Cast Iron Dryer Roll Inspection to TAPPI Requirements

The testing of cast iron dryer rolls by conventional ultrasonics has always been difficult due to the large and irregular grain structure. It is this grainy nature of the material that results in creating various acoustic velocities that can display several different ultrasonic thickness results.

Often the data is based on the wrong acoustic velocity, which yields erroneous thickness data. Several different techniques have been tried and the most accurate aside from a "drilled measurement" has been achieved with a transducer array called the "Auto-V". This array has also been referred to as the "Hartford Wedge" in reference to a predecessor of this technology that has been improved on in several areas in its present configuration.

The system relies on a transducer array that uses four transducers to gather and verify data at the same spot on a dryer. The first two transducers gather velocity data at the spot to be examined, and the other two utilize the determined velocity to get an accurate thickness at that data point on the roll. The transducers "talk" [multiplex] four times per second updating velocity data to the thickness transducers. This results in a continuous readout of the dryer shell along the entire face of the roll and an overall system accuracy of 98%. This is a 6% improvement over the older wedge system, which relied on manual switches to change from the velocity to thickness display.

In addition to determination of the dryer shell wall thickness verification, the maximum allowable working pressure for each roll is calculated by the ASME Code. It is this information that is critical to assure the continued safe operation of the paper machine, or Yankee Dryer Roll. Magnetic particle examination of the dryer journals is used to detect cracking that could lead to a catastrophic in service failure. Ultrasonic straight beam testing of 20% of the head bolts on each roll is used to further enhance the effectiveness of the dryer roll inspection.

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Technician controls the progress of the scan manually across face.

The system can read both the dryer wall thickness and the material velocity.

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Four magnetic wheels hold the transducer cart on the roll. The clearance is about 4”-5” in a vertical direction to allow the cart to travel along the roll.

The journal area of each dryer is checked for cracking that could lead to a failure.

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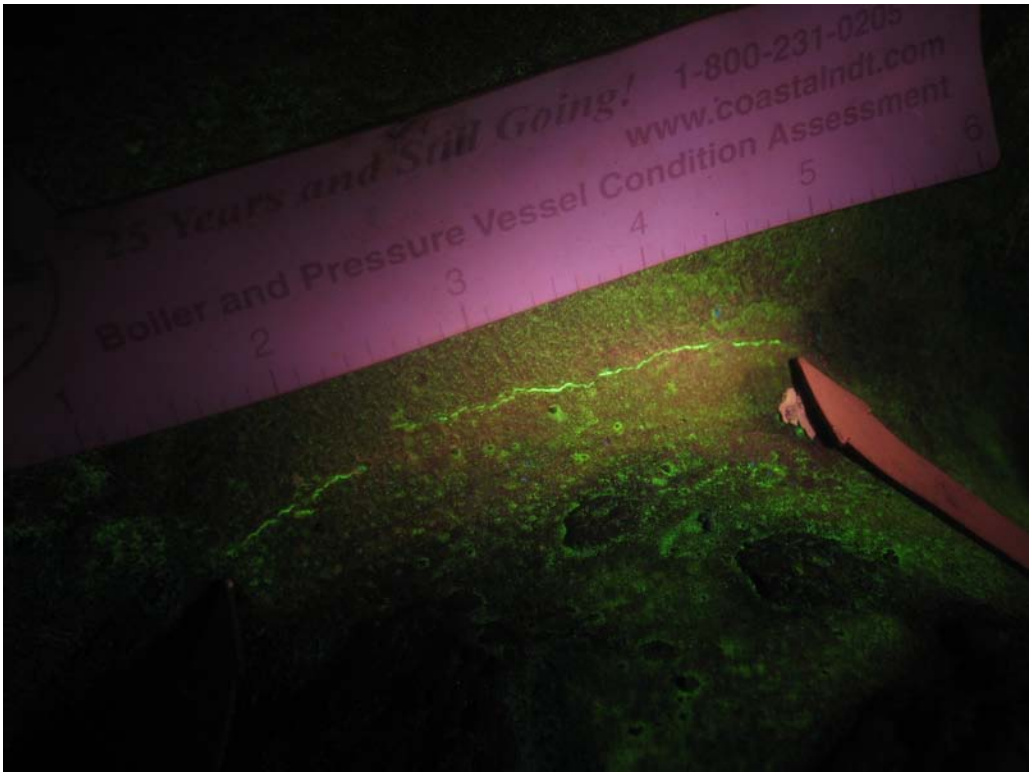

The cracking is best detected by the wet fluorescent magnetic particle method.

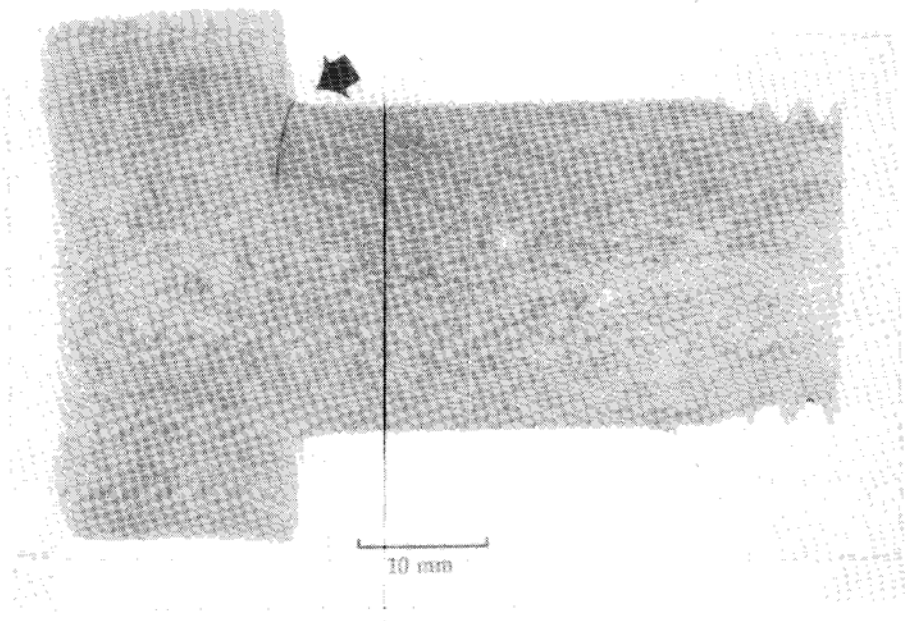

Fig. 3. Cross-section of dryer bolt showing typical stress corrosion cracking under bolt head.

Ultrasonics is used to detect cracks prior to failure in the dryer roll head bolts