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ONGOING WORK WITH PVP2007-26387 "DETERMINATION AND QUALIFICATION OF ALTERNATIVE FLANGE ASSEMBLY PROCEDURES" AND RESULTING GASKET RETORQUE DWELL PERIODS BASED ON ALTERNATIVE FLANGE ASSEMBLY PROCEDURES

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ABSTRACT

As a result of the work from PVP2007-26387[1], alternative (non-traditional) Flange Assembly Procedures are being adopted for use at one large U.S. chemical producer/shipper. Based on the success of the Alternative Flange Assembly Procedures the Authors decided to further investigate the effects of Alternative Flange Assembly Procedures on Gasket Retorque Dwell Periods, specifically in a General Purpose (GP) Tank Car Hinged/Bolted Manway Connection. This ongoing work can serve as a guide to others in industry as "Best Practices" for selecting and qualifying Gasket Retorque Dwell periods using Alternative Assembly Procedures for their flanged connections for commonly used manway gasket type(s).

INTRODUCTION

While the use of a manual torque wrench would be considered "best practice", the reality of the situation recognizing "Real World" experiences is that trying to achieve torque values in the range of 100 – 250 ft-lbs with a standard 18 inch or 2 foot torque wrench presents ergonomic concerns as not all loaders/unloaders have the same physical ability. Use of a longer torque wrench to gain a mechanical advantage is not a straight forward option as, depending on the tank car arrangement, the longer torque wrench can have limited movement and present safety hazards because of safety rails and fittings housing on top of the tank car. There are pneumatic torque wrenches available; however these generally operate at low speeds and additionally prove to be very costly for a plant that has multiple loading racks.

The primary objective of PVP2007-26387[1] was to qualify a less time consuming, physically easier assembly procedure, preferably using an air impact wrench, which results in an equal or higher level of securement reliability as currently achieved using the current star-pattern assembly with a manual torque wrench or pneumatic torque wrench.

While this objective was met, the final assembly process selected and currently in use at one major rail shipper differs slightly from the procedure outlined in PVP2007-26387[1]. Figure 1A details the initially proposed alternative flange assembly procedure.

Working with the shipper's engineering, maintenance and loading personnel the alternative assembly procedure outlined in Figure 1B was adopted, as it is very similar to the traditional criss-cross (star pattern) assembly procedure[2] and was more readily accepted by the loading personnel. Furthermore, it was determined the ½" impact was unsatisfactory for unloosening some manway eyebolts and a ¾" impact with a variable range is now used on the lowest setting.

Step 1	Clean & lubricate eyebolt threads and nut bearing surfaces
Step 2	Starting with bolt #1, directly opposite from hinge, tighten nuts, until just snug, in a rotational pattern. Do not tighten past snug.
Step 3	Step 3 Continue tightening in a rotational pattern for two complete rotations around manway, applying load for 5 seconds on each nut

FIGURE 1A: 1ST ALTERNATIVE ASSEMBLY PROCEDURE

Step 1	Clean & lubricate eyebolt threads and nut bearing surfaces
Step 2	Starting with bolt #1, directly opposite from hinge, tighten nuts, until just snug, in a star pattern. Do not tighten past snug.
Step 3	Starting with bolt #1, directly opposite from hinge, continue tightening in a star pattern, applying load for 5 seconds (1/2 Impact), or 2 seconds (3/4 Impact) on each nut
Step 4	Step 4 Continue tightening in a rotational pattern for two complete rotations, applying load for 5 seconds (1/2 Impact), or 2 seconds (3/4 Impact) on each nut.

FIGURE 1B: FINAL ALTERNATE ASSEMBLY PROCEDURE

[1] Frew, Waterland, "Determination and Qualification of Alternative Flange Assembly Procedures", PVP2007-26387, July 22-26, 2007

[2] ASME PCC-1-2000, "Guidelines For Pressure Boundary Bolted Flanged Joint Assembly