Question 60: Please discuss advanced methods you use to monitor corrosion in operating units. Are any of these used in conjunction with the DCS for continuous on-line monitoring?

Jim Johnson (Marathon Petroleum)

Marathon utilizes three methods of corrosion monitoring in the crude/vacuum units: multipoint resistance measurement (iicorr, FSM, GEBetz RCM) systems for naphthenic acid corrosion, ER probes, and corrosion coupons. While the use of coupons may not be considered an 'advanced method' for monitoring corrosion, we do continue to utilize them in our refining system.

Two of our refineries have installed multipoint resistance measurement technology in areas that previously experienced naphthenic acid corrosion. One refinery utilizes iicorr's Field Signature Method (FSM) system, while the other location utilizes GEBetz' Resistance Corrosion Monitoring (RCM) system. Neither of these systems is monitored continuously. Rather, spot readings are taken on a routine basis with the calculated corrosion rate reported to the refinery. A mix of ER probes and coupons are utilized in our refineries. Either is used depending on the corrosion history of the particular circuit and how frequent corrosion data is required. One of our refineries utilizes a data logger on the ER probe signal to capture data on a near continuous basis, whereas at all other locations the probes are typically monitored on a weekly basis. We have no examples where data is sent to the DCS. Corrosion coupons are still widely used, mainly for general corrosion monitoring. At one refinery that is designed for high TAN crudes, corrosion coupons of various less corrosion resistant metallurgies are placed in select circuits to provide data on the relative corrosivity of certain crudes and cuts. This data will be used in an effort to better optimize metallurgy requirements in the future and provide pertinent corrosion data if a common crude is processed at another location.

Doug Meyne (Champion)

Traditionally, standard corrosion coupons and ER probes are used to monitor corrosion in operating units. The main limitation of these types of corrosion monitoring devices is the limited amount of data that they generate, usually 1 to 2 corrosion rates a week if not less. Corrosion in operating units tends to be episodic in nature and can be attributed to many changes in operating conditions. Under normal conditions a system may see 1-5 mpy corrosion rates; however, the rates can spike up to hundreds of mpy during one of these corrosion episodes. It is critical to identify these corrosion spikes while they occur so that changes in operations or chemical additions can be made immediately to resolve the issue. By reducing the time duration of these spikes, the overall corrosion rate is minimized.

In order to "see" these corrosion spikes and overcome the limited data acquiring capabilities of traditional coupons and ER probes, Champion utilizes data loggers to obtain multiple corrosion rates per day. Standard ER probes are hooked up to the data loggers which have the ability to store several days of corrosion rates. Typically, the rates are uploaded to a handheld unit out in the field and then

downloaded to a PC. The data loggers can also be tied directly into a DCS system via cables or wireless buses to yield true “real time” corrosion rates. These data loggers our part of our standard corrosion monitoring package and can be set to read corrosion rates on any given time interval.

Eberhard Lucke (Commonwealth E&C) I haven’t seen any operation yet that would show corrosion monitoring in the DCS. The most advanced I have seen (and I may be outdated on that) was installed corrosion probes with easy connections to a data logger (handheld, PDA like device). A dedicated maintenance person would walk the unit in certain intervals and collect all the data from the corrosion probes via data logger. The data would then be transferred electronically into spreadsheets and used in an offline unit monitoring system. I assume that with new wireless technologies and internet connections, automatic data transfer into databases and even the DCS should be no problem, if required.

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