bigHead Bonding Fasteners Limited

Fixings for Resilient Blanket Insulation materials - Storage Tank Shells in Cryogenic Applications

Overview

In many cases, the insulation system adopted for cryogenic storage tanks comprises of composite layers of resilient glass fibre blanket and expanded Perlite. This is placed between the inner tank and the reinforced concrete outer skin. Generally, the resilient blanket is anchored to the outer surface of the inner tank shell by means of bigHead’s purpose designed “Shell Set Pins” over which the blanket is “impaled”, before final retention with spreader washer and the unique bigHead S3 type Ratchet washer.

bigHead has been continually manufacturing products of this nature to support the developing LNG/Oil & Gas market for a significant number of years with great success.

The Blanket

The resilient blanket material is typically either Textraline or Cryolene glass wool, although there are other materials utilised in some applications. Nominal blanket densities are circa 16-18Kg/m³ and would normally be supplied in rolls of between 1 and 2 metres wide by 100mm in thickness.

The blanket will normally have a facing material comprising an aluminum foil layer – thickness between 5-10 microns that is either affixed to the blanket during its manufacture or is affixed as part of the installation process at site during final build.
**bigHead Shell Sets**

**bigHead’s** involvement from initial design stages through to full production manufacturing ensures complete product alignment to meet specific customer/contract requirements and a perfect “fit for purpose” fastener. The **bigHead** Shell Fastener systems include a range of backing plates, pins, spreader washers & retaining clips specifically designed for this purpose. Shell Sets are manufactured to comply with the technical/project specifications supplied by the client.

Pin dimensions in terms of diameter and length can be manufactured to accommodate any particular application/resilient blanket thickness. The backing plates are also of bespoke designs in order to accommodate the dimensions/features of the tank itself. The fastener assemblies can be supplied in corrosion protection treated carbon or 316 stainless steel materials as required.

**Shell Sets comprise three basic elements:**

- A backing plate, perforated to improve adhesive curing rates and mechanical bonding strength, with an M6 (or similar) hexagon nut, resistance welded centrally.
- A blanket pin of specified diameter (normally in the range of 5-10mm) threaded on one end for attaching to the backing plate. The pin length is dictated by the required final thickness of resilient blanket insulation material.
- A large diameter (normally 50mm) spreader washer for load dissipation and to prevent “blanket creep” over the smaller S3 Ratchet Washer
- A spring clip washer (Ratchet Washer), for retaining the insulation material/assembly once the blanket has been “impaled” over the blanket pin

*Other methods utilised for final retention of the blanket assembly include ‘R’ Clips and also ‘Star Washers’ (see inset images below).*

Photo 1 – Basic Shell Set Assembly
Basic Methodology

**bigHead** shell sets are normally affixed at 400mm X 600mm spacing, by bonding of the backing plates to the external surface of the inner tank or pressure vessel shell using a proprietary adhesive such as Sikaflex 221. Having installed the shell fasteners to the tank skin the resilient blanket material is then impaled onto the pin before anchoring with load spreader and final ratchet washer.

**Top Corner installations/arrangements**

Methods utilised for affixing of insulation materials around the top corner of the tank shell are somewhat more complex.

A combination of a special backing plate complete with centrally welded nut but assembled to the blanket pin in the reverse condition permits abutment of the “Top Corner Fastener” directly to the suspended deck outer rim plate up-stand, having been pre-drilled around the full circumference of the tank to match the clamping bars (*see below). The blanket pin, once assembled to the backing plate and having been inserted through the outer rim plate is then affixed with the first of two S3 ratchet washers, before impaling through the fiberglass packing piece and adjacent resilient blanket material, finally penetrating the outer (aluminium foil backed) paper scrim material. The installation is completed by attachment of the roll formed *clamping (or Backing ) bars which run effectively as a continuous ring around the full diameter of the tank, through which the pin end is passed before finally affixing of the second S3 ratchet washer.

See opposite & below:
Top Corner Fastener Sets come in two basic configurations:
The first being as described above and secondly as per the illustration below. For this fastener type the assembly method is somewhat different but the principle and resultant configuration is quite similar.

![Image of Top Corner Fastener Set]

The Top Corner Fastener shown above is based upon utilisation of another of bigHeads’ specially designed ratchet washer, this time the S6 (larger diameter) version. A combination of 3 ratchet washers assembled in the configuration shown permits a similar fixing method to the first option at lower cost. The above is somewhat lesser in mechanical strength by way of pin diameter but axially can attain similar retention strengths.

**Bighead Experience.........**

bigHead first manufactured & supplied Shell Sets back in 1998, after a period of product development alongside a leading Oil and Gas plant and storage facility manufacturer and since then has supplied Shell Sets and Top Corner Fastener assemblies to the following projects:

- LNG Storage Tanks – Dabhol Revival Project - India
- RG PLL LNG Terminal phase II – Jetty facilities - India
- Rabigh Development Project – Cryogenic Tanks – Saudi Arabia
- Ethylene & Propylene Storage Tanks – IOCL Naphtha Cracker Project - India
- Adriatic LNG Storage Tanks – Aker Kvaerner – Spain
- Wheso Volker-Stevin Alliance

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