A Case Study

Real World Solutions from Teledyne Benthos

Real-time rapidly deployed wireless current monitoring

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Teledyne Benthos Equipment: Acoustic Modems

Customer: Naval Oceanographic Office

Application: Underwater wireless data transfer

Depth: 20 to 30 meters

Range: Approximately 1000 meters

Data Rate: 1,200 bits/sec

Host Sensor: Teledyne RD Instruments Workhorse Sentinel 600 KHz or 300 KHz Acoustic Doppler Current Profiler (ADCP)

Modems: Gateway Buoy with ATM-885R OEM PCB, SR-50 Acoustic release/ modem

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The Challenge

The Naval Oceanographic Office (NAVO) needed to provide underwater current profiles for Navy based test programs and exercises, such as AUV Fest. AUV Fest provides an environment for autonomous underwater vehicle (AUV) manufacturers to demonstrate their new vehicles and ancillary equipment to potential customers. Changing sea conditions can greatly influence the length and success of a mission, thus real-time data is extremely important to the operators for their pre-mission planning and real-time operations. Real-time systems typically require large buoys, large batteries, large bottom frames and expensive and cumbersome cables. NAVO needed to reduce the size, weight, underwater footprint and complexity of deploying these systems. Teledyne Benthos was contacted for possible alternatives to their current mooring solution.

The Solution

NAVO needed to collect current profiles from a Teledyne RD Instruments Acoustic Doppler Current Profiler (ADCP) and transmit those profiles to shore in real-time, so the acoustic modem solution was selected. They also required a reduced seafloor footprint that was cost effective. The Teledyne Benthos SR-50 combined acoustic modem / acoustic release unit was selected. The SR-50 combines the proven, reliable modem and release technology offered by Teledyne Benthos into a single unit, thus reducing the need for two subsea devices. The SR-50 was configured with a remote transducer head to allow optimum positioning of the transducer above the sensors for clear acoustic communication to the surface. The body of the SR-50 could then be located near the bottom of the mooring for best mechanical release functionality (see figure 1). The SR-50 and ADCP both contain internal batteries and interface through a single RS-232 cable. The sensor collected data once every half hour. The data was sent via RS-232 to the SR-50, which acoustically transmitted the data to the topside or surface modem.

The topside modem was housed in a 2-person deployable, lightweight Gateway buoy. The buoy contained enough battery power for two weeks of transmission to shore using a FreeWave 900MHz RF radio modem. The buoy also contained an ATM-885R OEM PCB acoustic modem which communicated acoustically to the SR-50 in the water and via RS-232 to the FreeWave radio modem which communicated through the air back to shore.

The real-time data telemetry system can be deployed using smaller ships which cost less money to operate and are more readily available in most areas. The

Figure 1 ADCP with SR-50 below and remote transducer head mounted in the upper right section of the frame

lightweight and compact design of the units allows NAVO to get the job done with less funding and in less time.

After multiple deployments, NAVO requested a buoy modification that would increase the deployment life and ruggedness of the buoy. Design ideas were discussed between NAVO, Mooring Systems Inc. and Teledyne Benthos. A new, more robust buoy system was designed with increased battery life to meet the longer deployment times that were now required. The size was increased slightly and the buoy was designed more as a wave-follower (see figure 2). Using a new generation acoustic modem, the ATM-886-4G in a PVC housing allowed the buoy configuration to change without increasing cost. Once all the customer requirements were satisfied, the buoys were shipped to NAVO, where they will be stored for use on upcoming projects.

Conclusion

NAVO can now monitor the water conditions from shore, over a mile from the Gateway buoy, and receive real-time wireless ADCP current information. The ADCP data is transmitted from subsea to the Gateway buoy through the water using the Teledyne Benthos combined modem/ release SR-50. The Gateway buoy then relays that data wirelessly through the 900MHZ Freewave radio to shore. The system works great and makes short term monitoring of the water conditions simple and efficient for the end-users.

Figure 2 New Gateway buoy. Designed in accordance with NAVO specifications.

Acoustic modems provide users a reliable method to wirelessly retrieve data and perform command and control functions underwater. The systems provide a viable cost effective alternative to expensive cables and can be used for many subsea operations.

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