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## **Question 38: What is your experience with rod baffle exchangers for naphtha hydrotreater or reformer preheaters?**

**Brad Palmer** (ConocoPhillips)

There are a number of vertical RODbaffle® exchangers in ConocoPhillips Reformer preheat service. They have very good heat transfer and excellent reliability. They rarely foul; thus, seldom need cleaning. When polling the network, it was common to hear that a bundle had never been cleaned or never needed repair. Those exchangers cleaned were after multiple turnaround cycles, 10+ years. A Reformer application is provided below along with more detailed technology information from one of our heat exchanger experts.

One of our CCRs installed two very large, vertical RODbaffle® CCR Combined Feed Exchangers in 1996. Both exchangers were 83" in diameter and 40' long. The hot exchanger had a HAT of 60 °F, a CAT of 71 °F, a surface area of 48,500 ft<sup>2</sup> and a process duty of ~ 160 MM Btu/hr. The cold exchanger had a HAT of 71 °F, a CAT of 15 °F, a surface area of 47,400 ft<sup>2</sup> and a process duty of ~ 145 MM Btu/hr. These exchangers have just been cleaned for the 1st time since they were originally installed in 1999, and only because we wanted to inspect the equipment, not because of fouling or problems.

Over 2500 RODbaffle® exchangers have been installed in numerous process applications since ConocoPhillips patented this technology in 1971. RODbaffle® exchangers have been designed in all common TEMA configurations, having shell diameters in excess of 180" and over 80' long. Feed/Effluent service is the most common application for vertical RODbaffle® exchangers, though there are many vertical RODbaffle® thermosiphon reboilers and gas coolers. Thermal/hydraulic performance of a RODbaffle® exchanger is similar to that of a double-segmental plate-baffle unit on maximum cut and spacing. RODbaffle® offers improved shell-side flow-field uniformity, reduced form drag and flow reversals, lower weight, and reduced shell-side fouling rates when compared to traditional plate-baffled exchangers. Tube-side cleaning for RODbaffle® units is identical to that of plate-baffle units. Shell-side cleaning for RODbaffle® exchangers is normally much easier than plate-baffled exchangers, as shell-side solids collection does not occur in RODbaffle® the way it does in the stagnant flow zones found in plate baffle exchangers. There is typically not a materials spec break inside RODbaffle® exchangers. The support rod and baffle ring materials will generally be the same as that of the tubes to prevent dissimilar material corrosion. In shell-side boiling feed-effluent applications, RODbaffle® offers far superior vibration resistance to traditional plate-baffle exchangers. This is also true in high-pressure shell-side gas cooling applications.

Both HTRI and HTFS have a RODbaffle® option in their respective shell & tube exchanger design programs. Matthew C. Gentry, P.E. wrote a paper for the 1999 NPRA Meeting in San Antonio entitled, Industrial Applications for RODbaffle® Heat Exchanger Technology which provides a great deal of technical information about this technology. The NPRA RODbaffle® paper identification number is AM 9

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