

Benthic Geotech has developed a Hydrocarbon Analysis System that enables real time methane sensing while drilling sub sea bed sediments.

Benthic Geotech Pty Ltd, an Australian marine geotechnical services company, is the developer and operator of the world's most advanced undersea robotic drilling rig, PROD\*. The rig is capable of performing rotary diamond drilling, piston and push coring and a range of in situ tests to sub sea bed depths of greater than 100m in water depths of up to 2,000m. PROD, the Portable Remotely Operated Drill, and its associated equipment is transported in 20' shipping containers and can be deployed from a variety of vessels.

When used on Benthic Geotech's PROD, the Hydrocarbon Analysis System can produce a composite trace of hydrocarbon presence and relative abundance. This can be produced concurrently with normal sampling and boring activities.

The System provides an early warning of potential shallow gas hazards and identifies the presence of methane hydrate concentrations.

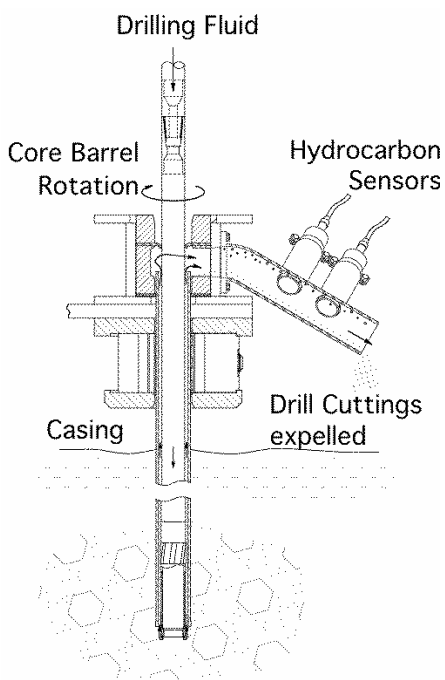
## Real-Time Monitoring During Drilling

The Benthic Geotech prototype Hydrocarbon Analysis System analyses drill returns as they pass through PROD before being vented on the sea bed. The System, in its present form, includes two hydrocarbon sensors in line with the drill returns path. Drill returns, composed of seawater drawn from above PROD and pumped down the drill hole, mixed with cuttings created at the drill bit, also contain any gas or dissolved hydrocarbons that were held in the interstices between sediment particles. Using tool geometry, drill fluid flow rate, and borehole progression rate, the relative concentration of hydrocarbons sensed can be used to estimate the in situ hydrocarbon composition of the material being drilled. Infiltration rate of gas into a borehole may also be estimated by water flushing and monitoring gas concentration over set time intervals.

Gas origin, approximate concentration and approximate depth of intercept are logged versus borehole depth in real time and displayed on monitors in the control unit on board the surface vessel. Data is stored in digital format and can be combined with core logs and other in situ test data.

## The System incorporates proven deepwater sensor technology

At present, two sensors are used; one for high range and the other for low range concentrations. These sensors have been used in environmental and scientific studies in many locations to subsea depths greater than 2,000m and, like the PROD, have been proved robust and reliable.



### Low Range Sensor

|                      |                        |
|----------------------|------------------------|
| Type:                | METS                   |
| Depth Rating:        | 0 – 2,000m             |
| Temperature Range:   | 2 – 20 deg Celsius     |
| Methane Sensitivity: | 300 nmol/l – 10 µmol/l |

### High Range Sensor

|                      |                     |
|----------------------|---------------------|
| Type:                | IR-METS             |
| Depth Rating:        | 0 – 2,000m          |
| Temperature Range:   | -2 – 60 deg Celsius |
| Methane Sensitivity: | 10 µmol/l – 1mmol/l |

\* This system and other PROD related drilling, sampling, and subsea technologies and methods are protected by international patents, patents pending, and patent applications.

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