

Modelling and Process Control in the Powder Coatings Industry

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This presentation gives an overview of the modelling, optimization and process control activities within the project and WP4 particularly. It is divided into 3 main parts that reflect the overall work and the contribution of CITY univ. to the corresponding WP4 tasks. The first part focuses on the modelling-optimisation of the solidification process, where we present the process flow diagram and the process model (PDE) which has been developed. On the parallel we run a set of experimental trials on the SBS pilot cooling belt to support the modelling activity; i.e. we used real experimental values to estimate the unknown model parameters and hence validate the models. Next, we proceed with the optimization task, from which we derive the optimal ranges of the main process variables by minimizing a suitable cost function. Finally, the design specifications for the fully automated cooling belt that will handle the new synthesized resins are given as well.

The second part highlights the modelling and control design of the industrial powder coating line with emphasis on the extrusion process. The system identification task and the various control design strategies are presented together with comparisons on the control performance. The predictive control strategy shows the best control performance in terms of tracking and disturbance rejection capabilities and more significantly minimizes the control effort which means less operational and maintenance costs (during the machine running). The final part describes step-by-step the production phases and the establishment of the production protocols for the powder coatings manufacturing line. Results from the experiments that took place in both MEGARA facilities and SBS pilot line are also given and compared to ensure that the powder coatings recipes-production protocols produce the desired results and are reproducible.