

Automated inspection of heavy plates with phased-array based porosity testing

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As part of the quality assurance process, heavy plates are tested for internal imperfections by means of ultrasound in the rolling mill. Modern automated ultrasonic heavy plate testing systems are integrated in the customer roller conveyor and can process trimmed and uncut plates with segmented TR probes. Depending on a maximum plate width, the plate body is tested with up to 108 segmented probes, each having four receiving channels and one transmitter channel, accordingly to international standards for defects of size FBH 3 mm. The plate thickness is specified from 5 to 80 mm. To test the plate edges, two segmented TR probes and one TR probe are mounted in two edge inspection carriages. In order to minimize the unchecked area of the edge, even with uncut plates, both test carriages are pneumatically placed against the left and right plate edges and follow them longitudinally. For the transverse edge test, the plate is stopped on the roller conveyor and an edge inspection carriage is rotated by 90 degrees. The inspection carriage then moves to the opposite side and inspect the transverse edge. As part of an order for China Steel Corporation in Taiwan, in addition to testing with TR probes, it is necessary to inspect the plate edges over a width of 300 mm by means of angle inspection for porosities and inclusions. This inspection is performed for each plate edge with 6 phased array probes, each with 32 elements, as a linear scan. The phased array probes are mounted in two additional edge inspection carriages. The testing mechanics is equipped with a transverse adjustment that compensates the influence of the plate thickness on the inspection position. The test data is evaluated in accordance with international standards or in-house standards defined by the customer directly after the data acquisition. The results are displayed online during the test procedure as C - scans.