Kinetics Controls & Innovation Ltd

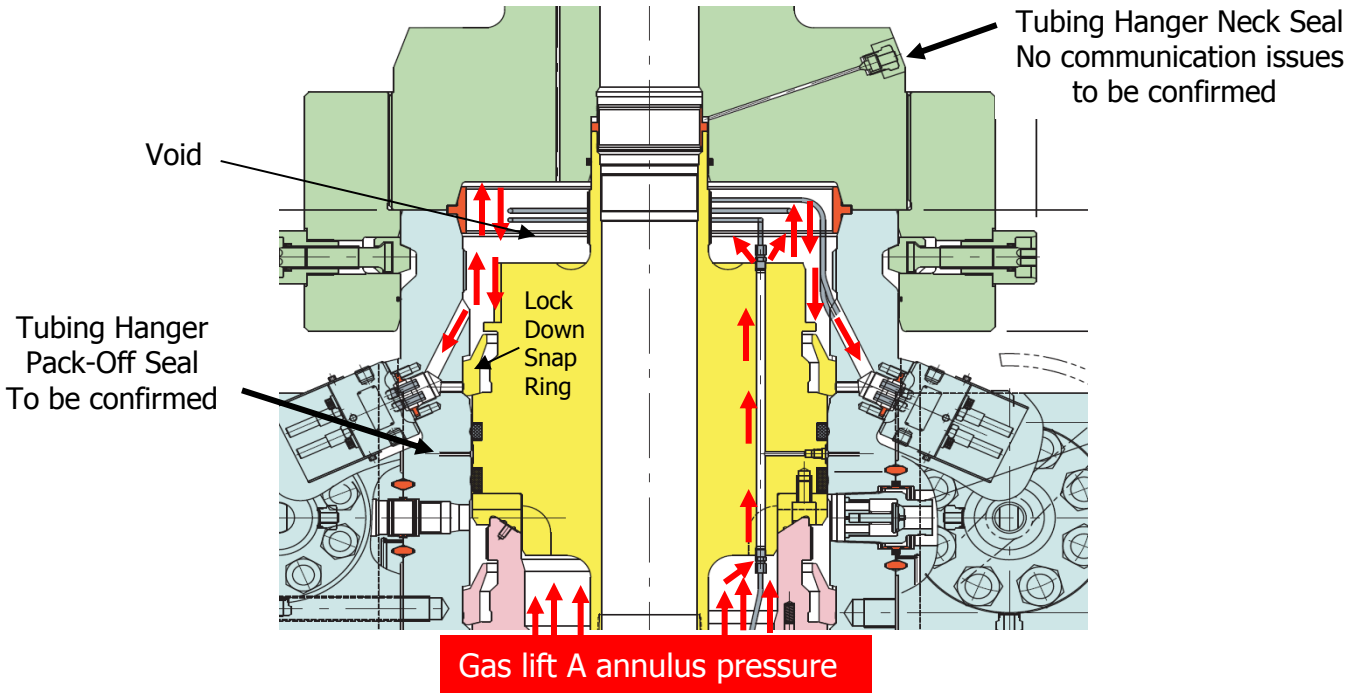
North Sea Platform
Tubing Hanger Control Line Isolation
Project, Product & Deployment Review
Mac-Seal 02 & IBS

Design Review:

Indications are that the control line may have been stretched on the tubing hanger. This may have a bearing on the current situation. The void is showing the same pressure as the annulus. But on this occasion the void will hold this pressure when the annulus is bled down.

The following is based on this possibility and a process of providing an isolation.

Further testing / evaluation will be carried out at the hanger and tubing neck seal areas.



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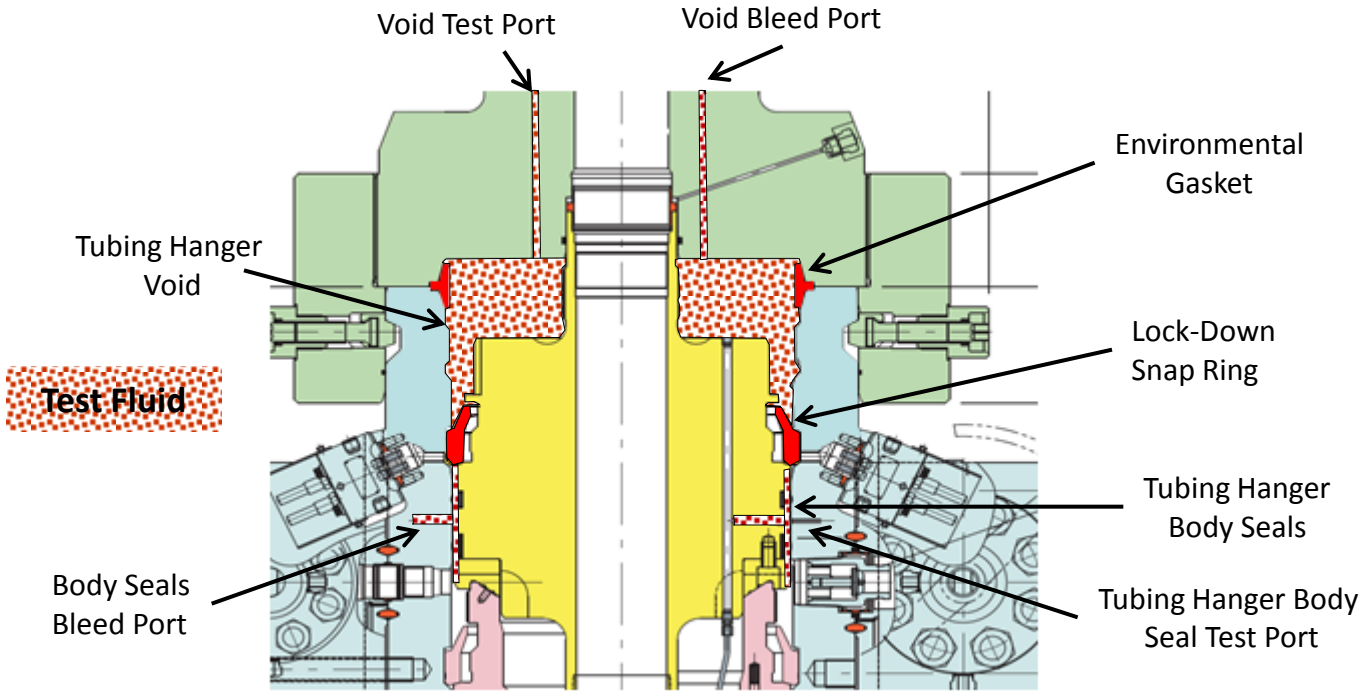
Tubing Hanger Void Evaluation

Evaluation:

1. Vent pressures above and below tubing hanger assembly
2. Sting and vent Tubing Hanger Void Test & Bleed Port, Neck Seal Test Port and Body Seal Test Port(s).
3. Inject Test Fluids through Void Test Port until returns are seen at Void Bleed Port. Close in Bleed Port.
   Continue to Inject until a PBU is achieved if possible.
4. Monitor Neck and Body seal Test Ports for returns.
5. Monitor for 15 minutes and record leak rate.
6. Vent pressure in Tubing Hanger Void.
7. Sting and vent Tubing Hanger Body seal Test Port.
8. Inject test fluids through Body Seal Test Port until returns are seen at Body Seal Bleed Port.
   Continue to inject until a PBU is achieved if possible.
9. Monitor for 15 minutes and record leak rate.



Maximum Test pressure is 5000 psi. DO NOT EXCEED 4000psi.

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Product information:

IBS (Isolation Barrier System).
The IBS is deployed as a fluid (two part mix) and will transform to a flexible solid at a predetermined time. The IBS can be returned back to a fluid or it can be mechanically removed with impact.
In this application the IBS will provide a platform protecting the hanger lock down ring during the deployment of the KCI MS-Sealant 02. Temperature range: -05 to 90°C

MS-Sealant 02.
The MS-Sealant 02 is deployed as a fluid (two part mix) and will transform to a solid self energizing resilient rubber type seal structure. The MS-Sealant 02 is self bonding and can be removed by cutting and peeling.
In this application the MS-Sealant 02 will fill the remaining hanger void in support of containing gas migration through the control line. Temperature range: -50 to 250°C

MHS-Protect 04.
The MHS-Protect 04 is a paint on anti-corrosion product that will provide a visual indication that injection ports 10 (in) and 10 (out) contain sealant products.

Option: Once the sealants have been converted to a solid replace the injection fittings in support of any ongoing monitoring requirements (if possible).

Deployment Overview:
Flatten the pressure to the A Annulus and Tubing Hanger Void.
Sting and confirm access through both existing ports i.e. 10(in) & (out) (KCI to inject high viscosity fluid)
Install injection manifold to test port 10 (in) Sting and vent through port10 (out)
Inject 26 litres of light oil through port 10 (in) until returns are present through port 10 (out)

Inject IBS through port 10 (in) and inject 6litres of IBS sealant. Displacing oil through port 10 (out)
Flush with oil 500mls to clear IBS from port 10 (in) injection fitting and access port to the void.

Close ports 10(in) and 10 (out), remove IBS manifold, and allow 24hours for the IBS to convert to a flexible solid (sample left on wellhead to confirm conversion).

Sting and vent port 10 (out).
Inject 22litres of MS-Sealant 02 through port 10(in) and displace oil through port 10 (out).
Visual conformation though port 10 (out) of MS-Sealant 02.
Close port 10(out).
Build injection pressure up to 1,000psi and lock in at the manifold.

MS-Sealant 02 setting time is 8 to 10 hours subject to the temperature (sample left on wellhead to confirm conversion).

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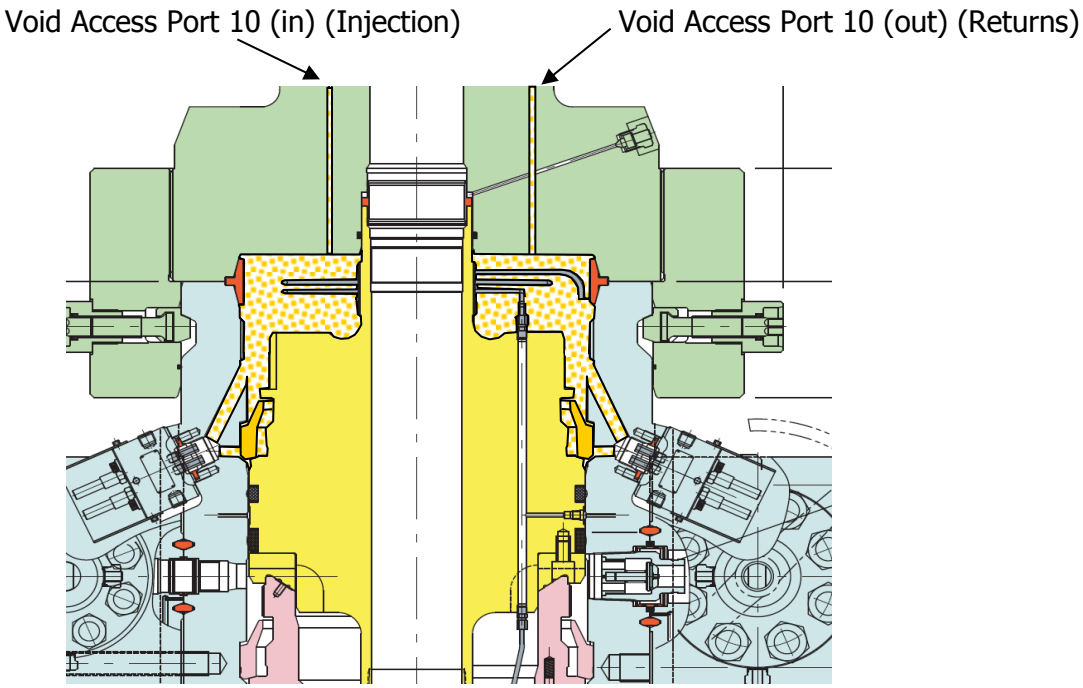
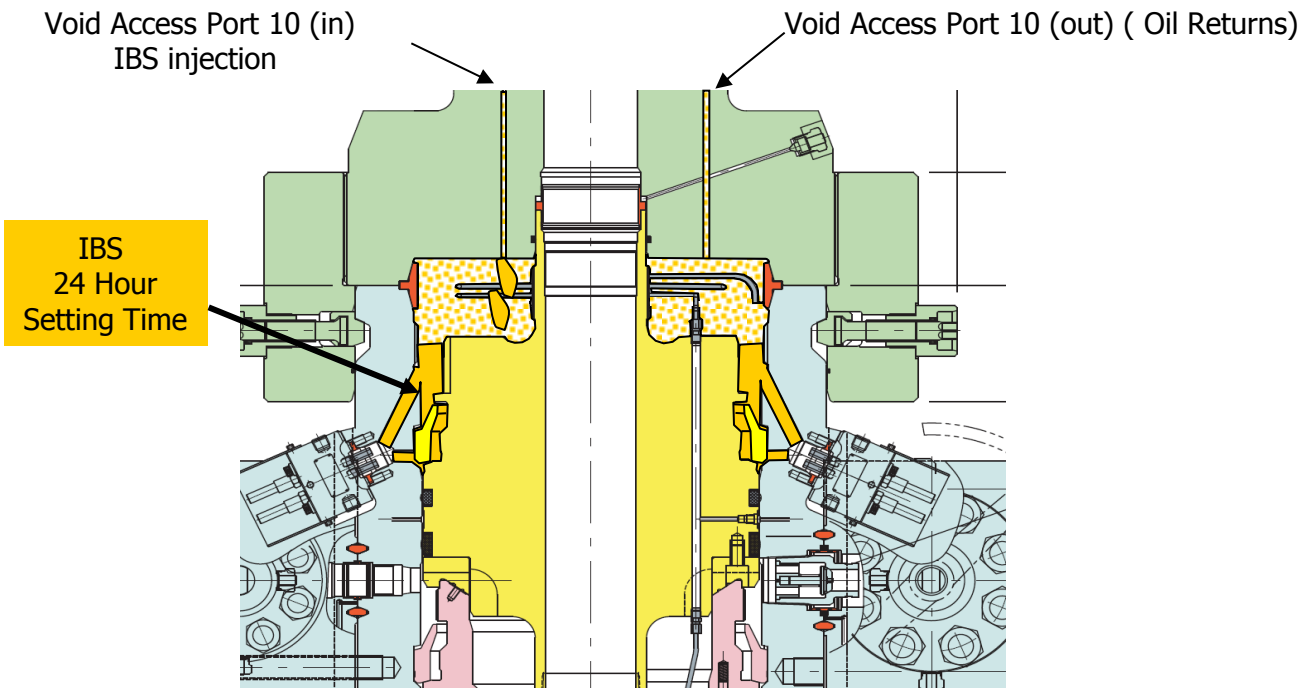


Tubing Hanger Void Filled with Oil



Tubing Hanger Void IBS Injection (6 Litres)

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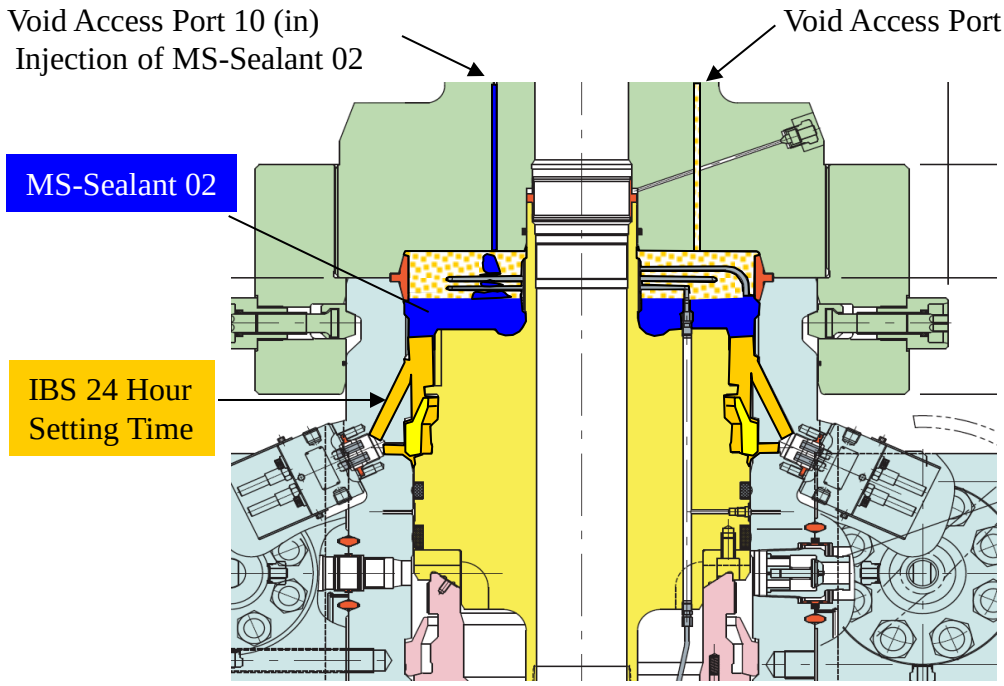
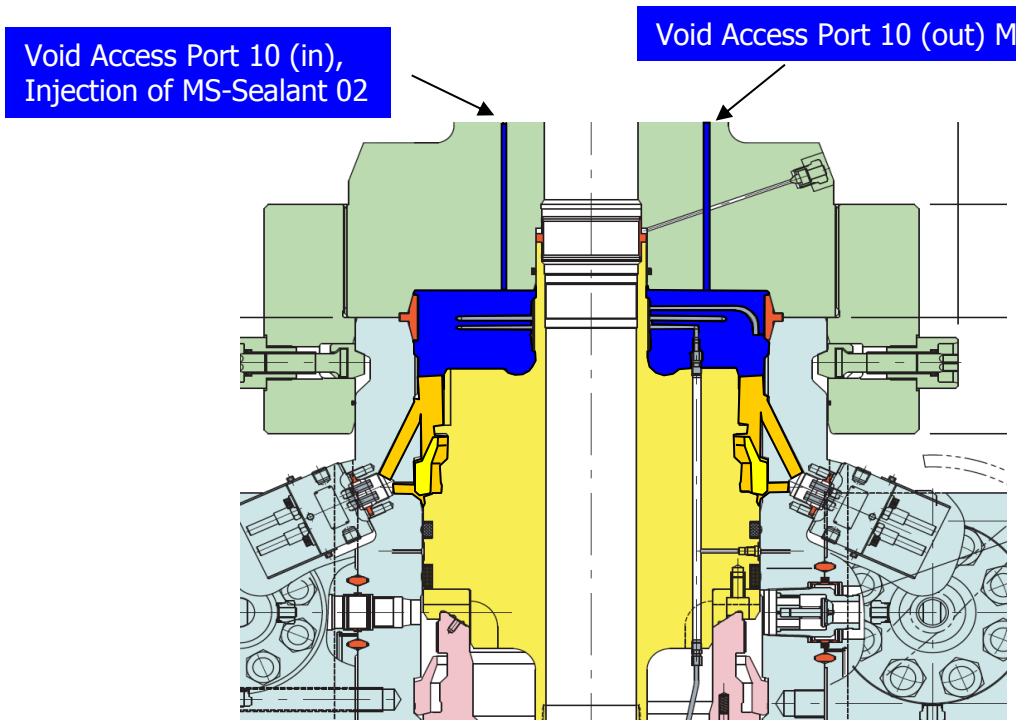


Tubing Hanger Void MS-Sealant 02 Injection (22Litres)



Tubing Hanger Void MS-Sealant 02 Injection (22Litres)