

## Waste Heat Boiler Back in Service

### EST Group Manufactures and Installs Custom Pop-A-Plug® P2 Tube Plugs to Bring Fertilizer Plant Back to 100% Capacity

#### Industry/Facility

Fertilizer Manufacturing (Ammonia)  
Mesaieed, Qatar

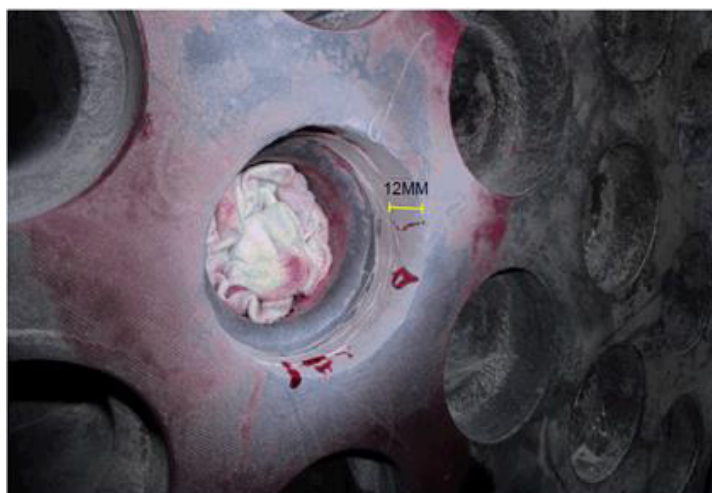
#### Application

Waste Heat Boiler with Alloy F22 tubesheet

#### Challenge

Tubes in several heat exchangers within a critical waste heat boiler (high temperature, high pressure) developed stress corrosion cracking and needed to be plugged. The customer first tried welding plugs in place which required preheating of the tubesheet followed by post weld stress relieving after welding. This resulted in additional delays and costs with getting the waste heat boiler back in operation.

The Alloy F22 tubesheet also had 1/4" (6.35 mm) Inconel weld clad overlay which complicated the welding process. Plugging tubes in this manner caused adjacent tubes and welds to start cracking around the heat affected zone. As a result, the critical waste heat boiler could not start up and the entire production facility was down as the lead time for a new waste heat boiler was still several months away.

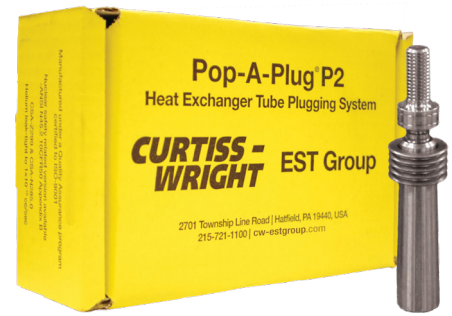


Significant cracking within the heat affected zones resulting from the use of welded plugs in the waste heat boiler

## Solution

Based on information provided by the customer, EST Group engineered, manufactured and tested Pop-A-Plug P2 plugs constructed with ASTM A-182 F22 CL3 material for inside diameters up to 2.76" (70.1 mm). This allowed the customer to machine the tube end partially out of the tubesheet and install the Pop-A-Plug P2 plugs directly into the tubesheet.

During the installation of Pop-A-Plug Tube Plugs, EST Group Field Services installed over 130 plugs including installing a plug 18" (457.2 mm) deep in order to plug a tube that had a crack between the tube and the tubesheet on an internal bore weld.



## Result

The customer realized the welded plug solution was doing more harm than good and continuing this way would never allow them to bring the unit and the plant on line again. Based on the experience of EST Group with the materials and service in question, the decision was made to use EST Group Pop-A-Plug Tube Plugs. Although these ASTM A-182 F22 CL3 Pop-A-Plug Tube Plugs required a few days to be manufactured, they only required a very short time for actual installation. Since there were no more issues with heat affected zones (like with a welded plug) no further tube and weld damage has occurred, allowing the waste heat boiler to be returned into service and the entire plant returned to operation.

EST Group provided a supervisor to train the customer's technicians for the first installation and they were very impressed with EST Group's performance. Since completion of the initial installation of Pop-A-Plug P2s in the waste heat boiler, the customer has placed three additional orders of the ASTM A-182 F22 CL3 Pop-A-Plug Tube Plugs and is now abandoning the time consuming, damaging process of welding plugs in favor of using EST Group's Pop-A-Plug Tube Plugging System.

### Pop-A-Plug Tube Plug Features and Benefits

- Pressure Ratings up to 7000 PsiG (483 BarG)
- No welding required
- Reduce downtime from days to hours
- Controlled and repeatable installation
- Unique breakaway prevents damage to tube and tube joint
- Offers the lowest life cycle cost when compared to alternative tube plugging methods
- Helium leak tight seal to  $1 \times 10^{-10}$  cc/sec
- Meets ASME PCC-2 Article 3.12 requirements
- Suitability and type tested by TUV

### Pop-A-Plug Tube Plug Materials

- ASTM A-182 F9/F11/F22
- Zirconium
- Carbon Steel
- Brass
- Titanium
- Carbon Steel A350 LF2
- SS-20CB3/ Alloy20
- 316 SS
- SS-316/316L
- Duplex SS /Super Duplex SS
- Carbon Steel A350 LF2
- Chrome Moly F5/F9/F11/F22

**Other materials and grades available,  
please contact EST Group for details**