

So your mobile crane won't lift the test load?

Consider wire rope, parts of line

By Dave Decker

Sometimes during a load test, a telescopic boom mobile crane reeved with less than the maximum parts of line will not pick up the test load. So why can a crane lift its rated test load with a fully reeved block and yet fail to pick the reduced test load when it is not fully reeved?

There may be too much wire rope on the drum. Understanding the how and why of line pull can help us determine the best course of action to take in resolving this problem.

Understanding line pull

For each layer of wire rope on the hoist drum, the effective diameter of the drum increases by approximately twice the wire rope diameter. For example, if the wire rope diame-

ter is 3/4", the effective drum diameter will increase by 1-1/2" for each layer on the drum. If the diameter of an empty drum is 24", the first layer makes the effective diameter 25-1/2". The eighth layer brings the diameter to 36".

Torque demand is the result of force (line pull) x radius (distance from the drum axis to the outer layer of wire rope). Torque is expressed in foot-pounds. If the line pull remains the same, and the number of layers on the drum increases, the torque required to lift the load (torque demand) increases.

For example, assume the line pull resulting from a load on the hook is 16,000 pounds. The radius to the first layer of wire rope is $25\text{-}1/2" \div 2$, or $12\text{-}3/4"$. Torque required to rotate the drum equals 17,000 foot pounds (i.e., $16,000 \times 12.75 \div 12$). To rotate the drum with eight layers requires 24,000 foot pounds (i.e., $16,000 \times 18 \div 12$) of torque to lift the same load.

Hydraulic pressure and hydraulic motor efficiency limit torque available to lift the load. If a crane is not reeved with the maximum parts of line, the rope may build up to where the available torque is not sufficient to rotate the drum. This can also happen on fully reeved cranes if there is too much extra rope.

Dealing with the problem

If the excess wire rope is not needed, remove it. If this is not practical, then how do we certify the crane? If the crane has the same maximum capacity at extended boom length(s), perform the test with the boom extended. If the crane can not lift the test load, check the OEM's allowable line pull for the particular model hoist and layer of rope.

If allowable line pull (available torque) is the limiting factor, reduce the test load based on the allowable line pull limitation, and perform the required test. Certify the crane based on the reduced test load. If the crane can not lift the reduced test load, verify that the system hydraulic pressure and relief valves are set within OEM specifications. If the settings are within specification, contact the OEM. ■

Dave Decker is crane training coordinator at the Navy Crane Center, Lester, Pa. This article first appeared in the 16th edition of Crane Corner, the Navy Crane Center's newsletter. This article, as well as past issues of Crane Corner, can be found on the Navy Crane Center's web site: www.efdnorth.navy.mil/cindex.HTM

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