

AMERAPEX NDT LLC
Pulp and Paper Industry Solutions
In Brief

Technology for In-Service Testing and Loss Control

CHLORINATOR TOWERS:

Chlorinator towers are very often constructed from FRP materials making inspection very difficult using conventional NDT methods. The CARP. (Committee for acoustic emission in reinforced plastics). This committee was established by FRP users in early 1986 to develop a procedure for FRP and is now a code of practice, such as ASME V section 11 and has become a requirement in the petrochemical industry for this type of structure. This method is able to not only determine the location of the problem but able to identify the type activity detected i.e. Debonding, fiber breaking, matrix cracking etc.

The tower is tested by emptying the tower for a period of 12 hours prior to the test .The sensors are then mounted on the outside of the tower and it is monitored while being filled up with a suitable liquid, in stages from 0 to 50 and up to the 100%,

BATCH DIGESTERS:

Most batch digesters are constructed with a carbon steel base and a stainless steel internal layer. Several digesters have been reported to have inter-layer cracking that could be structurally significant. Conventional NDT requires the time consuming and costly removal of all the insulation. However, AET only requires that a 4 inch diameter hole be cut in the insulation, permitting the sensors to be mounted. The vessel is then subjected to a 10% over working pressure to complete the test.

RECOVERY BOILER FLOORS:

The material of construction varies from a plain carbon steel, with or without studs, to a composite stainless steel layer on a carbon steel substrate. In the case of plain carbon steel construction, the main problem appears to be water-side cracking. A recent research project was completed to determine AET's ability to detect and asses the critical size of water side cracking .UT and the destructive tests where used to confirm the AET results, with a very good correlation.

A similar study was conducted on composite tubes. AET signature recognition software this was able to determine whether the activity was from cracking in the carbon steel substrate or in the stainless steel layer, the foremost being of most importance.

The technique used in both cases, is to mount the AE sensors on the underside of the boiler floor, just prior to a hydro test. Access is gained via the vestibule and the boiler floor

monitored during an increase in pressure, from 50% of working pressure in stages, up to 110% of the working pressure. The time to conduct a test of this sort on a normal recovery boiler 32 feet by 30 feet takes approximately 6 hours to complete. Other areas of the boiler can be tested at the same time with the use of additional sensors.

The main advantages in both of these applications is that the boiler does not have to be cleaned prior to the test, and secondly only the areas that show positive activity would have to be cleaned for follow up NDT in order to achieve a more accurate location of the activity (the normal accuracy of AET is 12 square inches). Most important of all, the critical assessment of the structural significance of the defect is possible, whereas PT can only identify the presence of a crack.

SUCTION ROLLS:

The early detection of internal cracking in suction rolls has long been of concern in the paper industry. Until now, the engineers have been forced to use very inefficient NDT methods such as PT that requires the roll to be removed from service, stripped of its inside equipment and thoroughly cleaned and degreased before applying the penetrant. Using the AET method, the roll can either be tested in the machine if a two hour window is available, or tested outside the machine without any impact to production. If the test is conducted in the machine, the felt

tension is increased by 10% above the normal working tension, or if a press roll is available a 18 inch square 1 inch thick rubber pad is placed in the center of the roll and pressure applied. This is done four times, with the roll being rotated 90 degrees for each test. If the test is conducted outside of the machine, then a weight of at least 3,500 pounds is applied to the center of the roll using a crane or a fork lift, This is also done four times, with the roll being rotated 90 degrees each time.

A special technical committee to establish a standard procedure for this test has been formed by TAPPI under the chairmanship of Dave Bennett of Champion International, with membership including Stan Botten of AMERAPEX NDT LLC.



DRYING CANS:

The use of acoustic emission testing of drying cans, have now been in use now for several years. Each drying can is considered to qualify as a pressure vessel by itself and is subject to the normal pressure vessel codes and standards. One of the accepted methods of testing a drying can is to pressurize the can using the steam pressure and increasing the pressure by 10% above the maximum pressure it has seen in the last six months. However this can present a problem in that very often the boilers are already operating at full capacity and increasing the pressure would create a problem. Recent studies have indicated that a very reliable technique is to use the cooling down stresses as a means of detecting crack like defects, this technique has very successfully been used in the high temperature steam piping in the Power plant application. This allows the mounting of the AE sensors using waveguides on the drying cans, without disassembly and as many as 12 cans can be tested at one time in a reasonable time.

REEL SPOOLS:

The failure of a reel spool during the winding process can cause serious delays and possible damage to the paper machine. The only way to inspect the shafts on the reel spool to date has been to remove the reel from service, strip the bearings and housing, and then conduct an MT and/or UT test on the exposed area. The use of the AET method has now been applied economically and successfully to over 200 reel spools, with all suspect reel spools being confirmed by either visual or MT methods.



The test is conducted at a suitable location, usually at the end of the reeling machine where an area is selected so that anchor bolts can be fixed into the floor, allowing the placement of the filled reel spool on a pedestal. Then using a sling, a chain hoist and a dynamometer, to apply a downward load on the center of the reel spool, a load is normally 10% above the mass of the reel spool and the paper is applied four times with a rotation of 90 degrees each time. The testing time is usually 45 minutes per reel spool. Depending on the rate that the spools are supplied to the testing crew, as many as six reel spools can be tested in one day. The procedure has been accepted and published as a TAPPI. TIP DOCUMENT. Details are available on request.



REEL SPOOLS:



O₂ OXYGEN REACTORS

O² OXYGEN REACTORS:

After discovering under-insulation SCC on a stainless steel reactor, during a standard hydro test. The major problem areas were cut out and repaired. However this left several areas that with minor crack-like indications, confirmed using PT. AET is being successfully used to monitor, on a regular basis, any growth or deterioration in the structural integrity of the vessel. This has proved that the corrective action taken in improving the protection of the vessel surface to prevent chlorine attack is working.

The technique used cases like this is to cut four inch diameter holes in the insulation at locations, determined by the AE attenuation tests. The sensors are mounted, and the reactor monitored, either during an increase in operating pressure from 80% to 110% for an on line test. Or during a hydro test, with the pressure lowered to 50% and then increased in stages to 110% of the highest pressure recorded in the last six months of operations. This test can be completed in two days depending on the accessibility to the sensor locations. Laboratory tests were conducted to determine the type of activity that can be expected from the materials of construction and the presence of SCC activity. A paper describing this work was authored by Dave Bennett of Champion International and published in the TAPPI journal. Copies are available on request.

YANKEE DRYERS:

We have a lot of experience in doing AE on Yankee Dryers during the startup and pressurization to examine thermal related cracking, corrosion and leaks. We have been active and attended several TAPPI conferences and committee sessions on this subject. For more details please contact us.

For further information about the applications described in this document, or any other application you may require, contact. **AMERAPEX NDT LLC.** by telephone at 713-263-0900 or Fax 713-263-0922 or by e-mail to info@amerapex.com