



Kinetics Controls & Innovation Ltd

**North Sea  
24" Valve Isolation  
Bruce Area Development  
Project & Product Overview**

**Procedure: Sealant Injection into XV30493 and XV30494 24" Valve MOL pig Launcher using IBS**

**REVISION HISTORY**

<b>Serial</b>	<b>Date</b>	<b>Description</b>	<b>Author</b>	<b>Checked</b>	<b>Project</b>
01	03-05-2012	Issued for internal review	AP	RM	RM
02	04-05-2012	Issued for external review	AP	RM	RM
03	17-05-2012	Re-Issued Incorporating Client comments	AP	RM	RM
04					

**KCI DRAFT PROCEDURE**

KCI Reference: AB871RM/PROC01

Rev. No 01

01 May 2012



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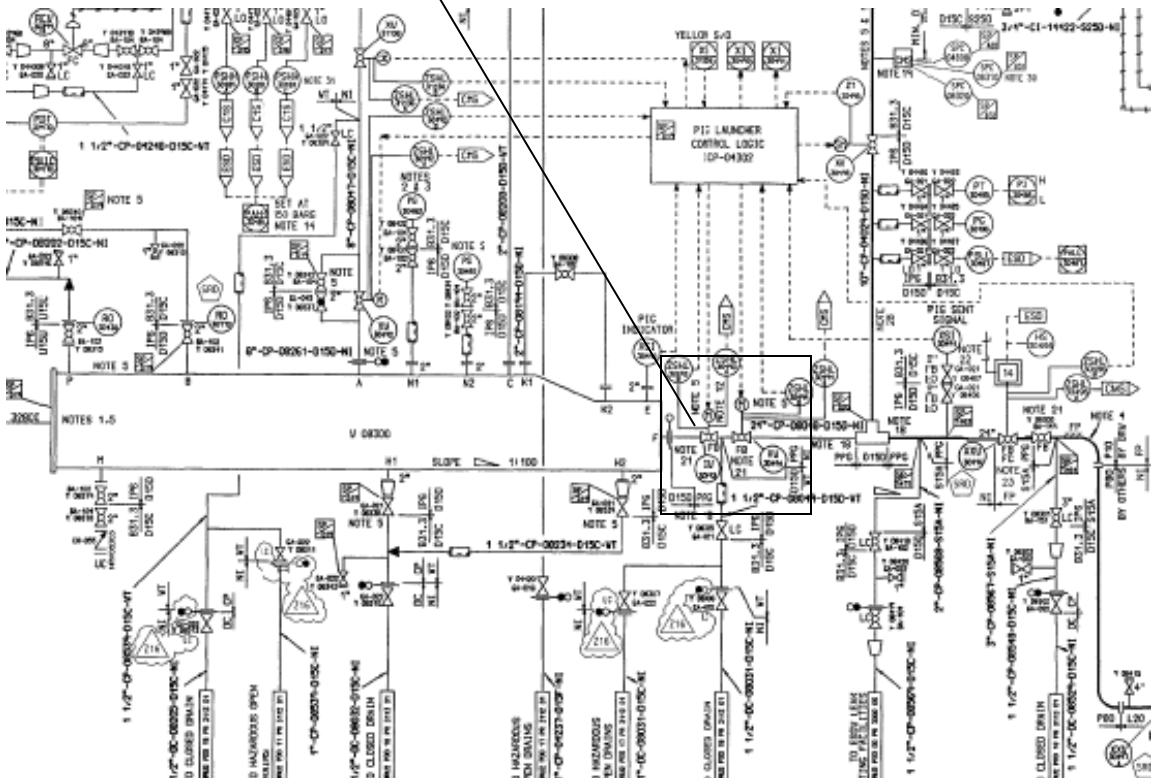
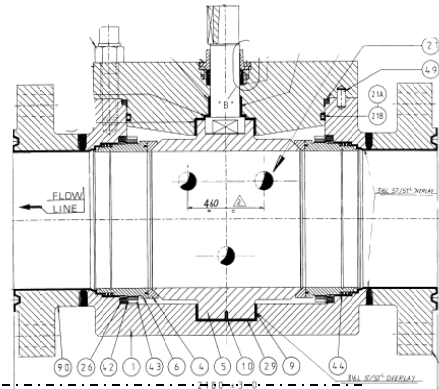
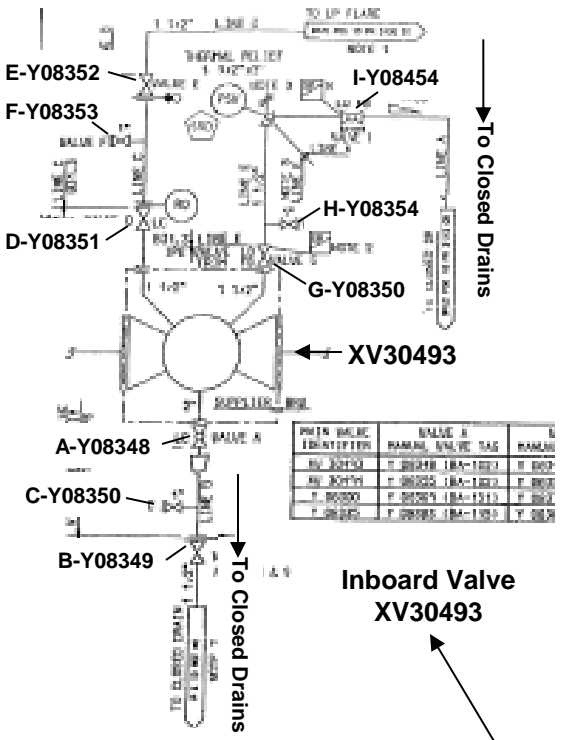
### **Section:**

#### **Introduction**

1. Site History
2. Objectives
3. Scope of Work Operations
4. Equipment Tooling
5. Mixing and Characteristics of IBS Product
6. General Safety
7. Method Statement for Product Injection

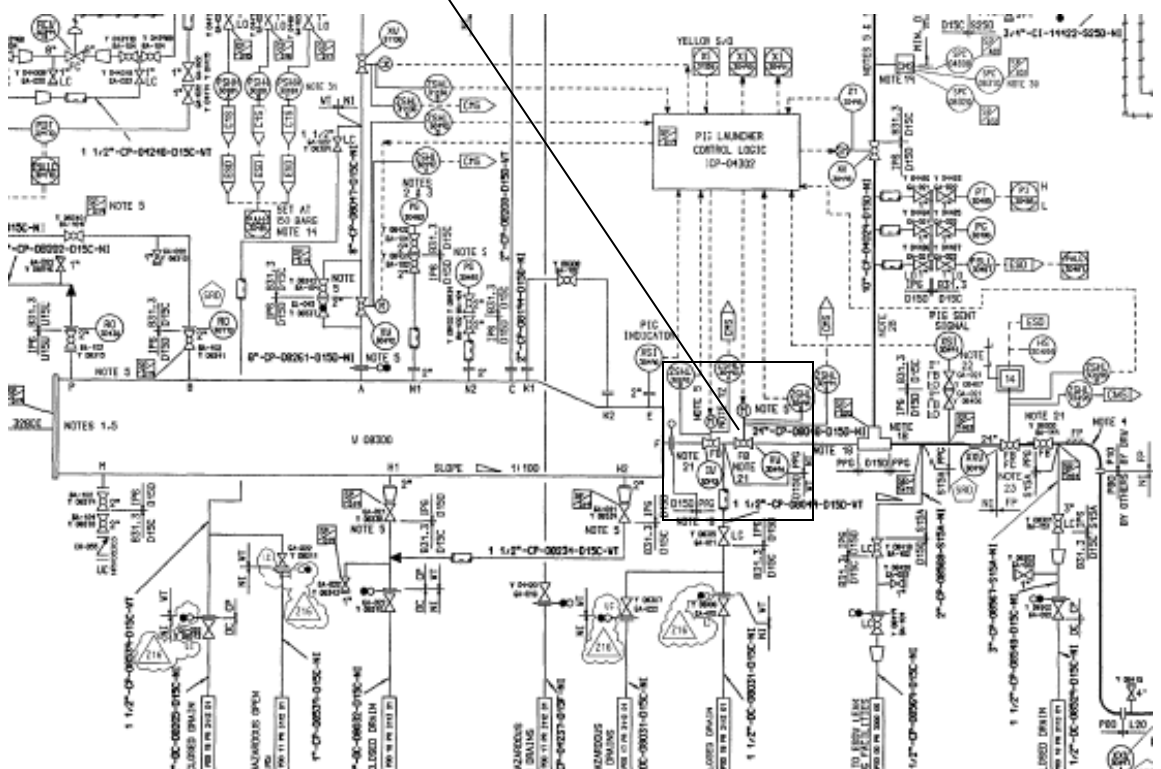
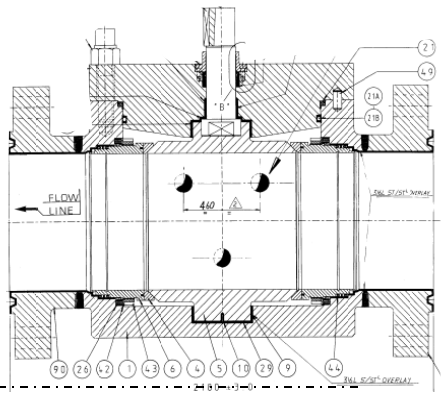
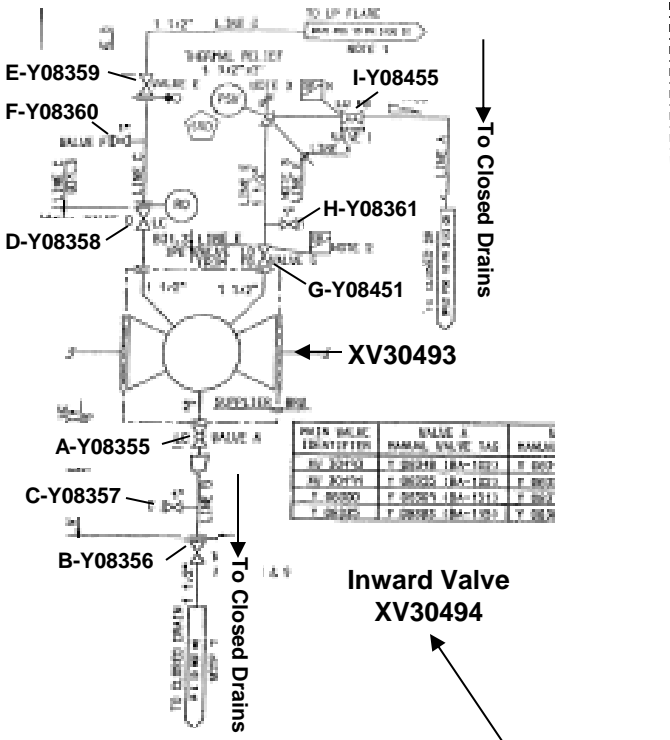








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Reference BRU2-P00-04-PR3026-00 Z16 ( Outward 24" Ball Valve)

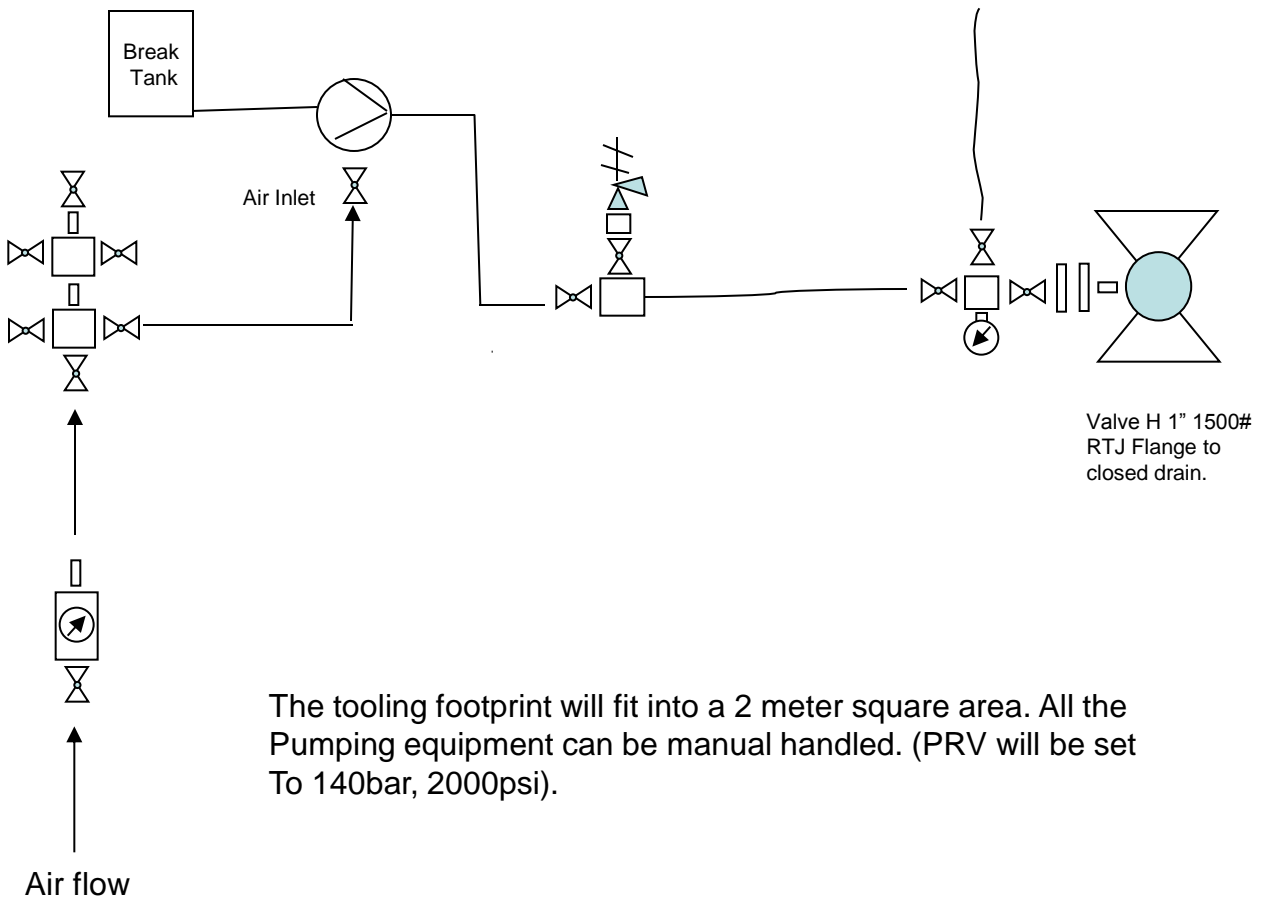
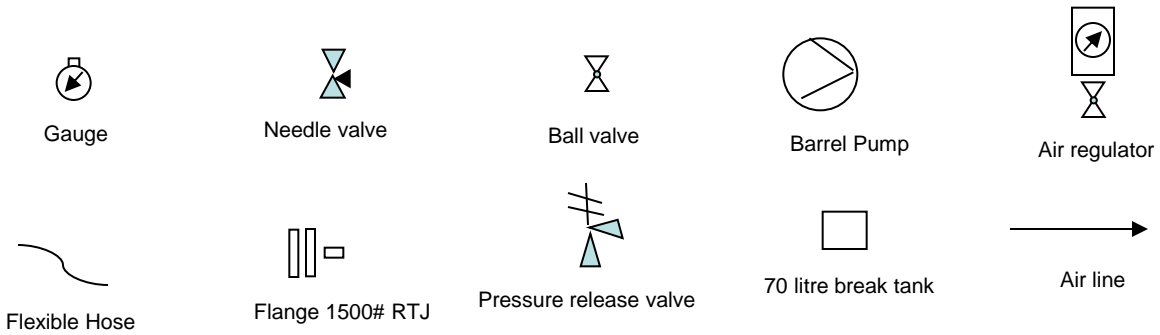


Offshore Installation Interface Requirements

Serial	Statement	Action	Complete	Comments
01	Work site to be established within close proximity to the XV Ball Valve 30493 and XV30494	KCI, BP		
02	Use of closed drain system for the discharge and flushing operations. Aqueous discharge can be pumped into 20 litre containers as contingency.	BP		
03	Deck crew for lifting operations and adequate lay down area for sealant and equipment.	BP		
04	Use of installation plant air system and hoses. Plant air 260scfm @ 7bar will be adequate for KCI Pumps.	BP		
05	Access to spill kits as required and a small bund of 2 meters square to contain the mixing containers and small drums.	KCI, BP		
06	Storage, security and shipping of equipment to and from worksite.	BP		
07	Process line pressure information. Pressure in pipeline _____ barg, Date/Time: _____	BP		
08	Confirmation that pipe work and valves have been pre-filled with oil. A sample to be taken once pre-fill has been completed.	BP		
09.	Access to a potable water source for flushing equipment post operations.	KCI, BP		
10.	To utilize mechanical and technical operators to aid pumping operations and fitting of interface flanges.	BP		



### Rig up Schematic and Symbols



The tooling footprint will fit into a 2 meter square area. All the Pumping equipment can be manual handled. (PRV will be set To 140bar, 2000psi).





### Rig up Schematic and Symbols



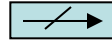
Gauge



Four way block

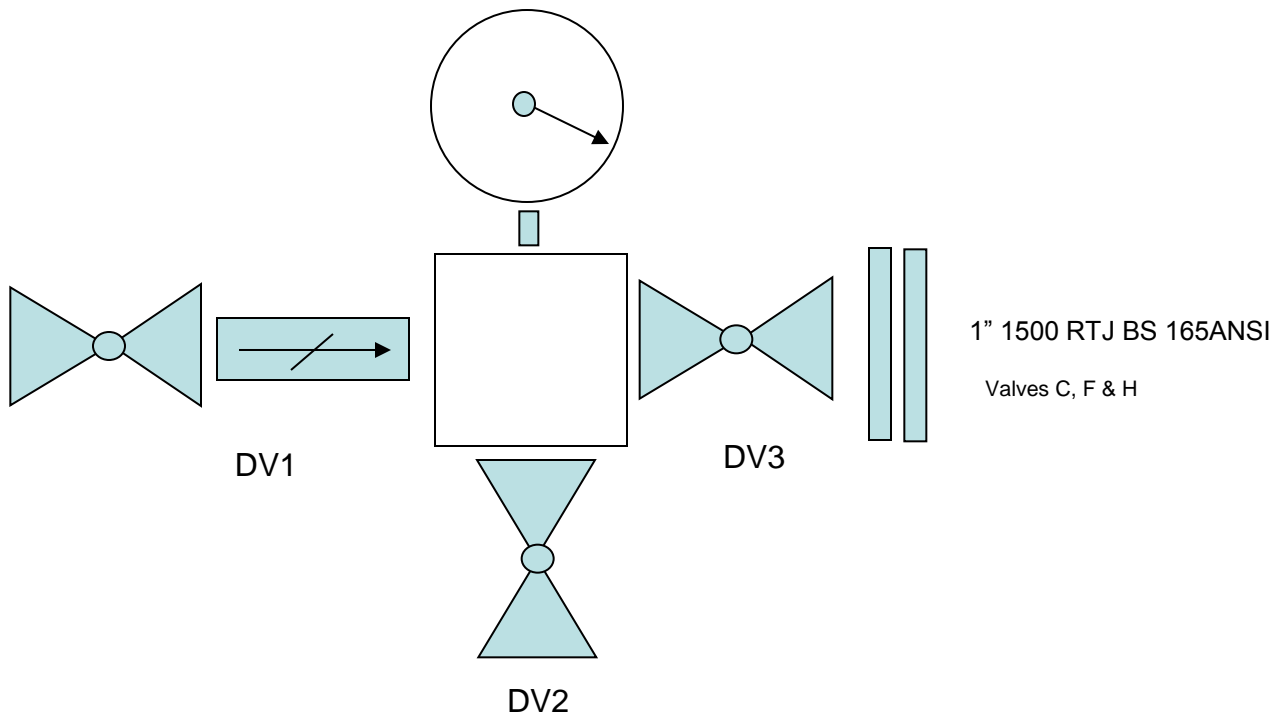


Ball valve



Check Valve

### KCI Deployment Manifold



In preparation for the leak test on the hose and deployment manifold located on 1" flange @ Valves H, F & C the valves on the deployment manifold should be aligned as detailed below:

- Valve ID – DV1 = Open
- Valve ID – DV2 = Closed
- Valve ID – DV3 = Open
- Valve ID – Valves H, F & C Closed

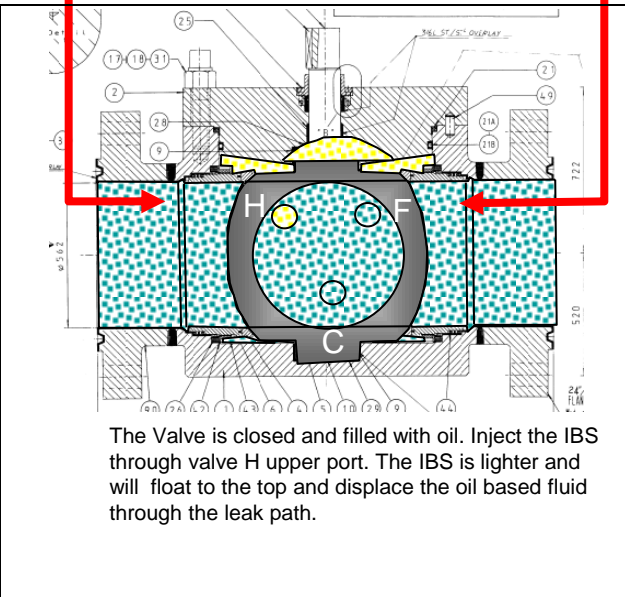
Pressure relief valves (PRV) shall be fitted to the outlet of the air driven pumps set at 70 bar.



### KCI IBS – Sealant Injection Process

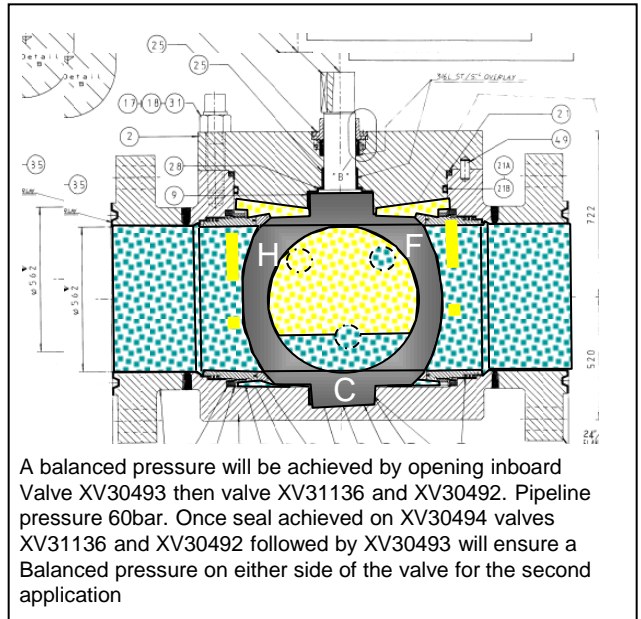
1

Balance Pressure i.e. no flow



The Valve is closed and filled with oil. Inject the IBS through valve H upper port. The IBS is lighter and will float to the top and displace the oil based fluid through the leak path.

2



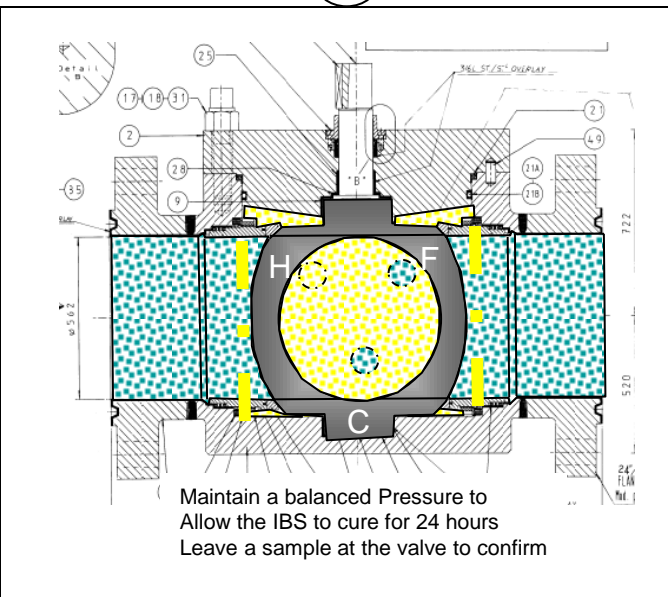
A balanced pressure will be achieved by opening inboard Valve XV30493 then valve XV31136 and XV30492. Pipeline pressure 60bar. Once seal achieved on XV30494 valves XV31136 and XV30492 followed by XV30493 will ensure a Balanced pressure on either side of the valve for the second application

Oil Base Fluid

IBS Fluid State

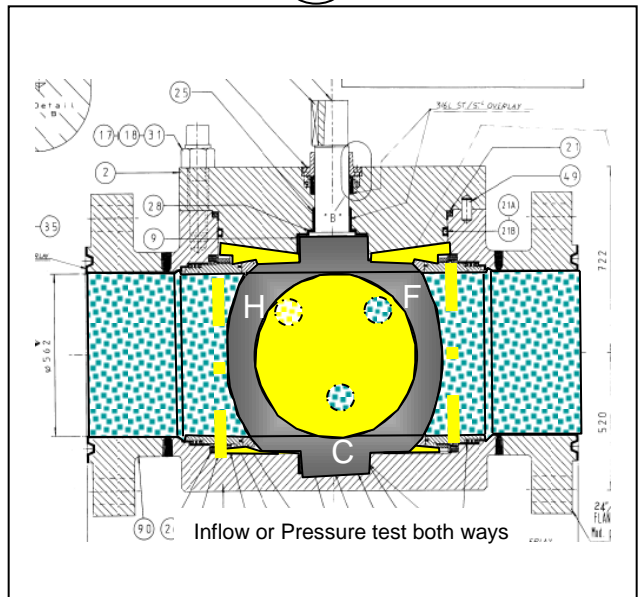
IBS Cured

3



Maintain a balanced Pressure to Allow the IBS to cure for 24 hours Leave a sample at the valve to confirm

4

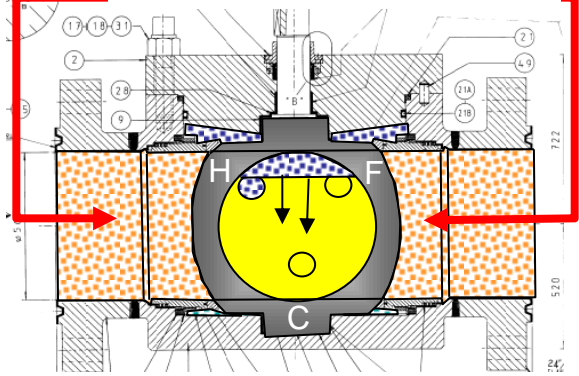


Inflow or Pressure test both ways

# KCI IBS- Breaker Method Review

1

Balance Pressure i.e. no flow

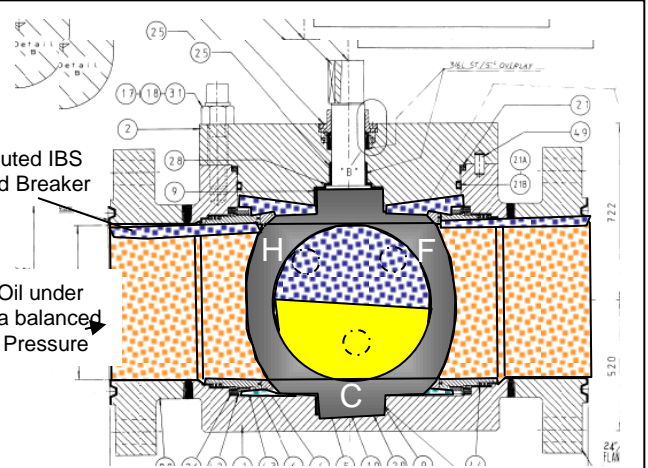


Inject 80Litres of in through Port A. The will compress the IBS from above. If PBU may be present maintain this at the balanced pressure (T.B.A.). Open the valve 10% after 4 hours. This will allow the diluted IBS to be displaced. Inject a further 20litres or IBS Breaker in through port C and close the valve and continue to inject a further 80Litres of IBS Breaker. The plug loses around 30% of its size with every new application of IBS Breaker

2

Diluted IBS and Breaker

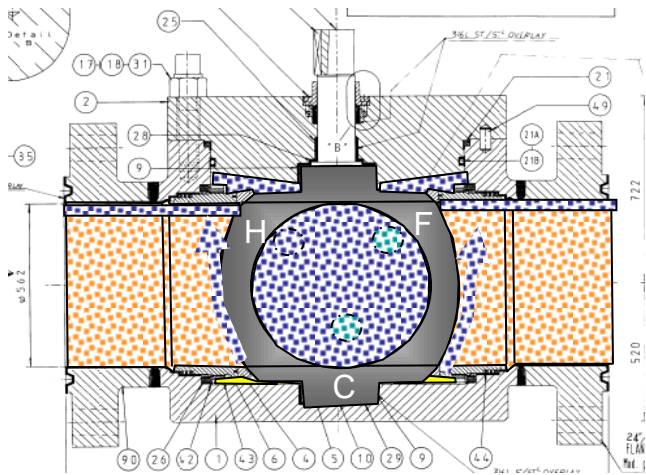
Oil under a balanced Pressure



Repeat the process every 4 hours. A PBU may not be present subject to the unknown position of the leak path (s) but with the valve closed and supported with oil both sides the new Breaker will flow to the top within the closed valve and displace the oil.

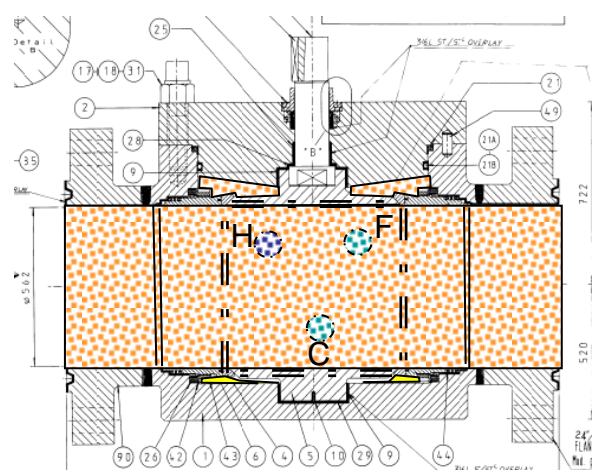
3

Inject the Breaker through Port C



4

Flush or drain the pipe





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### **IBS Product Information, Mixing & Characteristics**

The KCI IBS is a compound deployed in a fluid state against pressure (if required). The IBS is designed to flow around existing materials and annulus areas and convert to a solid flexible material to establish a pressure energised seal.

The product is provided in two parts, a white compound, and a buff Activator. Both products combined provide a package to meet a specified cure time and consistency. It should be noted that the activator measure is subject to curing time requirements and can not be adjusted. If further information on curing times by volume is required contact KCI Limited for advice as required. Standard cure time is 24 hours subject to temperature and ambient conditions. Deployment time is subject to the volume to be pumped and the ambient deployment temperature.

It is important to review the label attached to both compound and activator and check MSDS information.

#### **Mixing:**

Deployment and mixing should take place in a well ventilated and well lit site area. KCI provide containers large enough to support mixing and deployment with an air hand drive mixing paddle. The compound should be poured carefully into the container provided and stirred gently. The activator should be applied into the same container and mix the combined fluids for approximately 5 to 10 minutes.

#### **Deployment: Subject to viscosity**

**Deployment Tools:** Orion Barrel Pump, complete with interface fitting, manifold. The barrel pump should be used In conjunction with the container provided for stability.

All feed hoses provided are new and for IBS deployment only.

#### **Cleaning the tool and accessories:**

Place the pump in a container filled with potable water or specified breaker and flush out the existing IBS fluid material. The IBS and Potable water mix should be pumped to closed drains or into another container or IBC for disposal. Once clear water is being displaced a light oil should be pumped through the tool assembly to remove excess water and to keep it in a good operating condition.

#### **IBS Removal and dilution:**

The IBS product can be diluted and converted back to a fluid solution. IBS breaker can be injected through the same entry point or injection port with a set volume. The IBS breaker is a water based solution and will convert the solid IBS back to a safe aqueous solution over a 24 - 36 hour period.

**Note: This product is required to be deployed by KCI trained personnel.**



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### **General safety**

Safety is the responsibility of every employee irrespective of status. Employees will ensure that Their workplace is safe and functions efficiently and safely. Safe working practices are to be Implemented and adhered to at all times. Particular attention will be given to work site safety and to any safety systems and procedures provided.

Personal Protective Equipment (PPE) will be issued to all personnel. The minimum PPE of hard Hat, safety boots, full length coveralls, gloves, ear protection and eye protection will be worn At all times when working on site.

Barriers will be erected in order to ensure that unauthorised personnel do not enter the worksite, And announcements will be broadcast to warn personnel of any operations that require the worksite to have barriers in place. The routing of hoses will done as safely and with minimum To normal platform operations as possible.

All hoses, valves and fittings will be checked to confirm that they are of a suitable pressure rating for the task. All hoses will be tagged by the KCI supervisor to confirm that they have been Checked. All hoses will be secured with whip-checks and 'R' pins as required.

On completion of the work scope, and prior to demobilization, all hoses will be flushed and Purged. Any equipment which is damaged or faulty will be clearly red tagged and an equipment Damage report will be completed.

### **Safety Systems**

All personnel will undertake the platform safety induction upon arrival. KCI supervisor will use Site orientation and induction to establish their routes of escape from the area as well as the Nearest emergency equipment and call point locations.

The work site permit to work system will be implemented and strictly adhered to at all times. No Work will be carried out unless the required Permit has been raised, authorised and signed on. If the scope of work changes during the duration of the permit, the KCI supervisor will ensure Any changes to the work are discussed with the client, and the permit modified (if necessary) And re-issued.

A pre-job brief will be held to ensure that all parties involved in, or affected by, the work are aware of Its nature and of the potential hazards involved. Any outstanding actions following the meeting will be closed out prior to operations and task commencing.



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### **Safety Systems cont'd**

A Toolbox Safety talk will be conducted on site with the KCI personnel before on all new tasks To be under taken prior to commencement. All personnel associated with the task will attend, With details of the work, the hazards and the precautions discussed. The Toolbox talk will be Logged in the Daily Operations Report.

Any changes to the scope of work must be risk assessed. Prior to implementation, the Changes must be reviewed and accepted by KCI Ltd, platform OTL and the client.



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### 24" VALVE ISOLATION USING IBS - METHOD STATEMENT

Serial	Statement	Action	Complete	Comment
1.	Liaise with WSS WTL to raise PTW and conduct toolbox talk with all parties on work scope requirements. Review Risk Assessment.	KCI		
2.	KCI personnel to ensure tooling and product is tested and prepared prior to pumping operations.	KCI		
3.	Refer to procedure drawings for rig up. Page 6 of this procedure refers	KCI		
4.	Confirm isolations and status of XV30494 and XV30493. Confirm isolation on valve H, F and C on the 1" 1500 RTJ	KCI		
5.	Confirm isolations and status of XV39403, XV39404, XV31136 and XV30492. With XV30493 opened a balanced pressure will be achieved by opening XV31136 and XV30492.	KCI BP		
6.	Leak test can be conducted with product without activator or additives prior to pumping into valve.	KCI		
7.	Attach deployment manifold to Valve H Y08354. Check the line and all valves are in the closed position before Initiating plant air.	KCI		
8.	Pump IBS until returns are has been displaced from the line. Close valve on end of hose. Continue to pressure up the line until <b>140bar, 2,000 psi</b> is achieved. lock in the pump.	KCI		
09.	With pressure of <b>140bar, 2,000psi</b> check line for leaks. If no leaks observed after 10 minutes open valve bleed off fluid pressure to container provided by KCI.	KCI		
10.	With pressure 0psi close valve and isolate air supply from the pump.	KCI		
11.	Prepare the 60 litres of IBS to receive activator and additives and mix in the container provided. Prepare further fluid mixtures ready for pumping operations.	KCI		
12.	With all valves in the closed position on Valve port H, Confirm that the pressure is balanced either side of the XV 30494 valve. <b>Approximately 60bar, 870psi.</b>	KCI, BP		



24" VALVE ISOLATION USING IBS - METHOD STATEMENT

Serial	Statement	Action	Complete	Comment
13.	Open valve H Y08354 on XV30494, 1" Flange. This will confirm and indicate pressure in the valve . Record the pressure. IBS fluid will be pumped in at a slightly higher pressure. <b>Approximately @ 70bar, 1015psi TBC</b>	KCI		
14.	Start to build up pressure in the line until it is proportionally higher than the valve cavity pressure. When correct pressure achieved open feed line valve DV1.	KCI		
15.	Commence pumping the IBS into the valve cavity. Bleed oil periodically through the lower port Valve C Y08350 until IBS returns are visual.	KCI		
16.	Close the lower port valve C and continue pumping IBS. Once IBS mixture in deployment bin is approximately 5 litres stop pumping and close in feed line valve.	KCI		
17.	Prepare another batch of IBS mixture for use. Additional IBS will be close at hand for top up as required. Monitor for a PBU. After IBS and additives have been added build up to required pressure.	KCI		
18.	Open feed line valve and continue to pump IBS until set volume has been injected or PBU in the Valve cavity continues to rise above that of the balanced pressure. Close feed line valve and monitor pressure on feed line manifold gauge.	KCI		
19.	If pressure remains constant after a 15 minute duration close Valve H Y08361 and KCI ball valve DV3. The residual pressure in the deployment hose can be bled off to container.	KCI		
20.	The IBS should now be left to cure. A balanced Pressure on either side of the valve should be maintained. Continue to monitor oil export pressure upstream of XV 30494.	KCI, BP		
21.	With IBS injection complete a sample should be taken to gauge curing process. Flush the equipment to clear the line of any IBS residue.	KCI		
22.	When containers topped up with potable water for flushing, ensure correct valves for flushing are open. Pump residue to container provided by KCI.	KCI		
23.	Once flushing phase complete and returns are clear close valves. Bleed off plant air to source.	KCI		
24.	Once system is 0 pressure. Check line and close remaining valves.	KCI		





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### 24" VALVE ISOLATION USING IBS METHOD STATEMENT

Serial	Statement	Action	Complete	Comment
25.	Once the pre-set volume of IBS has cured 400 litres (check sample) there will be a requirement to check integrity of the IBS seal application.	KCI, BP		
26.	With a balanced pressure either side of the XV ball valve, upstream pressure should be reduced to identify if initial isolation is holding and leak paths have been located.	BP		
27.	In the event that the first isolation volume has been unsuccessful then an additional application of IBS can be injected into the valve cavity. (Contingency)	KCI, BP		
28.	For additional IBS injection follow steps 13 to 20. (No action to be taken unless confirmed by client).	KCI BP		
29.	Additional injected volumes of IBS will bond and mould with the original IBS plug and provide an enhanced sealing measure.	KCI		
30.	With a successful seal achieved on outboard valve XV30494 a balanced pressure will be required for the IBS application on XV30493 this will be achieved by closing valves XV31136, XV30492 and then closing XV30493.	BP		
33.	A leak test can be conducted using IBS product without activator prior to pumping into the valve. Attach KCI deployment manifold to Valve H Y08361 or Y08354.	KCI		
34.	Pump IBS through the system until returns are confirmed. Close valve on end of deployment line and bring pressure up 140bar, 2,000psi and lock in pump. Check line for leaks. Hold pressure for duration of 10 minutes.	KCI		
35.	Leak test successful, bleed down system. Prepare 60litres of IBS and activator and mix in deployment tank provided. Prepare further fluid mixtures ready for topping up.	KCI		
36.	Confirm balanced pressure in place approximately 60bar, 870psi. Open valve H Y08354 on XV30493 1" flange and BV3 on deployment manifold. This will confirm pressure in valve XV30493.	KCI BP		
37.	Start to build up pressure in the deployment line until it is slightly higher than the valve cavity 70bar, 1015psi. When correct pressure achieved open valve BV1.			
38.	Commence pumping the IBS into the valve cavity. Decant samples periodically through the lower port valve C Y08350 and Y08357 until IBS returns are visual.			



24" VALVE ISOLATION USING IBS METHOD STATEMENT

Serial	Statement	Action	Complete	Comment
39.	Close the lower port valve C Y08350 and continuing pumping in set volume of IBS. Once IBS in deployment bin is exhausted or at approximately 5 litres stop pumping and close in BV1 and BV3.	KCI BP		
40.	Prepare another batch of IBS mixture for pumping. After activator and additives have been added open up valve BV1 build up the pressure required 70bar, 1015psi, open BV2.	KCI		
41.	Commence pumping the IBS until set volume has been injected or PBU in the valve cavity continues to rise above that of the balanced pressure. Close valve BV1 and monitor Pressure on feed line manifold gauge.	KCI		
42.	If pressure remains constant after a 15 minute duration close valve H Y08354 and BV3. The residual pressure can be bled off by opening BV2 to a collection container.	KCI BP		
43.	The IBS should now be left to cure the balanced pressure maintained. An IBS sample will be taken to gauge curing.	KCI		
44.	Rig down equipment and flush hoses and manifold to containers provided by KCI. Tidy up work site.	KCI		



IBS ISOLATION PLUG DEGRADATION USING BREAKER SOLUTION METHOD

Serial	Statement	Action	Complete	Comment
45.	Once the pig loading has been satisfactorily completed the IBS plug will need to be reduced and removed to aid the launching of the pig.	KCI		
46.	With a balanced pressure either side of the XV 39403 ball prepare 80 litres of breaker for injection into the valve.	KCI		
47.	Conduct a leak test on equipment. Leak test can be conducted using the breaker product.	KCI		
48.	With leak test completed on deployment manifold attached to valve C Y08350 and Y08357 on the 1" RTJ 1500#. Open valve and monitor pressure in cavity. (If present)	KCI		
49.	If no pressure present commence injecting the 80 litres of breaker which will compress the IBS plug from below. Due to the compression process a PBU may occur.	KCI		
50.	After 4 hours has elapsed and ensuring the balanced pressure is maintained open the valve XV30493 or XV30494 10% to dispel the exhausted breaker solution. With the valve open commence pumping 20 litres of breaker to flush then both valves.	KCI,BP		
51.	With both valves closed continue injecting 80 litres of breaker solution to continue the IBS breakdown process. The phases 49-51 should be repeated every 4 hours.	KCI,BP		
52.	Adding the additional breaker solution a PBU may not be visual due to unknown position of leak paths and breakdown of IBS plug. With valve closed and with fluid on both sides the new breaker will position itself to the top of the closed valve.	KCI		
53.	On the last breaker application inject the 80 litres in through the Valves H Y08354, Y08361 and Valve F Y08353, Y08360 to clear pipe work and reduce size of the IBS plug. This will increase the effectiveness of the final degradation process.	KCI		
54.	After last application of breaker rig down KCI equipment. Clean and flush hoses safely to KCI provided containers .	KCI		
55.	The IBS plug will be dissolved totally or reduced significantly to small particles which will not interfere with pig launching operations.	KCI		