

A photograph of an industrial facility, likely a refinery or chemical plant, featuring a complex network of large, silver-colored pipes and vertical columns. In the foreground, there are several large, yellow-handled valves. The background shows more industrial structures and a clear sky.

# High Resolution Corrosion/Erosion Monitoring System Delivers Time and Cost Savings



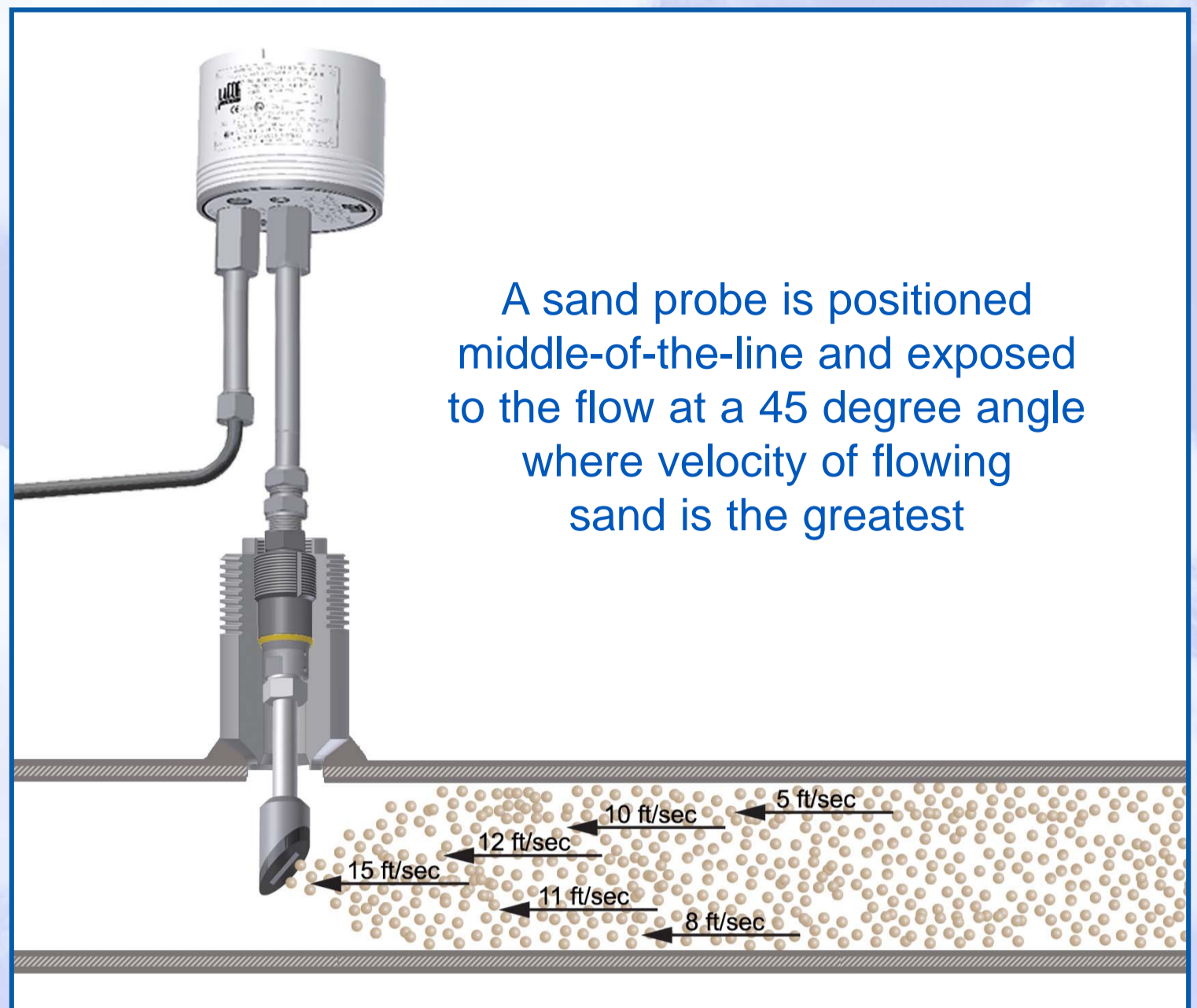
Corrosion costs the Oil and Gas industry over five billion dollars a year in the United States alone. The need for a comprehensive corrosion monitoring system is now more important than ever due to more stringent safety and environmental standards and increased scrutiny from the media and governmental agencies.

RCS offers a comprehensive Corrosion/Erosion Monitoring System (CEMS) that not only uses the latest corrosion monitoring technology but is highly cost effective. A prime example is a CEMS that RCS recently installed and implemented at a major offshore development. The project consisted of five multiple wellhead platforms, a floating production, storage and offloading vessel, and a riser utility platform. The total production of this offshore development is 190,000 bpd of oil and 510,000 bpd total liquids.

An extraordinary challenge was posed by the destructive combination of sand and corrosive compounds present in the produced crude oil. Traditional methods of monitoring erosion and corrosion were inadequate because they could not distinguish one destructive mechanism from the other. RCS answered the challenge by integrating the Quicksand™ System with its patented Microcor® High Resolution Technology for an overall CEMS. The diagram on this page shows how the Quicksand System works.

The Corrosion/Erosion Monitoring System consisted of:

- 142 monitoring points - A combination of 95 Quicksand™ and Microcor® Transmitters with corrosion/biological probes and 47 Coupon monitoring points.
- Cosasco® Access System containing RSL retrievers, access fitting assemblies, and service valve kits.
- ICMS3™, data retrieval and management system, corrosion server and software.



**Quicksand™ utilizes the same high resolution technology as Microcor® with a probe specifically designed for sand erosion detection**

## The Design of an Optimal Corrosion/Erosion Monitoring System

The first step in designing the monitoring system is to choose the best locations and types of corrosion monitoring points for producing optimal results. When deciding the locations, care must be taken to ensure adequate access space is available around the monitoring point. At each location in the pipeline a Cosasco® access fitting assembly must be installed by welding it onto the pipeline and then trepanning (cutting the hole). A solid or hollow plug is then inserted into the access fitting assembly. This serves as a seal and a carrier device for the coupons/probes. A protective cover (optional) is then placed over the access fitting body to prevent damage. Once the access fitting assemblies are installed with solid or hollow plugs, the monitoring points can be configured.

The CEMS uses both probes and coupons to determine corrosion rates. The probes are installed with a Cosasco® RSL Retriever and Service Valve. Once the probe is installed a Microcor® or Quicksand™ Transmitter is connected to a

probe via a probe adapter. The transmitter is connected to an ICMS3™ data management server via a multi-drop cable containing a 24VDC power supply and RS485 communication bus. Data is collected and stored on the ICMS3™ server. Using ICMS3™-Amulet Software the corrosion/erosion data can be analyzed and graphed. The ICMS3™ server is also connected to the operator's distributed control system through a MODBUS link, enabling correlation of corrosion data and other process parameters.

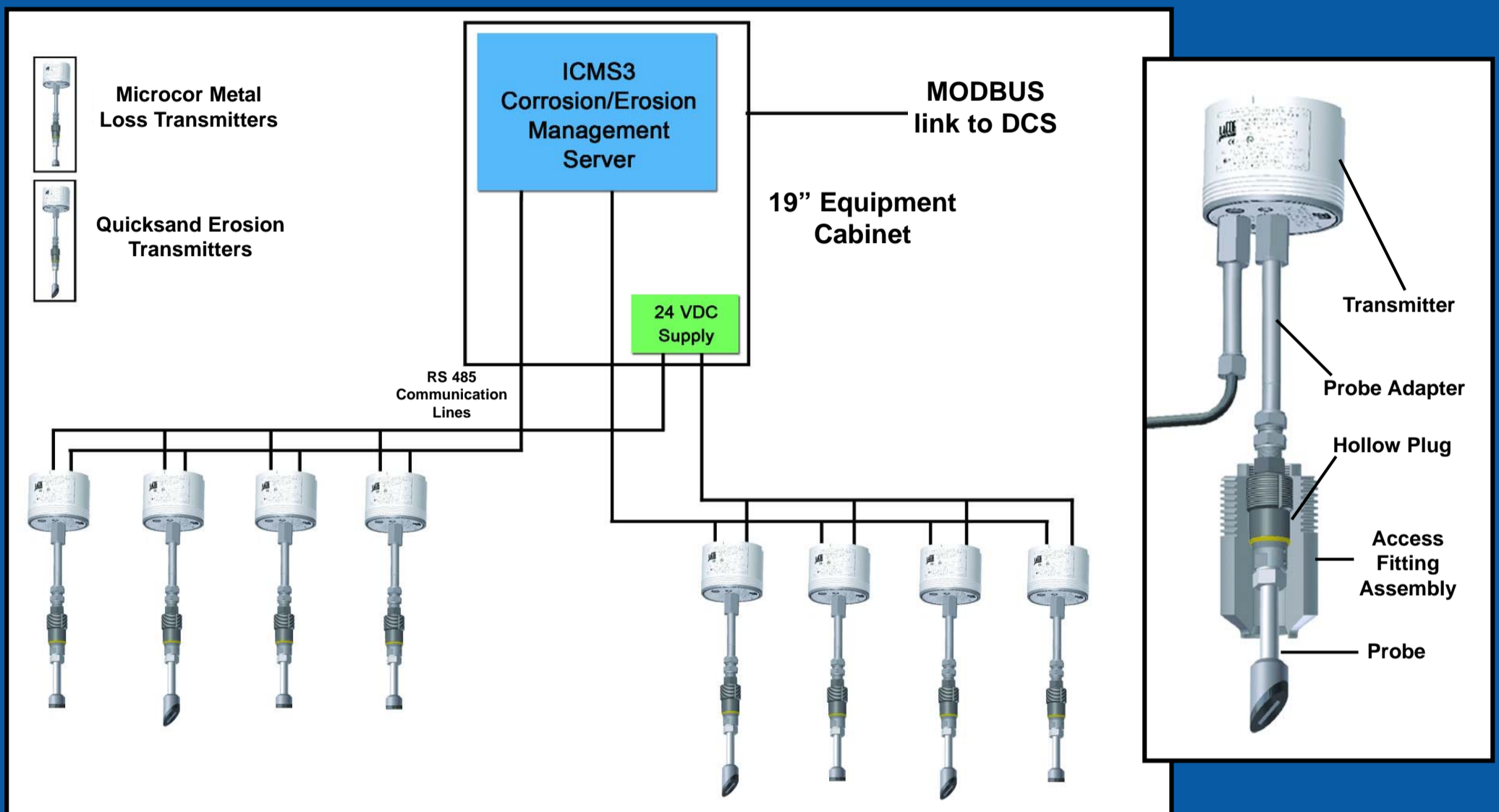
Weight-loss coupons are attached to a solid plug by way of a coupon holder, then inserted and retrieved with the RSL retriever at three month intervals. The coupon is weighed before insertion and then retrieved and weighed again at the end of the exposure period. The average corrosion rate over the exposure period is calculated.

# SYSTEM DETAILS

## Monitoring Points

In this particular project the system consisted of 142 monitoring points that included a combination of 95 Quicksand™ and Microcor® Transmitters with Microcor® and Quicksand™ corrosion probes (see diagram below). Each individual corrosion/erosion monitoring points includes a Cosasco® 2", flanged, high pressure access fitting assembly, carrying a hollow plug with a corrosion/erosion probe attached. The probe is connected to a Microcor® or Quicksand™ digital transmitter via a short probe adapter (see diagram below).

Weight-loss coupons were used on the other 47 monitoring points. The coupons are mounted on a coupon holder and use the same flanged, high pressure, access system noted above, with the exception that the coupon holders are carried by a solid plug. The coupon holders use a flush disc coupon, and the holders are sized such that the coupon is located flush with the inner surface of the pipe.



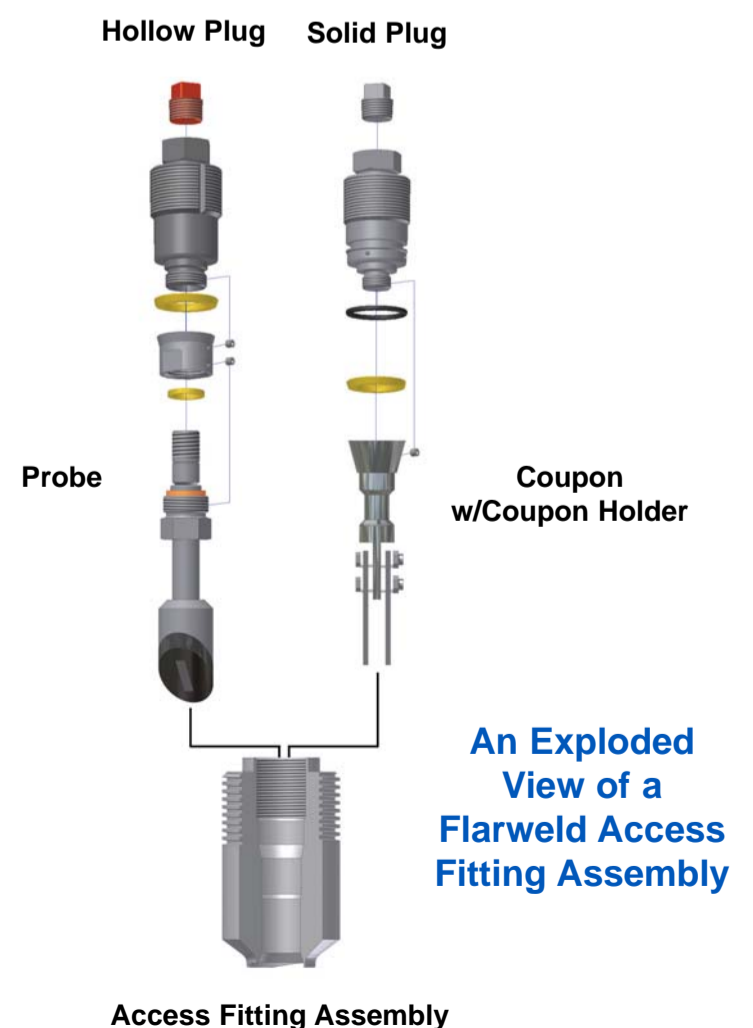
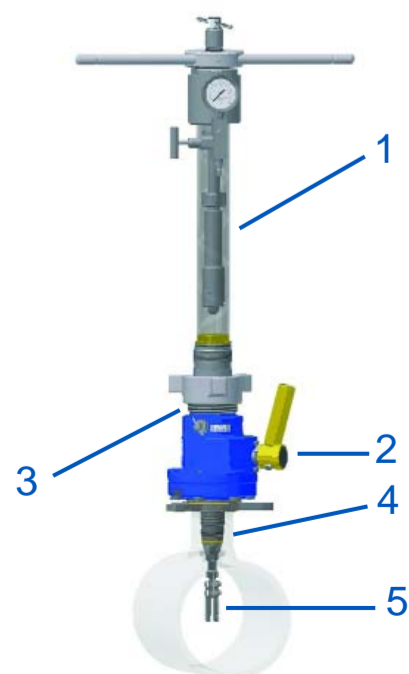
Typical configuration of a complete Corrosion/Erosion Monitoring System

## Cosasco® Access System

The Cosasco Access System enables safe access to high pressure systems without the need for shutdown. An Access Fitting Assembly is welded or flanged to the piping. A hollow or solid plug is then screwed into the internal threads of the access fitting, and then covered with a protective cover with bleed valve. For removal of probes/coupons a portable 2" Service Valve and a short length, non-telescoping RSL Retriever are moved from one monitoring location to another as needed for retrieval (see diagram to the right). To see how the probes/coupons are installed/retrieved see diagram on back page.

### Cosasco Access System shown complete with:

1. RSL Retriever
2. Service Valve
3. Access Fitting Assembly
4. Coupon Holder
5. Coupons

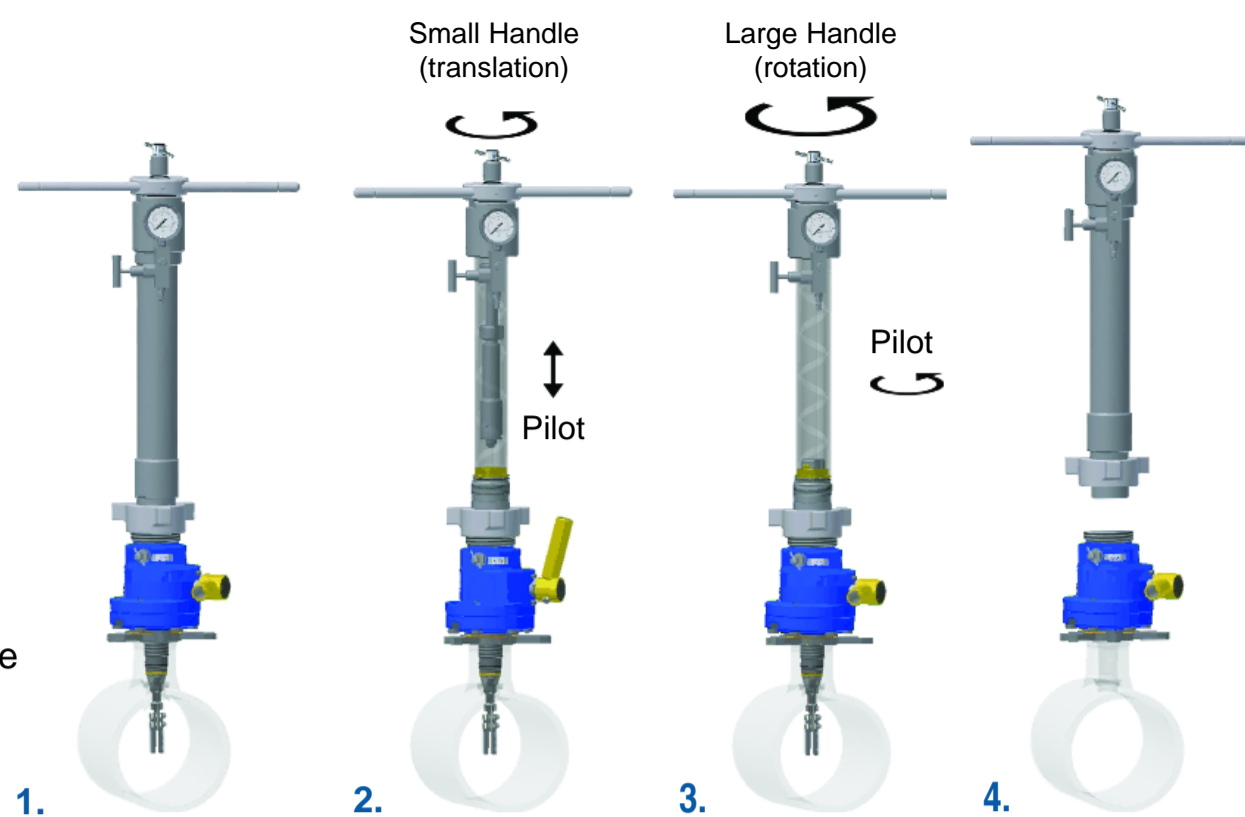


An Exploded View of a Flarweld Access Fitting Assembly

## RSL Retriever

### Sequence of Operation

1. Attach service valve and retriever to access fitting.
2. Engage plug with retriever. Unscrew plug. Pressurize retriever.
3. Retract retriever with plug. Close valve to isolate process.
4. Depressurize retriever and remove plug. Reverse procedure to install.



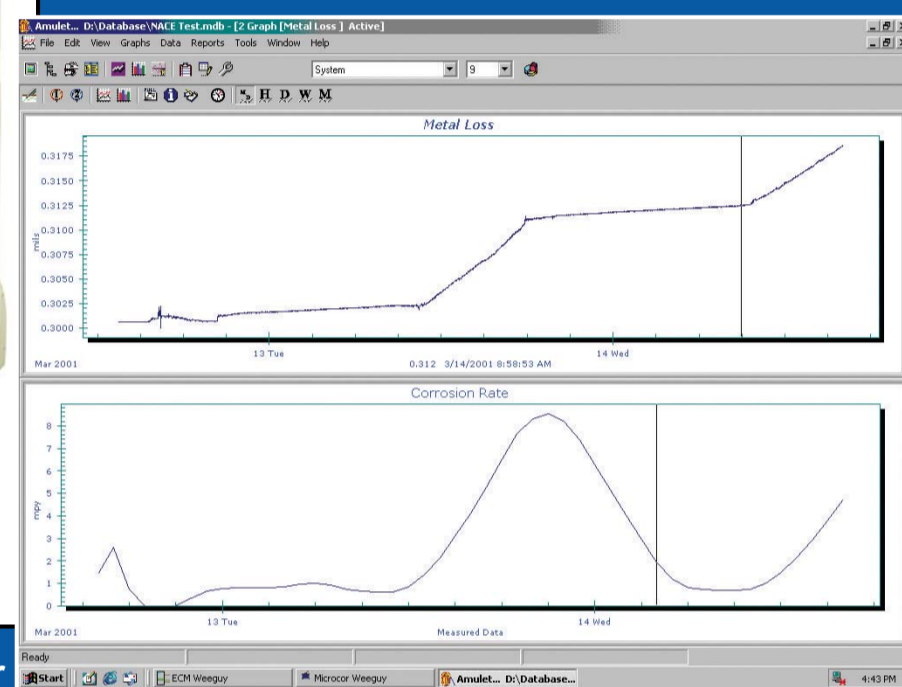
## ICMS3™ Data Retrieval and Management System

The total CEMS is controlled and maintained through RCS's Integrated Corrosion Monitoring System (ICMS3™). The arrangement of transmitters in this project is such that all 95 can be connected through 4 local loops. The data is transmitted to the ICMS3™ server via a single multi-drop cable that contains a 24VDC power supply to power the transmitters and a RS485 communication bus for data transmission. The ICMS3™ System is contained in a durable cabinet that uses a 19" rack mounted server and includes ICMS3™-Amulet Software for data analysis and graphing. The ICMS3™ Server is also connected to the facilities overall control system through a MODBUS link, enabling correlation of corrosion data and process parameters.



ICMS3™ Server

### ICMS3™-Amulet Software



## The Corrosion/Erosion Monitoring System offers the following benefits:

- Immediate alerts to process upsets enabling remedial action to prevent further damage
- Information gained about sand production supports better reservoir management
- Measures rates from both erosive and corrosive factors
- Rapid detection of low erosion/corrosion in systems with little or no corrosion allowance
- A single cable can connect up to 32 transmitters with a single cable run
- Enables corrosion/erosion rates to be correlated with other process parameters for greater control
- Saves money by reducing consumption of chemical inhibitors
- Saves money by saving time

The above System is representative of a typical large Corrosion/Erosion Monitoring System. Each system is unique and can be designed to meet individual project specifications.

RCS offers the widest range of corrosion monitoring products available for a variety of industries including oil and gas, petrochemical, pipeline, water and environmental. All our products and services are backed by nearly sixty years of design and manufacturing experience, and an unmatched tradition of quality.



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