

Real-Time Systems for Offshore Oil & Gas Operations

Real-Time Systems for Offshore Operations - Why?

State-of-the-art real-time monitoring systems provide the means to measure ocean current profiles in ultra deep water, surface currents, waves, winds, and structure positions and motions. In common applications, real-time data are updated at 10-minute intervals and can be displayed on the host facility and transmitted to multiple locations as needed on shore. The reasons for collecting current profiles are wide ranging – from satisfying regulations (MMS NTL No. 2007-G17 in the Gulf of Mexico) – to assisting operations by monitoring sometimes rapid changes in the strength of currents associated with mesoscale features such as eddies – to collecting data to improve regional data bases used in design. Woods Hole Group provides design, installation, operation and maintenance of integrated systems and software to meet diverse customer requirements.

Real-Time System Description

- *Sensors and Deployment Mechanism*

A typical monitoring system consists of a deployment frame, a low frequency (38 or 75kHz) acoustic Doppler current profile (ADCP) looking downward to a depth of up to 1000m, an optional high frequency (300kHz) ADCP profiling upward, a meteorological station, and one control PC with data output to the local network. The deployment frame may consist of an elevated deck, a hydraulic lifting boom, and a pneumatic winch for an over-the-side deployment. Other deployment alternatives include sled-mounted systems in the moon pool, moored systems or bottom-mounted systems. For the over-the-side mount, the ADCP transducer is installed on a mounting frame utilizing spreader bars and four sheaves for guiding the lifting wires. The optional upward-looking ADCP is mounted on the spreader bar itself. The bar is deployed to a depth of approximately 30m-50m, returning data to ~1,000m. The upward-looking ADCP provides current profile data for the near surface zone. Other sensors may be installed/integrated to monitor meteorology, vessel position and motion, anchor/winch tensions, or other structural parameters.

Rig Experience

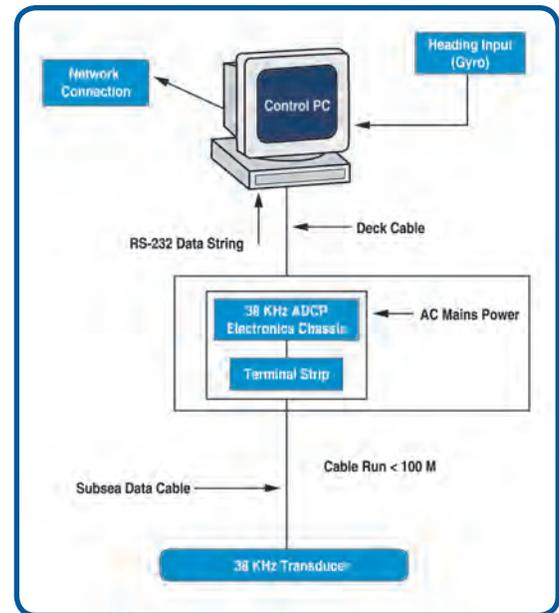
Artic 1
Atwood Hunter
Deepwater Millennium
Deepwater Pathfinder
Discoverer 534
Discoverer Enterprise
Discoverer Spirit
ENSCO 7500
Falcon 100
Glomar Explorer
Glomar Jack Ryan
GSF Celtic Sea
GSF CR Luigs
GSF Development Driller II
Nobli Amos Runner
Noble Lorris Bouzigard
Noble Max Smith
Noble Paul Romano
Ocean America
Ocean Baroness
Ocean Concord
Ocean Quest
Ocean Voyager
Transocean Marianas

- **Data Management**

Data are routed to the surface by a secure power/data cable. Power and data are routed to/from a junction cabinet in an air-conditioned interior space and then to the control PC. Moored or bottom-mounted systems are generally battery powered, and can transmit data acoustically to the surface.

System operation is performed by a dedicated PC located in the control room. This PC is usually integrated with the Local Area Network. Software used to display and archive the data includes the Woods Hole Group Integrated Real-Time Monitoring System (IRMS) software. Data are stored on the Control PC's hard disk drive, and are usually telemetered to shore with an automated FTP method. Worldwide telemetry is possible with this method.

This method has been used successfully by WHG for a variety of oil industry offshore systems.



System configuration.

Project Elements

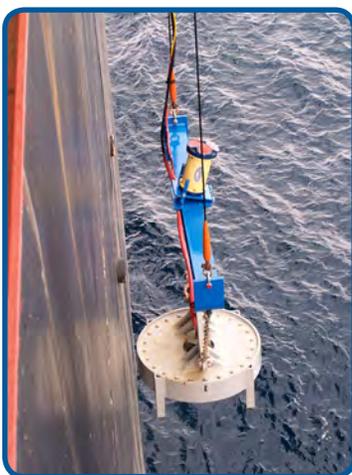
Mobilization - Prior to system installation, all equipment is tested and integrated.

Installation - Safe and efficient installation and commissioning require careful planning, rig support, and adherence to all rig directives for safety and protocols. Engineers depart the rig once the system is operational and either client or rig-designated personnel are trained in routine operation, data retrieval, and system recovery procedures.

Servicing - Routine servicing is normally at three to six month intervals.



On-deck deployment system.



Over-the-side mount.

Demobilization - At the completion of the measurement program, the entire system (less permanently installed equipment) may be demobilized and removed from the rig, or simply transferred to the next customer.

Project Management - Woods Hole Group takes pride in its customer service, adhering to schedules and budgets. Proactive communication is the norm, particularly if unexpected events arise.

Data Analysis & Reports - Woods Hole Group specializes in oceanography and ocean engineering, and can add value to measurements depending upon customer requirements. Data reports, design criteria studies, and specialized projects (e.g., fatigue analysis, internal waves, other) are within our expertise.

Woods Hole Group Experience

Woods Hole Group personnel have decades of experience supporting offshore oil and gas requirements for exploration and production operations from ultra deep water, to shallow water, and into ports and harbors. We have worldwide experience for a diverse client base including major and independent oil and gas companies, engineering companies, rig providers, port and harbor authorities, and government agencies.

Real-Time Met-Ocean Monitoring System for the Drillship Glomar Jack Ryan

Woods Hole Group designed and built a real-time meteorological and oceanographic monitoring system for the Drillship



Glomar Jack Ryan, operating in the Gulf of Mexico, the Atlantic Ocean off South America (Trinidad and Brazil), West Africa, and offshore Australia while under lease to ExxonMobil, Chevron, BP, and others. The system consists of a Teledyne RD Instruments' downward-looking 38 kHz phased-array acoustic Doppler current profiler (ADCP) suspended below the surface, sensors that measure wind speed and direction, and an upward-looking 300 kHz ADCP to measure near-surface currents.

Woods Hole Group's proprietary Integrated Real-Time Monitoring System (IRMS) software was used to network, archive, and telemeter the data, as well as to generate real-time user-specific displays on a PC. Data were used onboard to make day-to-day operational decisions, and archived data were used for offshore design purposes. Woods Hole Group installed and serviced the monitoring system on site. We also provided data QA/QC, management, and services for automated daily transfer of data from the rig to the client's shore side facilities.

Environmental and Structural Monitoring System, West Seno Field

The West Seno Field is an offshore oil and gas production facility offshore Indonesia in the Makassar Strait. Woods Hole Group has extensive experience measuring currents and developing metocean design criteria in the Strait. At West Seno, there are significant operational concerns associated with currents and winds that affect the risers, anchors and winches, and the production facility movements and position. Woods Hole Group provides real-time data onboard the West Seno platform so that operators can make informed decisions. User-customized displays integrate the environmental data with structural data (e.g., line tensions) and position. Real-time data also are available at shore side facilities to guide decision-making.



Real-Time Met-Ocean Monitoring System for the Cassia Oil & Gas Production Complex

Woods Hole Group was contracted by BP Trinidad and Tobago, LLC (bpTT) to design, build and install a meteorological and oceanographic measurement system on the bpTT Cassia oil and gas production complex, offshore eastern Trinidad. Woods Hole Group provided system design, integration, installation, and real time data display along with monthly data reporting and archiving during the 24-month project.



The bpTT Cassia Metocean system consists of two Nortek AWAC Acoustic Doppler Current Profilers arranged to generate a continuous profile of currents through the 90m water column.

The system also measures wave height and direction, along with wind, barometric pressure, and temperature/relative humidity sensors. Data are integrated into the Woods Hole Group propri-

etary Integrated Real Time System (IRMS) to acquire and store all raw data, and to display the processed data on the Cassia production complex for operational use in real time. BP in Houston is able to access the real time processed data through any BP web enabled access port.



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Commercial Considerations

- What type of rig/ship/platform will be operating?
- Does the rig have an existing Monitoring System?
- Was system location ideal for this rig?
- What elements will remain?
 - On rig cabling/junction boxes
 - Support platform
 - Winch(es)
 - A-frame
- What is the ideal profiling range?
 - ~30m to ~500m
 - ~30m to ~1000m
 - ~10m to ~500m
 - ~10m to ~1000m
 - > 1000m
- What is port of mobilization?
- Will Company provide accommodation for personnel at port?
- Will Company handle shipping/transportation from port to rig?
- How soon is the System required?
- What is the expected length of System deployment?
- What are the Data Requirements?
 - Current profiles
 - Winds/Meteorology
 - Waves
 - Current profile
 - Near-surface currents
 - Near-bottom currents
 - Position tracking
 - Riser/winch tension
 - Other

Recent Clients

ARAMCO
BP
BHP Billiton
C&C Technologies
Chevron
Devon
ExxonMobil
MMS
NOAA
Ontario Hydropower
Petrobras
Port of Los Angeles
Shell
USACE

Woods Hole Group Attributes

What distinguishes Woods Hole Group is the dedication and experience of the staff, and the emphasis on quality, safety, and customer service. The Oceanography & Measurement Systems team includes a diverse staff of reliable field engineers and technicians with international experience, as well as world-class applied oceanographers and ocean engineers with practical industrial experience. Clients rely on the team to provide turnkey services from integration and deployment of measurement systems, to data recovery and quality control, and through analysis and engineering/operational guidance. The team operates according to approved HSE protocols and quality standards, and emphasizes customer communications and responsiveness.