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(54) **A method of drying in a superheated steam "flash" dryer**

Trocknungsverfahren in einem Heissdampf"blitz"trockner.

Procédé de séchage dans un sécheur à séchage instantané par vapeur surchauffée

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Description

[0001] This invention relates to a method of drying in a "flash" type superheated steam dryer.

[0002] A "flash" type superheated steam dryer comprises a pipeline in which a drying medium flows, the medium being superheated steam, and a product, for example tobacco material, a fan propelling the drying medium and the product, a superheater for the drying medium, steam, a separator separating the product from the drying medium, and air-locks separating the interior of the drying pipeline from the surroundings, located at the inlet and outlet of the product, preventing losses, i.e. spilling out of the drying medium while allowing for the flow of the product, and a system of automatic control of the process parameters.

[0003] The operation of a "flash" type superheated steam dryer may be divided into the following stages:

- Preparing the machine for the process;
- Stand-by for the start of the drying process;
- Drying process (the actual process);
- Cooling the machine after the drying process.

[0004] The above mentioned functions are controlled by a system of automatic control of the process.

[0005] Process parameters are controlled during the process, such as the drying medium temperature, the oxygen contents in the drying medium, the mass inflow of the product, and the moisture content of the product to be dried at the outlet of the drying process, as the resulting quantity.

[0006] Since the moisture content of the dried product, suitable for further processing, must be confined within very narrow limits, typically less than $\pm 1\%$, precise control of the system and limiting duration of transient non-stationary states, generated at the moments of changing the process stages and by disturbances due to the inertia of the dryer, are of critical importance.

[0007] According to the state of the art, the drying process in "flash" type superheated steam dryers was based on controlled supplementation of steam, the steam replenishing losses of water. According to those methods of drying, when a product to be dried was added or exchanged, disturbances of the drying process were occurring, and the stabilization period was long, until the process achieved the steady state. Frequently, the obtained product had to be recirculated into the drying process or had inappropriate parameters, such as the moisture content, this being very adverse for such products as tobacco material. Often, obtaining an inappropriate product resulted in the necessity of stopping machines, and the start-up was a long-lasting process.

[0008] DE 1432575 discloses a method of drying cut tobacco in a "flash" type dryer in which a drying medium in a form of steam is delivered to a product to be dried and then delivered to a separator which separates the product from the drying medium. In the described method

water is added to the path of the drying medium.

[0009] According to the invention, a method of drying in a flash type superheated steam dryer wherein a drying medium in a form of steam is delivered to a product to be dried and then delivered to a separator, which separates the product from the drying medium, the medium being delivered to a superheater via a fan, whereupon again the product is added, wherein superheated water is added to the path of the drying medium in a controlled manner, preferably directly via nozzles.

Preferably, the superheated water is added upstream the steam superheater.

Also preferably, the superheated water is added upstream the fan.

The superheated water may also be added upstream the product inlet into the dryer.

[0010] Oxygen contents is preferably regulated in the range of 0% - 5%.

[0011] Delivery of the superheated water upstream the steam superheater allows for replenishing the steam in the dryer and for regulation of the oxygen contents in the range from 0% to 5%.

[0012] Introduction of the superheated water upstream the fan decreases the volume while increasing the density of the steam, this resulting in an increase of the flow rate in the process zone.

[0013] Introduction of the superheated water upstream the product inlet into the dryer gives the possibility of rapid change of temperature and flow rate.

[0014] The method according to the invention significantly reduces the periods of transient nonstationary states related to the beginning, interrupting and terminating the drying process, allowing for better stability of the parameters of the product to be dried during the drying process, thanks to the increase of elasticity of the parameters of the dryer operation, and significantly increases the effective production time, thus increasing the efficiency. After injection of the superheated water, almost immediately adjustment of the drying process occurs and no product degradation happens.

[0015] Furthermore, by using the method according to the invention fast compensation of disturbances of the drying process and better stability are obtained resulting in better product quality.

[0016] Furthermore, according to the invention, the delivery of the superheated water may be used to accelerate cooling of the dryer after the drying process.

[0017] According to the invention, the dryer becomes more dynamical, particularly when a product is being changed. The quality of the drying process increases, stoppages are avoided, and neither overdried nor underdried products are obtained.

[0018] The method according to the invention eliminates the necessity of using an external source of steam for approaching the process capacity quickly (achievement of appropriate parameters during the startup of the dryer) when the drying medium is superheated steam.

[0019] The present invention will be understood more

fully in conjunction with the drawings in which:

Fig. 1 shows an arrangement of the dryer in which the superheated water is delivered upstream the steam superheater;

Fig. 2 shows an arrangement of the dryer in which the superheated water is delivered upstream the inlet of the product into the dryer;

Fig. 3 shows an arrangement of the dryer in which the superheated water is delivered upstream the fan.

[0020] Figs 1 - 3 show a modern arrangement of a dryer comprising a pipeline in which a drying medium flows, the medium being superheated steam, and a product, for example tobacco material, a fan propelling the drying medium and the product, a superheater for the drying medium, for example steam, a separator separating the product from the drying medium, and air-locks (not shown) separating the interior of the drying pipeline from the surroundings, located at the inlet and outlet of the product, preventing losses, i.e. spilling out of the drying medium while allowing for the flow of the product, and a system of automatic control of the process parameters (not shown).

[0021] In the method of drying according to the invention superheated water is added to the path of the drying medium in a controlled manner, preferably directly via nozzles.

[0022] The superheated water may be added upstream the steam superheater (Fig. 1), upstream the product inlet into the dryer (Fig. 2), or upstream the fan (Fig. 3).

[0023] The superheated water may be added via the same nozzles, depending on needs.

[0024] Adding the superheated water upstream the steam superheater allows for replenishing the steam in the dryer and for regulation of the oxygen contents in the range from 0% to 5%.

Claims

1. A method of drying in a "flash" type superheated steam dryer wherein a drying medium in a form of steam is delivered to a product to be dried and then delivered to a separator, which separates the product from the drying medium, the medium being delivered to a superheater via a fan, whereupon again the product to be dried is added, wherein superheated water is added to the path of the drying medium in a controlled manner, preferably directly via nozzles.
2. A method according to claim 1, **characterized in that** the superheated water is added upstream the steam superheater.
3. A method according to claim 1, **characterized in**

that the superheated water is added upstream the fan.

4. A method according to claim 1, **characterized in that** the superheated water is added upstream the product inlet into the dryer.
5. A method according to claim 2, **characterized in that** oxygen contents is regulated in the range of 0% - 5%.

Patentansprüche

1. Verfahren zur Trocknung in einem Heißdampftrockner "flash" Typs, in dem das Trocknungsmedium in Form vom Dampf zum Produkt zugeführt wird, welches getrocknet sein sollte und welches dann in den Separator zugeführt wird, welcher das Produkt von dem in den Überhitzer über den Lüfter zugeführten Trocknungsmedium separiert, und wo dann das Produkt erneut zugegeben wird, in dem das überhitzte Wasser auf eine kontrollierte Weise zum Strahl von dem Trocknungsmedium, vorteilhaft unmittelbar über die Düsen, zugegeben wird.
2. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** das überhitzte Wasser über den Dampfüberhitzer hinweg zugegeben wird.
3. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** das überhitzte Wasser über den Lüfter hinweg zugegeben wird.
4. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** das überhitzte Wasser über den Produkteinlauf in den Trockner hinweg zugegeben wird.
5. Verfahren nach Anspruch 2, **dadurch gekennzeichnet, dass** der geregelte Sauerstoffgehalt im Bereich von 0% - 5% liegt.

Revendications

1. Procédé de séchage dans un sécheur à vapeur surchauffée de type "flash" dans lequel un agent séchant ayant la forme de vapeur est délivré au produit séché et ensuite au séparateur, où le produit séché est séparé du agent séchant, l'agent séchant étant amené dans un surchauffeur à travers un ventilateur, après quoi le produit séché est encore ajouté, dans lequel de l'eau surchauffée est introduite dans la circulation de l'agent séchant de manière contrôlée, avantageusement directement à travers une buse.
2. Procédé selon la revendication 1, **caractérisé en ce que** l'eau surchauffée est introduite en amont du sur-

chauffeur du vapeur.

3. Procédé selon la revendication 1, **caractérisé en ce que** l'eau surchauffée est introduite en amont du ventilateur.

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4. Procédé selon la revendication 1, **caractérisé en ce que** l'eau surchauffée est introduite en amont de l'entrée du produit dans le sécheur.

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5. Procédé selon la revendication 2, **caractérisé en ce que** le contenu du oxygène est contrôlé dans les limites de 0% et 5%.

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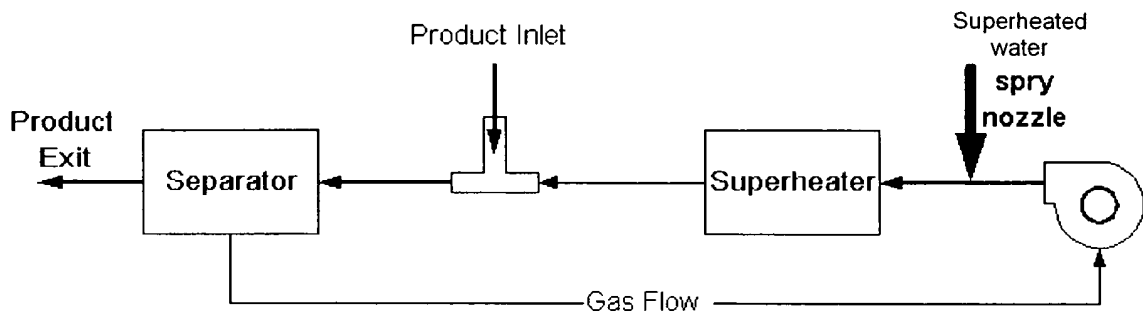


Fig. 1.

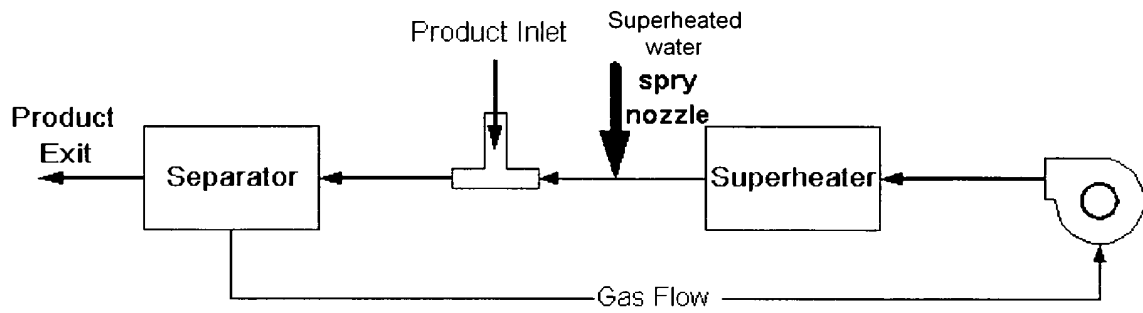


Fig. 2.

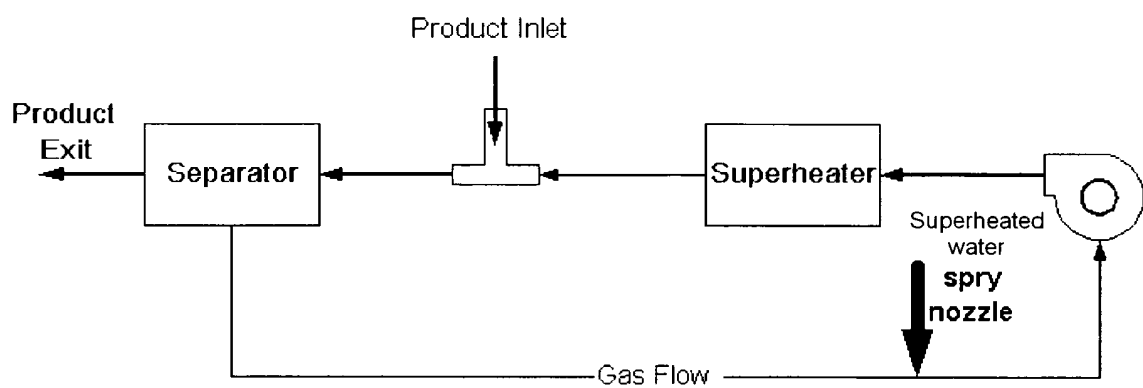


Fig. 3.

REFERENCES CITED IN THE DESCRIPTION

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