

# Digital UWB Radar for Industry Applications

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Ultra Wideband Radar has the potential of dramatically improving the control and surveillance of industrial processes in confined areas. An example is the application of UWB radar for surveillance of furnaces for heat treatment of steel billets. Since the operating temperature inside the furnace is 1200 °C, there is today no other known method capable of visualizing the process for the operator of the furnace.

In our installation at AB Sandvik Materials Technology, by using the non-destructive UWB Radar technique, we have shown that it is possible to visualize in real-time the ongoing process inside the furnace behind a 0.5 m thick ceramic wall. The system is also able to sustain high temperatures and powerful electromagnetic disturbances while performing measurement with wide dynamics and high stability. The wide bandwidth is a requirement for obtaining high spatial accuracy and resolution but puts further requirements on the design of the antennas and the electronics.



The picture shows part of the installation at Sandvik. The sensors are equipped with antennas and electronics for detecting signals with a bandwidth of 6 GHz. For communication between sensors fibre optics are used, because of its high bandwidth and good immunity for electromagnetic disturbances.

The design is based on the idea of transmitting a continuous m-sequence and then detecting the correlated impulse response [1]. Our results show that it is possible to determine the deformation of the steel billets inside the furnace with an accuracy of less than 5 mm. The radar system is also able to detect cracks and other deformations in the furnace wall.

[1] “M-sequence ultra-wideband-radar: state of development and applications.” J Sachs, P Peyerl, R Zetik, S Crabbe - Proceedings of Radar, 2003