Economizer Inlet Header Cracking

Purpose

Advise owners and operators to inspect economizer inlet headers. Several recent inspections have revealed cracking on the inside diameters of tube stubs and header bore holes.

Problem

The economizer inlet header on any drum type unit may be subjected to thermal quenching during start-ups and hot banked conditions. The thermal fatigue is caused primarily by relatively cold feedwater being intermittently added to the unit when the inlet header is hot. The feedwater flow can be infrequent enough so that between flow periods the header temperature rises considerably above that of available feedwater.

Often the earliest damage is cracking of the inlet header in the tube hole closest to the inlet connection. The degree of cracking generally decreases with distance from the water inlet connection. This cracking can be quite advanced before leaking occurs. Figure 1 is a sketch depicting the beginning and advanced stages of bore hole cracking.

Background

Economizer inlet header cracking has generally been observed on cycling (on/off line) drum type units that have experienced numerous start-ups and hot restarts. However, several base loaded units have also experienced the problem. On the other hand, some cycling units, having in excess of 800 start-ups, have not shown evidence of header cracking. Figure 2 shows the typical locations of cracking.

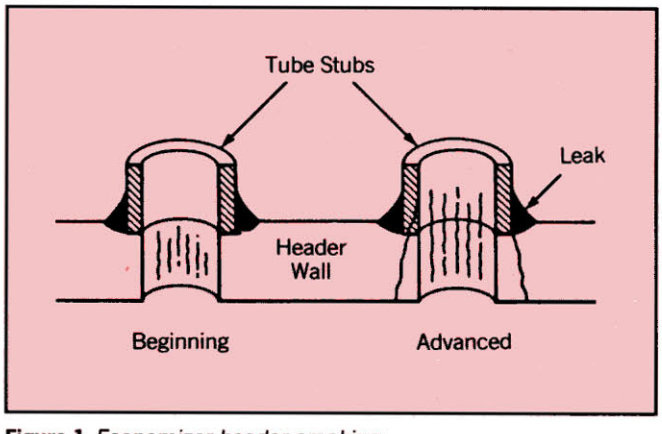

Figure 1 *Economizer header cracking.*

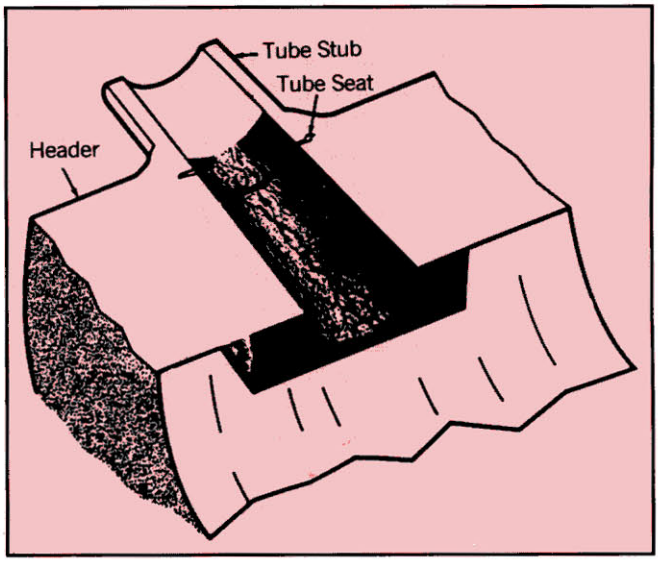

Figure 2 *Bore hole cracking.*

Recommendations

Visual internal inspections should be performed on all units that cycle on-off, on all base loaded units that have had a high frequency of forced outages, and on any unit that has experienced economizer inlet header stub leaks. These inspections should be performed using fiber optics.

To minimize future problems, some testing and analysis of results should also be performed. The tests are designed to evaluate the best means of minimizing the effects of thermal quenching during start-ups. Figure 3 shows typical locations of thermocouples needed for testing. Time/temperature gradient data should be obtained during several start-ups to evaluate the potential for problems. Whenever possible differential temperatures between header and fluid inlet temperatures should be less than 100°F. If the test and stress analysis indicate that temperature gradients leading to extreme thermal fatigue stress levels exist, the following are methods used to decrease the temperature gradient and minimize thermal quenching:

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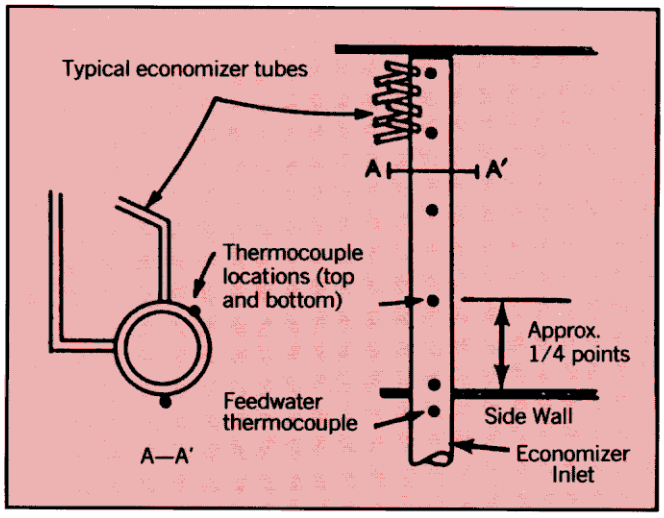

Figure 3 *Typical location of thermocouples.*

1. Utilize continuous, or frequent, "trickle" feedwater feed, as opposed to intermittent feed, during start-up and hot restarts.
2. Discontinue the use of the economizer recirculation line, especially during warm and hot starts, if at all possible.
3. Provide maximum feedwater heating as early as possible during start-ups and idle periods, and maintain it to minimize the magnitude of the thermal cycle.
4. During idle periods, fill the drum as high as possible to minimize the number of drum fills. When filling, fill at a very slow rate — "trickle feed" to limit the rate of thermal shock.
5. Review water quality entering the economizer during start-ups. Corrosion can accelerate crack growth.

Support

Babcock & Wilcox Field Service Engineering should be contacted if assistance is required for inspections, testing, data evaluation, and problem resolution.

For more information...

In the U.S., call 1-800-BABCOCK (222-2625) or fax (216) 860-1886 (Barberton, Ohio). Outside the U.S., call (519) 621-2130 or fax (519) 621-2142 (Cambridge, Ontario, Canada). In Mexico, call (5) 208-1906 or fax (5) 533-5550. Or contact your nearest B&W sales or service office worldwide.

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