SEACON®

Technical Bulletin
No. 1002

INSTALLATION TORQUE OF BULKHEAD CONNECTORS

Thread torque specifications are one of the more perplexing problems in civil and mechanical engineering. The reason it is perplexing is friction. A torque specification developed for use in one material may, or may not, vary when applied to a different material. The use of lubricated threads instead of dry threads causes the friction to drop in most cases. It is these latter characteristics of friction that are so frustrating.

The Machinery's Handbook indicates values of the coefficient of friction can vary from 0.8 for clean, dry steel to 0.35 for brass to 0.20 for polyethylene, all unlubricated. If the surfaces are lubricated the values for the same materials become 0.16, 0.19 and 0.20, respectively. Note that the coefficient for steel drops precipitously while the coefficient for brass drops a bit and for polyethylene it does not drop at all. While Machinery's Handbook is not an all inclusive source for coefficient of friction information, it does quickly indicate the magnitude of the problem. The Loctite Corporation has determined that 85 to 90% of the torque applied to a threaded part may be required just to overcome friction.

While friction is the big concern, there are other concerns as well. The surface of the seat under the connector must have a 32 RMS surface finish which precludes using "as received" surfaces as sealing surfaces. The seat must be perpendicular within 0.0005" of the axis of the thread. The perpendicularity requirement is such that the threads in the housing must be machine made or there is a large possibility of connector failure. This is caused when one edge of the connector touches the housing first which creates a very large bending moment in the threads of the connector. Threads, whether plastic or metal, are not meant to resist bending moments. There must be a lead-in chamfer and/or counterbore that ensures the last threads on the connector cannot bottom out on the last threads of the housing it is being screwed into. All of this is simply good machining practice.

The torque specifications for metal shell SEA CON® connectors are suitable for all metals they may be installed into, unlubricated. If the threads are lubricated a torque reduction of approximately 50% is recommended. Installing metal connectors into plastic housings requires the torque limits to be checked to ensure the plastic housing does not strip out.

GRE connectors face a different situation, however, because the GRE material is not as strong as metal and over-torquing will break the connector. The torquing recommendations for GRE connectors as listed in the catalog was developed years ago by actually installing connectors, unlubricated, into a steel housing. When installing these connectors into a plastic housing, the torque must be decreased. Recent calculations indicate that when the original tests were made the coefficient of friction was 0.60. Since the coefficient of friction for plastics such as PVC or Delrin® (DuPont trademark for Acetel Resin) appears to be about 0.15, the torque should be reduced to about 1/4 of the catalog value. One must be particularly cautious when installing connectors into plastic housings, for the nature of the specific plastic must be known to ensure success. Understanding the nature of friction in relation to torque specifications will help any company produce a quality product. See the attached graph .

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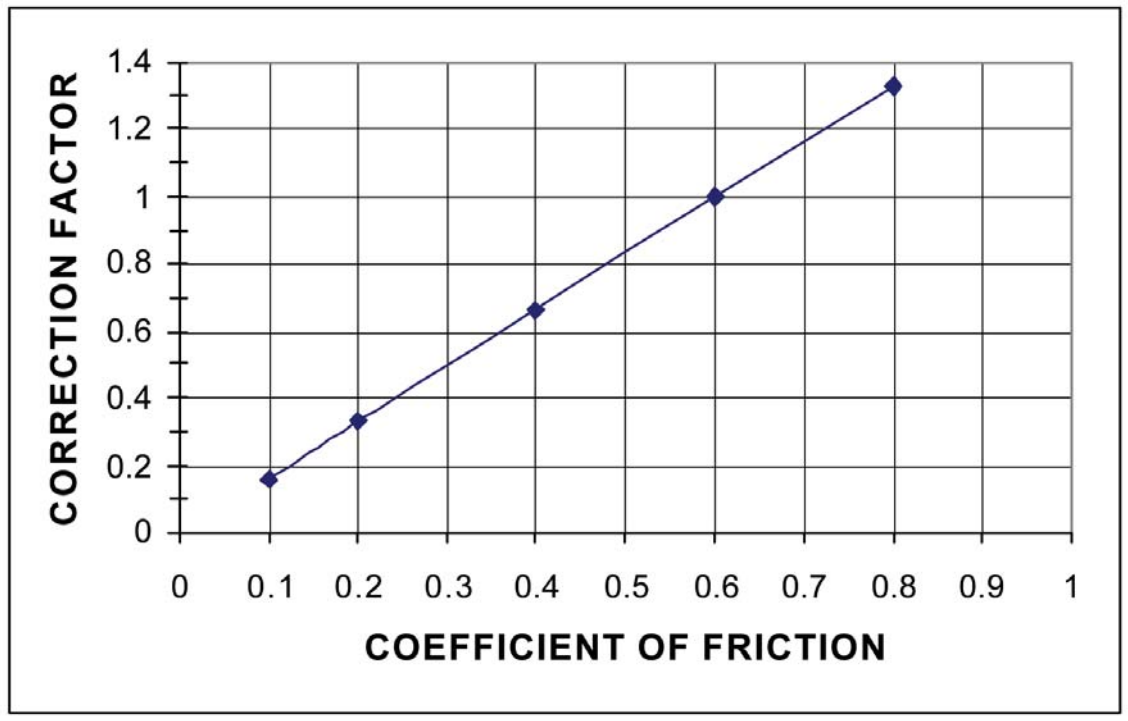

$Tc = Tsc \times f$

Tc = CORRECTED TORQUE
Tsc = TORQUE FROM SEACON CATALOG
f = CORRECTION FACTOR

NOTE:

Friction values are approximate due to the wide range of the variables. Lubricated threads will have lower friction coefficients. Lubrication materials include oils, greases, anti-seize compounds, thread locking compounds, dry film lubricants, etc.