MICRO-EPSILON

Automated Inspection & Repair of Marine Propellers

Traditionally, the inspection and repair of marine propellers has been very labor intensive, with all data collection, documentation, and blade manipulation having to be manually performed by human operators. An innovative machine has been developed to automate these processes, providing the benefits of reduced labor time, increased safety, improved repeatability, and computer-based data storage and reporting. The machine's designers required a high-speed non-contact displacement sensor capable of dynamically profiling the blades, which can be as large as 1.5 meters in diameter.

Due to the large size of the propellers being measured, very long measurement ranges were required for the displacement sensor. The most challenging aspect of the sensor requirement was target material and angle, since the propeller blades can be very shiny stainless steel at angles as high as 45 degrees from normal. While laser triangulation is the measurement technology that best fits the application, most laser triangulation sensors cannot reliably measure on such targets over long ranges, even though they typically utilize class III laser power to ensure adequate light returns from the target.

The laser triangulation model optoNCDT1700-500/750 is uniquely capable of profiling the large and shiny propeller blades, due to its proprietary and highly sensitive CCD array. Should a propeller be too shiny for the sensor with its default settings, the unit's exposure time can be increased to allow for adequate light quantity and successful measurement. Not only did the sensor outperform everything else the engineers evaluated for this application, but it did so with standard class II laser power. This means that the shops using the machine do not need to address any regulatory requirements such as on-site laser safety officers or additional signage.

Several other important factors contributed to the selection of the ILD1700-500/750. The sensor's measurement rate of 2500 per second allowed the machine to inspect entire propellers in as little as two minutes. Also, the highly-stable CCD based measurement allowed for repeatability of the entire machine on the order of 75 microns. Lastly, the sensor's integrated electronics contributed to the compact design of the inspection machinery.

Measurement system requirements
- Repeatability (data average of 1): 90-150 microns
- Accuracy: 400-750 microns over full scale
- Target Type: Shiny/polished stainless steel
- Target Angle: 0-45 degrees
- Measurement Rate: 2500 per second
- Laser Class: II

Ambient Conditions
- Shop floor
- Room temperature

System Structure
optoNCDT1700-500/750

Reasons for System Selected
- Ability to measure polished stainless steel target at up to 45 degree angle
- Large measurement range
- Laser class II
- Integrated electronics / Compact design

Technology Advantage
- Proprietary high-sensitivity CCD array
- Adjustable exposure time
- Laser class II
- Integrated electronics