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Article by the GREAT LAKES SEAWAY REVIEW

Subhead: Callaway automation project weds trusty 1950's steam propulsion to efficient 21st century automation

In 1999, Great Lakes Fleet Inc. was weighing the possibility of repowering its 50-year old steamer Cason J. Callaway with a new, medium speed diesel plant. The primary objective was to realize savings from the reduced manning that an automated diesel engine would allow.

The cost of conversion, however, was daunting. Daunting enough, in fact, to steer GLF toward an innovative alternative: modernizing Callaway's existing steam engine with state-of-the-art automation technology. Working with steam engine management specialist G.R. Bowler Inc. of Ontario, New York, the refit took place during the 2000-2001 winter lay-ups and in the spring of 2001 Callaway sailed with her new systems.

With one whole navigation season now in the books, the results of the project are in and they appear to exceed all expectations.

"We originally aimed for about a five percent improvement in fuel consumption and efficiency from the automation and another five percent from the turbine maintenance project done at the same time," said James Sharrow, then director of engineering and maintenance for GLF. Sharrow has since established a private consulting firm, J.D. Sharrow & Associates.

"By the end of the season, however, we were seeing as much as 20 percent improvement," Sharrow said. "It was a very impressive project, in more than one respect. We were successful in removing three full time oiler positions in the engine room, had less overtime, better fuel efficiency and fewer breakdowns."

Cason J. Callaway is one of three "AAA Class" vessels owned by GLF. In all, five vessels were constructed within this class at Great Lakes Engineering Works in River Rouge, Michigan, all of which still operate on the Great Lakes. Even after 50 years, the freshwater environment has been kind to the hulls of the AAA boats and GLF has committed to keeping its three operational by modernizing their aging propulsion systems.

Original equipment on Callaway included two Foster Wheeler boilers and a 7000 SHP Westinghouse cross compound turbine engine with a double reduction gear turning a single fixed pitch propeller. During its life, the vessel has undergone several significant alterations, principally lengthening of the hull by 120 feet to 767 feet in 1974, boiler automation in 1972 and conversion to self-unloader in 1982.

Before the 2000 refit, all of Callaway's propeller commands were registered by the Master via the original Chadburn Engine Order Telegraphs (EOT) that was delivered with the ship in 1952. A watch standing engineer was required to be available to acknowledge and respond to these EOT commands, and needed to be stationed at the throttle valves while maneuvering.

Revolutions of the fixed pitch propeller were controlled by the watch standing engineer by opening, closing and adjusting the manual throttle valves. Watch standing oilers were required by the U. S. Coast Guard Certificate of Inspection to assist in the engine room, and made rounds several times each watch to record the information displayed by the dozens of manual gauges that monitored temperature, pressure and rotational speed of most equipment in the engine room. These activities were very similar to all steam powered vessels built in the early 1950s.

Having decided to stick with steam, GLF wanted a new control system that would replace all prior control logic at a centralized location, enable full bridge control of the throttle and eliminate the watch standing oiler position by automating most of the oiler's on-watch duties.

Other objectives of Callaway's mid-life refit included maximizing combustion efficiency, minimizing electrical consumption of auxiliaries and carbon build up within flues, enabling a centralized, remote controlled ballast system, use of more computer monitors to replace analog gauges and supplement the existing emergency generator with an auto start diesel unit required for complete start-up of the steam plant from a dead ship condition.

Siemens Moore's Advanced Process Automation and Control System (APACS) hardware and Process Suite Graphical Interface Software were chosen for process control. This hardware/software combination has been applied to other ship control projects, including the ballast control and automation systems on the GLF self-unloaders Edwin H. Gott and Edgar B. Speer, and for boiler automation on at least three oceangoing steamers. However, the Callaway project was the first on the Lakes to requiring integration into a vessel built in 1952 that was originally designed with a three man watch system.

While everyone involved with the project agrees that Callaway's performance has been greatly enhanced, it is difficult to quantify the improvement for a couple reasons. One is the lack of good baseline data.

"We know what the vessel is doing now, but it is difficult to make comparisons with what she was doing before because much of that data is not available at the level of precision we now require," said Gary Bowler, president of G.R. Bowler Inc. "We went back to data when the ship was built, and in fact used her original sea trial data, but the ship has since been lengthened, has had bow and stern thrusters added and the propeller pitch was changed."

While the statistical documentation may be hard to sort out, there have been plenty of other clear indicators of success.

"One of the biggest discoveries we've made is that the combustion control on the boiler is much more precise than the old systems," said Bowler. "At the end of each season, Callaway's boilers are always opened up for cleaning and in the past there has always been much to clean. But when they looked inside after the 2001 season, the boilers were spic and span inside. The chief engineer even called me right from the shipyard to remark about that."

Going into the project, both Sharrow and Bowler were curious as to how Callaway's officers and crew would respond to such radical changes in processes and procedures that had been largely unchanged for half a century. They were pleasantly surprised.

"We wondered whether some of the veteran engineers would accept it, but they jumped in with both feet," said Bowler. "They are proud of the new systems and eager to explain them to the younger engineers."

Added Sharrow, "There is normally a learning curve that you go through when you break in a new system, but we saw virtually none of that."

A total of 22 other U.S. flag steamers exist on the Great Lakes, of which two were never converted to self-unloaders and remain in long-term lay-up. An additional two other vessels have steam reciprocating engines and are of an age that likely disqualifies them from possible consideration for similar automation projects. This leaves 18 other possible candidates for employment of the technology installed in 2001 on the Callaway. GLF has started a phased automation program similar to Callaway's on fleetmate Arthur M. Anderson.

Judging from the bottom line results of the Callaway experiment, many steam engines long thought to be headed toward retirement on the Great Lakes may now be reborn with this technological fountain of youth.