

MARINE TECHNOLOGY

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Besides the ongoing flow of projects supporting Marine Science on shore and at sea, several major developments were finalized in 2004:

- * The integration of the three departments Mechanical, Instrumentation and Electronics officially started in April 2004. The new start was also a reason for a new name of the department, which fits better with its activities: Marine Technology (MTC).
- * Two Computerized Numerical Controlled (CNC) turning lathes were purchased and commissioned.
- * The new offices and a part of the workshop space of Marine Technology Mechanical became available.



The new workshop-space and offices of Marine Technology Mechanical



In January 2004, Herman Ridderinkhof had the honour of laying the 'highest' brick

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PROJECTS

MOVE Mobile Vehicle for benthic research

The development of this deep-sea crawler designed to cover up to 30 stations at a maximum depth of 6.000 meters continued. The first shallow water sea-trials showed good results on manoeuvrability, energy consumption and stability on the seafloor



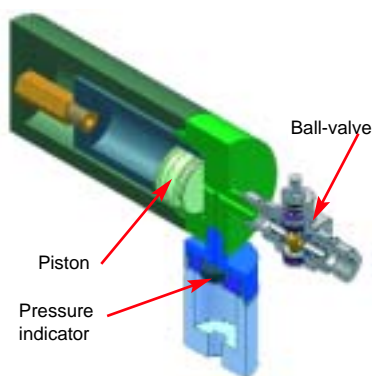
Recovery of the MOVE after the first sea trials



The MOVE mounted in its deployment-frame ready for sea-trials

HIGH PRESSURE SAMPLER

The meso- and the bathypelagic oceanic realms are by far the least explored systems on earth. Much less is known about biological and biogeochemical processes and their rates in the ocean's "inner space" than, for example, in the euphotic layer or, at and in the deep-sea floor. Most of the few studies reporting rate measurements from these layers assume that pressure does not affect these measurements. The few comparative data from measurements under in situ (high) pressure and (low) surface pressure conditions indicate, however, that hydrostatic pressure might considerably affect the rate measurements. As a consequence, the actual rates of biological and biogeochemical processes in the ocean's interior are essentially still unknown.



Section view of the Sampler

This gap in our knowledge on the actual material flux in the largest oceanic subsystems is directly addressed in the new Science Plan of the NIOZ in the Theme 'Dark Ocean Processes' and in the ALW-funded ARCHIMEDES project. The availability of a new type of "High Pressure Sampler" with a large number of small volume chambers to obtain sufficient replicates is crucial for both themes. The chambers should be easily mountable on a CTD-frame and rapidly transferable into temperature-controlled incubators once retrieved on board of the ship.

The first step in the development of a high pressure sampling system was the evaluation of existing systems. Essentially all existing high pressure retaining systems including the one at the Centre National de la Recherche Scientifique (CNRRS) in Marseille (France) have the main drawback that they have large volume chambers making them inappropriate for intensive use with radioactive tracers.



Tests in the pressure tank at the Dept. of Marine Technology

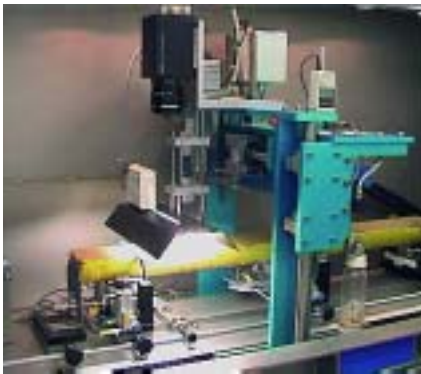
Thus, in order to meet the specific requirements, a whole new system had to be developed. This system consists of several small volume bottles (50 ml and 200 ml) to allow sampling of sufficient replicates at one depth and sampling at several depths. The high-pressure sampling and incubation device operates like a syringe. On deck the tracer used for metabolic activity measurements is added to the individual chambers and the valve closed. At the sampling depth, the valve is opened by the trigger mechanism and the piston pushed down by the entering seawater. The chamber behind the piston is filled with seawater and by lowering the piston this water flushes through a couple of nozzles into the outer cylinder. The nozzle acts as a hydraulic brake, which ensures that the piston is slowly pressed down in the cylinder. After the cylinder is filled, the valve is closed.

To avoid pressure loss during retrieval of the samplers, the sampler is constructed with a double wall. The inner cylinder holds the water sample and the chamber between the inner and outer cylinder has almost the same pressure as at sea level. At sampling depth the inner cylinder will deform due to the pressure just as it would deform under surface pressure conditions with the same inner pressure. A single cylinder would deform during retrieval to the surface by the decreasing external pressure. But now, both during filling and retrieval to the surface, the pressure condition of the depth of sampling is retained. Only temperature causes small pressure changes of the sample (generally less than 8 %).



Preparations for testing during the BADE-cruise on board of R/V Pelagia in Sept/Oct2004.

The new device was extensively tested during the BADE-cruise and several small modifications will be made on the basis of the experience gained, About 100 of these pressure-chambers should be operational in the early summer of 2005, so that they can be used during the ARCHIMEDES expedition to the Canary Abyssal Plain in September / October 2005.

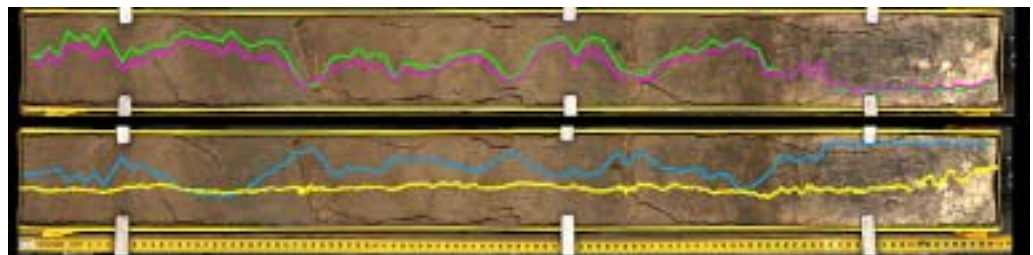


COLOUR ANALYSIS MODULE for XRF-Sediment Core scanner

A high resolution Colour Line Scan Camera with a spatial resolution: $< 0,1 \text{ mm}$ was mounted on our X-Ray Fluorescence (XRF)-Sediment Core Scanner. This enables scientists to perform high-resolution colour analysis on their vertically split sediment cores directly on board.

High resolution 3-CCd camera mounted on XRF-Core Scanner

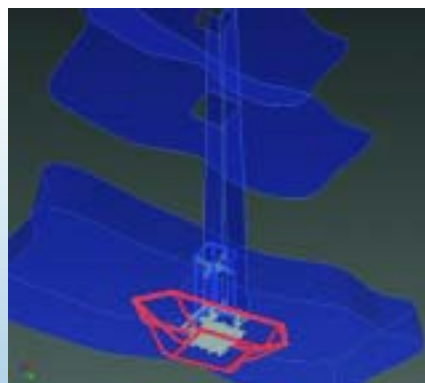
Color images are also used to interpret the data obtained from the XRF-analysis.



MOONPOOL on new TESO Ferry 'Dr. Wagemaker'.

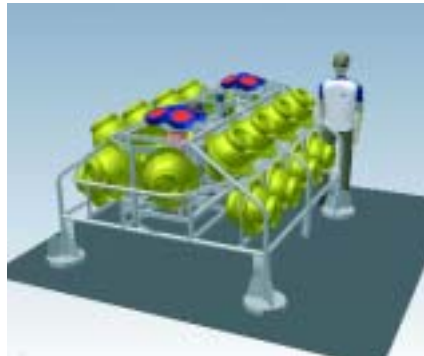
Measurements for the research project 'tidal and morphodynamics of coastal zones' will also be carried out from the new TESO ferry 'Dr. Wagemaker'. Just like the 'Schulpengat, this new ferry will also cross the Marsdiep inlet of the Wadden Sea between Den Helder and Texel during its operational life. Because NIOZ has been involved in the design of the ship from the beginning, we have been able to obtain a moonpool. This allows the equipment to be lifted from the ships' bottom. In this project the NIOZ scientists can obtain numerous data via an on-line connection between the ferry and the institute.

Data on the current strength and direction, water temperature and salinity will also be displayed on-line for the general public on two big plasma screens in the passenger areas of the new ferry, which will start its operational life in June 2005.



ADCP/fast thermistor string BOTTOM-LANDER

A flat and stable deep-sea lander for ADCP and thermistor string measurements. The pictures show a 3-D engineering model and the lander ready for shipping. In October, the lander was deployed near the top of the Great Meteor Seamount in the Canary Basin of the Atlantic Ocean at a depth of 530m.



CFC-analyser

The first prototype of our Chlorofluorocarbon (CFC) analyser for the measurements of low concentrations of CFCs in seawater was tested on the North Sea in November 2004. A gas chromatograph is the core of this equipment and the software was developed in house by MT-Electronics.



OPERATIONAL ASSISTANCE during cruises

Technical assistance during sea-going cruises on the RV Pelagia but also on other research vessels as the RRS Charles Darwin (SOC) and the French RV Marion Dufresne (IPEV).

On a preparatory cruise for the IODP-proposal coordinated by Utrecht University in October 2004, NIOZ carried out seismic research on the Marion Dufresne.

