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Pop-A-Plug® Tube Plugs

Heat Exchanger Tube Plugging to Reduce Tube Capacity/ Increase Flow Rate

This article relates a novel case-study use of tube plugs by the Dutch company Wilton Heat Transfer Services (formerly Bronswerk Heat Transfer Services) to solve a problem that an end-user client – a gas production and distribution company – were having with a heat exchanger in one of their process trains.

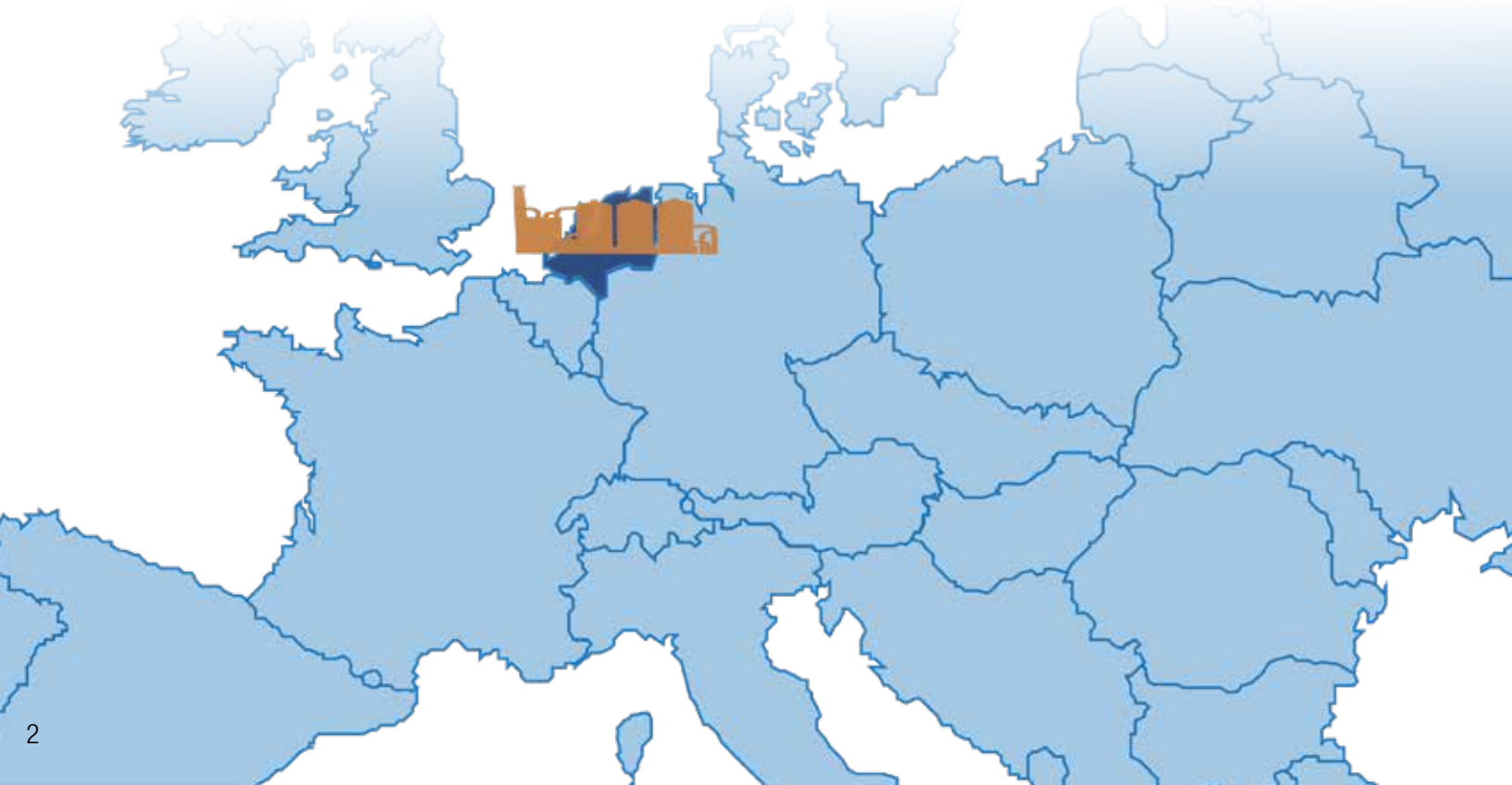
Heat exchanger tube plugs are typically used to plug leaking or degraded tubes to prevent cross contamination of shell-side and tube-side media. Recently, a novel use of tube plugs was identified. Dutch contractor Wilton Heat Transfer Services (formerly Bronswerk Heat Transfer Services) was contacted by a large gas production and distribution company about a problem they were having with a heat exchanger in one of their process trains. The gas formation they were drawing from was approaching the end of its production life. As the producing volume declined, the feedstock flow rate and pressure to the processing plant also decreased. This decrease unbalanced the unit efficiency and caused gas hydrates to form in their heat exchanger tubes, further reducing unit efficiency and increased maintenance shutdowns. These were costs the end-user could no longer tolerate.

Working closely with the end-user, Wilton Heat Transfer Services reviewed a number of alternative solutions and ultimately settled on a tube plugging program that would reduce the number of available tubes in the heat exchanger thereby increasing the flowrate of the production gas through the tubes.

Facing the obstacle

In a nutshell the challenge was that the flow conditions at the heat exchanger changed and were no longer the same as the original design conditions.

The heat exchanger was operating inefficiently, leading to increased maintenance downtime, poor end-product, safety concerns, and increased costs.



Considering the alternatives

Several alternatives were evaluated including designing a new heat exchanger or tube bundle. Tube was a distant alternative until a pro/con analysis was performed.

Ultimately, due to the speed with which it could be accomplished and the overall operating flexibility provided, tube plugging was selected. Flow analysis identified specific tubes to plug in order to eliminate hot/cold spots in the tube bundle. An analysis of tube plug technologies was performed and an engineered tube plugging solution [Pop-A-Plug Tube Plugs by Curtiss-Wright EST Group] were selected and implemented.

Alternative	Pros	Cons
Heat exchanger replacement	• New heat exchanger – design optimized for current operating conditions	• Cost • Lead time, 26–30 weeks • Design is optimized for current conditions, should conditions change a new unit will need to be designed and purchased
Tube bundle replacement	• New tube bundle – design optimized for current operating conditions • Less expensive than complete heat exchanger	• Cost • Lead time, 10–16 weeks • Design is optimized for current conditions, should conditions change a new unit will need to be designed and purchased
Tube plugging	• An engineered solution – pressure rated; helium leak tight • Installs quickly (minutes per tube end) • Installs without damage to tube, tubesheet, or tube joint • Removable • Fast installation • Flexibility – plugs can be installed and removed to adapt to changing operating conditions • Meets ASME PCC-2 guidelines • Same day / next day availability	• None

Critical attributes for engineered heat exchanger tube plugs

- The tube plugs provide a reliable, leak tight seal across the full range of design conditions of the service in which the plugs will be installed.
- They can be installed without welding or damage to the tube end or tube-to-tubesheet joints. They also eliminate the need for hot work permits.
- The tube plugs provide a fast and simple installation.
- The plugs are readily and easily removable to allow tubes to be returned to service, if operating conditions change again, or other tubes in service leak, or are condemned by thinning/damage.
- The plug material should be selected to match the tube material. This minimizes galvanic corrosion concerns and differences in thermal coefficients of expansion.
- They comply with ASME PCC-2 Article 312.
- They have a proven track record of service.

Outcome

Wilton received and installed 1200 plugs, completing the work within a week. Wilton Heat Transfer Services and the end-user have added this solution to their heat exchanger repair options in the future.

Pop-A-Plug Tube Plugs: Full material traceability – all plugs are laser etched with lot number.

For more information, visit cw-estgroup.com. Contact us at EST-Sales@curtisswright.com or +1 215.721.1100 / 800.355.7044 to speak with EST Group's Sales Team today!

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North, Central & South America **EST Group** 2701 Township Line Road Hatfield, PA 19440-1770 USA | +1.215.721.1100 +1.800.355.7044 | est-info@curtisswright.com
Europe / Middle East / Africa **EST Group B.V.** Hoorn 312D 2404 HL Alphen aan den Rijn The Netherlands | +31.172.418841 | est-emea@curtisswright.com
China +86.400.636.5077 | est-china@curtisswright.cn | **Singapore** +65.3158.5052 | est-asia@curtisswright.com