Product Datasheet: Electrical Resistance Monitoring

INTRODUCTION

The electrical resistance (ER) technique is an "on-line" method of monitoring the rate of corrosion and the extent of total metal loss for any metallic equipment or structure. The ER technique measures the effects of both the electrochemical and the mechanical components of corrosion such as erosion or cavitation. It is the only on-line, instrumented technique applicable to virtually all types of corrosive environments.

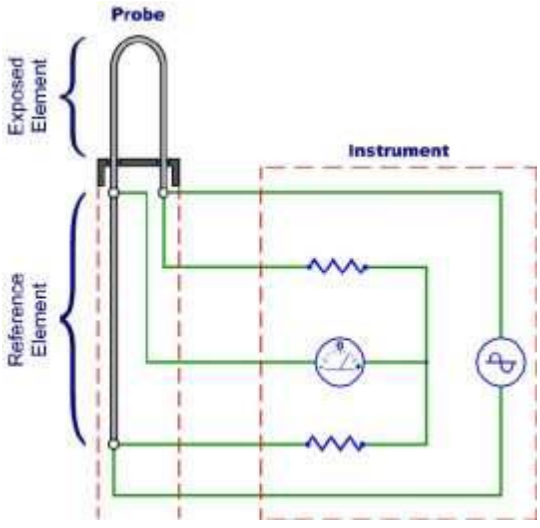
Although universally applicable, the ER method is uniquely suited to corrosive environments having either poor or non-continuous electrolytes such as vapours, gases, soils, "wet" hydro-carbons, and non-aqueous liquids. Examples of situations where the ER approach is useful are:

- Oil/gas production and transmission systems
- Refinery /petrochemical process streams
- External surfaces of buried pipelines
- Feedwater systems
- Flue gas stacks
- Architectural structures

An ER monitoring system consists of an instrument connected to a probe. The instrument may be permanently installed to provide continuous information, or may be portable to gather periodic data from a number of locations. The probe is equipped with a sensing element having a composition similar to that of the process equipment of interest.

PRINCIPLES OF OPERATION

Reduction (metal loss) in the cross sectional area of an element due to corrosion results in a proportionate increase in the element's electrical resistance. Practical measurement is achieved using ER probes equipped Practical measurement is achieved using ER probes equipped with an element that is freely "exposed" to the corrosive fluid, and a "reference" element sealed within the probe body. Measurement of the resistance ratio of the exposed to reference element is made as shown in the figure.

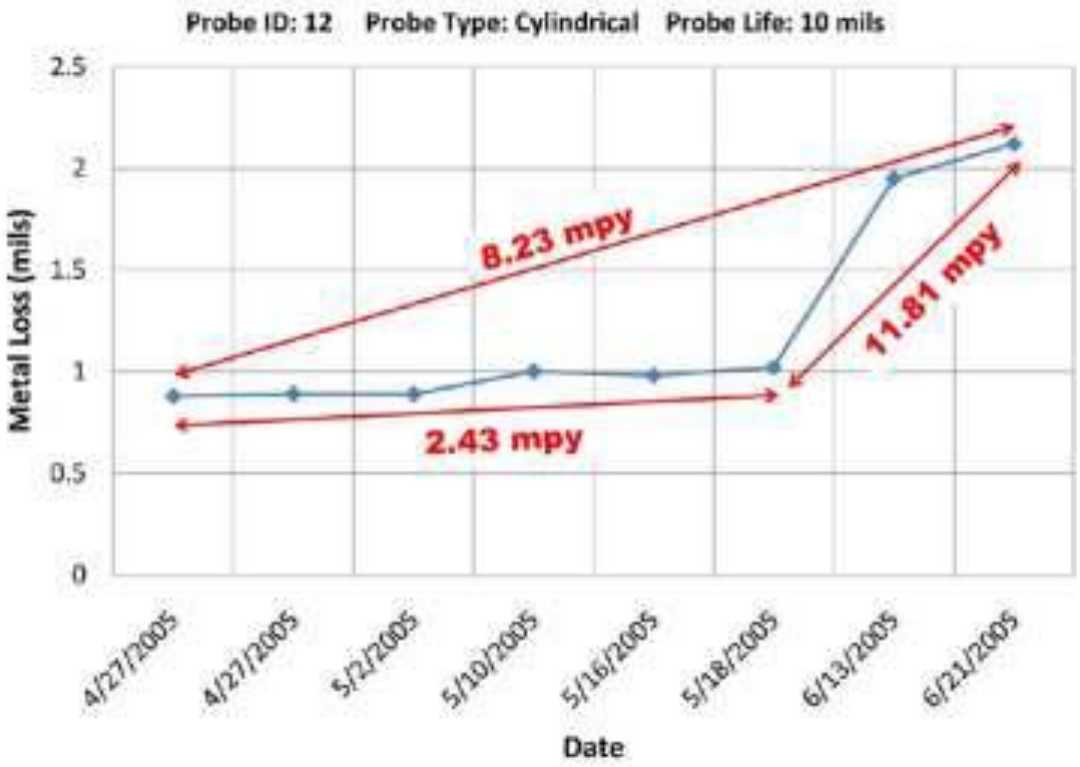


Since temperature changes affect the resistance of both the exposed and reference element equally, measuring the resistance ratio minimizes the influence of changes in the ambient temperature. Therefore, any net change in the resistance ratio is solely attributable to metal loss from the exposed element once temperature equilibrium is established.

All standard Metal Samples Corrosion Monitoring Systems ER probes incorporate a third element called the "check" element. Because the check element is also sealed within the probe body, the ratio of its resistance to that of the reference element should remain unchanged. Any significant change in this ratio indicates a loss of probe integrity.

Measurement of the ER probe may either be taken periodically using a portable instrument, or on a continuous basis using a permanently installed unit. In either case, Metal Samples Corrosion Monitoring Systems ER instruments will produce a linearised signal which is proportional to the metal loss of the exposed element.

The rate of change in the instrument output is a measure of the corrosion rate. Continuously monitored data is usually transmitted to a computer/data-logger and treated to give direct corrosion rate information. Manual graphing techniques are usually used to derive corrosion rate from periodically obtained data as illustrated.



GRAPH PLOTTING MEASUREMENT VERSUS TIME TO DERIVE CORROSION RATE.

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