

Smart inspection of rail wheels with matrix arrays

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Rail wheels are one of the most safety critical components of rolling stock. Any failure can lead to catastrophic events resulting in high material damage and personal injury or even fatalities. Therefore, international railway standards require non-destructive inspection by means of ultrasound testing (UT) on a regular basis. Due to increasing distances, loads and speeds there are increasing demands on the precision and the scope of testing. However, the inspection of train wheels is complicated due to the large variety of wheel geometries and the further influence of different milage. Moreover, extended inspection areas up to a full body inspection define many different defect positions, which are to some part difficult to access. This article describes an industrial solution based on the Krautkrämer WheelStar UFPE, which allows the full-body inspection of train wheels including face, flange, web and tread for volumetric defects (from \AA 2mm) and surface cracks (from 5 mm length and 1 mm depth). To cope with the testing complexity advanced UT technologies are used in combination with a high automatization level and user-friendly controlling and inspection tools. After a general description of the overall setup, general probe configurations and the positive impact of matrix arrays on the overall design will be discussed. Afterwards, measurement results will highlight the testing capabilities. Comparative studies reveal the improvements of matrix arrays. Besides, it will be shown in which way the implementation of matrix arrays gives access to new features such as a high precision coupling check, geometry measurements and smart inspection such as the compensation of wheel wear or the identification of the wheel type.