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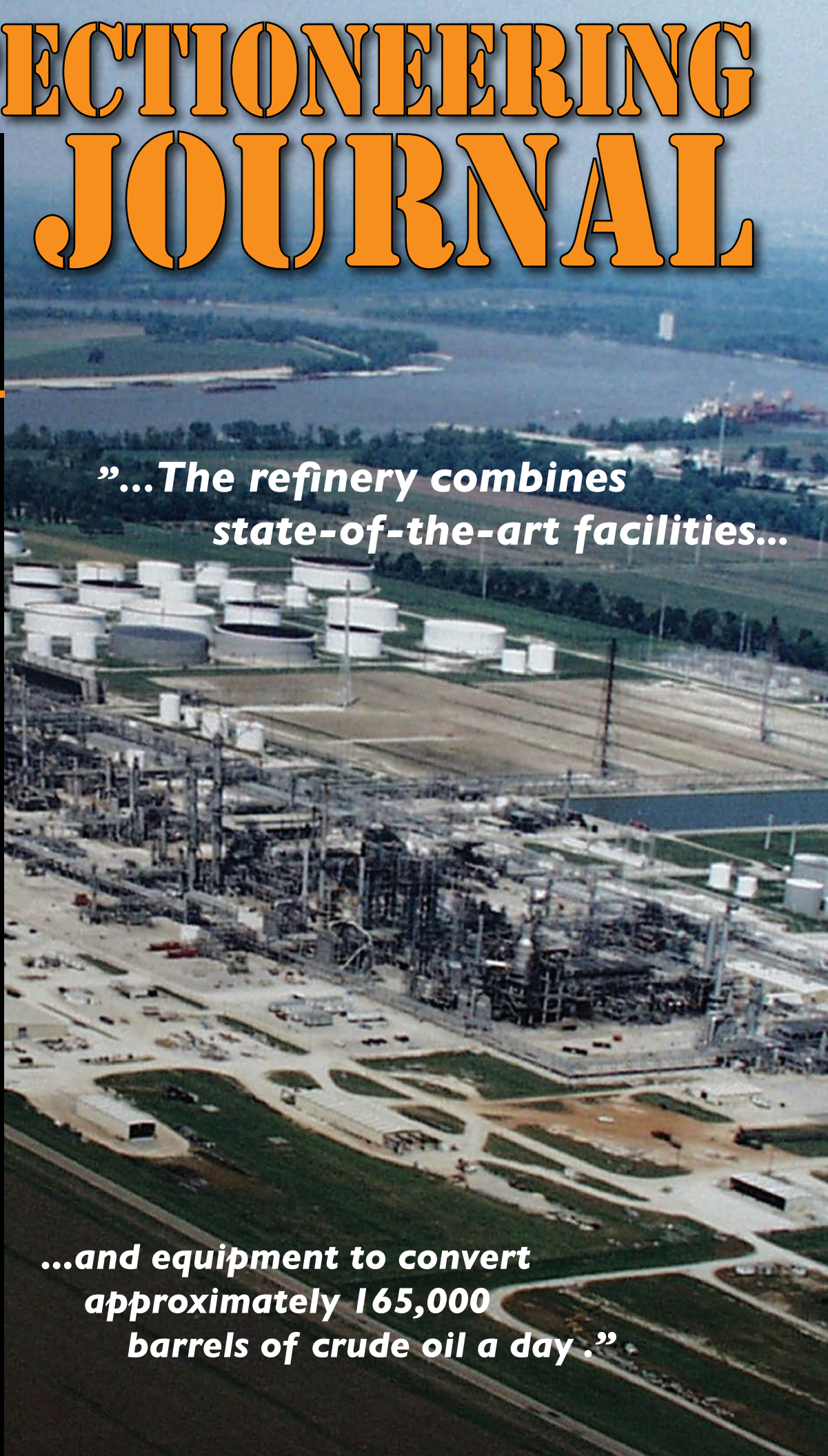

Integrity of Salvaged, Remanufactured and Repaired Control Valves

Depending on equipment age, repair history, application severity and other factors, salvaged/refurbished (aka "remanufactured") or repaired control valves may no longer meet a manufacturer's original specifications as designed in accordance with the ANSI/ASME B16.34 control valve standard, "Valves – Flanged, Threaded, and Welding End".[1]

This is the only available ANSI/ASME standard currently written for control valves; however its scope covers "new" valves. Thus, in the absence of a Standard for "used" control valves (i.e. to include salvaged/refurbished, remanufactured, or repaired) the issue of ensuring sustained integrity, through valve refurbishment to the manufacturer's design specifications as developed in accordance with the ASME standard, may be overlooked.

Control valve damage resulting from severe service applications is typically recognized by visual inspection and corrective action (assuming such repair actions appropriately return the valve to its original design specifications and dimensions as covered in the remainder of this article). However, there are many process applications where gradual degradation of control valve surfaces or thickness may not be noticeably visible, possibly resulting in potential integrity failure (loss of containment) with potential injury or property damage.

So the questions that beg answering for "used" equipment such as salvaged, remanufactured, or repaired control valves are:

- "When new chemical plant and refinery projects require adherence to a control valve design standard such as ASME B16.34 to better ensure plant design safety and address regulatory requirements, then why wouldn't periodic inspection with adherence to the same standard be required during the operational life of a control valve?

- Is the process industry requiring inspection, verification and certified documentation of control valve design parameters that are critical for integrity and meeting piping system pressure class, specifically including certification of body wall thickness?

Standards have been developed to address these types of issues for the repair and refurbishment of "used" pressure vessels. Such is not the case for control valves; however there are methods available to help upstream and downstream process industry end users manage their control valves to:

- Reduce risks associated with loss of containment
- Address the mechanical integrity element of the PSM Standard[2] and RMP Rule[3]
- Simultaneously increase reliability and uptime
- Minimize internal resource demand by using supplier capabilities

Many individuals incorrectly perceive hydro-testing as the sole indication of control valve integrity. Upon reviewing the ASME B16.34 standard, one will find that hydro-testing is required, but another critical design element is additional wall thickness as addressed in B16.34 paragraph 6.1.7. This paragraph, titled "Additional Metal Thickness" references required additional wall thickness, determined by individual manufacturers, needed for additional stresses (due to valve shape, design contour, internal web, etc.) such as:

- Assembly loads
- Actuating (closing and opening) loads
- Shapes other than circular
- Stress concentrations

Until standards are developed for "used" control valves, end users can request that their suppliers provide inspection, verification and certified documentation services (such as signed certificates of conformance), ensuring that the suppliers' control valves meet all manufacturers' specifications as originally designed to the ASME B16.34 standard, and specifically ensuring appropriate additional wall thickness as referenced by paragraph 6.1.7. (Note that when addressing control valves, ANSI/ASME B31 Series of piping specifications directs you to ASME B16.34).

Process application and age have a major impact on a control valve's life-cycle and its integrity. Erosive applications have a greater impact on body wall thickness than the gradual, time-based effects of surface oxidation or corrosion. Thus, restoring and/or verifying critical valve design parameters such as wall thickness, is a critical element in maintaining a control valve's integrity.

To complicate the issue, there are numerous examples of third party claims that their salvaged or repaired control valves are equivalent to all OEM specifications. However, they do not have access to the original manufacturers' specifications and standards developed during control valve product design. Yet they may market salvaged units as "remanufactured" with claims such as:

- "meet or exceed factory specifications"
- "meet and even exceed OEM testing standards"
- "remanufactured to like new"
- "fully reconditioned to OEM specifications"

- "remanufactured to original manufacturers' specifications and tolerances"

Despite these claims, most third party salvagers or repairers simply do not have the information they need to guarantee the restoration of control valves to full compliance with an original manufacturer's design and manufacturing specifications.

There are straightforward and efficient methods to identify and abate existing, potentially non-compliant salvaged or repaired control valves, which can be addressed in a future article.

Going forward, however, one can maximize assurance of control valve integrity meeting the requirements of the PSM Standard and RMP Rule by easily implementing, and strictly enforcing, supplier qualification requirements such as:

- Demand signed documentation from your supplier(s) of salvaged ("remanufactured") or repaired control valves that certifies their ability to conform to all of an OEM's original specifications as designed to ASME B16.34, specifically including conformance to manufacturer design requirements of additional metal thickness, as referenced by paragraph 6.1.7.
- Require any supplier or service provider incapable of complying with the above to indicate their non-compliance on all correspondence including specification documents, quotations, packing lists and invoices.

In this way, any anticipated application of non-conforming control valves will be known, and the appropriate MOC evaluations undertaken before any installation of the equipment. The intent is similar to the Fitness For Service evaluation process that is used to restore and re-certify the pedigree of a pressure vessel before application in a service for which the design basis of the vessel cannot be confirmed.

In summary, industry awareness of the technical and/or safety compliance issues associated with salvaged (remanufactured) or repaired control valves should provide the impetus for chemical processors and refiners to develop appropriate corporate policies and guidance directing inspection, engineering, maintenance, and procurement assessments of potential safety and regulatory issues associated with this equipment.

Such actions assist in creating a safe workplace and in demonstrating a proactive safety culture by reducing the probability of deficient salvaged or repaired equipment being the focal point of a future, potentially significant incident.

References:

[1] "Valves – Flanged, Threaded, and Welding End", The American Society of Mechanical Engineers, 2004
[2] Regulations (Standards – 29 CFR) 1910.119: "Process safety management of highly hazardous chemicals"; U.S. Department of Labor, Occupational Safety & Health Administration
[3] Code of Federal Regulations 40 CFR Part 68.73: "Chemical Accident Prevention Provisions; Mechanical Integrity"; U.S. Environmental Protection Agency
"Repair Your Mechanical Integrity Program", Michael Hazzan, Acu-Tech, ChemicalProcessing.com, Nov 2005
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