

## Incident Investigation Summary

**Responsible Managers**      Alastair Park  
**Incident Reference No:**      7586/09/NG  
**Person Responsible for National Implementation:**      Alastair Park

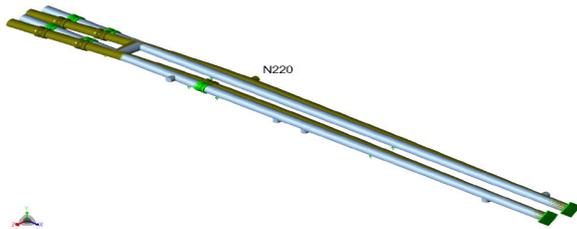
### Excessive displacement of discharge manifolds at St. Fergus Terminal

#### What happened?

A member of St. Fergus site staff observed that the ends of the plant 2 discharge headers (36" diameter) had moved laterally on their pipe supports by around 60 mm. The displacement was sufficient to force several recently fitted sealant injection fittings against the adjacent valve access gantries. The sealant injection points were visibly deformed and one had sheared off. There were no injuries and no loss of gas occurred.

#### The investigation found:

- The displacement was caused by differential thermal expansion of the headers during an isolation of the Plant 2 aftercoolers.
- The unusual design of the discharge headers led to this issue. The manifold consists of two long parallel pipes connected together by a cross branch. When differential expansion takes place the parallel headers behave somewhat like a bimetallic strip where relatively small axial expansion produces a larger lateral deflection.



Representation of the discharge manifolds taken from the pipework stress analysis conducted as part of the investigation. The blue shows the original position, the green the displaced shape under the differential thermal loading. Note that the displacement as shown is greatly exaggerated, the actual deflection at the ends being around 60 to 70 mm.

#### Why Did This Happen?

**Immediate Cause** - The lateral movement of the parallel discharge headers occurred as a consequence of differential axial expansion of the headers caused by the method used to isolate the aftercoolers. The sealant points were installed with insufficient clearance to the walkway.

**Root Cause** - A failure to identify the potential for displacement due to differential thermal expansion when applying the aftercooler isolation.

#### Learning points

##### For St. Fergus Site Manager

1. The St. Fergus Site Manager shall update local procedures to ensure that the method used to isolate the Plant 2 aftercoolers (and the equivalent isolation for Plant 1) are prevented from happening in the future. **Action Jeff Smith, 31<sup>st</sup> January 2010.**
2. A desktop study of the plant at St. Fergus and its detailed operation should be undertaken with the intention of identifying potential locations where large unexpected deformations or stresses might arise. Any locations of concern should be subject to further assessment such as pipework stress analysis. **Action Jeff Smith & Robert Bood, 31<sup>st</sup> May 2010.**

##### For all other Compressor, Terminal and LNG Gas Facility Engineers.

1. All GFE's shall consider whether they or their colleagues have observed lateral (or axial) expansion of a magnitude which they would consider to be in excess of that occurring on the majority of the plant. GFE's should provide brief details (via email) of such observations to Robert Bood in GNI by Feb 28<sup>th</sup> 2010. This shall be done for each site that they are responsible for and shall include a nil return for those sites where no issues are identified. **Action All GFE's, 31<sup>st</sup> March 2010.**

**Circulation: Distribution, Transmission, SHE**  
**Issue Date: 01 February 2010**

**Review Date:**

For further information regarding this bulletin please contact Robert Bood (01926 656046) or the Responsible Manager detailed above.