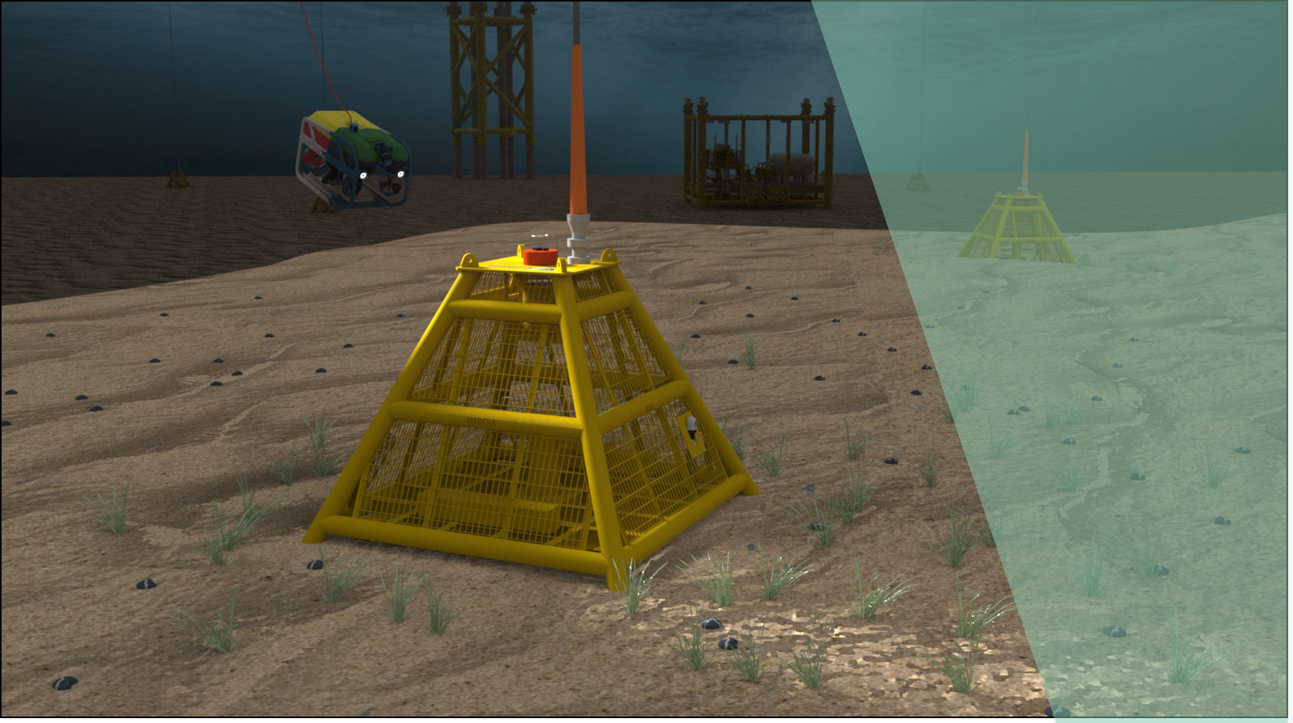


Product

CO_2 Monitoring Platform

Product Application

- Provides early indicators of potential leakage, supporting proactive mitigation measures to be implemented
- Provides long-term monitoring throughout the entire lifetime of the CO_2 storage reservoir

A complete end-to-end solution

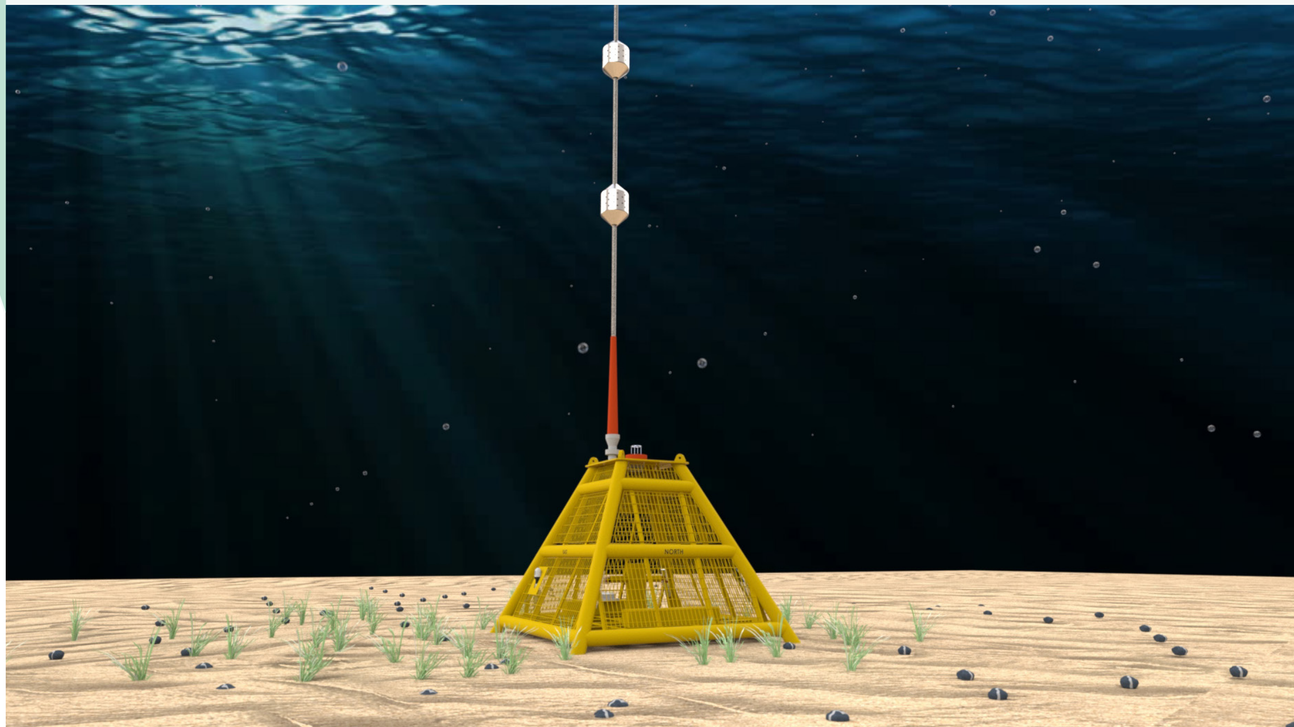
Offshore carbon capture and storage is an important technology that will be essential for supporting our global transition to net zero. Critical to the success of offshore carbon capture and storage will be the ability to guarantee the performance of the storage formation, and to prevent leakage back into the water column.

We've developed a complete CO_2 monitoring solution for offshore carbon capture and storage that uses field-proven technology to provide you with the confidence that your storage sites are performing as expected, against baseline engineering and seismic data, during and post CO_2 injection.

This, combined with our patent pending approach to long-term site integrity, will provide a further measure of security by alerting engineers to any actual CO_2 leaks into the water column long during and after the injection process has been completed.

Key features

- Our unique combination of a data buoy, stretch mooring cable and subsea structure has created a standalone system for complete CO_2 monitoring
- A varied range of sensors that require power, telemetry, and data transmission between the seabed and surface
- Self-powered via solar or wave, equipped with backup surface batteries for easy maintenance and inspection
- Satellite data telemetry system that can send back data to any location worldwide
- Stretch mooring cable provides power & data, eliminating entanglement and reducing watch circles and seabed scour
- Remote sensor nodes to cover an entire storage site and/or areas of special interest such as pockmarks and abandoned wells



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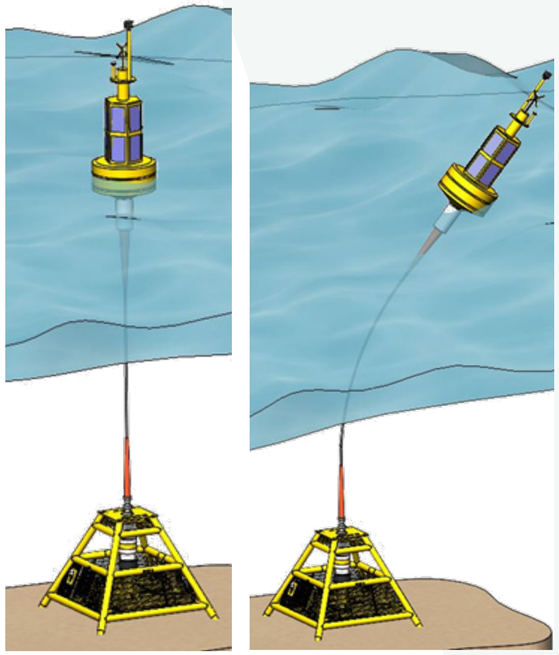
CO_2 Monitoring Platform

An offshore carbon capture and storage monitoring, measurement, verification, and response solution

A standalone system

Our unique combination of a data buoy, stretch mooring cable and subsea structure has created a standalone system that can host:

- A varied range of sensors that require power, telemetry, and data transmission between the seabed and surface
- Self-powered via solar or wave, equipped with backup surface batteries for easy maintenance and inspection
- Satellite data telemetry system that can send back data to any location worldwide
- Stretch mooring cable provides power & data, eliminating entanglement and reducing watch circles and seabed scour
- Remote sensor nodes to cover an entire storage site and/or areas of special interest such as pockmarks and abandoned wells



- Stretch Mooring Umbilical
- 2.5 X Length
- Power & Data
- Eliminates Entanglement & Reduces Watch Circles

Modular polymer data buoy platform

4G and satellite telemetry system

Wave and solar based power generation

Radar reflector, solar power and navigation lights

Bend restrictor

Battery power for subsea and surface sensors/communication

Subsurface seismic sensors

Permanently installed shallow borehole fibre optic arrays can be the first line of defence and provide evidence that the storage site is performing as expected against the baseline engineering and seismic data, during and post CO_2 injection.

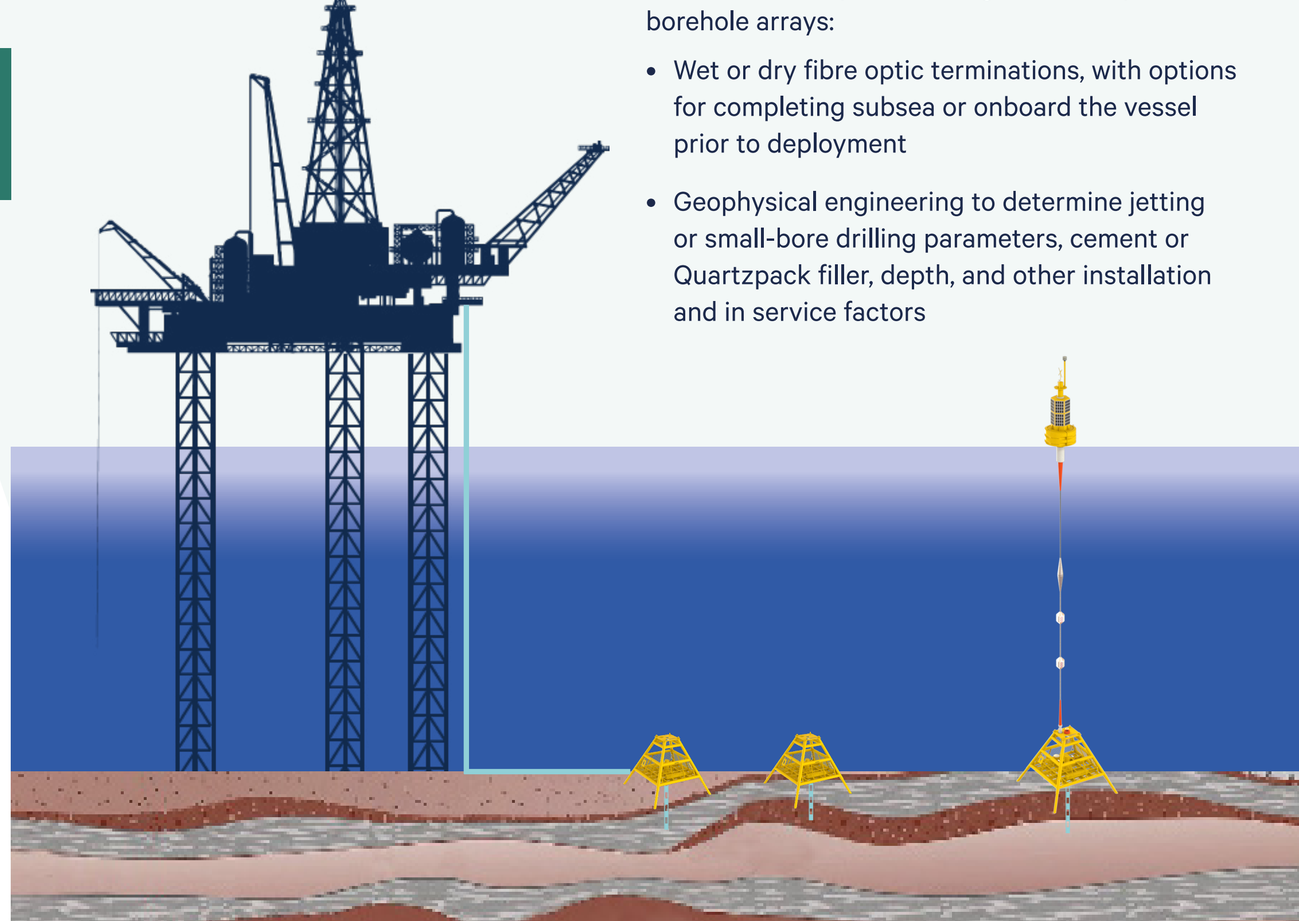
The CO_2 plume can be tracked, and its migration within the formation compared against predictions and storage site expectations. Should any deviations arise, it allows for proactive measures to be taken against potential leakage. Such as reducing, redirecting, or stopping the injection process before a problem manifests into a leak into the water column.

By using acoustic sensing, the advantages of high fidelity (time synchronised and phased content) distributed data collection are even more pronounced. For example, with conventional systems seismic images are built up from a series of discrete ‘wiggle plots’ and building up a useful image can take significant time and cost. Using a high fidelity Distributed Acoustic Sensing yields a far more detailed and immersive image in just one shot – creating considerable efficiency savings.

Installation

Our vessel-based shallow borehole array installation process and system provides a simple and low-cost way of installing the fibre optic borehole arrays:

- Wet or dry fibre optic terminations, with options for completing subsea or onboard the vessel prior to deployment
- Geophysical engineering to determine jetting or small-bore drilling parameters, cement or Quartzpack filler, depth, and other installation and in service factors



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CO_2 Monitoring Platform

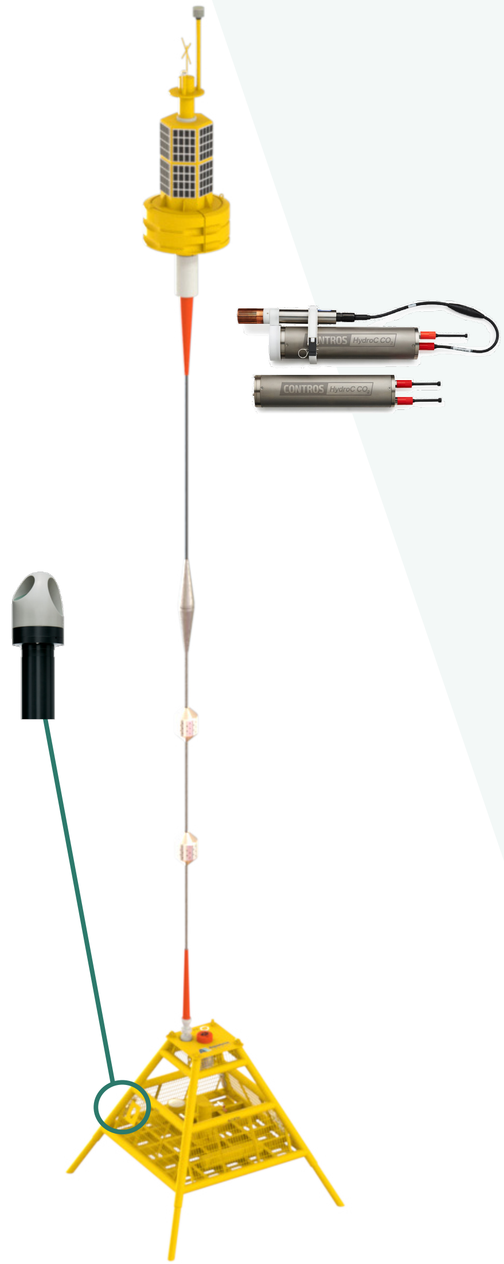
An offshore carbon capture and storage monitoring, measurement, verification, and response solution

Dissolved gas sensors

The addition of dissolved gas sensors (potentially at the same remote node location as the subsurface sensors) offers a further measure of security, alerting engineers to actual CO_2 leaks into the water column via a reactive alarm system.

This patent-pending approach enables meaningful analysis of location and magnitude of a leak, as dissolved gas data is combined with current velocity, direction as well as data from other nodes.

This is however a reactive alarm. Once CO_2 has entered the water column CO_2 injection can be stopped (if still in this phase of the project) but more extreme measures such as well re-abandonment or relief well options maybe need.



Dissolved gas sensor & Aquadopp profiler:

- Can detect tiny amounts of dissolved gas and identify the location of a leak (when combined with current sensor)
- Detecting CO_2 levels in combination with current direction and velocity will allow for the identification of the location of the leak
- Dependent on current direction to expand detection range
- Can detect dissolved CO_2 and can distinguish between CO_2 or other gases
- Long term deployment on sea by observatories

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Specific Site Leak Detection

The development of new technologies now means that fibre optics can also be used for taking measurements.

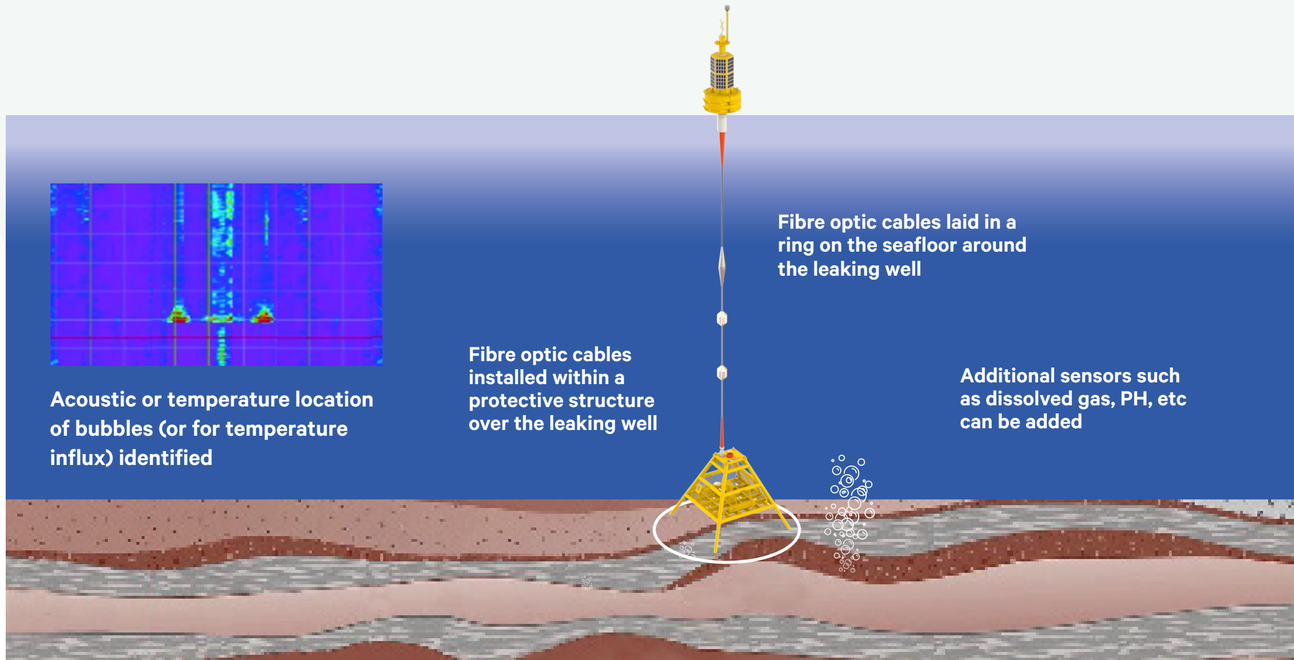
Our system involves the use of fibre optic cables to 'listen' for gas leaks and/or detect temperature fluctuations. Power and data telemetry comes from our standard monitoring system, meaning the system can be deployed in remote locations away from the coast or platforms. Both temperature and acoustic systems involve running a cable all the way around the leaking wellhead to create a 360° ring of monitoring.

Seabed option:
The cable will be housed in a large metal ring that will be placed around the wellhead. Housing the fibre optics within a structure protects the cable itself from damage and prevents marine growth from hindering recordings.

It also ensures that the cable remains in the same place, rather than being moved around by currents.

Protective structure:
This involves integrating the fibre optic cable within the subsea structure. Attaching the cable to the subsea structure has an added benefits as it raises the cable off the seafloor thus preventing it for getting covered in sediment and moves it closer to actual leak site on the wellhead.

A final bonus is the added protection the wellhead will get from having a protective structure placed over it. The structure itself will be fisher friendly, meaning that any fishing operations that take place in the area surrounding the well head can continue as normal.



Related Products and Services

Carbon Capture & Storage

We're ready with the expertise and equipment to support with the most efficient approach to offshore carbon capture and storage projects.

Our Subsea High-Pressure Drilling Riser, with AQC-SR connectors, and our Completion and Workover Riser Systems, with AQC-CW connectors, have both been designed and qualified ready for the low temperatures required to complete successful CCS operations. And our field-proven well re-entry and tieback engineering products and services will support legacy well re-entry and abandonment operations.

Offshore Analysis

Our highly qualified and experienced team provides in-depth analysis, highlighting specific project needs and building bespoke models to replicate situations in offshore environments.

We specialise in a range of riser and conductor analysis services, including but not limited to, jack-up high-pressure riser analysis, platform well conductor analysis, tieback analysis as well as fixed and floating offshore wind analysis.

Offshore Platforms

Our unrivalled life of field and brownfield modification experience means we're perfectly placed to support in upgrading existing infrastructure to store CO_2 in depleted reserves.

From compressor considerations to wellheads and pipe engineering, our team can support with all platform simplification and modification requirements and can support all project stages through to design, fabrication, project management and offshore installation.

Offshore Wind

As turbines grow taller, waters get deeper, and floating projects come closer to commercial feasibility, it has never been more important to apply intelligent offshore engineering principles to the offshore wind sector.

Our offshore heritage means that we are perfectly placed to develop and implement innovative installation technologies, helping project developers, vessel owners and service companies maximise their value in the offshore wind supply chain.

Offshore Green Hydrogen

We're thinking differently about the future of green hydrogen – we're taking it offshore.

We are using a mixture of flexible new and legacy offshore assets to put the electrolyser where the wind is, giving a steady source of power to the hydrogen producer, and a new customer-base for the windfarm developer.

Supporting the full offshore energy ecosystem