Balloon keeps HRSG warm

A problem faced by engineers today is that their combined-cycle plants are not operating base-load as owners thought they would be when designed. Thus auxiliaries and "extras" that would have facilitated cycling service and simplified periodic shutdowns lasting for days (sometimes as long as several weeks) were not considered. No need; so owners thought.

One such extra is a stack damper. It can prevent rapid cool-down of the heat-recovery steam generator (HRSG) during overnight and weekend shutdowns, permitting as "hot" starts many of those previously classified as "warm," and as "warm" starts many of those previously classified as "cold." In brief, stack dampers prolong equipment life.

While waiting for management to budget the retrofit—assuming, of course, that the economics work—you can take advantage of the operational benefits of a stack damper by installing a duct balloon. Think of an industrial-grade version (temperature rating to nearly 500F, for example) of the air-filled cushions kids jump on at some fast-food restaurants, malls, and amusement parks.

Duct (or stack) balloons are made by Scherba Industries Inc, Brunswick, Ohio, and distributed exclusively by G R Werth & Associates, North Riverside, Ill. For more information visit www.ductballoon.com or contact Gary Werth directly (708-447-3522, gary@grwerth.com).

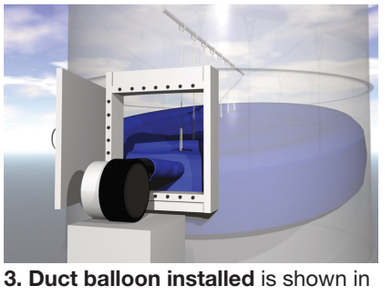
The business in duct balloons began for Scherba about four years ago when the company was approached by American Electric Power Co, Columbus, to supply "a heavy-duty inflatable device" to temporarily seal off 18-ft-wide by 20-ft-high duct-work at a coal-fired plant to facilitate maintenance.

More recently, a 2 × 1 combined-cycle plant in northwestern Indiana powered by Model 7FA gas turbines purchased a stack balloon. The facility is a merchant generator with a steam host. Under operating conditions that prevail for about four months a year, the facility will have one GT/HRSG train operating and the other in warm standby.

The dual-pressure HRSG in standby is kept warm by steam sparging in the high- and low-pressure drums, according to the maintenance manager, who spoke with the editors of the COMBINED CYCLE Journal by phone. Upwards of 50,000 lb of steam daily was being used for keeping the unit warm. But the draft created by the open stack was wasting energy by cooling down the boiler.

1. Access door was installed in the stack to allow installation and removal of the stack balloon in a few minutes

2. Balloon hangs from a rod that extends from one point on the stack to another 180 deg away. Think of a curtain rod



3. Duct balloon installed is shown in artist rendering

The plant manager remembered an experience about 10 years ago when a gas-turbine-based plant that he worked at used a weather balloon to eliminate stack draft. That, plus an article detailing the AEP experience led the plant to contact Werth.

The plant's two main objectives, easy insertion and removal of the balloon and avoiding the need for confined-space entry, suggested the only practical location for the balloon was in the stack. An access door was installed in the stack at a practical location and provision made for a rod to suspend the balloon (Figs 1 and 2).

The maintenance manager told the editors that a slightly oversize (with respect to the stack diameter of 17 ft 6 in.) balloon was installed last October, but it was not quite right. There was some blow-by. A second, larger balloon was manufactured and installed, and that has worked well. The plant's experience suggests that the balloon be about a foot larger in diameter than the stack to do a good job of sealing.

The new balloon weighs just under 50 lb and takes two people to handle it easily. Current operating practice is to install the balloon about an hour after unit shutdown, a process that takes about 15 minutes (Fig 3). About another five minutes is needed to inflate the balloon with a small 120-V blower supplied by the manufacturer. The blower stays on all the time the balloon is in place.

Adjustments in balloon position are easy to make. The blower is turned off, the balloon repositioned, and the blower restarted. Removal of the balloon is as easy as installation if a rear vent is provided to relieve trapped air as the balloon is withdrawn through the access door.

The stack balloon is working well, say plant sources. Temperature of the boiler was about 65F-70F without it, more than 100F with it. As for the cost/benefit, there are no hard numbers yet, but the plant will be tracking steam consumption when the balloon is in place and comparing it to consumption before the balloon was installed.

Two recommendations for others who might install a duct or stack balloon: Try to locate the balloon upstream of the stack thermometer so operators can monitor sealing efficiency without leaving the control room (leakage by the balloon will lower the stack temperature). Second, do not install balloons near welds that are not ground off and smooth with the stack's internal surface. Reason: As the balloon "works" in the stack with changing wind speed and temperature, it could wear out locally.