

# Verification of performance of XRR and HSI as Quality control in industrial R2R vacuum coating

Please find the full text in the attachment.

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The deliverable deals with the verification of the HSI as a valuable tool for roll-to-roll inline processes. This is demonstrated with the example of different single layers and one double layer system. Details are given in the corresponding chapters. Ground truth data came from different sources, among them also X ray Reflectometry. The general procedure of machine learning is presented in section 2.1. The examples for single layer systems and double layer systems are shown in the sections 2.3 and 2.2, respectively.

In the content of the deliverable various quantitative numbers are given:

1. a set of surface images of a roll need to be taken from a roll
2. a roll section of 100 m x 0.6 m
3. R2R processing at 2 m/min possible
4. 4-layer stack: individual layer thickness and its deviation with sensitivity of  $\pm 1$  nm.

Even though these four criteria had not been demonstrated together, the work for this deliverable dealt with all of them. Images of the roll had been taken. Due to aperture restrictions at the coFlex 600, the maximum width of observation was 0.49 m. This value can easily be adapted to 0.6 m in a production machine. More than that, the scaling of resolution with observation width, achievable under normal circumstances can be evaluated based on the project results.

The maximum total length of 275 m was investigated with the HSI system in the roll-to-roll machine. This was done with the partner roll from NORD. The HSI inspection was demonstrated at a maximum line speed of 6.4 m/min. The partners have developed a general understanding of the deformation of the field of view, in dependence of the interaction between the frame rate and line

speed. This deformation of the field of view is not limiting the information provided by HSI. However, the understanding is necessary to identify the exact position which a measurement signal is related to.

Considering all the difficulties which had been faced during the installation, the four-layer stack seemed to be too complex for the evaluation approach of NanoQI. More details and a guideline for a modified approach in a possible follow up project are given in section 2.4.

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