

From a Voith Schneider tug to a Tractor Plus = Rotor@tug

"When the idea first started leaking out, most of us wanted the company to up the horsepower and put bigger new Voith Schneider drives in," explains Capt. Doug Hajek onboard the Foss Maritime' tractor tug *Wedell Foss*.

The idea that Hajek refers to was the need to increase the bollard pull of the company's fleet of 1982 built 3000 HP cycloidal drive tractor tugs. Over their 23 year life the boats in this class have proven themselves to be fine boats. "Most of us were skeptical," explains Hajek, "These have been extremely friendly boats to operate and we were afraid this would get compromised."

But a lot has changed in ship docking since 1982. This is especially true with the container ships that come into port such as Tacoma where the *Wedell Foss* earns her keep. A big modern container ship presents a huge wall of windage that can make them a challenge to handle when threading into slim waterways. "The Foss Design Committee did their work and even our most mild concerns have not come about," concludes Hajek in the kind of praise of the shore staff that is all too often lacking in the pilot houses of tugs.

The committee to which he refers is headed by Foss Engineering Director Don Hogue and includes staff naval architects Warren Snider and Gisli Olafsson along with deck machinery specialist Joel Altus. With a number of successful projects under their belt the group was tasked to find the best way to bring the bollard pull of the 23-year old boats from the existing 35-tons to at least 50 tons. "The team grows and shrinks as needed," explains Hogue, "from time to time we include people from our own engineering, shipyard, operations and marine personnel departments. We also had engineering support from The Glosten Associates, Kooren Shipbuilding and Trading B.V. (the patent holders of the Rotor propulsion system) and then we bring in our other valued vendor partners like Cummins and Schottel.

The team studied all the options for the boats including the full repower and addition of larger cycloidal drives. The addition of an azimuthing propeller drive was favored as the most operational and cost effective, "But co-mingling of the wake fields was a real concern," explains Hogue. In the design stages they were able to determine that water flows to the cycloidal and prop drives would not be a problem if the z-drive was placed far enough aft. But this then presented a problem of what to do with the big skeg that was central to the operation of the cycloidal drives when working a ship off the stern. But even this was solved when it was found that dramatically reducing the depth of the skeg to fit the z-drive simply meant that they went from a static to an active skeg. "The ASD (azimuthing stern drive) unit becomes an active powered skeg," explains Hogue, "We get some lifting body effect from the nozzle by feathering the controllable pitch prop and turning the nozzle appropriately." The same principle is used on the famous Rotortug(s) of KOTUG International in the ports Rotterdam, Bremerhaven and Hamburg.

During the design and development of the project, Kooren Shipbuilding and Trading B.V. invited Foss Maritime to have two senior Captains do some familiarizing and training on the RT Magic of Kotug International B.V. in the port of Rotterdam. Both Captains were exited about the way they were able to handle the triple propeller tug in all kind of situations.

Capt. Hajek concurs, "Cavitation is not a problem. This addition of the Cummins engine and azimuthing drive has not only enhanced the bollard pull, it has enhanced the over all performance when handling barges and assisting ships."

The final modification design, which has now been completed on the *Henry Foss* as well includes the addition of a Cummins KTA50 M-2 engine facing aft and set between the front end of the boats' two big 900 RPM 1500 horsepower EMD engines that face forward toward the cycloidal drives. The Cummins turns up to 1800 RPM, to push 1700 HP down a 15-foot Centa carbon-fiber shaft to a Schottel SRP 1212 CP z-drive unit. To accommodate the engine and drive addition

space in a storage room aft and fuel tankage was reduced. And one of the two generator sets was relocated. Fortunately the engine spaces were roomy and well able to accommodate the relatively small envelop of the Cummins KTA50. Cost of the modification is about US \$2 million for each vessel which is between 1/4th and 1/3rd the price of a new vessel. The well maintained boats were built with a 40-year operational life and this modification promises to push that out to and even beyond the planned vessel life.

While Hajeck and other Captains had grown fond of the tugs over the years, they are delighted with the modifications. The addition of the z-drive has increased the bollard pull from 75,000 pounds or about 21.5 pounds per horsepower to 114,900 pounds for about 22.5 pounds per total HP. The Cummins / Schottel drivelines thrust at about 28 lbs per HP by themselves.

The controllable pitch prop in a nozzle adds strong and immediate thrust while not sacrificing any of the strong directional abilities of the cycloidal drives. Using the z-drive as a powered skeg it is now possible to walk the tug sideways at over five knots. This allows amazing flexibility in handling containerships that are notorious for their high minimum speeds as the tug can travel sideways while still having cycloidal thrust available to apply to the ship's side.

With two more 3000 HP boats in their own fleet and large numbers of this type of boat in operation world wide, Foss is pleased to share their hard won knowledge in moving these boats from a 35-ton to a 57-ton bollard pull while enhancing their overall operational abilities.

For further information:

Donald G. Hogue
Engineering Director
Foss Maritime Company
660 West Ewing St.
Seattle, WA 98119-1587
Phone: 206 281 3875
e-mail: don@foss.com
www.foss.com

Karel Kaffa
Vice President
Kooren Shipbuilding and Trading b.v.
Parklaan 2
3016BB Rotterdam
Phone: 31-10-2170257
e-mail: k.kaffa@rotortug.com
www.rotortug.com