EDDY CURRENT INSPECTION

Eddy current testing is an inspection method for locating indications such as soft areas (bruises), wide cracks and magnetism and is performed after completion of the grinding operation. (Figure 1). While the roll is still in the grinder, a dual wire differential probe is brought close to the roll surface on one end of the roll body. With the roll rotating at a set speed, the probe is then slowly traversed across the entire length of the roll body. Synchronization of the traverse rate and roll RPM is designed to insure that every point on the roll surface is passed between the dual wires. As the probe traverses the roll body, eddy currents are induced on the roll surface between the wires by the application of an alternating current. Instantaneous changes in either the electrical conductivity or the path length between the wires can be detected and are displayed on two separate channels named the Pinch/Bruise channel and the Crack/Spall channel respectively. The specific procedures for performing eddy current inspection are dependent on the eddy current equipment used and is provided by the manufacturer.

Changes in electrical conductivity are detected on the Pinch/Bruise channel and are the result of changes in hardness and microstructure between adjacent points on the roll surface. Areas of magnetism will also result in a continuous change in electrical conductivity between all adjacent points within the magnetized area. A gauss gauge (magnetic field indicator) can be used to confirm the presence of residual magnetism (>30 Gauss). Typical roll conditions that can yield changes in the electrical conductivity of the roll surface include but is not limited to: localized over tempering (bruise), localized work hardening, a roughly ground roll surface and inclusions where exogenous material is entrapped in the roll surface. These conditions are displayed on the Pinch/Bruise channel hard copy print out as individual spikes above the residual noise level or as large areas of grass that also exceed the residual noise level (Figure 2).

Changes in path length are detected on the Crack/Spall channel and are the result of surface cracks. As the probe passes over a crack, the generated current must travel down the crack wall and back up the other side in order to reach the opposite wire. This difference in path length is then displayed on Crack/Spall channel as individual spikes (Figure 2). Eddy current inspection is unable to detect cracks less than 0.006” wide and is only semi-accurate at detecting cracks wider than 0.006”. For accurate detection of all surface cracks, ultrasonic inspection should be used.

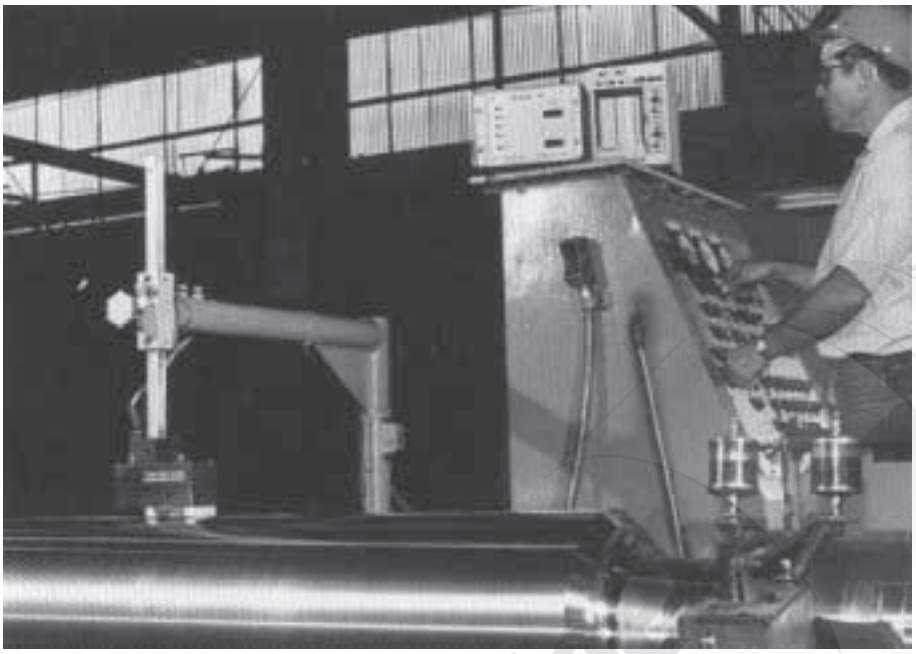

FIGURE 1
Eddy current inspection being performed on a roll after completion of the grinding operation.

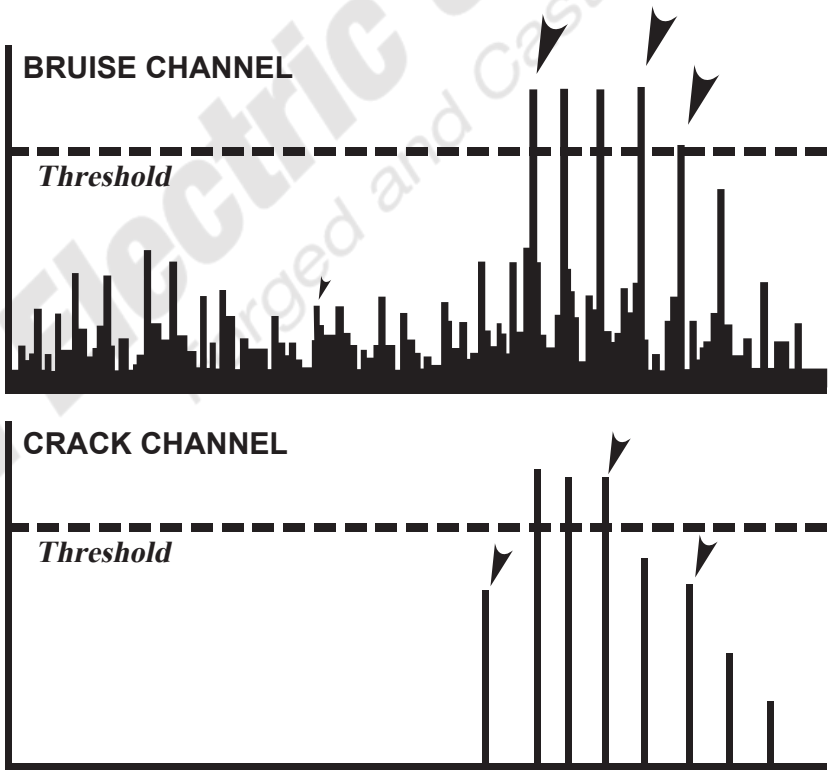

FIGURE 2
Example of a typical eddy current inspection chart record.
Large arrows highlight typical spikes from a bruise on the roll surface.
Small arrow highlights residual noise on the Pinch/Bruise channel.
Medium size arrows highlight cracks displayed on the Crack/Spall channel.