Magnetic flux leakage testing with direct field (DCMFL)

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When testing ferromagnetic tubes or bars for longitudinal and oblique defects using the direct field magnetic flux leakage (DCMFL) method, the material under test is magnetized with two magnetic poles transverse to its longitudinal axis. Defects in the material disturb the magnetic flux in the material. Stray fluxes then leak from the material into the nearby air, which are detected by magnetic field-sensitive sensors. One goal in defect inspection is to ensure that similar shaped defects are detected with a comparable signal level, regardless of the tube position at which they are located and how much the angles of oblique defects deviate from the longitudinal axis of the tube. However, the magnitude of the stray fluxes depends not only on the shape of the defects, but also on the angle at which the magnetic flux lines strike the defects, as well as the strength of the magnetization in the material surrounding the defect. In DCMFL testing of tubes, there are several causes for variations of magnetic flux at different locations in the material. These variations affect both the angle and the strength of the magnetic flux. As a result, the signal levels for similar defects differ significantly from each other. By taking appropriate measures to compensate and homogenize these variations, oblique defects as well as defects with a small distance to the tube ends can be detected with a good repeatability.