FIXTUR LASER

Accuracy and time

Two patrol boats with an unusual power transmission system have been built in Holland. The measurement task was to align the propeller shafts to prevent vibration and consequent bearing damage. Instead of the traditional arrangement with a straight driveline, the two engines were installed directly above the propellers, see figure 1. It was therefore necessary to join up the intermediate shaft coming from the engine to the gearbox input shaft via two universal joints. The angle between the two universal joints was about 7°. The angles did not need to be exactly 7°, but they had to be equal. If they were not, the rotation of the engine and gearbox would not be synchronised, which would lead to considerable vibration.

The problem was solved by using laser-based measurement equipment. This gives more accurate and considerably faster measurement than using conventional technology, involving tense piano wires, protractors, spirit levels and plumb lines. This example demonstrates an opportunity for applying the technology and the possibility of long-term savings. The pay-off time for the investment in a measurement system is very short.

To achieve the requirement for exactly equal angles, it was necessary that the two distances L, between the point of intersection B and the gearbox input shaft A, and between the point of intersection B' and the intermediate shaft A' were exactly equal. An adjustable dummy shaft was located at the point of intersection and a transmitter/detector unit (Combi-laser) was mounted on it.

Alignment took place in three stages:

1. The dummy shaft was lined up with the gearbox input shaft.
2. The dummy axle was angled 14° and the intermediate shaft was aligned with the dummy shaft.
3. The engine was aligned with the intermediate shaft.

Sea trials showed that the alignment was very successful. There was not the slightest sign of vibration.

If the same alignment work had been done with traditional technology, the work on the two boats would have taken two men 64 hours each. As it was, the alignment was carried out by one man in a total of 12 hours. The yard thus saved 116 man hours.

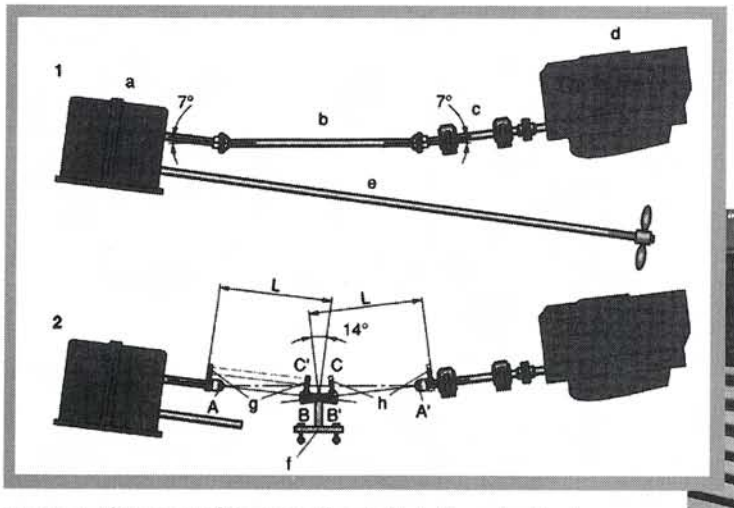

Figure 1. Alignment of the propeller shafts in the patrol boat.

1. The angles of the two universal joints must be exactly equal.
2. The position of the dummy axle during alignment.

a. gearbox
b. shaft with both universal joints
c. intermediate shaft with support bearings
d. engine
e. propeller shaft
f. dummy propeller shaft with adjustment screws
g. Combi-laser at stage 1
h. Combi-laser at stage 2

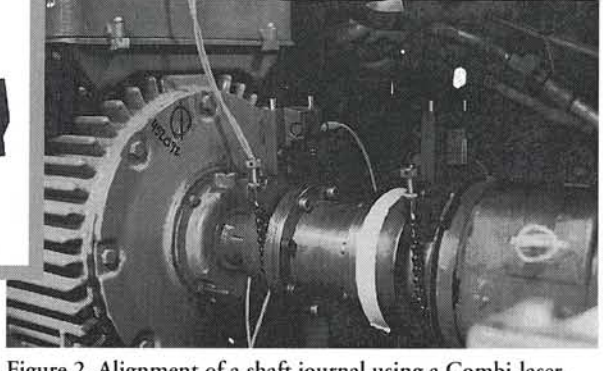

Figure 2. Alignment of a shaft journal using a Combi-laser.

The Combi-laser is a laser-based measurement equipment made by Fixturlaser in Mölndal. The system consists of two transceivers. Each unit contains a laser transmitter and a SiTek PSD detector. The system also contains a microprocessor which processes the measurement values and provides information about the relationship of the machines to each other. The Combi-laser is equipped with 6 different programs for specific applications and is available in an EX-classified version.