

## **Corporate Experience, Lindholm Engineering Consultants**

Lindholm Engineering Consultants has the following selected direct experience related to the design, inspection, analysis and certification of ships and maritime equipment:

### **Maritime Marketing and Ballast Water Filtration Assessment, Clean Filtration Technology/Dow Chemical, Redwood City, California, December 2012 to April 2013.**

Lindholm Engineering Consultants was contacted again by Clean Filtration Technology (CFT) to provide a review of the possibility of using CFT's Tequatic™ filtration technology for ballast water filtration. Two system sizes – the Tequatic 150 (150 millimeter nominal inlet diameter) and Tequatic Max (400 millimeter nominal inlet diameter) – were evaluated. These systems were analyzed to determine arrangement and footprint requirements for a 250 cubic meter per hour ballast system. Three dimensional models, installation plan and matching Bills of Material (BOM) were created for each potential system. A report summarizing the current Ballast Water Management legislation and the methodology for installation was delivered along with the drawings and BOM.

### **“LEINEBRIS” Main Mast Vibrational Analyses, Sea Tel, Concord, California, October 2007**

Lindholm Engineering Consultants modeled the existing arrangement of the main mast of the fishing vessel “LEINEBRIS” to determine the vibrational characteristics of the mast. Sea Tel has had repeated problems with antenna mounting suffering damage on this vessel; a fundamental high vibration was found for the mast which coincided with the fundamental frequency of the antenna mounting. Further analyses were made to determine if a simple correction could be made to the mast to lessen the fundamental vibration. It was found by increasing the lateral stiffness of a platform below the antenna, the natural frequency of the mast would be moved away from the fundamental frequency of the mounting.

### **CE Examination Procedures for MED Certification, Sea Tel, Concord, California, November 2007**

Lindholm Engineering Consultants is reviewing the conformity assessment procedures to obtain the ‘wheelmark’ of the Marine Equipment Directive (MED) as it would apply to marine stabilized antenna. Sea Tel can currently meet the CE marking requirements as applied through the Radio Equipment and Telecommunications Terminal Equipment (RTTE) Directive. However, with the increased use of data transmission and secure radiotelephony, it may be necessary to certify to the more stringent requirements of the MED. The procedure under development will provide a ‘roadmap’ for the company to anticipate this certification.

## **Bonneville Dam Stop-Log Crane Inspection and Finite Element Analyses, U.S. Army Corps of Engineers, Portland District, July 2007**

Lindholm Engineering Consultants carried out an inspection of all joints of the Cornell Manufacturing Company's 40 ton Pedestal crane boom used as a stop-log placement and removal crane for the Cascade Locks at the Bonneville Dam, Oregon. The weld sizes were measured for comparison against the design and AISC/AWS recommendations for weld strength. A Finite Element Analysis (FEA) was made of a beam model of the crane boom and jib. The FEA model indicated the boom was incapable of operation at the design wind of 60 miles per hour. A reduced operating wind speed was suggested. Further, it was determined the welds were sufficient in accordance with good design practice. Visual inspection of the jib indicated the jib head plate skip welding was insufficient for the loads imparted and the plating was subject to severe distortions. Lindholm Engineering Consultants recommended the jib head be reanalyzed to determine the proper design for the load and the jib should be removed until redesigned.

## **Engineering Support, Sea Tel, Concord, California, May 2007**

Lindholm Engineering Consultants reviewed the environmental design conditions for Sea Tel's motion stabilized antennas. Their existing criteria were compared against industry standards for maritime installation of equipment on masts. Vibratory amplification of typical mast arrangements was modeled in Finite Element Analysis software to determine if typical shipboard vibrations would be amplified by the additional weight of the antenna and slenderness of the mast structure. A review of shock testing standards was carried out in response to potential military applications. Reports were prepared confirming the environmental criteria need to be increased to mitigate observed damage, amplification could be a factor and outlining potential shock criteria.

## **Engineering Support and Maritime Marketing, Clean Filtration Technology, Saratoga, California, May 2006 to March 2007**

Lindholm Engineering Consultants assisted in engineering layouts, specifications and installation manual preparation for drinking water applications of new cyclonic filter technology. Lindholm Engineering Consultants found new opportunities in the maritime industry to apply filter technology, including ballast water treatment, intake straining and waste water filtration.

## **Refrigeration System Installation Drawings, S/S "CAPE FEAR," Alameda, California, February 2006**

New refrigerated/frozen stores spaces were added in the forward hold of the "CAPE FEAR." These spaces and the refrigeration system to cool the spaces were not submitted to the United States Coast Guard at the time of installation. Lindholm Engineering Consultants attended the vessel, surveyed the installation and created installation drawings for approval by the USCG.

**Bilge/Ballast System Separation and Redesign, S/S "CAPE FEAR," "CAPE FLATTERY," "CAPE FAREWELL," and "CAPE FLORIDA," Beaumont, Texas March 2006.**

Lindholm Engineering Consultants surveyed the above vessels, two sets of sisterships of similar design (C8 and C9 LASH). The bilge and ballast system on these vessels were combined; Lindholm Engineering Consultants separated the bilge and ballast systems, specified additional piping and pumps to make the systems separate, redesigned the ballast distribution manifolds and indicated modifications which would be necessary to incorporate improved oil water separator systems. The revised bilge and ballast drawings were submitted to ABS for approval.

**Stability Test, USCGC CHASE, San Diego, California, December 2006  
Stability Test, USCGC MORGENTHAU, Alameda, California, January 2006**

Lindholm Engineering Consultants was responsible for organizing and carrying out the stability test for the United States Coast Guard Engineering Logistics Center (ELC) of the United States Coast Guard Cutters MORGENTHAU (WHEC 722) and CHASE (WHEC 718). Steven Lindholm served as the Inclining Officer, coordinating the delivery of equipment onboard, inventory, tank capacities and the inclining test. The test was successful, with a straight-line fit to the data on the curve of tangents.

**HVAC Reheater Engineering Specification, M/S "PACIFIC COLLECTOR," Alameda, California, January 2007.**

Lindholm Engineering Consultants provided a specification to purchase engineering to replace the reheaters in the heating, ventilation and air conditioning system of the "PACIFIC COLLECTOR." This vessel, previously registered as the "TEXAS CLIPPER II" and operated by Texas A & M University, had extensive corrosion within the steam reheat system for the HVAC. The manager of the vessel wanted to replace the reheat system with electric reheaters. The specification identified the scope of the work for engineering the new reheat system.

**Oily Water Separator Installation Specification, M/V CAPE FEAR, Alameda, California, May 2005.**

Lindholm Engineering Consultants was contracted by Interocean Uglands Management to develop the installation plans and specifications for a new oily water separator (machinery bilge water separator) to be installed upon the Barge Carrier CAPE FEAR. The plans were completed and the specification submitted. Approval by the American Bureau of Shipping was pending final approval of the new Oily Water Separator (Client furnished equipment).

**Cargo Damage Survey, M/V RUBY RAY, Richmond, California December 2004**

Lindholm Engineering Consultants provided Property and Indemnity survey services in recordings and assessing the damage to cargo from shifting during transit. The cargo was new passenger vehicles from Korea and the damage was determined to have been caused by one vehicle coming free of its tie-down straps. Samples of the straps had been retained, and at least some of the straps

had parted. Cause could not be directly assigned to material failure or incorrect securing, as the position of the failed straps was not retained prior to the survey.

### **Property and Indemnity Survey, T/T DILIGENCE, Los Angeles/San Diego, California, November 2004**

Lindholm Engineering Consultants acted as Property and Indemnity (P & I) and Hull and Machinery surveyor for damages to the tailshaft of the turbine tanker DILIGENCE. As the surveyor, the principal attended the vessel alongside the terminal in Los Angeles for preliminary assessment of the damage and confirmation that the vessel could not be moved under its own power. After the vessel was towed to San Diego and lifted on dry-dock at Southwest Marine, the surveyor assessed the damage to the tailshaft, stern bearing and housing and provided estimates of repair.