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Safety issues with hydraulic cylinders

Background

After the completion of a scheduled maintenance operation on the suspended deck on a car ferry, the deck was to be stowed away in its topmost position. The suspended deck is lifted by a hydraulic telescopic cylinder. When the cylinder had reached its extreme outmost position it collapsed and piston number 2 separated from the cylinder housing. This caused the suspended deck to fall down, approximately 4,5-5m. The deck stopped about 1m above the main deck.

The lifting cylinder was a telescopic cylinder with 4 pistons. Each piston consists of a guide ring (the piston) and a stop ring attached at the cylinder end of the piston. The stop ring is threaded on to the piston and the threads are secured by the application of lock fluid.

The stop ring became undone from piston number 2 as a result of it starting to unthread itself from the piston. This process continued until there was only a fraction of the threaded area that was engaged. When the telescopic cylinder was operated, the force exerted on the piston exceeded the strength of the remaining overlapping threaded area, resulting in the collapse of cylinder number 2. Piston number 2 became disconnected with the cylinder and the suspended deck fell down.

The telescopic cylinder was part of a certified and approved lifting arrangement. It has amongst other been subjected to monthly inspections on board and annual inspections by certified experts.

Recommendations

Inspections of cylinders must be carried out as soon as possible in order to uncover defects in connections on telescopic cylinders. The required method of inspection must be clarified with the manufacturer in each individual case, but will typically consist of verification of the length of stroke according to the manufacturers specifications. The need to establish further safeguarding, for instance mechanical locking of threaded connections, should also be discussed with the manufacturer of the equipment.

Relevant inspection routines should be incorporated into the ships maintenance system.

Depending on design, the issues mentioned above could also be relevant for conventional hydraulic cylinders.

The Norwegian Maritime Directorate has initiated an investigation into the matter. The investigation report will be made available at www.sjofatsdir.no/safety.



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