

Waste Heat Boiler Back in service

EST Group manufactures and installs custom Pop-A-Plug® P2's to bring fertilizer plant back to 100% capacity.

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Summary

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.

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 upto 2.76" (70.1 mm). Although these Pop-A-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. This allowed the waste heat boiler to be returned into service and the entire plant returned to operation.

WASTE HEAT BOILER BACK IN SERVICE

EST Group manufactures and installs custom Pop-A-Plug® P2s to bring fertilizer plant back to 100% capacity.

INDUSTRY/FACILITY

Fertilizer Manufacturing (Ammonia)

Mesaieed, Qatar

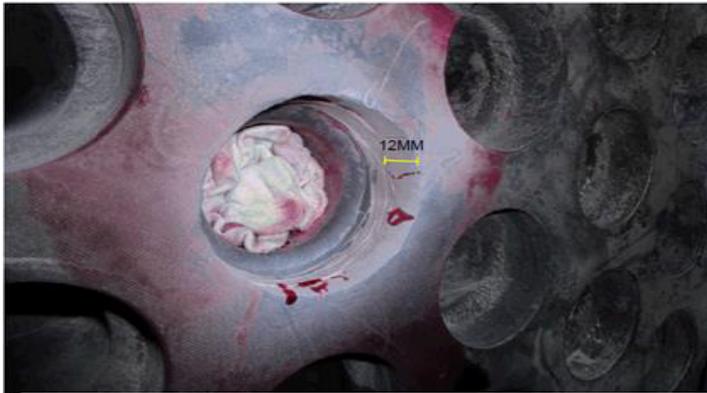
APPLICATION

Waste Heat Boiler with F22 Alloy tubesheet

CHALLENGE/PROBLEM

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/RESOLUTION

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 P2s directly into the tubesheet.

During the installation of Pop-A-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.

Upon completion, plant personnel literally broke out in exuberant cheering!

THE BENEFITS

The customer realized the welding 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-Plugs. Although these ASTM A-182 F22 CL3 Pop-A-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. This allowed 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-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.

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EST Group
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FOR INTERNAL USE ONLY

Pop-A-Plug® II

Ram Package	P2 Kit Part Number	Size Range (inches (mm))
PAP-6600	P2-400-Q	0.401 - 0.420 (10.19 - 10.68)
PAP-6600	P2-420-Q	0.421 - 0.440 (10.69 - 11.19)
PAP-6600	P2-440-Q	0.441 - 0.460 (11.20 - 11.70)
PAP-6600	P2-460-Q	0.461 - 0.480 (11.71 - 12.21)
PAP-6600	P2-480-Q	0.481 - 0.500 (12.22 - 12.72)
PAP-6600	P2-500-Q	0.501 - 0.520 (12.73 - 13.22)
PAP-6600	P2-520-Q	0.521 - 0.540 (13.23 - 13.73)
PAP-6600	P2-540-Q	0.541 - 0.560 (13.74 - 14.24)
PAP-6600	P2-560-Q	0.561 - 0.580 (14.25 - 14.75)
PAP-6600	P2-580-Q	0.581 - 0.600 (14.76 - 15.26)
PAP-6600	P2-600-Q	0.601 - 0.620 (15.27 - 15.76)
PAP-6600	P2-620-Q	0.621 - 0.640 (15.77 - 16.27)
PAP-6600	P2-640-Q	0.641 - 0.660 (16.28 - 16.78)
PAP-6600	P2-660-Q	0.661 - 0.680 (16.79 - 17.29)
PAP-6600	P2-680-Q	0.681 - 0.700 (17.30 - 17.80)
PAP-6600	P2-700-Q	0.701 - 0.720 (17.81 - 18.30)
PAP-6600	P2-720-Q	0.721 - 0.740 (18.31 - 18.81)
PAP-6600	P2-740-Q	0.741 - 0.760 (18.82 - 19.32)
PAP-6600	P2-760-Q	0.761 - 0.780 (19.33 - 19.83)
PAP-6600	P2-780-Q	0.781 - 0.800 (19.84 - 20.34)
PAP-6600	P2-800-Q	0.801 - 0.820 (20.35 - 20.84)
PAP-6600	P2-820-Q	0.821 - 0.840 (20.85 - 21.35)
PAP-6600	P2-840-Q	0.841 - 0.860 (21.36 - 21.86)
PAP-6600	P2-860-Q	0.861 - 0.880 (21.87 - 22.37)
PAP-6600	P2-880-Q	0.881 - 0.900 (22.38 - 22.88)
PAP-6600	P2-900-Q	0.901 - 0.920 (22.89 - 23.38)
PAP-6600	P2-920-Q	0.921 - 0.940 (23.39 - 23.89)
PAP-6600	P2-940-Q	0.941 - 0.960 (23.90 - 24.40)
PAP-6600	P2-960-Q	0.961 - 0.980 (24.41 - 24.91)
PAP-6600	P2-980-Q	0.981 - 1.000 (24.92 - 25.42)
PAP-6600	P2-1000-Q	1.001 - 1.020 (25.43 - 25.92)
PAP-6600	P2-1020-Q	1.021 - 1.040 (25.93 - 26.43)
PAP-6600	P2-1040-Q	1.041 - 1.060 (26.44 - 26.94)
PAP-6600	P2-1060-Q	1.061 - 1.080 (26.95 - 27.45)
PAP-6600	P2-1080-Q	1.081 - 1.100 (27.46 - 27.96)
PAP-6600	P2-1100-Q	1.101 - 1.120 (27.97 - 28.46)
PAP-6600	P2-1120-Q	1.121 - 1.140 (28.47 - 28.97)
PAP-6600	P2-1140-Q	1.141 - 1.160 (28.98 - 29.48)
PAP-6600	P2-1160-Q	1.161 - 1.180 (29.49 - 29.99)

Ram Package	P2 Kit Part Number	Size Range (inches (mm))
PAP-1750	P2-1180-Q	1.181 - 1.200 (30.00 - 30.50)
PAP-1750	P2-1200-Q	1.201 - 1.220 (30.51 - 31.00)
PAP-1750	P2-1220-Q	1.221 - 1.240 (31.01 - 31.51)
PAP-1750	P2-1240-Q	1.241 - 1.260 (31.52 - 32.02)
PAP-1750	P2-1260-Q	1.261 - 1.280 (32.03 - 32.53)
PAP-1750	P2-1280-Q	1.281 - 1.300 (32.54 - 33.04)
PAP-1750	P2-1300-Q	1.301 - 1.320 (33.05 - 33.54)
PAP-1750	P2-1320-Q	1.321 - 1.340 (33.55 - 34.05)
PAP-1750	P2-1340-Q	1.341 - 1.360 (34.06 - 34.56)
PAP-1750	P2-1360-Q	1.361 - 1.380 (34.57 - 35.07)
PAP-1750	P2-1380-Q	1.381 - 1.400 (35.08 - 35.58)
PAP-1750	P2-1400-Q	1.401 - 1.420 (35.59 - 36.08)
PAP-1750	P2-1420-Q	1.421 - 1.440 (36.09 - 36.59)
PAP-1750	P2-1440-Q	1.441 - 1.460 (36.60 - 37.10)

Ordering Information

When ordering please supply the following information:

- Tube O.D. and wall thickness or measured tube I.D.
- Tube material
- Tubesheet material is required if plug will be installed directly into tubesheet
- Maximum pressure and temperature
- Type of tube to tubesheet joint (rolled, welded, etc.)
- Condition of tubes and age of heat exchanger

Standard Materials

Brass, Carbon Steel, 316 Stainless Steel, Monel, Copper Nickel.

Delivery Information

Substantial quantities of P2-400-Q to P2-960-Q are normally in stock for immediate shipment. For details on exact delivery, larger sizes, or alternate materials, contact EST Group.

Contact EST Group about information on installation and removal equipment.

Specifications subject to change without notice.
See DC4002 for more technical information.

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