

Reduction of rejects by combining data from the casting process and automatic X-ray inspection

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Automatic inspection of castings with X-rays (radiographic and computed tomography) is widespread for parts that are relevant for safety or have high quality requirements. Examples in the automotive sector are aluminum wheels, chassis parts and new parts within the electric power train. Those parts are automatically inspected, which means that both the image acquisition and the evaluation of the images is done fully automatically. Today, in most industrial implementations, the generated data with a size up to several gigabytes per part is summarized to a simple good or bad decision, according to specification. All other data is dismissed, although this information can be valuable to optimize production processes and thus minimize rejects. This contribution gives an overview about the results of the project Cast Control, which is a collaboration of Fraunhofer Development Center for X-ray Technology EZRT, Fraunhofer Center for Applied Research on Supply Chain Services SCS and industry partner RONAL GROUP. RONAL GROUP is a major aluminum wheel manufacturer, mainly for the OEM market. Within the project we combined serial production data from the low pressure die casting process from a foundry of the RONAL GROUP with the data generated in the automatic X-ray inspection. After collecting a large base of sample data, we were able to train a neural network for the prediction of error metrics obtained by X-ray inspection. We apply a combination of layer-wise relevance propagation and dimensionality reduction to find correlations between data of the casting machines (process and sensor) and the characteristics of anomalies detected during X-ray inspection. This information can be used to optimize the production parameters in order to reduce scrap.