

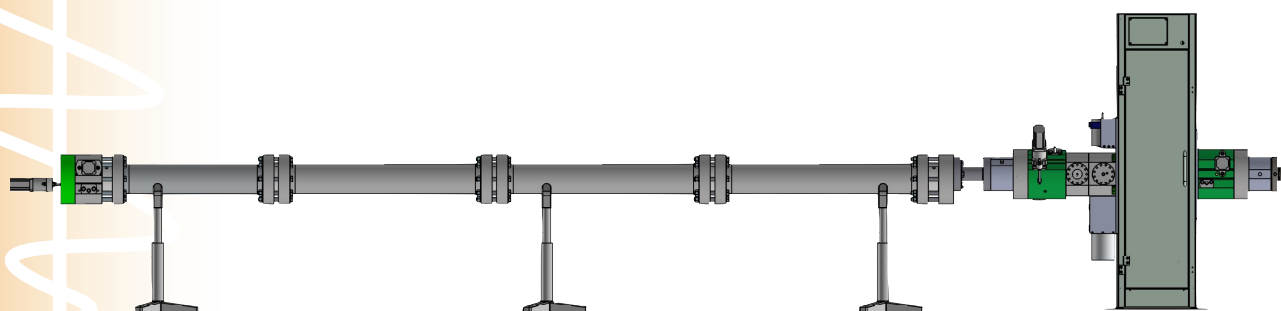
PCATS: Pressure Core Analysis and Transfer System

Pressure cores are taken in geological formations where the preservation of in situ pressures during recovery is critical to maintain the physical, chemical or biological components of interest.

PCATS has been used on many pressure cores taken from gas-hydrate-bearing formations. The dissociation of gas hydrate during recovery of standard cores creates large volumes of gas that expand and destroy the fabric of the core prior to it reaching the surface. Cores recovered at or near in situ pressures and temperature preserve structures and grain/hydrate relationships. PCATS turns these cores into useful laboratory samples for further testing.

Core handling and analysis under pressure

PCATS provides the mechanism and infrastructure whereby pressure cores can be transferred from the coring tool into a measurement chamber, non-destructively analysed providing simple geophysical data and X-ray images, sub-sampled, and transferred into customised pressure chambers for transport or further analysis.



Immediate core evaluation

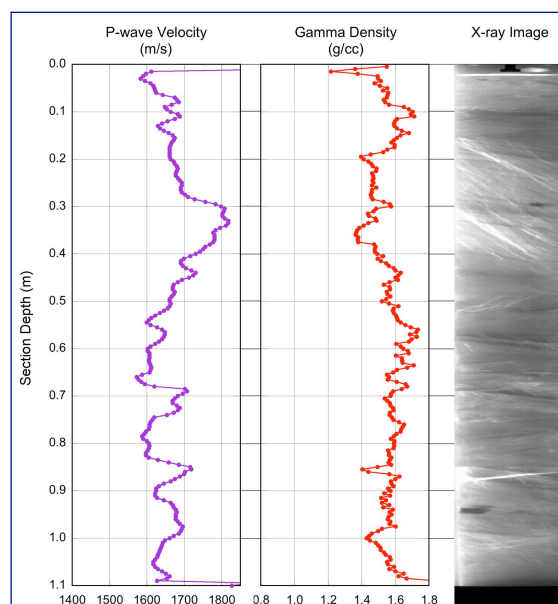
As cores are withdrawn from a compatible pressure corer autoclave, they are X-rayed to determine the length, quality, and contents of the core. These X-ray images allow the core to be immediately evaluated, including identification of cores which have not recovered their targets and must be retaken.

Non-destructive measurements

Using PCATS, automated, high-resolution, non-destructive measurements can be made on pressure cores at in situ conditions. Gamma and X-ray radiation are transmitted through the aluminum pressure housing to measure gamma density and create X-ray images; P-wave velocity is measured using an ultrasonic pulse transmission technique with transducers located inside the pressure chamber. Cores are both translated and rotated under computer control, allowing complex data sets such as helical X-ray scans for computed tomography to be collected.

Multiple data sets at varied orientations can be collected for each core, including high-resolution movies of core rotated in the X-ray beam. Full X-ray computed tomographic reconstructions of portions of core under pressure can be generated at sea.

The PCATS nondestructive data set, collected immediately onboard ship, provides the user with both quantitative information on the nature of the formation recovered as well as detailed qualitative information about the nature of sedimentary and other structures. With this data set, a detailed subsampling and analysis plan can be created for each core.



On-board sub-sampling

Once all the non-destructive measurements have been completed, a core can be cut under pressure at multiple, client-defined locations along its length and the pieces transferred to customised storage or analysis chambers.

To cut cores into “whole round” core subsamples, PCATS first employs a rolling cutter wheel to make a swarf-free cut through the plastic liner, before a guillotine slices through the sediment core. Cut samples are then pushed into purpose-built sample chambers which are sealed and isolated with a large ball valve.

PCATS triaxial cell

PCATS Triaxial is the first triaxial measurement cell to receive a never-depressurized sample. In PCATS Triaxial, samples can undergo advanced resonant column testing, as well as more traditional triaxial tests. These geotechnical measurements can be coupled with mini “production tests” and direct permeability evaluation.

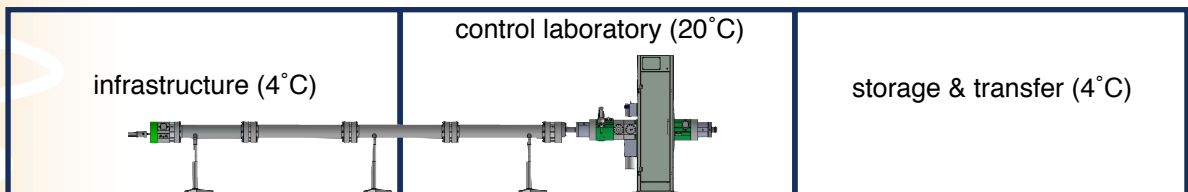


Mini-production tests

Cut samples of any length can be depressurized slowly to provide on-board hydrate quantification. If desired, these mini “production tests” can be carried out while making measurements in PCATS or PCATS Triaxial so that geophysical and geotechnical data can be collected on samples under production conditions.

Transportable system

The main body of the Geotek PCATS is set up inside two portable 20-foot laboratory containers for easy transportation to seagoing or shore-based operations. A third refrigerated container can chill the corer autoclave as well as providing integral storage for pressurized, gas-hydrate-bearing samples cut with PCATS.



PCATS specifications

- **Compatible coring systems:** Aumann HPTC, Fugro FPC & FRPC
- **Pressure rating:** 350 bar maximum working pressure
- **Temperature range:** 4-20 °C working temperature
- **Gamma density system:** Lead-shielded ¹³⁷Cs 10 mCi source and NaI detector
- **P-wave velocity sensor:** Geotek 230 kHz ultrasonic transducers
- **X-ray imaging system:** 130 kV microfocal X-ray source with digital image intensifier capture system
- **Dimensions:** 20-foot laboratory container with extensions for manipulator & corer autoclave

Core processing speed

An average cycle of core extraction, non-destructive analysis, sub-sampling, transfer of core sections (4), and preparation of the PCATS to receive the next core can take approximately 4 hours and requires two scientists/technicians. During intensive pressure coring operations, cores can be transferred to holding chambers for temporary storage at high pressure.

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