

Crane Control System for USCG Icebreaker Ships

PROJECT BRIEF

We Can Take You There!™

Description: Since the late 1970s, the US Coast Guard's two polar icebreakers, the Polar Star and the Polar Sea, have been exploring glacial regions and marine ecosystems in search of answers to such scientific questions as global warming. After 35 years, however, the research vessels were nearing the end of their service lives. In 2009, the US Coast Guard contracted with Allied Systems to provide new crane hardware and new hydraulic power units on the bow and stern of each ship and Concept Systems was enlisted to install and program the new crane control systems and operator interfaces. The USCG project required a control system that was not only robust enough to withstand harsh polar environments, but also called for centralized operation with a touch-screen Operator Interface (OI) at each HPU location; the ability to redirect hydraulic fluid flow from one crane or anchor windlass location to another; a provision of one or multiple backup systems that would allow the cranes and anchor windlasses to remain operational in the event of a critical system failure; and the capability of providing green, load sensing technology for maximum efficiency.

Based on the Allen-Bradley ControlLogix platform, Concept Systems provided design supervision, PLC-associated hardware and OI units for the centralized HPU control system. The HPU system network was divided into two areas—the aft area, which is the back part of the ship, and the front or bow area, with each area equipped with two HPUs. The bow area also includes the windlass room, which houses a supervisory system that controls only the bow areas. A master supervisory station, located in the engineering room, controls all four HPUs.

Performance and diagnostic/troubleshooting capabilities were key features of the system. Performance functions included the ability to redirect the hydraulic fluid flow from one crane or anchor windlass location to another through the control system via the OI. Concept Systems also developed control and monitoring systems for circulating, filtering, heating, and cooling the oil in the HPU tanks for operation in all environments. Additional performance features included a sequential start-up, which allows the operation of the HPUs to minimize load on the supply line, and emergency stop zones that safely stop HPU operation in both the bow and aft areas.

Diagnostic capabilities programmed into the OIs allow Coast Guard staff to diagnose problems in the field from each HPU station. Each HPU also has an interlocking safety feature for continuous troubleshooting. For instance, the system will automatically shut down if the oil level is low, if pumps fail, or power is lost at a location. The system also features extensive historical data logging and reporting capabilities.

Although Concept Systems' crane control system design has yet to be put into operation at-sea, the system has undergone rigorous factory testing and is prepared to be installed on the two ships, which will again be operational in 2011. The US Coast Guard icebreaker ship control system provided by Concept Systems offers not only a more efficient means of operating the ships' cranes, but improved safety, reliability, and flexibility in even the harshest environments.

Services Provided:

- System Design
- System Development
- Documentation
- Functional Description
- Factory Acceptance Testing

Results:

- User friendly system comprised of standard, industry accepted hardware and software
- A centralized control system of ease-of use
- System design and programming

Technologies/Platforms Used:

- Allen-Bradley ControlLogix
- PanelView Plus 700 HMI
- Rockwell RSLogix 5000
- FactoryTalk View ME