

Inline X-ray inspection assisted by simulation tools

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The manufacturing of industrial or consumer products follows a trend with an increasing frequency of updates in design or in the used materials. This brings the need for faster prototyping, customised and modular production lines, along with a reduction in the batch sizes. Also, in the context of reliable and reparable consumable devices, the quality control of individual parts plays a more important role. Within this framework, automatized inspection devices are required, featuring an easy adaptation to updated or new samples. CEA List has an active contribution on this topic through developments of innovative methods and devices, targeting a high flexibility and adaptability, for inline or at-line inspection scenarios. For this purpose, we use simulation tools in order to create reference data which is being used for the analysis algorithms. In particular, for X-ray inspection applications, we use CIVA RT/CT to model the complete systems and in order to generate synthetic reference data. In this paper we present two applications, one for the inspection of printed electronic circuits and the second one for the inspection of additive manufacturing parts. Since in the first case the samples are generally flat, a high resolution digital radiography system was implemented. A relatively simple analysis algorithm uses synthetic reference data for the inspection and automated decision process. For the second case, the samples can have a large variety of shapes and therefore a 2D and 3D adaptable approach was proposed. Depending on the initial requirements, the samples can be verified for dimensional conformity on radiographs, or checked for flaws together with the full dimensional conformity on 3D reconstructions in XCT (X-ray Computed Tomography) mode. We describe the methods and the implemented devices, with results on representative samples for demonstration purposes.