

New concept of a batch drying unit using a comb nozzle structured array of impinging jets

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One of the most sensitive steps during the manufacturing of high technological functional films is the drying process. The performance depends on the drying conditions and hence homogeneous drying under predefined conditions is mandatory. Arrays of impinging jets can be used to achieve high drying rates. One disadvantage of regular designed jet arrays is the inhomogeneous distribution in the field of the transfer coefficients.

In this work, we present the development process of a batch drying unit using a well-defined array of impinging jets with local removal of the spent fluid. The key element of the development is the nozzle system. Using 3D prototyping for manufacturing process, a comb nozzle patterned structure of the array could be realized and a homogeneous distribution of the fluid supply throughout the array could be achieved. The developed system allows minimizing the percentage standard deviation relative to the mean value of the heat transfer coefficient (HTC) down to five percent at an average HTC of around $40 \text{ W}/(\text{m}^2 \cdot \text{K})$. Furthermore, fields of application and a first realization at BASF SE for pre-industrial scale in the coating and film processing group will be shown.