
COSASCO TWO-INCH SYSTEM

INSTALLATION, OPERATION & MAINTENANCE
MANUAL

INJECTION & SAMPLING SYSTEM

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Chapter 1

Introduction

During the installation/construction stages of the Cosasco Injection and/or Sampling Systems, the following Manuals are recommended:

600000-MANUAL – RBS/RBSA Retriever and Service Valve
740074 – Trepanning, Positioning and Welding
740078 – Hot Tap

The Cosasco Injection System and Sampling System share many interchangeable parts. The Injection System relies on an externally supplied pressure differential which is greater than the pipeline or vessel operating pressure. The Sampling System is in effect a reversal of the principles involved in the Injection System in that the external pressure is atmospheric and lower than that of the pipeline or vessel pressure.

Both Systems can be operated on pipelines or vessels already on stream and under full system operating pressures. However, by utilizing the Cosasco Hot Tap (Manual 740078), in conjunction with the Cosasco Retriever and Service Valve tandem hook-up (Manual 600000-MANUAL) either System can be added at a later date even when it is impractical to shut a system down. This same hook-up can also be used in inserting or retrieving the many other Cosasco corrosion monitoring or prevention devices while units are under full operating pressures.

Chapter 2

General

Internal corrosion in product pipelines or vessels, in most cases, is caused by water and oxygen dissolved in the product. The water, in contact with oxygen, corrodes steel. If corrosion is not controlled, many forms of physical deterioration can result. There would also be contamination of the product with rust particles and other precipitates.

In a basic sense, corrosion occurs by one of two processes. One is by the exposure of metals with gases at high temperatures and is called “dry” corrosion. The other, “wet” corrosion, is caused by the reaction of metals and their environments at normal temperatures, but where the reaction is electrochemical and dependent upon the presence of an electrolyte. Most water is very conducive to wet corrosion due to the complex mixtures of dissolved solids and gases it contains.

Chapter 3

Sampling Considerations

Sampling is one of the main ways of obtaining an analysis of wet corrosion environments. It is not a prevention measure in itself, but permits analysis for specific testing of oxygen, carbon dioxide and hydrogen sulfide content. It also allows testing for iron, acids, bacteria, organic matter, effluents and solid matter. Whether applied to a gas, oil, or water system, sampling can be a very helpful aid in diagnosis both potential corrosion problems and the effectiveness of corrosion prevention measures.

The Cosasco Sampling System allows for the sampling extraction point to be at any position on the pipe OD or on the vessel. To utilize Sampling to its maximum, extraction areas should be considered at:

1. The beginning and the end of lines.
2. Pipeline junctions.
3. Low spots in the pipeline.
4. The drain line of three phase separators upstream of water drain or dump valves.
5. Tank or vessel bottoms.
6. The drain lines of desalters.
7. The gas outlets from two phase separators.
8. The gas main to compressors.
9. Immediately prior to chemical injection points.
10. The end of pipelines to test for residual inhibitor.

The above suggested sample extraction areas should not be considered as all inclusive nor as absolutes, since each system has its own peculiarities and often requires its own special arrangement for Sampling.

Chapter 4

Injection Considerations

The Cosasco Injection System was developed to allow for the injection of various inhibitors to retard the various corrosion mechanisms. The National Association of Corrosion Engineers (NACE) has indicated at least the following mechanisms:

1. Adsorption. Forms an invisible thin film only a few molecules thick on the metal to be protected.
2. Coating. Forms a visible bulky precipitate which coats the metal and protects it from attack.
3. Passive. Causes the metal to corrode in such a way that a combination of adsorption and corrosion product forms a passive layer on the metal to be protected.
4. Favorable environment. Causes conditions in the environment to be more favorable for the formation of protective precipitates.
5. Corrodent removal. Removes the aggressive corrodent from the environment.

To use inhibitors effectively, several considerations by the corrosion engineer should be realized. The engineer should:

1. Be able to identify those problems which can be solved by the use of corrosion inhibitors.
2. Consider the economics involved as to whether or not the loss due to corrosion exceeds the cost of the inhibitor and maintenance and operation of the injection system.
3. Consider the compatibility of inhibitors and the product flow in order to avoid adverse effects which could occur, such as foaming, decreases in catalytic activity, degradation of another metal, etc.
4. Be able to apply the inhibitor under conditions which will produce the maximum expected corrosion prevention effect.

When using an inhibitor it should be remembered that all the natural protection such as iron oxide is removed and a protective film is put on the pipe or vessel surface. If this film is removed by uninhibited products, the surface is very susceptible to the water and oxygen in the product flow and their combination begins the corrosion process immediately. It is very important that the film remain intact so this condition cannot exist.

Also, it is important to use the correct amount of inhibitor, since many inhibiting agents can accelerate corrosion, particularly localized attack such as pitting, when present in small concentrations. Too little inhibitor is less desirable than none at all. To avoid this possibility, inhibitors should be added in excess and the concentration checked periodically. When two or

more inhibiting substances are added to a corrosive environment, the inhibiting effect is sometimes greater than that which would be achieved by either of the two (or more) substances alone. This is called a synergistic effect. The mechanism of the synergistic effect is not completely understood within the industry.

Liquid inhibitors are usually preferred because of the ease with which they can be transported, measured and dispersed. Organic inhibitors rarely have the optimum characteristics of viscosity, freezing or boiling points and are therefore dissolved in an appropriate solvent to achieve the desired properties. It is often desirable to blend the inhibitor with a demulsifier, dispersant, surfactant, antifoaming agent or synergistic agent.

Premixing or the dilution of the inhibitor can improve handling and promote a more rapid environment phase contact. Viscous inhibitors can be diluted with a compatible hydrocarbon carrier to decrease viscosity thereby making pumping easier and metering at the pump more accurate. Dilution of the inhibitor is sometimes necessary to achieve a desired low dosage rate; i.e., gallons-per-minute, gallons-per-hour, etc.

Inhibitor concentrations are expressed as parts per million (ppm). For liquid inhibitors, volumes are used; for example, gallons of inhibitor per million gallons of product to be inhibited. To obtain the amount of inhibitor required for a given system, divide the amount of the product flow to be inhibited by 1,000,000 and multiply by the ppm desired:

$$Q = \frac{V}{1,000,000} \times \text{ppm}$$

Q = Quantity of inhibitor required.

V = Volume or amount of product flow to be inhibited.

ppm = Concentration of inhibitor in parts per million.

Chapter 5

Injection and/or Sampling System Installation

(See Figures 1 and 2)

A. Installation prior to Hot Tap:

First, consult Manual 740074, Trepanning, Positioning and Welding, for proper instructions for the attachment of the Access Fitting body and/or welded end fitting to the pipeline, pressure vessel or tank.

1. Apply Teflon tape and/or a suitable thread sealant, such as Kopr Kote, to the thread ends of the Nipple.
2. Thread engage the Nipple to the Tee of the Access Fitting body. To the opposite end of the Nipple, thread engage the Shut-off Valve. Make sure all connections are securely tightened and that the Shut-off Valve is in the closed position.
3. Perform the Hydrostatic Test procedure as outlined in Section 2, of Hot Tap Manual, 740078, to ensure the integrity of the Access Fitting body weld and the Nipple and Shut-off Valve connections.

*****CAUTION!*****

4. Perform the Hot Tap procedure as outlined in Section 3, of Manual 740078.
5. After completion of the Access Fitting body cleaning operation as described in paragraph 24, Section 3, of Hot Tap Manual 740078, loosen the anti-vibration Allen head set screw on the bottom of the Solid Plug Assembly. The set screw is the locking device on the Solid Plug Nut.
6. Remove the Solid Plug Nut from the bottom of the Solid Plug Assembly. (Note that this is a left-handed threaded nut).
7. Attach the multiple-use Injection/Sampling/Sand Probe Nut on the exposed threads at the bottom of the Solid Plug Assembly, while leaving the primary packing in place. Again, remember that it is left-handed threaded.
8. Compress the primary packing by tightening up the Injection Nut to not more than 1/4 turn after making initial contact with the packing.
9. Lock the Injection Nut securely to the Solid Plug Assembly by tightening the anti-vibration Allen head set screw.

10. Thread engage the applicable device (Injection Tube, Sampling Tube, Nozzle Assembly, or Cap/Vane/Core/Strainer) to the female threads of the opposite end of the Injection Nut. Make sure of a secure connection.

11. Index the hex head of the Solid Plug Assembly by making a reference mark to indicate the position or orientation of the orifice device. (Applies only if it is an Injection Tube x Head, Injection Tube with Right Angle Nozzle Assembly, or Injection Tube x Quill).

Indexing can be done either by center-punching an indentation or by filing a notch on the hex head of the Solid Plug Assembly, assuring alignment with the orifice of the Injection Tube x Head, Nozzle Assembly, or the quill cut of the Injection Tube x Quill. The scarf cut of the Quill should face upstream of the product flow.

12. The Solid Plug Assembly with its attendant Injection Nut, injection dispersion end(s), or Sampling Tube, is now ready for installation into the Access Fitting Body.

*****CAUTION!*****

REMEMBER!.....INSTALLATION IS BEING ACCOMPLISHED ON LINES OR VESSELS THAT ARE UNDER OPERATING PRESSURE: THEREFORE, be sure to observe the instructions of Section 5, of Manual 600000-MANUAL, RBS/RBSA Retriever and Service Valve.

B. Installation if Access Fitting body is in place and line or vessel is operational and under pressure:

*****CAUTION!*****

First, consult Manual 600000-MANUAL, RBS/RBSA Retriever and Service Valve, which describes the considerations, care and caution that should be used when retrieving or installing while pipelines and/or vessels are under operating pressure.

*****CAUTION!*****

1. Perform the retrieval of Plug Assemblies under pressure as outlined in Section 4, of Manual 600000-MANUAL..

2. Remove the Plug Assembly from the Socket Adapter Assembly, and its attendant corrosion monitoring or prevention device.

3. Select a Solid Plug Assembly and remove the Solid Plug Nut from the bottom of the Solid Plug Assembly.

4. Attach the multiple-use Injection/Sampling/Sand Probe Nut on the exposed threads at the bottom of the Solid Plug Assembly. Be sure the primary packing is in place.
5. Compress the primary packing by tightening up the Injection Nut to not more than 1/4 turn after making initial contact with the packing.
6. Lock the Injection Nut securely to the Solid Plug Assembly by tightening the anti-vibration Allen head set screw.
7. Install an appropriate size pipe plug to the female threads of the opposite end of the Injection Nut, ensuring a secure tightening. (Note: This may be an NPT thread or a UNF thread depending upon the type of Injection Nut that was ordered when the Cosasco Injection System was purchased).

The pipe plug will ensure a pressure integrity of the line or vessel while the instructions contained in paragraph 8 through 13 are carried out.

*****CAUTION!*****

8. Perform the installation of the Solid Plug Assembly under pressure as outlined in Section 5, of Manual 600000-MANUAL.
9. Remove the pipe plug from the Tee of the Access Fitting body.
10. Apply Teflon tape and/or a suitable thread sealant, such Kopr Kote, to the thread ends of the Nipple.
11. Thread engage the Nipple to the Tee of the Access Fitting body. To the opposite end of the Nipple, thread engage the Shut-off Valve. Make certain all connections are securely tightened and that the Shut-off Valve is in the closed position.

*****CAUTION!*****

12. Again, perform the retrieval of the Solid Plug Assembly under pressure as outlined in Section 4, of Manual 600000-MANUAL. This is the same procedure that was indicated and executed in paragraph 1 above.
13. Remove the pipe plug from the Injection Nut that was installed as indicated in paragraph 7 above.
14. The remainder of the installation instructions are the same as indicated in paragraphs 10 through 12 of Section V, paragraph A – Installation prior to Hot Tap.

Chapter 6

Field Operation of the Cosasco Injection and/or Sampling System

A. Injection operation:

Field operation of the Cosasco Injection System is basically reduced to either manipulation of the Injection or Feeder Pump and the Shut-off Valve. The Injection Pump is normally a customer furnished or supplied part.

In use, the Injection Pump is connected to the Shut-off Valve and hydraulically injects the inhibitor through all of the interconnecting devices (Shut-off Valve, Nipple, Tee, Injection/Sampling/Sand Probe Nut, Injection Tube and the various atomization devices) and into the vessel or pipeline to be inhibited.

The Injection Pump must generate sufficient pressure to allow overcoming the line operating pressure and thus “pump” injection fluid into the product vessel. Cosasco recommends a pressure differential of at least 100 psi (7.03 kg/cm²) be maintained to adequately disperse the inhibitor into the process flow. The Injection Pump can be used to control the amount of inhibitor fluid admitted.

The Shut-off Valve may be used to stop the chemical inhibitor flow at any time, or it may be used to control the amount of flow chemical inhibitor admitted to the Tee of the Access Fitting Assembly, and consequently the amount of inhibitor to the process flow.

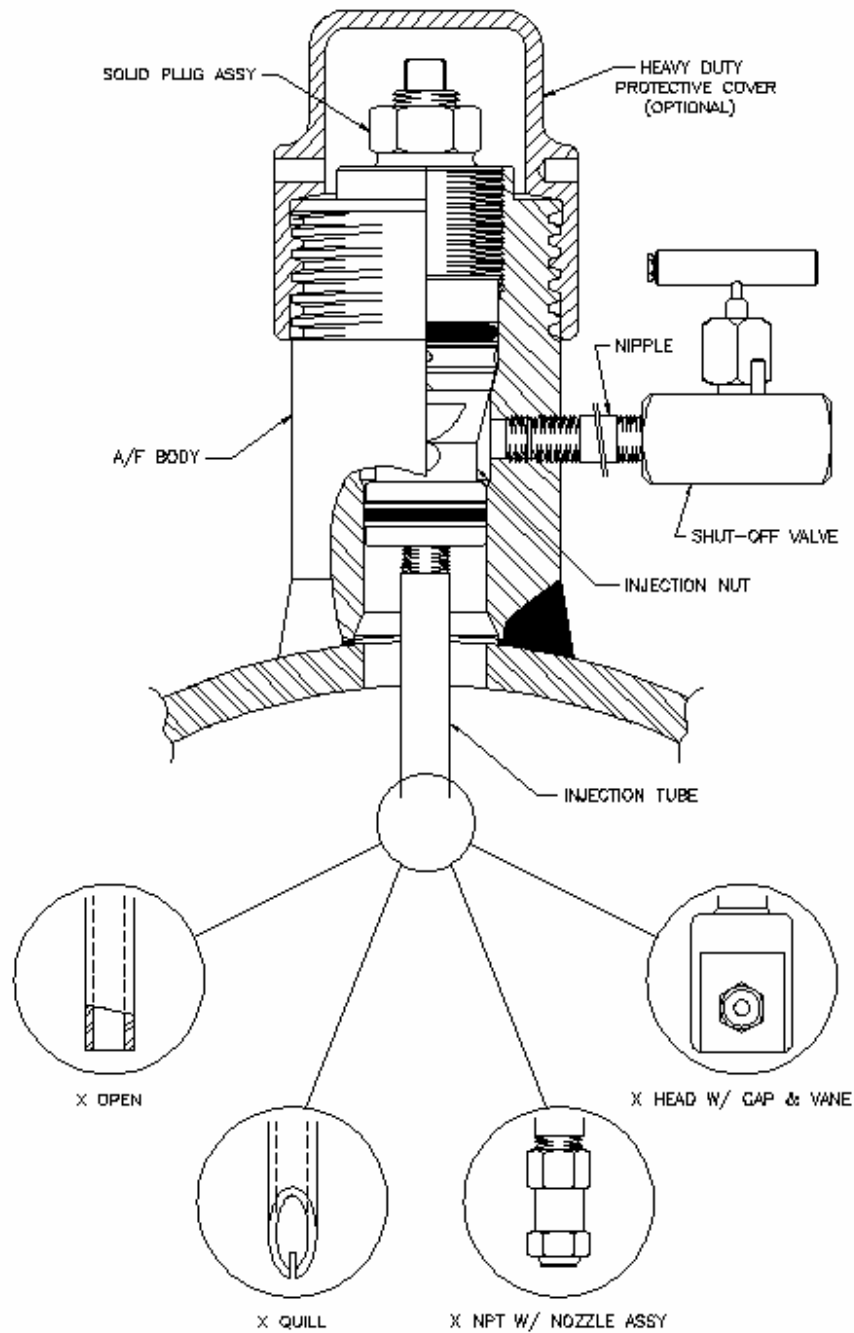
Additionally, it may serve as a safety Shut-off Valve in the event of Injection or Feeder Pump failure. When used in this capacity it prevents the siphon effect of the process flow which would occur because of either no pressure differential or possibly a reverse pressure differential.

B. Sampling operation:

Field operation of the Cosasco Sampling System is reduced to the control of the Shut-off Valve. The Shut-off Valve may be used to control the flow of product sample or it may be used to stop the flow completely. The various optional Diverter Hose Assembly lengths, Snap-tite Couplers and Reducers that are available can prove to be convenient aids while sampling. In use, they connect to the Shut-off Valve providing a flexible means of assisting in the collection of fluid or gas samples and their diversion to proper containers for later analysis.

10 Chapter 6

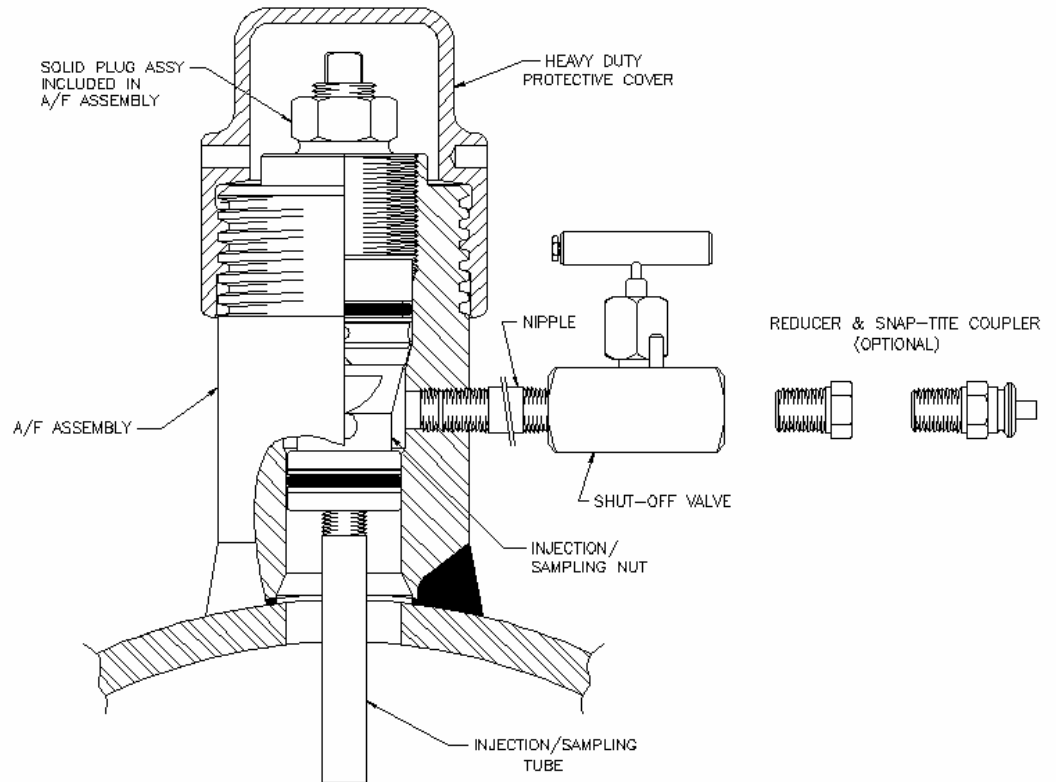
NOTE: ACCESS FITTING ASSEMBLY COMPRISED OF:
ACCESS FITTING BODY & SOLID PLUG ASSEMBLY



A TYPICAL ROHRBACK COSASCO INJECTION SYSTEM
WITH VARIOUS INJECTION DISPERSION ENDS
AND COMPONENTS

FIG. 1

Field Operation of the Cosasco Injection and/or Sampling System 11



TYPICAL ROHRBACK COSASCO SAMPLING SYSTEM

FIG. 2