

SUPERHEATED STEAM DRYING

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Initial situation

The convection driers employed in the textile industry are run on hot air. They involve high costs and require a large amount of energy. The waste air which contains pollutants and is discharged over the roof causes a high loss of energy and considerable load of atmosphere. The introduction of superheated-steam drying in textile industry allows to considerably reduce the environmental load caused by the waste air. Superheated steam drying means that the steam taken over from the drier is no longer discharged over the roof but is condensed. In the course of this process, thermal energy is recovered and the pollutants contained in the condensate can be separated.

Research target

The research target was to create the basis for the introduction of superheated-steam drying in the textile industry, the determination of the conditions for the profitable use of superheated steam in textile driers and the preparation of recommendations for the application of the method and for necessary changes to the design of convection driers.

Research result

Equations for the calculation of the drying rate were prepared for the range between hot-air and superheated-steam drying. Extensive test series were performed to confirm that the calculations are of a high accuracy. The drying rate decreases with increasing steam content. This can be compensated by enlarging the drier and increasing the drying temperature. The decreasing drying rate entails a positive reduction in heat requirement. The hot air driers presently employed cannot be used for superheated-steam drying in their present design. In order to meet requirements in respect of tightness and protection against corrosion new drier concepts are necessary. Possible measures for solving this problem have been investigated.

Application and economic advantages

Owing to the air protection regulations becoming more and more stringent, textile finishing companies are urged to eliminate the respective deficiencies in their driers. The fact that certain limits, both economically and technologically, have been reached in the development of heat recovery systems and waste-air cleaning systems makes it necessary to open up new possibilities. The introduction of superheated-steam drying allows to attain a new quality in the reduction of environmental load by decreasing energy consumption and avoiding air pollution. Data about the profitability of this drying method, however, are not available yet.

Therefore, it is important to gather information about the development of the drying costs. The drop in the drying rate with increasing steam content is accompanied by a reduction in heat requirements so that the costs may be expected to develop positively. Furthermore, it is necessary to find out how the possibilities of compensating the decrease in the drying rate, enlarging the drier and rising the drying temperature influence the costs. From such findings, recommendations for the profitable employment of superheated-steam drying are to be derived.

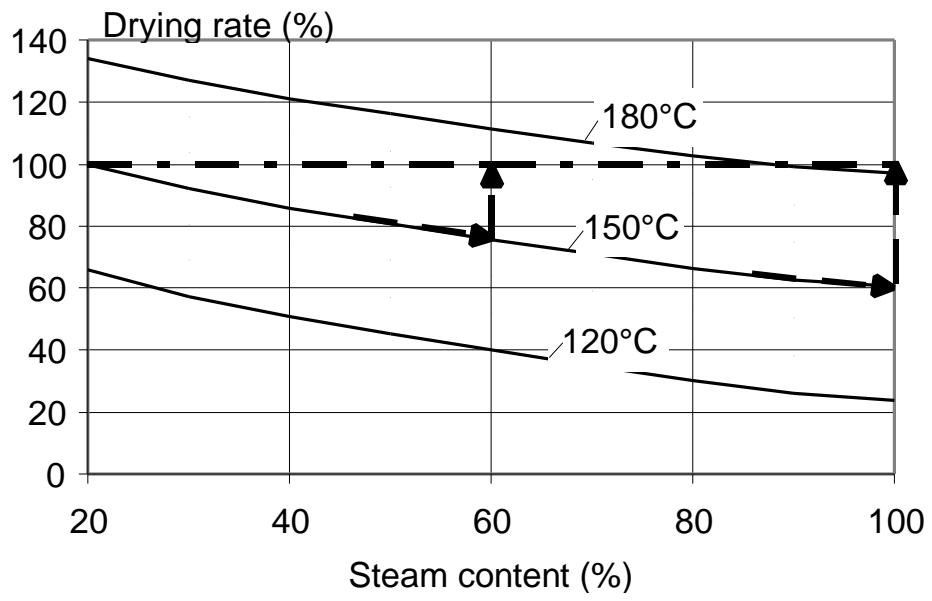


Fig.: Drying rate dependent on steam content