ROV Kiel 6000: A New Research Platform for Ocean Observatories and Deep-Sea Investigations Down to 6000m Water Depth

Thomas Kuhn

Leibniz Institute of Marine Sciences at the University of Kiel, IFM-GEOMAR
Kiel, Germany
e-mail: tkuhn@ifm-geomar.de

Abstract

The Leibniz Institute of Marine Sciences in Kiel, Germany, is currently acquiring a deep-sea remotely operated vehicle (ROV) with a depth rating of 6000m. This electric, work-class ROV built by SCHILLING ROBOTICS LLC within their Quest production line will be equipped with 7 brushless thrusters each with 210 kgf peak thrust, 1x 7-function, spatially-controlled and 1x 5-function, rate-controlled manipulator, a sonar system as well as 1 broadcast quality video camera, 2 high-resolution color zoom cameras, 4 b/w observation cameras and 1 digital still camera. All color cameras are mounted on pan and tilt units. Scientific tool packages include a laser video measurement system and CTD as well as a tool sled mounted underneath the ROV frame with 2 hydraulically driven trays and up to 300 kg of scientific payload.

The heart of the ROV is a digital telemetry system (DTS) with its basic unit, the communication node, a small, lightweight, 16-port module that can be used alone or daisy-chained for additional functionality. The node features a Gigabit Ethernet backbone, and each port can be individually configured for serial, video, or Ethernet. The DTS™ node routes power and telemetry between the system and all instruments on the WROV and tool skids. Four (4) nodes will be supplied with the ROV Kiel 6000 system to operate all standard on board equipment. Initial complement of ports is allocated as follows: 12 Video, 36 Serial, and 12 Ethernet, capacity will be 64 ports.

To support certain devices requiring high-speed telemetry, such as multi-beam sonar's (MBE), and real-time high-definition video, a course wave division multiplexer (CWDM) is included. The CWDM interfaces to a secondary single mode fiber optic element and provides up to six

(6) channels on this fiber. The implementation of HDTV is planned after an international standard has been set in near future.

ROV Kiel 6000 will be run in life boating mode, i.e., the ROV is directly linked to the surface vessel via a steel-armoured, fiber-optical umbilical. No tether management will be used. The ROV control system allows station keeping (±0.3 m) and automatic flight control such as automatic displacement, cruise and trim. Navigation will be realized by the USBL-based POSIDONIA™ system supported by the SONARDYNE ROV-Homer™ system. An intertial navigation system such as IXSEA's PHINS™ is planned to be implemented at a later stage.

The ROV system works with a 19mm, 6500m fiber-optical umbilical wound up in 19 layers on an electrically-driven winch. Two fibers will be used simultaneously during a dive and a third backup fiber is also connected. This configuration will not only allow for the transmission of large amounts of data, but will ensure continuous work should one fiber break.

The ROV is currently being built by SCHILLING ROBOTICS LLC at their factory sites in Davis, California and delivery for the first deep-sea test is planned for July 2007.

Thomas Kuhn

Name	Dr. Thomas Kuhn
Date of Birth	October 24, 1964
Nationality	German
Family Status	Married
Address	Leibniz Institute of Marine Sciences (IFM-GEOMAR) Wischhofstr. 1-3, Geb. 8E/211 D-24148 Kiel, Germany phone: +49/(0)431-6002134 e-mail: tkuhn@ifm-geomar.de

1989 - 1994	Technical University Clausthal, Earth Science Program M.Sc. (Diplom) in Geology. M.Sc. thesis (Diplomarbeit): *Sedimentological & geochemical investigations of marine sediments from Ampere Seamount (NE Atlantic) in relation to glacial/interglacial stages*
1994 - 1999	Ph.D. student at the Dept. of Economic and Environmental Geology, Free University of Berlin. Ph.D. thesis: *Geochemical and mineralogical investigation of sediments and Fe-Mn crusts from the Rodrigues Triple Junction (Central Indian Ocean) with special respect to hydrothermal signals*

Work Experience

1986	Geological Research and Exploration Ltd. Halle, Dept. of Industrial Minerals
1988	Geophysik Leipzig Ltd.
1994 - 1999	Research Assistant at Department of Economic and Environmental Geology, Free University of Berlin
1999 - 2000	Research Assistant at Institute of Freshwater Ecology Berlin
2000 - 2003	Research Assistant at the Institute of Mineralogy, Freiberg University of Mining and Technology
since 2004	Research Associate at Leibniz Institute of Marine Sciences Kiel (IFM-GEOMAR)

Scientific interest

Remotely Operated Vehicles; development of technical systems for mining of submarine massive sulfides; PGE and Os isotopes in marine hydrothermal systems; trace element geochemistry in Fe-Mn crusts; 3D modeling of ore bodies and seafloor systems with gOcad®, formation of seafloor hydrothermal systems and comparison with ancient analogues.