Marine Engineering & Site Inspection

KONGSBERG

MS 1000 High-Resolution Scanning Sonar & Software System for Underwater Inspection, Survey and Visualization

Kongsberg Mesotech pioneered the use of scanning sonar for underwater marine engineering applications. The Company is a world leader in the development of products used for visualization of underwater structures (bridges, docks, piers, dams etc.) and using sonar to support a multitude of underwater construction applications.

Diving inspections are often challenged by high current, deep water, lack of visibility and debris accumulation around the structure. In addition to limiting the diver from completing a thorough inspection, debris buildup around bridge piers is potentially one of the most dangerous conditions the inspection diver faces. It introduces the possibility of entanglement, and even worse, diver entrapment if the debris moves.[1]

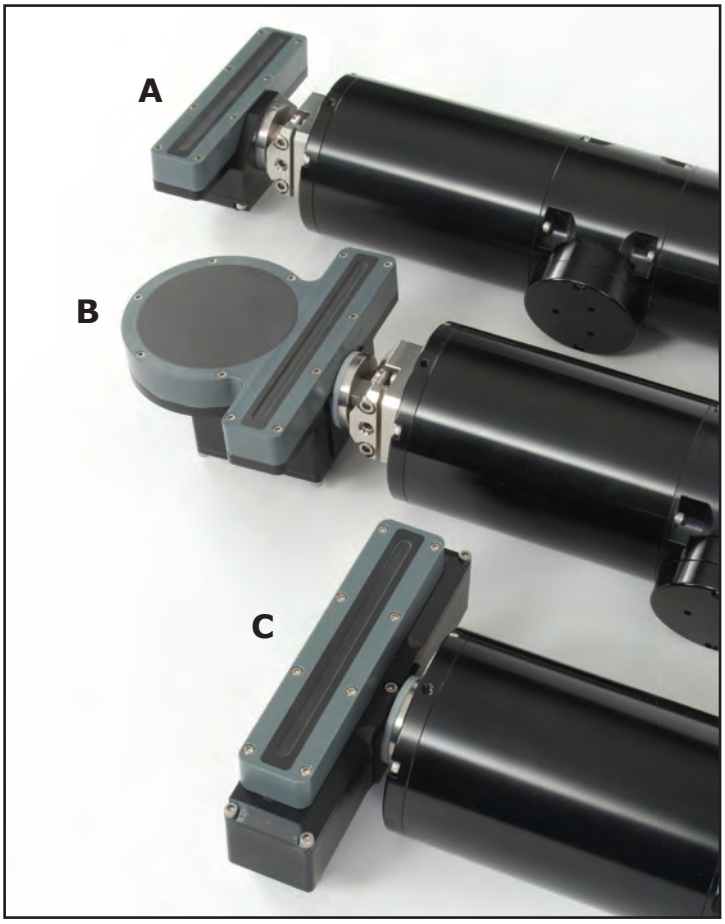
Benefits of Underwater Inspection & Surveying:

- Superior image resolution
- Accurate data reporting
- Frequent monitoring and lower costs

MS 1000 Scanning Sonar System

The high-resolution scanning sonar head operates on the full MS 1000 version processing software. The MS 1000 software has many advanced features for data interpretation, including the ability to measure length and area, geo-reference and track targets.

1171 Series domed profiling sonar head on a pole-mounted rotator



1171 Series high-resolution sonar heads: A. fan beam imaging transducer; B. fan/cone beam imaging and profiling transducer; C. back-to-back fan beam imaging transducer

High-resolution Scanning Sonar offers:

- narrower horizontal beam angle and smaller angular resolution (for superior image quality)
- tunable frequency transducers (model dependant)
- exposed transducer (to eliminate acoustic lensing)
- increased power output (for better signal to noise ratios)

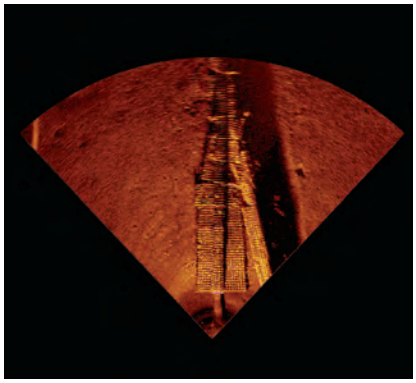
MS 1000 Processing Software offers:

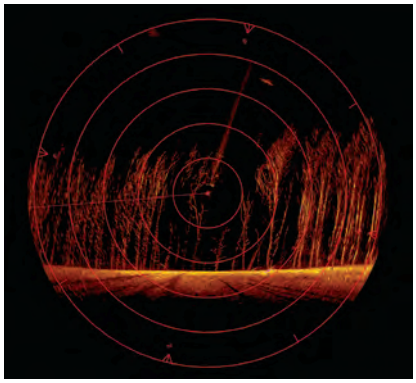
- 3D profiling possible with rotating device
- Track Plotter module allows user to plot scanned area, geo-reference sonar targets and create GeoTIFFs
- networking capability
- target tracking
- simultaneous multiple head operation

Scanning Sonar Applications

Underwater inspection of man-made structures is vital as they age. In addition, water currents, corrosion, and damage from storms and vessels may impact structure integrity. Diving inspections can be costly and dangerous due to a lack of visibility, plus inconsistencies in data reporting are common.

High-resolution scanning sonar provides higher definition images, and the compact size and portability of the equipment enables quick, frequent monitoring. The Kongsberg Mesotech scanning sonar and MS 1000 processing software system is ideal for underwater engineering, search and surveying applications.

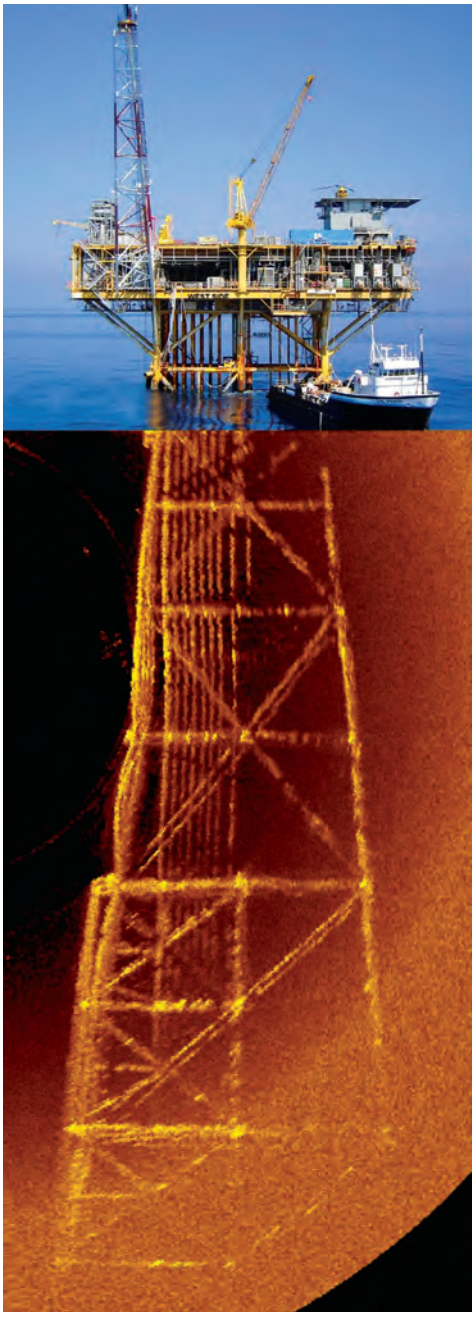




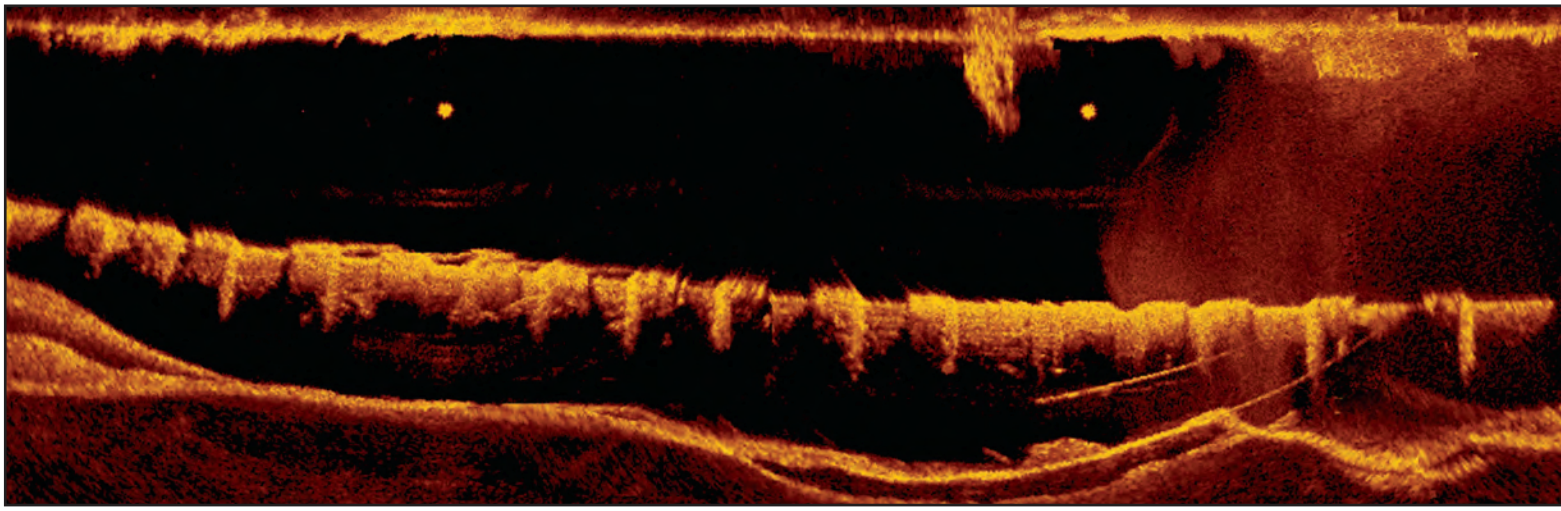
Imaging Sonar Applications

Imaging sonar uses a fan-shaped acoustic beam to scan a specified area or target. Sonar imaging applications include:

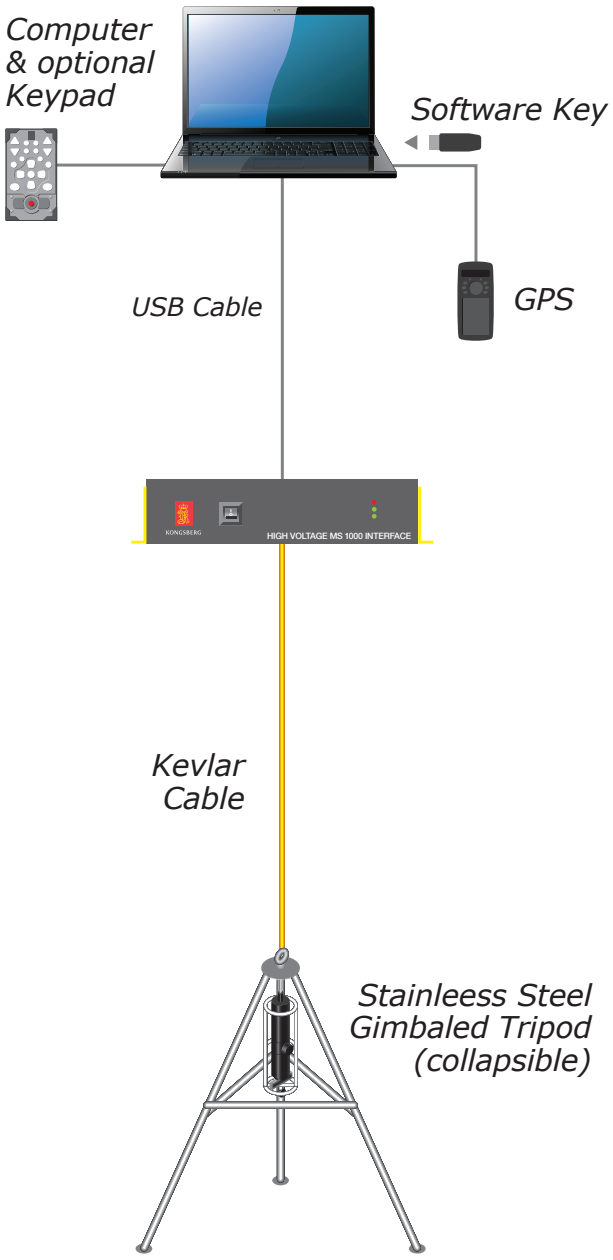
- inspection of man-made structures (bridges, docks, piers and dams)
- site and seabed search and survey
- underwater construction support
- positioning stabilization mattresses and gabions
- guiding grapples and buckets
- pipeline and cable surveys
- scour and sediment aggregation monitoring
- monitoring dredging and backfill operations
- diving support
- underwater timber stockpile assessment and recovery operations
- archaeological surveying



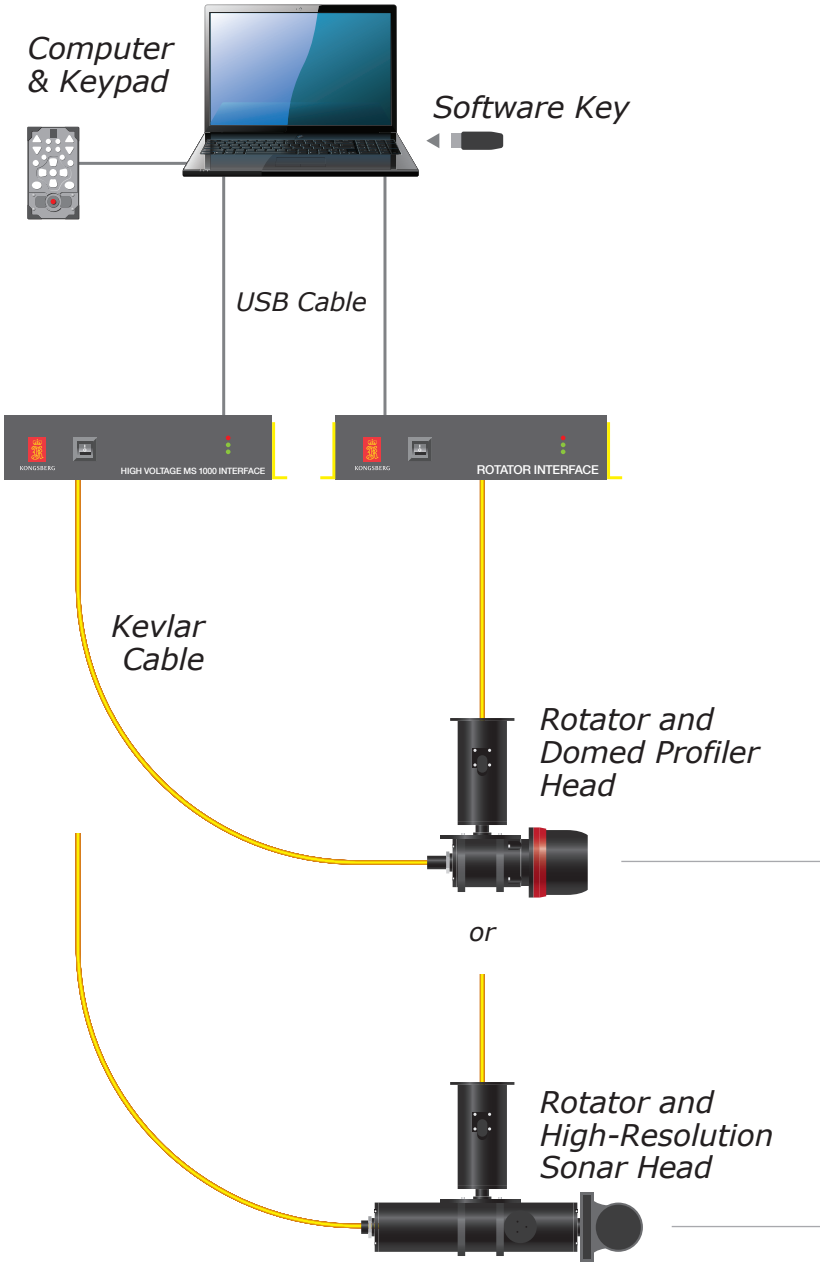
Top: Pipeline stabilization mattresses (Gulf of Mexico).
Above: Standing trees in flooded reservoir (USA). Data courtesy FBI Dive Team
Right: Oil platform (Gulf of Mexico). Data courtesy Fugro Chance
Below: River pipeline crossing (Russia). Data courtesy Peter Diving Services

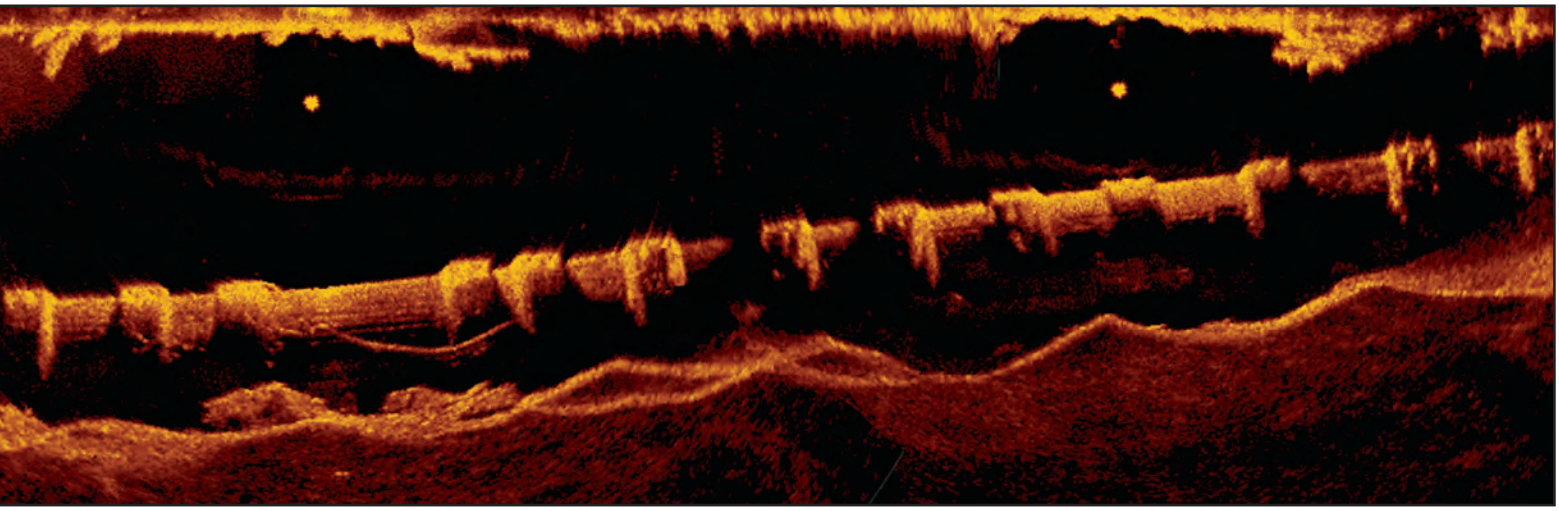


MS 1000
System Connections

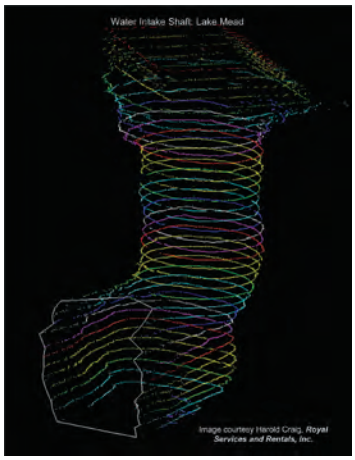


3D MS 1000 Profiler
System Configuration





Profiling Sonar Applications



Isometric view of horizontal profiles. Data courtesy Royal Services & Rentals, Inc.

Profiling sonar is primarily used for quantitative measurements where a narrow, conically shaped beam generates a single range point for each ping.

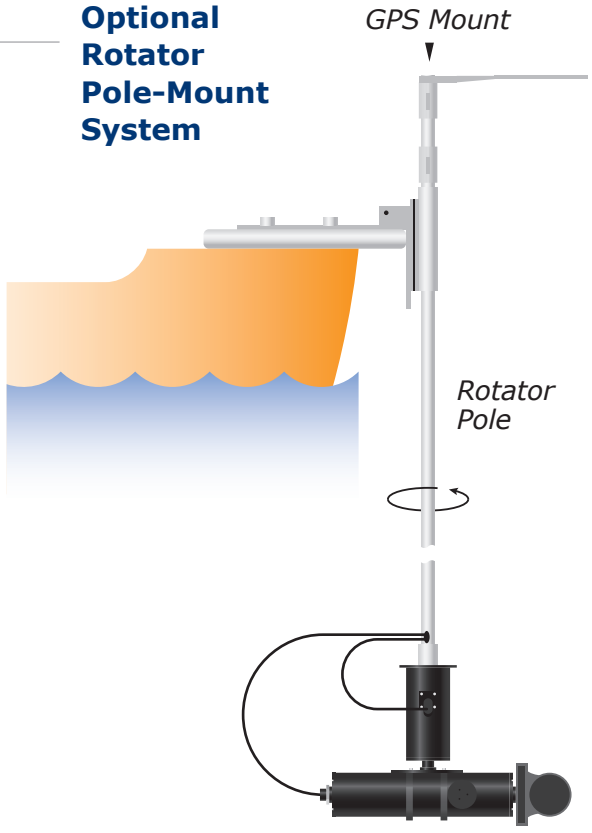
Single Axis Profiling

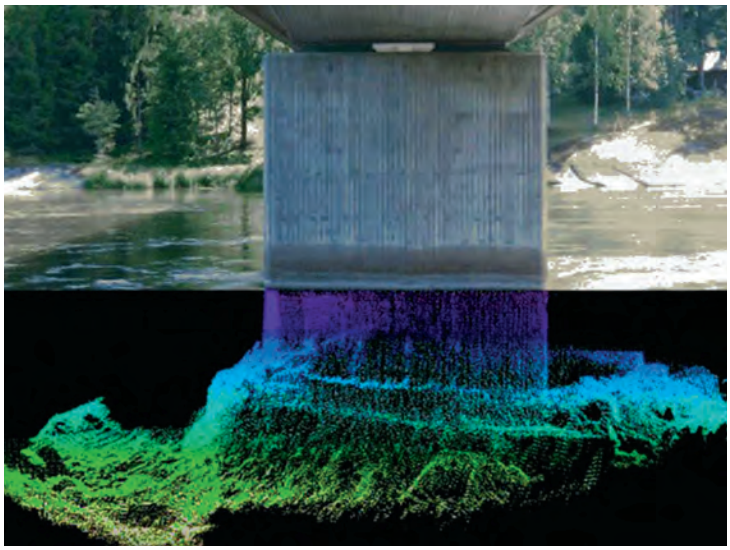
The sonar is positioned stationary while the transducer rotates through a selected arc of coverage and creates a line of profile points. To collect a different profile, the sonar head is re-positioned.

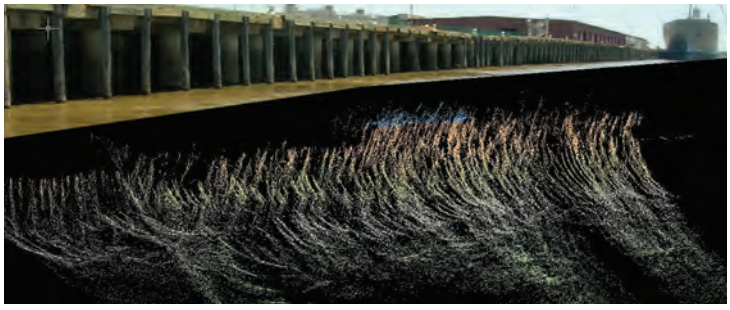
Dual Axis Profiling

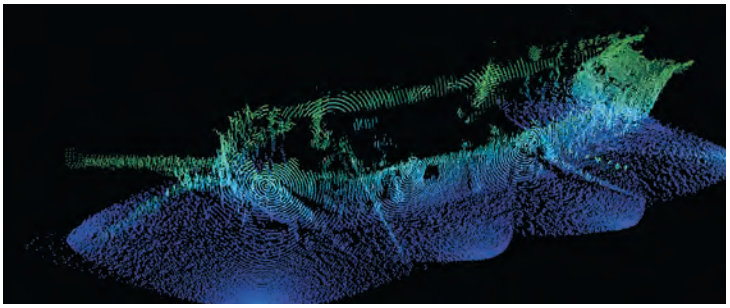
Integrating the single-axis profiling head with a mechanical second-axis drive (rotator) provides 3D capability. After collecting the single axis profile, the head is rotated by the second axis drive through pre-set increments and the scan process repeats. This generates a star-like pattern of profiles from a single position, after which the processed data generates a 3D point cloud projection.

Optional Rotator Pole-Mount System

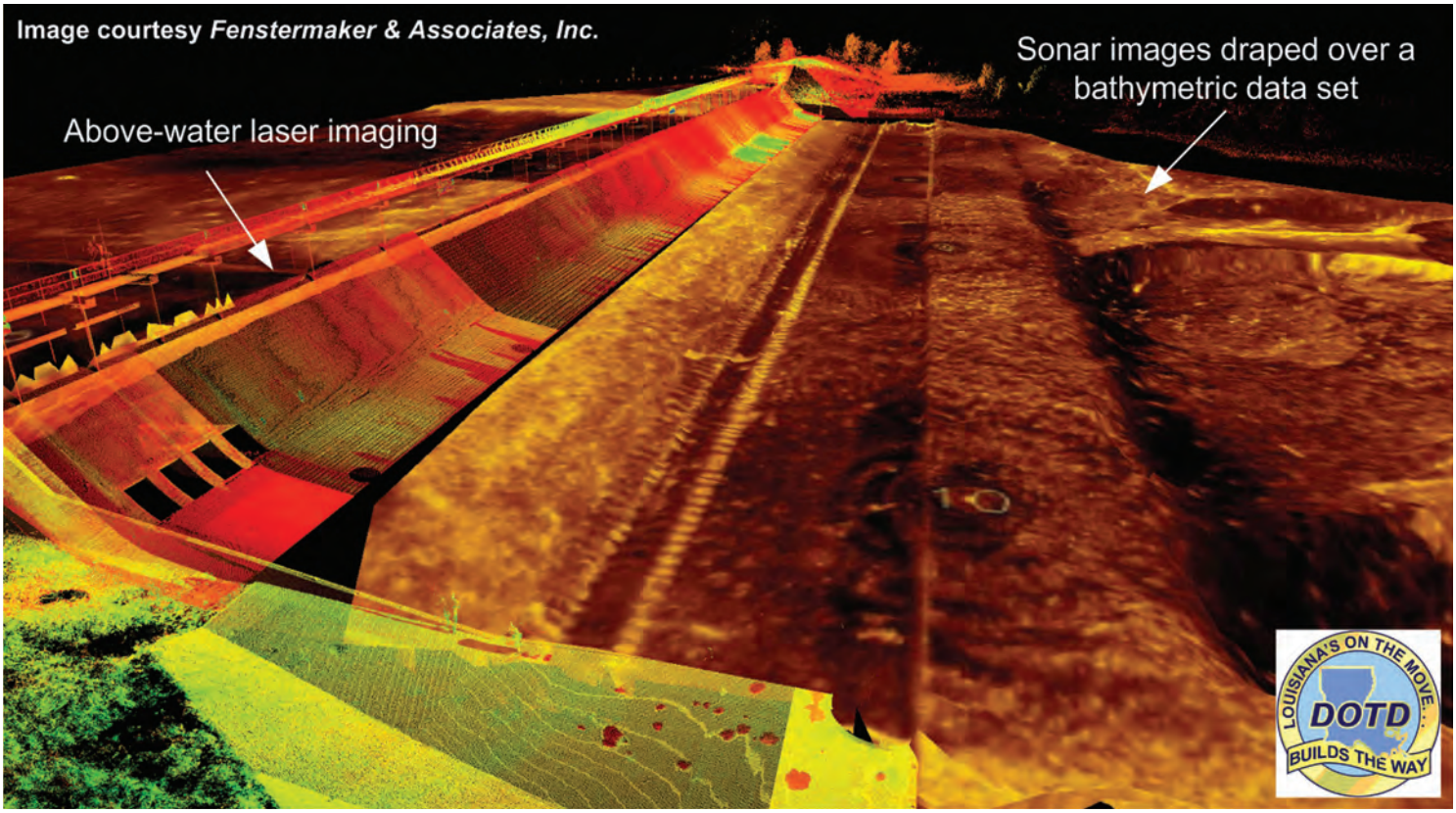


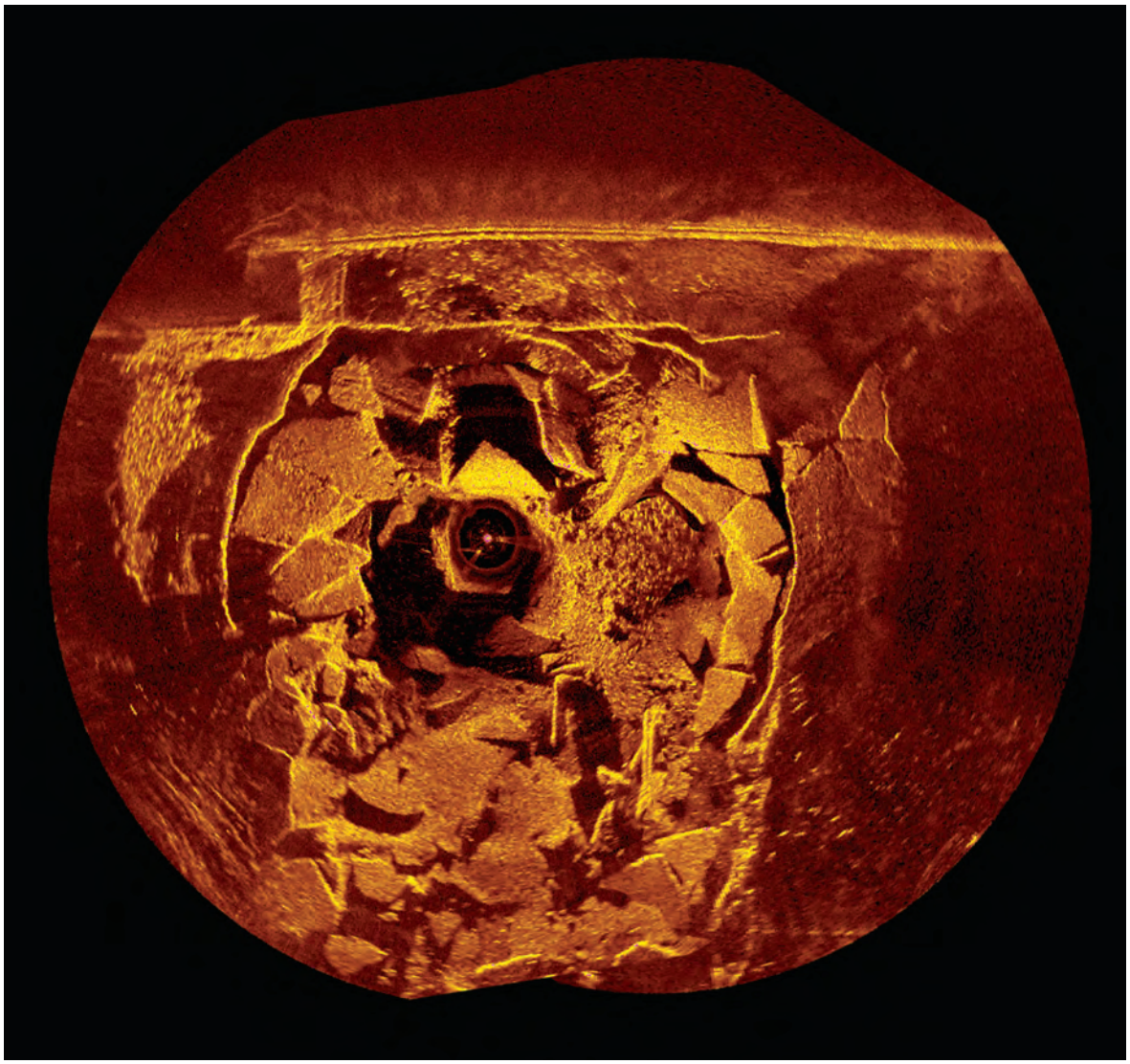






Top to bottom: Below waterline acoustic profiling of bridge pier (Finland). Data courtesy VRT Finland OY*; Point cloud projection of under-dock survey (Louisiana, USA).* Data courtesy Fenstermaker & Associates Inc.*; Dual-axis profiler shipwreck survey (Lake Ontario, Canada).* Data courtesy ASI Group Ltd.*; Riverbed profile (Finland).* Data courtesy of VRT Finland OY





Above: Combining above-water laser imagery with scanning sonar images (Louisiana, USA).
Data courtesy Fenstermaker & Associates Inc.

Left:Imaging sonar showing fractured concrete at aging dam infrastructure (USA).
Data courtesy Nautilus Marine Group, LLC., Lansing, MI

Training and Support

Technical Training

Kongsberg Mesotech provides comprehensive training delivered on site, at the Kongsberg Mesotech manufacturing facility in Vancouver, Canada or any Kongsberg facility. Kongsberg Mesotech also offers sonar application and data interpretation support.

Repair and Upgrade Services

Equipment repairs are available at Kongsberg Mesotech's manufacturing facility and strategically located affiliates. Upgrades and major rebuilds are completed at the manufacturing facility.

Manufacturing Facility:
Kongsberg Mesotech Ltd.
Vancouver, Canada

Affiliate Locations:
Aberdeen, United Kingdom
Singapore

Please call toll-free 1.888.464.1598 or email km.sales.vancouver@kongsberg.com for more information.

MS 1000 Software Updates

MS 1000 software updates are downloaded directly from the Kongsberg FTP site at ftp.kongsberg-mesotech.com. Please call 1.888.464.1598 or email km.sales.vancouver@kongsberg.com for download instructions.

Telephone Support

Please call toll-free 1.888.464.1598 for support, Monday to Friday, 8:00am – 4:00pm PST.

About Kongsberg Mesotech Ltd.

Kongsberg Mesotech Ltd. is a global leader in the underwater acoustic industry with over 40 years of innovative product development and manufacturing experience. Characterized by exceptional engineering capabilities, the Company focuses on providing customers with superior image resolution by producing quality and reliable equipment. Continuous research and development keeps pace with growing markets and demand as well as changes in customer requirements.

Kongsberg Mesotech supplies a worldwide customer base with products for search and recovery, marine engineering, security and surveillance, fisheries and various other underwater applications. There is an extensive support network including training, product support and assistance with application and data interpretation.

Kongsberg Mesotech is the Canadian subsidiary of Kongsberg Maritime, a leader in the merchant marine and subsea industries. Kongsberg Maritime is a division of Kongsberg Gruppen (Group), an international corporation headquartered in Norway.

About Kongsberg Gruppen

The Kongsberg Group is a leading international technology corporation providing advanced solutions and applications for the merchant marine, oil and gas, defence and aerospace industries. The group is comprised of Kongsberg Maritime, Kongsberg Oil and Gas Technologies, Kongsberg Defence Systems and Kongsberg Protech Systems, all with a focus on delivering high-quality products and premium service to global client bases. Kongsberg Group is publicly traded on the Oslo Stock Exchange under the stock symbol OSE: KOG.

[1] Mark W. Atherton (2011). *Echoes and Images, the Encyclopedia of Side-Scan and Scanning Sonar Operations*. Vancouver, BC, Canada.

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