, non-contact resistivity, magnetic susceptibility and spectral natural gamma. Typically data would be collected at a 1 cm to 2 cm logging resolution. The maximum core length accepted on the MSCL is 155 cm, with a maximum outer diameter of 150 mm.

BENEFITS

- **Non-destructive analysis** of whole and split core samples where data can be collected through the core liner
- **Fully automated and efficient** (4 m an hour at 2 cm logging resolution)
- **Simultaneous acquisition** of multiple geotechnical and geophysical parameters on whole and split core samples
- **Data points are co-registered** improving parameter correlation
- **Sensor geometry to the core surface is consistent** for each measurement



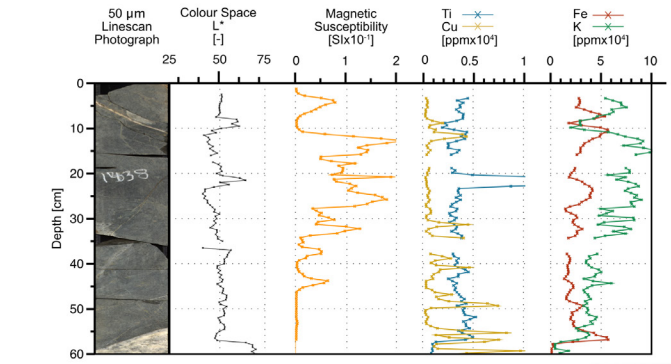
A standard multi-sensor core logger (MSCL-S)

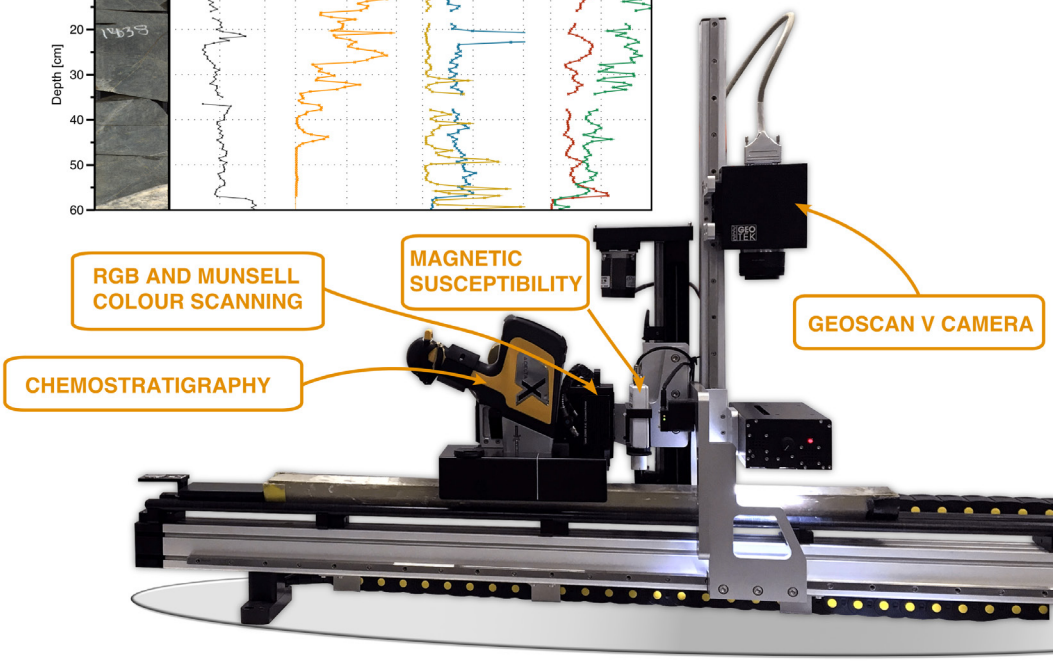
DELIVERABLES

- Factual data report with integrated X-ray and MSCL data sheets provided
- Processed Ascii tab-delimitated files
- If possible, depth corrected data
- 48-bit linescan tiff images provided with RGB file
- Geotek MSCL data and linescan image viewer provided

AVAILABLE SENSORS

- Attenuated gamma density
- P-wave transducers
- Non-contact resistivity
- Magnetic susceptibility
- Spectral natural gamma
- Visible and ultraviolet light linescan camera
- Near-infrared spectrometry
- Colour spectrophotometer
- X-ray fluorescence





MSCL-XZ: Bench-top core scanning system

X-RAY RADIOGRAPHY AND COMPUTER TOMOGRAPHY APPLICATIONS

X-ray radiography and CT provides valuable high resolution detail about the natural and artificial structure of core samples regardless of whether the material is still within its liner or exposed. X-raying has therefore quickly become imperative in order to save time and money, by providing geologists and engineers with the necessary information to make informed decisions about their core for future logging and testing programmes.

GEOTECHNICAL

- Visualisation of sample quality and recovery
- Identification of fracturing, bedding, gravels or authigenic precipitates
- Improved and informed laboratory test planning

GEOHAZARD

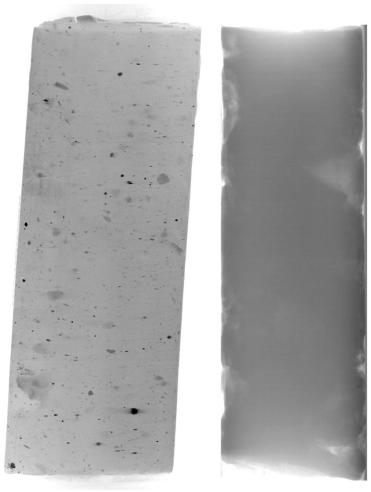
- Identification of geological features that may not be identifiable through visual core logging
- Visualisation of bedding contacts to better plan future logging and geological testing programmes
- Determination of relative palaeocurrent directions
- Identification of maximum bedding angle ahead of core splitting

OIL AND GAS/UNCONVENTIONAL

- Determination of maximum dipping angle of beds for slabbing
- Visualisation of bedding contacts and fracturing within the core
- Whole core X-ray CT scanning at 100 µm to 300 µm, and plug sample scanning at 20 µm to 30 µm for input into petrophysical models or to investigate the suitability of samples for SCAL testing

Linescan Image of Split Core versus Whole Core X-ray Image of 30cm Piston Core Sample in Plastic Liner

X-ray CT and Radiograph Examples of Waxed Subsamples



X-ray Radiograph of 1m Push Sample in Plastic Liner

X-ray Radiograph of 1m Whole 4” Aluminium Lined Rock Core

GEOTEK X-RAY MACHINES - XCT AND RXCT

Geotek X-ray radiography and CT services are conducted inline with ASTM D4552-14. A typical project would provide three 2D X-ray radiographs per core section at three orientations (0°, 45° and 90°), which allows for the 3D visualisation of features within the core. The maximum core length accepted in Geotek X-ray machines are 155 cm, with a maximum outer diameter of 160 mm.

MSCL-RXCT: A rotating gantry high resolution X-ray CT machine

BENEFITS

- **High-resolution** 100 µm 2D X-Ray radiographs CT on whole core and subsamples and 20 to 30 µm on plug samples
- **Specific instrument calibration and set-up** for both sediment and rock core to improve image quality
- **A range of core sizes in either metal or plastic liner types can be imaged.** Cores are securely held in the machine with minimal manual handling and dependance on client operatives

DELIVERABLES

2D RADIOGRAPH DELIVERABLES

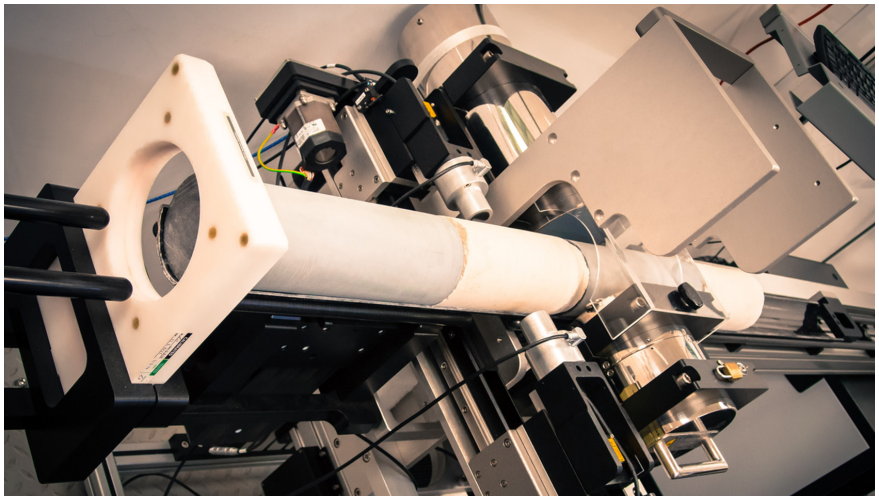
- 16-bit grayscale tiff image of each orientation scan (0°, 45°, and 90°)
- Comparable and varied contrast JPEGs of each tiff image
- Geotek X-ray viewer software to view and manipulate the contrast values of the tiff images
- Factual report including X-ray settings

3D COMPUTER TOMOGRAPHY DELIVERABLES

- Stacked 16-bit tiff image slices
- Comparable and varied contrast JPEGs of 0° and 90° slice through centre of the sample
- Axial view JPEG of top and bottom of sample
- Geotek CT viewing software
- Factual report including X-ray settings

Geotek Lab G10 onsite in Belgium

Briony setting up the X-ray CT machine in Lab G7



Rock core logging on the MSCL-S in Lab G6

MSCL-S and MSCL-XRF in Geotek Lab G6

MOBILE SERVICES

GEOTEK'S CORE LOGGING EQUIPMENT IS DESIGNED TO BE MOBILE AND VERSATILE TO SUIT A RANGE OF PROJECT ENVIRONMENTS BOTH OFFSHORE AND ONSHORE.

Using our experience in site-based work, Geotek install MSCL and X-ray machines in standard 20 ft or 40 ft containers.

These mobile laboratories are easily installed on marine vessels, drill sites, mining sites, or client laboratories.

Geotek's geoscientists will provide near-real time data from the MSCL and X-ray machines, ensure all field data are adequately QA/QC'd, and use their experience to maximise the output of the MSCL and X-ray dataset during site work.

Mobilised laboratory and office ready to sail

Large volumes of core at our laboratory in Daventry, UK

GEO TEK

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