SINTEF

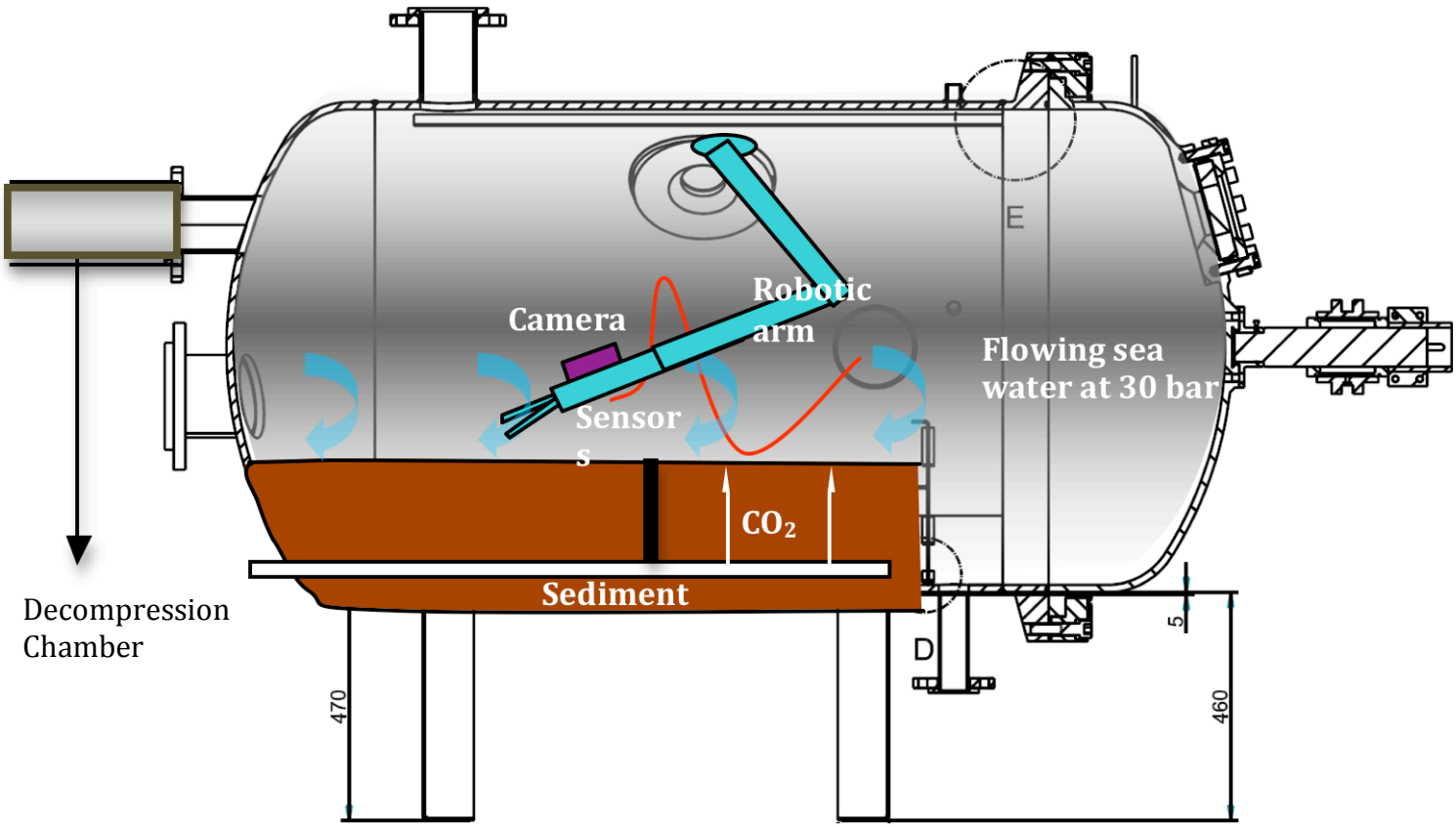
NTNU

Working under pressure

simulating leakage from CO_2 reservoirs in a high pressure system

THE HIGH-PRESSURE TANK

In order to simulate the conditions in deeper water a high-pressure tank in titanium has been constructed by StatoilHydro, The Norwegian University of Science and Technology (NTNU) and SINTEF. This tank can attain a pressure of up to 30 bar, which corresponds to an ocean depth of 300 meters. It has a volume of 1.4 m^3 and an internal decompression chamber so that animals or samples can be removed from the tank even when it is under pressure. The tank is equipped with circulation pump, metal sensitive electrodes and electronic hardware and software for control of operations and data logging and, a blood micro-sampling system for *in situ* measurements of blood parameters, and the robotic manipulator arm makes it possible to handle and monitor the animals in the tank during exposure.



Transect of tank. *Illustrations: StatoilHydro*

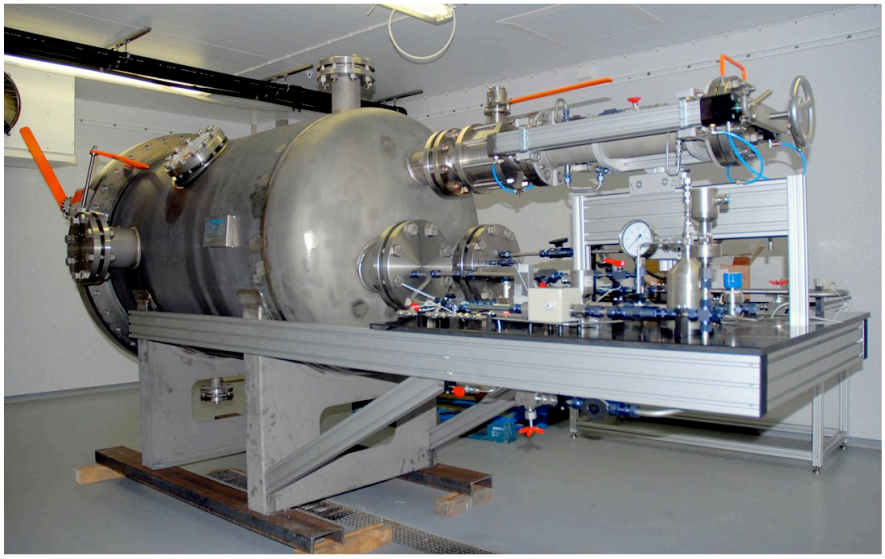
Specifications	Applications
• Pressure: ≤ 30 bar	- External blood micro-sampling system
• Volume: 1.4 m^3	- Robotic manipulator arm
• Flow: < 1 l/ min^1	- Internal decompression chamber for
• Resirc: < 10 l/min	samples (diameter < 9 cm)

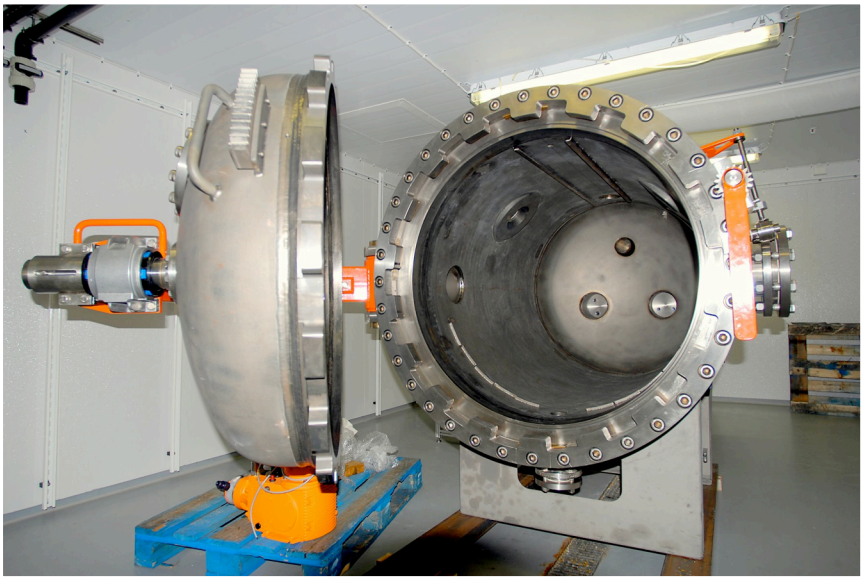
The seawater will flow continuously through the chamber and the pressure will be elevated to the desired level by the external pump, and carbon dioxide will be added to the water before it enters the tank or directly into tank through sediment chamber. The hydrostatic pressure inside the tank is stabilized with a small gas volume inside a cylinder, where a movable piston separates the gas phase from the seawater in the tank.

The manipulator arm is based on a hydraulic system, which can be controlled manually from the outside of the tank. The manipulator arm is equipped with "pinchers", which can hold and move objects inside the tank while it is under pressure. Of particular interest is the possibility to control the sampling of body fluids and to move samples of body fluids, seawater and sediment samples out of the tank

through the decompression lock while the tank is under pressure. The fluid sample is taken and moved out of the tank by the use of two reciprocate motor driven syringes mounted outside the tank and controlled from the computer. Several valves will be used to move the fluid sample to the desired chambers for decompression and removal of carbon dioxide. The arm is also equipped with a video camera connected to an outside monitor screen to allow fine manipulation of operations inside the tank.

The activity of the pressure pump, the addition of carbon dioxide and the registration of metal concentrations, pH and carbon dioxide tension will be controlled and monitored on a computer with Labview software, adapted to the operations of the tank by staff from SINTEF.





All activities involving the high-pressure tank will be conducted at its location at NTNU and SINTEF's facilities at SeaLab in Trondheim, Norway. For inquiries regarding the high-pressure tank or the activities at SeaLab please contact any of the persons listed below.

SeaLab with NTNU´s new research vessel "Gunnerus" in front. *Photo: Erik Høy*

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