

# Drive & Control profile

Holding the Barge:

## Great Lakes Dredge and Dock Company Teams with Bosch Rexroth to Design Deep Water Anchor and Winch Solution



Great Lakes Dredge and Dock Company has played a major role in creating and shaping shorelines and waterways through high-profile dredging, construction and public works projects on a global level.

For Great Lakes Dredge and Dock Company of Oak Brook, IL, dredging is a specialized field that comprises a full range of natural underwater materials, including silts, clays, sands and rock formations. It's within these contexts that Great Lakes applies

its dredging expertise to a variety of applications, such as to deepen and maintain waterways, shipping channels and ports, create and maintain beaches, excavate harbors and build docks as well as to restore aquatic and wetland habitats.

### Challenge

Keep barge stable and easily movable during a deep-water dredge project.

### Bosch Rexroth Solution

- Six hydraulically driven winches
- Control system that included a single joystick
- Proportional directional valves
- 625 hp hydraulic power and four 180 cc hp limited pumps

### Benefits

- Minimized field piping and wiring
- Barge moved more quickly and reliably
- Increased production and new opportunities for deep-water dredging

Over the years, Great Lakes has had a profound impact on the living environment and transportation infrastructure of numerous communities across the world, including some of America's largest cities like New York, Chicago, Los Angeles, Philadelphia, Boston, Houston and New Orleans. A significant contractor for the U.S. Army Corps of Engineers, the agency responsible for navigable waterways in the U.S., Great Lakes has also played a major role in creating and shaping shorelines and waterways through high-profile dredging, construction and public works projects, while also performing many projects internationally in Europe, Africa, the Middle East, and Central and South America.

Recently, Great Lakes was contracted to perform a deep-water dredge in Providence, RI. At depths of up to 100 feet, the project called for the barge to hold its position while an onboard crane hauled 50-ton buckets of muck to the surface—a task that had to be performed without a tugboat or built-in propulsion system and while the barge remained stable and easily moveable in the water's busy shipping lanes.

Great Lakes Dredge and Dock Company brought this challenge to Bosch Rexroth's Industrial Hydraulics business unit in Bethlehem, PA. Together, Great Lakes and Rexroth designed a solution that called for mounting six huge, hydraulically driven winches on the rear of the barge. The team then attached an anchor



The hydraulic power unit (HPU) houses a programmable logic controller, designed to minimize field piping and wiring.

to each winch's wire rope and ran three anchors out of the front of the barge and three anchors out the back. Finally, the team mounted a total of 625 hp hydraulic power, four 180 cc hp limited pumps, and, to tie the whole thing together, Rexroth integrated a control system that allowed the operator to drive the boat with a single joystick.

“By coupling Great Lakes' vast experience in the dredge industry with Bosch Rexroth's knowledge and experience in hydraulic controls, the deep-water anchor and winch solution came to life,” said James Lane of Bosch Rexroth's Systems and Engineering department. “Great Lakes approached us with the anchor and winch concept and then asked us to develop it for controlling the motion and implementing the concept. After some deliberation, the idea of coordinating certain winches in speed control and other winches in torque control was

developed to allow the operator to literally point and go with joystick-like control.”

According to Lane, since the barge would operate in shipping lanes, this fully manual control was essential, as the barge had to be able to get out of the way in case of an emergency, even if some winches were not working. Lane also noted the speed of the system is controlled via the proportional valve.

“It's the proportional directional valve that drives it,” said Lane.

These valves feature electrical position feedback and integrated control electronics in nominal sizes 6 and 10 for controlling the direction and volume of flow. The valves offer a porting pattern to DIN 24340, form A, proportional solenoid operation and spring-centered control spool. Their modular design provides maximum operating pressure to 4,568 psi and a maximum flow up to 80 liters per minute.

Another design goal was to minimize the field piping and wiring, which was accomplished by mounting a manifold near each winch and mounting a control enclosure on each manifold. The control was implemented via a programmable logic controller (PLC) housed in the enclosure of the hydraulic power unit (HPU). Two local operator consoles (manual only) and one central operator console (automatic and manual) were then linked together with oil header piping and a DeviceNet control bus. Great Lakes



A control system, integrated by Rexroth, allows operators to drive the boat with a single joystick.

mounted the equipment in three metal houses on the rear of the barge with three winches each in two of the houses and the HPU in between. Each house is approximately 36 feet by 14 feet by 14 feet. A 1 1/2-inch wire rope system attaches the anchors to the winches, stretches across the deck

of the barge and exits through sheaves at the front, rear and each corner of the barge.

“The operators are quite pleased,” commented Carl Pfeil, Great Lakes project manager. “Moving the barge used to be a burdensome and time-consuming task, but it can now be

accomplished quickly and reliably and with the simplicity of a joystick.”

Pfeil also noted that in certain applications where the water is very deep, like the Providence, RI, project this solution was designed for, the anchor system works better and does jobs that Great Lakes previously couldn't do.

“We can move the barge more quickly to keep production going,” said Pfeil, “which ultimately will open some doors and bring us new opportunities for deep-water dredge projects.”

Great Lakes and Rexroth completed the anchor and winch system, from concept and design through implementation, in six months. Rexroth supplied the entire project with the exception of the piping.

**Rexroth**  
Bosch Group