Engineered
Thermal Maintenance Solutions

Houston Refinery Replaces Sulfur Trap with S_xSeal 1000

CSI's S_xSeal™ 1000 solves the issues that a high-capacity refinery was having with one of its above-ground sulfur sealing devices. The S_xSeal's durable float design and proprietary internal sealing mechanism ensure sealing integrity. The result is issue-free sulfur sealing performance in an above-ground design that is simple to operate and maintain.

Client Challenge

All SRUs require some means of sealing the sulfur rundown lines between condensers and temporary storage. The purpose of a sulfur sealing device is to prevent process vapor (with remaining H_2S and SO_2) from escaping with liquid sulfur. Refineries and gas plants have two options for achieving a vapor seal in sulfur rundown lines. One option is the in-ground device, commonly referred to as a seal leg. The other option is an above-ground sealing device, often called a sulfur trap or sulfur seal, which uses a float-trap design to seal an orifice.

As an example, one of the largest US refineries (located in Houston, TX) has employed both seal legs and above-ground sulfur traps. Based on experience with seal-leg plugging and the consequent downtime and costly repairs, this Houston refinery embraced the concept of an above-ground sealing device. However, the sulfur trap they implemented had its own issues. The refinery's Consulting Engineer for Process Design and Technology reported that the sulfur trap's spherical float was prone to cracking, causing the unit to fail in a closed position. The Consulting Engineer also reported issues with sealing integrity due to misalignment of the float plug. So the refinery worked with trusted partner CSI to provide a more reliable above-ground sulfur sealing solution.

CSI Solution

The S_xSeal™ 1000 ensures reliable above-ground sealing performance because of its superior design. One primary distinction between the Houston refinery's original sulfur trap and the S_xSeal™ 1000 is the more robust float design. The S_xSeal™ 1000 float is cylindrical, rather than spherical, like the float in the sulfur trap. This cylindrical design precludes point

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S_xSeal™ 1000 sulfur sealing device, shown with ControTrace® steam tracing panels installed

Solution Overview

Client Profile

High-capacity refinery designed to process heavy, high-sulfur crude oil; total SRU capacity 1,456 metric tons per day

Business Objective

To provide a more reliable above-ground sulfur sealing solution without the performance and service issues of the legacy product

Solution

Benefits of S_xSeal™ 1000:

- Safe, reliable sealing performance
- Above-ground accessibility for quick, easy maintenance
- Serviceability with SRU running at full capacity

CSI Products & Services:

- S_xSeal™ 1000 sulfur sealing device
- ControTrace® steam tracing
- ControCover custom-fit, removable insulation
- Installation/commissioning support services

CSI Solution (cont.)

contact, thereby minimizing the potential for float cracking. Additionally, CSI builds the S_xSeal™ 1000 float from durable tubing and plate, instead of the formed sheet metal used in the sulfur trap. By design, therefore, the S_xSeal™ 1000 float is engineered for long life and dependable service.

Another key difference between the sulfur trap and the S_xSeal™ 1000 lies in CSI's proprietary sealing mechanism. The S_xSeal™ 1000 design includes four vertical alignment guides to ensure that the float-plug assembly seats properly in the orifice every time. In addition, the S_xSeal's unique plug and seat geometry maximizes contact between mating surfaces. To prevent debris from compromising the seal, the S_xSeal™ 1000 employs a dual debris-handling mechanism. First, a filter basket screens out any entrained debris larger that 1/8-inch. Second, a proprietary barrier around the orifice blocks smaller debris from getting stuck between sealing surfaces. Thus, the S_xSeal™ 1000 sealing mechanism is engineered for sealing integrity.

To ensure optimal performance at the intended location, CSI offers four standard S_xSeal™ 1000 models, which are designed for various operating ranges of sulfur flow rate and differential pressure. For example, the standard model implemented at the Houston refinery is designed for operation downstream of a fourth-stage condenser, where it accommodates a flow rate of 2 gpm and a head pressure of 2 psig. At the refinery's option, CSI also designed this particular unit for bottom discharge, so that liquid sulfur drains from the S_xSeal™ 1000 directly to the underground collection vessel. In all S_xSeal™ implementations, CSI works with refineries and gas plants to select the appropriate standard S_xSeal™ model (based on technical and commercial fit), and tailors the connecting piping for optimal performance in the given location.

S_xSeal™ 1000 installed at Houston, TX refinery

By implementing CSI's S_xSeal™ 1000, the Houston refinery has achieved its objective. The refinery now has a reliable above-ground sulfur sealing solution, without any of the performance or service issues experienced with the previous sulfur trap. After the S_xSeal™ 1000 had been in operation for a month, the refinery's Consulting Engineer told CSI that the S_xSeal™ was "a complete success." Nearly a year later, CSI checked in with the Operations Manager for Sulfur Plants at the Houston refinery. The operator said, "That S_xSeal™ 1000 is working perfectly. We couldn't be happier with it." In fact, according to CSI Applications Engineer Alan Crump, "the Houston refinery is so pleased with the S_xSeal™ 1000, they will consider implementing additional S_xSeal™ units whenever they have issues with remaining sulfur traps and seal legs."

S_xSeal™

The S_xSeal™ 1000 is "a complete success. We have not had any issues nor any complaints about the S_xSeal™."

Consulting Engineer, Process Design & Technology at the Houston, TX refinery

"That S_xSeal™ 1000 is working perfectly. We couldn't be happier with it."

Operations Manager for Sulfur Plants at the Houston, TX refinery

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