LEAKING ACHE TUBE INSPECTION AND REPAIR PROCEDURE

HUDSON MANUFACTURING PLANT
BEASLEY TX

HUDSON PRODUCTS CORPORATION

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Written by: Mike Norgren

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INTRODUCTION

This report is the procedures recommended by Hudson Products when leaking ACHE tube bundles are an issue in the field. Topics covered will include: OEM specification data sheet, tools, instruments, and procedures to inspect internal tube header, tube plug sealing, new replacement tube plug and gasket.

To follow the job scope for the inspection of the ACHE for leaks:

Open several plugs to gain access to internal tube header
Use bore scope to determine internal condition – look for pitting
Use ultrasonic tester in questionable areas observed with bore scope
Use penetrating dye and developer in questionable areas to determine any cracking in header – predominately in the header plug area, nozzles and spot check welds
Cutting tube with internal tube cutter
Drive seal plug, made of material compatible with the tube sheet, into tube bundle hull
Pressure test single tube

Instruments, tools and parts:

Bore Scope
Ultrasonic Test Instrument
Cutting tool Internal Tube Cutter
Internal Tube Expander (used for replacing tube with new one)
Seal Plug
Tube Plug and gasket
Oil Lubricant

PROCEDURE

Special note: Replacement of all or part of the tubes on induced draft units will require opening a space between the hoods or plenum and tube bundle frame to move old tubes out of and new tubes into the bundle area. The removal of the bundle, where it can be worked on at ground level, will provide the most satisfactory working conditions.

Determining a leaking tube bundle requires the use of air pressure or water to help detect the leaking area. Once a leak is determined remove several header plugs, by hand – inspect threads, to gain access to the internal header box. Use a bore scope to attempt to find any internal corrosion – if deterioration is detected, run the ultrasonic test instrument though-out the affected area. Make sure the UT instrument is calibrated on a test block for best accuracy. If the header is corroded beyond maximum design corrosion allowance – more detailed study may be required. In some cases, a new bundle will be necessary. If the headers are in good working condition but more than 10 percent of the tubes are leaking a re-tube will be necessary.

Assuming the headers are in acceptable condition, the leak or leaks can be often stopped by plugging off both tube ends using a tapered seal plug. Use a micrometer to assist in the tube ID measurements to accurately determine the correct seal plug size. You can also refer to the specification sheet and our parts department can supply the plug based on the original design. To plug a leaking tube, it will first need to be cut on one end with an internal tube cutter to prevent differential thermal expansion from adjacent tubes. Install seal plugs into ends of the tube with a seal plug drive extension and then drive it with an 8 pound sledge hammer until seated. To check for surface cracking on exterior of the headers, spray penetrating dye and developer around threaded plug holes, nozzle welds, and header welds to inspect for any cracks. Clean header plug hole of rust, burrs etc. Make sure that the spotface for each threaded plug hole is free of scratches and corrosion. Install new plugs and gaskets then torque to correct specification.

REMOVAL OF TUBES

If more than ten percent of the tubes need to be plugged you will have to install new replacement tubes. This is achieved by removing all tubes that interfere with the leaking one. The tube will need to be cut off on both ends directly behind the outside face of the tube sheet. A dull chisel with a 1-1/2 to 2" wide face, powered by a heavy duty chipping gun, is most satisfactory for this operation. The dull chisel will cause the tube to collapse, thus aiding in the removal of the tube hulls.

Next, remove plugs from plug sheet.

Then, remove tube hulls from tube holes.

a) If the tubes are heavy gauge (0.11 inch wall thickness), they may be difficult to remove without first pre-drilling the inside of the tube to reduce the wall thickness. A knockout pin powered by a heavy duty chipping gun may be sufficient to drive the tube hulls out of the tube sheet without damage to the holes. Knockout pin is inserted through the plug hole, thus driving the tube hull to the outside.
b) If the tube ends cannot be removed with the knockout pin, the hull will require drilling, using a drill size 1/16" smaller than the O.D. of the tube and drilling to a depth of approximately 75 percent of the tube sheet thickness. Tube hulls are drilled from the inside toward the outside by inserting the drill through the corresponding plug hole. After the tube wall has been reduced, the tube hulls can then be driven out using the drive pin
c) If tubes have been seal welded, drill the seal weld face to a very shallow depth with a drill size 1/32" larger than the tube O.D. to break the seal weld before drilling the tube hull. In all three cases pay special attention not to damage the TEMA grooves.

INSTALLATION OF NEW TUBES

Note: If a complete re-tube is necessary we recommend it should be done at the factory.

Subject: Expanding tubes into box type ACHE headers.

Before installing new tubes be sure to clean the tube hole sheet and the TEMA grooves. Pay special attention not to damage the TEMA grooves. Use a wire brush attachment and be careful not to scratch the TEMA groove in the longitude direction, this will cause a leak.

The torque control method of tube expansion is achieved with rolling motors both electric and air driven of the adjustable type and are adjusted to deliver the amount of torque required for the desired degree of tightness. Normally a 7 to 10 percent wall reduction will produce a tight leak proof joint without tube flaking. Should there be evidence of tube flaking on any tube rolling operation; the torque control must be decreased.

The expander is set to the desired depth by inserting it through the tube hole in which no tube has been installed. The expander collar is adjusted against the face of the plug sheet until the ends of the taper rolls are in line with the outside face of the tube sheet. This setting will allow for approximately 1/8” between the end of the rolled joint and the outside face of the tube sheet. For re-rolling tubes the same depth setting of the expander can be arrived at by measuring from the outside face of the tube sheet to the outside face of the plug sheet and setting the expander collar to the same distance from the end of the taper rolls, making allowance on depth of spot face.

To prevent movement during tube installation and tube expanding headers must be securely held in their proper location. This is accomplished by welding angle iron clips from the header shipping clips to the side frames. These clips will remain attached until the unit is installed and ready for operation.

Lightly roll the inlet side to hold in place. The amount of wall reduction shall be checked prior to final expanding of the tubes in headers. This is accomplished by setting the torque control unit to produce a light roll and then gradually increasing the torque on subsequent tubes. Calculate the wall reduction after rolling each sample tube until the desired wall reduction is obtained.

Install the replacement tube and evenly distribute on both sides. For tube installation in new bundles and re-tubing, each row of tubes are expanded on the inlet end only before installing the next row. Tubes are installed working from bottom row up. After all the tubes have been installed and the inlet end expanded, the outlet or return is then expanded.

Two people are required for expanding tubes in the inlet header, one to operate the expander and the other to hold the tube in place during the expanding operation. The tube

is held in place by placing a tapered rod into the outlet header end of the tube being expanded and applying a downward force.

Note: When expanding tubes into the inlet header, start the expanding operation on each tube with the collar of the expander approximately ¾" from the face of the plug sheet. This will permit the expander to feed into the tube and does not pull the tube towards the inside of the header. The tubes in the outlet or return header are rolled starting with the bottom horizontal row of tubes. The collar of the expander should be set against the plug sheet. By setting the expander collar against the face of the plug sheet, there will be a tendency for the tube to pull toward the inside of the header thus straightening any slight bows in the tube.

Note: Return or outlet headers 9' through 12' wide to decrease the possibility of bowing the header during the rolling operation. The vertical row of tubes on the centerline of the header should be rolled equidistant from the centerline to the edge of the header on each side of the centerline.

Lightweight cutting oil shall be used as a lubricant and coolant during expanding operation.