

Broken Roll Detection – Perfect Steel Pipes with Thermal Inline Inspection

In the seamless steel tube production pipe shells are produced by the push bench process, where they are pushed through a system of many non-driven roller stands based on the 3-roll system to get the final dimension. If one of the rolls is broken, structural voids near the surface are the consequence. So finding the structural voids means to find broken rolls.

A broken roll causes the effect that some of the material of the steel tube is pushed into the crack. Following rolls steamroll this defect and pushes it back into the pipe shell surface. The result is a structural void within the pipe shell. At cooling down phase this inner void causes a smaller heat flow to the surface than the defect free surrounding. This means voids, even if they are not visible at the surface, can be detected because of higher surface temperature.

Hot Samples

The PROFACTOR broken roll detection system inspects the pipe shell directly after the last roller stand. When the pipe shells are leaving this bench, they are transported through the checking system, to find out if a broken roll left a “fingerprint” on the pipe shell. The environments temperature is about 50°C. The temperature of the pipe shell is around 900°C in measurement position and it has a speed of 6.6m/s. Figure 1 shows the mounting frame at the checking position with a pipe shell in transportation.

Rough Surrounding

In order to fully inspect the whole pipe shell three cameras watch the whole circumflex of the 900°C hot pipe surface at about 15 meters after the last roller stand. Only the camera on the top of the frame watches the pipe shells surface directly. The two cameras on the sides watch the pipe shell across mirrors to avoid dirt falling onto the cameras protecting windows and to save space at the outer sides of the frame. Each camera is protected by a double walled, water cooled housing and is mounted within a solid frame for better protection against the rough environment.

High Data Volume

For result calculation the signals from cameras and temperature sensors of about 600 MB per pipe shell are guided by fiber optics to three computers, which are located about 200m away from the sensing place. Extraction of irregularities out of the image data is done here. The high data volume can be reduced to some basic facts like outline, shape and orientation.

Reliability Guaranteed

Periodically appearance of the broken roll fingerprints at each full roll revolution is an additional requirement for void detection. Doing so voids caused by roll defects can be separated from random disturbances like tinder with very high reliability. The groundbreaking result: In high-contrast disturbance surrounding low-contrast effects like broken rolls can be reliably detected.

Higher Quality, Higher Throughput

The Broken Roll Detection System runs since 2004 at voestalpine Tubulars in Kindberg, Austria. The immediate knowledge about roll defects, provided by the Broken Roll Detection System enabled the reduction of number of defect pipes produced. Furthermore the

possibility to immediate troubleshooting increased the throughput of high quality pipe shells. In generally the Broken Roll Detection System can be used for hot samples also with different cross-section.

Contact

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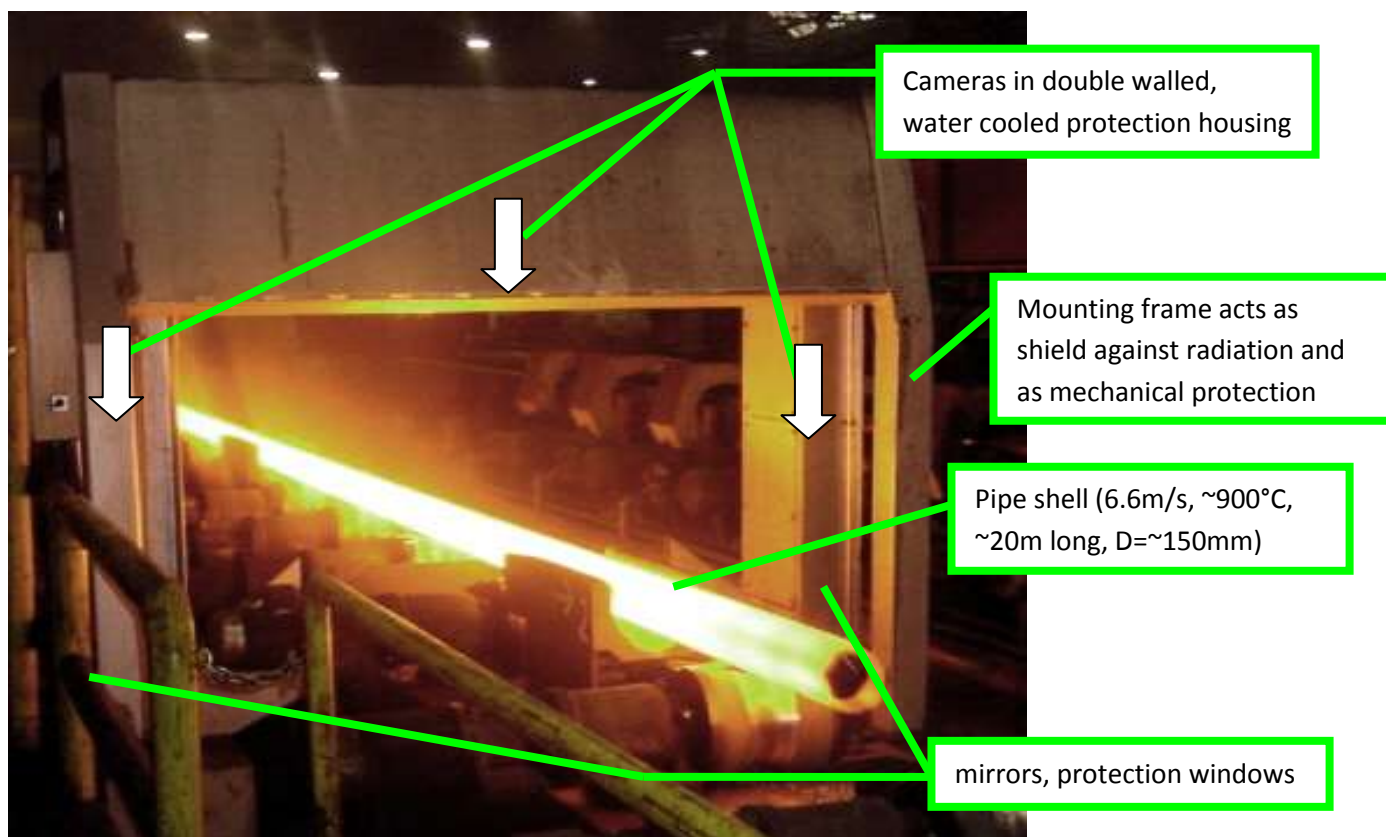


Figure 1: Measurement Position



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