Solution and implementation

At low temperatures upstream of the FGD, the further cooling of the flue gases requires wall temperatures below the acid dew point. This leads to acid condensation on the heat exchanger tube surface. By means of a corrosion-protected gas/gas heat exchanger, the heat is transferred directly and free of leakage from the flue gas to the clean gas, which is reheated and dried.

A heat exchanger designed for this purpose is the ECOCROSS system. Based on the positive experiences in waste incineration applications, the ECOCROSS system was upscaled to the dimensions of power plant requirements. In this case the heat exchanger consists of a casing, erected on site which is equipped with two rows of each 10 pieces of heat exchanger modules assembled into the casing on site.

In this project the heat exchanger was built with one path for the flue gas and also for the clean gas side. The casing for the heat exchangers is made of carbon steel; the entire side exposed to moist clean gas is protected by glass flake. The anti-adhesive property of G-FLON reduces the tendency of heat exchanger fouling. The use of G-FLON-PFA as tube material realizes maximum welding factors, and therefore an optimum quality of the tube to tube sheet connection (leakage-free). The design also ensures that individual tubes can be replaced.

Subject: Belchatow, Poland, lignite-fired power plant, 2 x 380 MWel, 2 boilers and 2 flue gas lines

Special feature: First ECOCROSS for a power plant application with a high performance tube and largest ECOCROSS-module built up at that time

Objective: Heat displacement around FGD. By use of a direct heat exchanger.

Commissioning 2007
ECOCROSS BELCHATOW POWER
PLANT UNIT 3 & 4

The special feature of this ECOCROSS is the high performance tube. This tube has been developed and patented by Babcock Borsig Steinmüller especially for this purpose. Taking into account the dust content of the flue gas which flows inside of the tube, each tube is equipped with a separate cleaning nozzle. Each heat exchanger module is cleaned automatically once a day.

Advantages of the heat-exchanger concept are:
- Gas tight according to DIN, no slip between the media
- Seamless, extruded tubes made from weldable fluorplastic material (G-FLON – PFA Type)
- High Performance Tubes ensure:
  - Radial stiffness
  - Extended tube surface
  - Increased heat transmission
  - Expansion joint effect
  - Simple and efficient cleaning procedure
- Avoidance of relative movement between tube and spacer
- Solid bottom tube sheet
- High operating reliability / availability and long lifetime due to corrosion protected design
- Customized concept planning due to close adaptation to the operating conditions

Flue Gas Cooling
- Flue gas volume flow 2 x 1,700,000 Nm³ / h
- Temperature in / out 140 / 128.4 °C
- Pressure drop 5.0 mbar

Clean Gas
- Flue gas volume flow 2 x 1,821,000 Nm³ / h
- Temperature in / out 65.4 / 75.4 °C
- Pressure drop 2.0 mbar
- Heat Duty 2 x 7.75 MW

Pollutants flue gas clean gas
- SO₂ 6,000 298 mg / Nm³
- HCl 15 0.8 mg / Nm³
- HF 15 0.8 mg / Nm³
- Dust 125 17.4 mg / Nm³

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