Technical Notice - Dyform™ Wire with Hydraulic Cylinders

Unidirectional lay wire (such as Dyform™, or “compacted strand”) is used in rigging applications where designers desire a lower-stretch solution than standard 1x19 wire rigging. Several problems result from the use of this wire with hydraulic cylinders including lower effective stiffness, unwinding of the lay of the wire and unscrewing of the rigging fitting assemblies.

Dyform wire is twisted in only the left hand direction. This construction improves the strength and stiffness of the wire when compared to 1/19 wire of a similar diameter. However, Dyform tries to “unwind” as it is loaded due to this construction. Hydraulic cylinders have no provisions to prevent this unwinding rotation. As the Dyform unwinds, it grows longer and the stiffness is effectively reduced. When the load is removed, hydraulic cylinders may not allow the wire to fully re-wind. After several loading cycles, the Dyform wire may be significantly unwound. The residual torque from this condition can act to unscrew rigging fittings on the wire. Based on the points above, Navtec does not encourage the use of Dyform wire with hydraulic cylinders.

Dyform is generally recommended for use with the appropriate swaged and swageless fittings without hydraulic cylinders. Swaged end fittings prevent the unwinding by locking the wire. During loading, right hand threads, such as those in swageless end fittings are tightened by the unwinding of the wire and are not affected. When unloaded, the wire fully re-winds and there is no residual torque to unscrew the fitting. Of course, as is the case with all rigging assemblies, it is important that all threads be locked.

For boats that have Dyform with hydraulic cylinders installed there are several alternatives. One alternative is to replace the Dyform with the equivalent 1 x 19 wire, rod or Kevlar cable.

The other alternative is to continue to use the Dyform wire with the hydraulic cylinder. In this case, it is very important to be sure that the threaded fittings in the stay are reliably locked against rotation. Since there is no thread in a swage eye, the swage eye does not require extra measures for locking it. Of course, the threaded joint(s) in a swage stud or swage turnbuckle assembly require locking.
While Loctite is frequently used with good results, due to possible variations in application, we do not recommend Loctite alone as an adequate lock in this case.
Acceptable locking methods include:

1. Adequately sized cotter pins such as are used in locking turnbuckles.
2. “Dinging” such as has been used to lock noses in marine eyes and other such assemblies. This requires the use of a dinging press, which can be found at many Navtec rigging shops.
3. Set screws. The set screw must engage a recess in the inner (male thread) surface and the set screw must be locked against loosening by Loctite.If the decision is made to use Dyform wire with a hydraulic cylinder, as with all rigging, it should be regularly checked for signs of deterioration. Signs of excessive unwinding of the lay may include broken strands, kinks of the wire or strands, or significant unevenness of the lay or construction. In practice, we have not observed these effects and think they are unlikely.

Please contact Navtec or Sailtec with any questions.

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