EXTEND SERVICE LIFE OF HRSG INSULATION

Thermal insulation in heat-recovery steam generators (HRSGs) must be able to withstand constant assault by gas-turbine exhaust traveling at velocities up to 120 ft/sec. And in certain areas of the boiler, particularly around the auxiliary burners, temperatures often approach 2000F. A hot spot caused by insulation deterioration at these locations can cause hundreds of thousands of dollars in damage, as well as days of downtime.

Performance expectations for the insulation system in many HRSGs is typically 10 years or more. But at Watson Cogeneration Co, insulation was wearing out in only four years. The 385-MW Watson Cogen plant sells electricity to the Southern California grid and produces high-pressure steam for refinery use by its parent company, the Atlantic Richfield Co (ARCO).

Premature failure of the HRSG insulation was a condition that John Camburn, Watson Cogen's chief inspector, termed "absolutely unacceptable.

"What we had in place was, basically, the industry standard configuration," he explains. 'The outer skin is carbon steel. We then mounted 6 in. of 8 Ib/ft2 ceramic fiber blanket on studs and covered the blanket layer with a 14-gage stainless-steel shroud." The shroud was supposed to protect the blanket from the tremendous gas turbine exhaust velocities. But despite constantly upgrading materials, Camburn found he was replacing the lining much more frequently than planned (Figs 3, 4).

The problem wasn't so much in the product but what the insulation design was required to do, he says. "There is a significant difference in the firing temperature and the radiant temperature so we needed to look at upgrading the initial design specifications." Camburn turned to JT Thorpe & Son, Richmond, Calif. Thorpe, which specializes in refractory linings, teamed with Thermal Ceramics, Augusta, Ga, a ceramics fiber and refractory company, to design a workable and cost-effective solution.

After considering several options, Camburn chose to abandon the traditional insulation in favor of a monolithic weld-on ceramic fiber module, supplied by Thermal Ceramics under the name Pyro-Bloc. Specifically, Camburn selected PyroBloc HS.

"The primary benefit to Watson Cogen is the enhanced velocity resistance provided by this module," says Tom Watson, manager of applications engineering for Thermal Ceramics. Like all Pyro-Bloc products, Pyro-Bloc HS starts with a special fiber that becomes extremely hard after the burnout of an organic lubricant. This hardening is enhanced by the addition of a proprietary agent during the manufacturing process, to ensure penetration through the full thickness of the module. The Pyro-Bloc HS module is resilient and compressible during installation but hardens upon exposure to nominal temperature.

As a result of this unusual hardness, Camburn found that he was able to install the insulation without the stainless steel shroud required by the original ceramic fiber blankets. "Of course, when this solution was first presented to me, I had serious doubts about its effectiveness," Camburn remembers. "I had Thorpe install a 3x

3-ft test panel and let it run for a summer to make sure it could withstand the velocities." After comparing wear on the PyroBloc HS with that of other linings, Camburn 's doubts abated. '"We fully expect, at last, a long life from our insulation in these critical areas," he says.

Another advantage of the Pyro-Bloc module system is that it can be installed quickly without a pre-laid-out stud pattern. Another benefit is that it costs significantly less than earlier insulation systems, according to the supplier. The typical Pyro-Bloc installation at Watson Cogen was approximately $130,000, compared with close to $500,000 for alternatives. Watson Cogen just finished retrofitting its fourth HRSG with Pyro-Bloc HS.