Superheated Steam Dryer™ and Processor

Environmental and energy saving drying technology
treatment of oil seeds, beans and proteins

GEA Barr-Rosin
**Superheated Steam Drying and Processing**

**Closed loop system**
The Superheated Steam Dryer (SSD) is a closed loop pneumatic conveying type dryer. The wet solids are fed into the flow of pressurized superheated transport steam by means of a pressure tight rotary valve, plug screw or similar. The Superheated Steam Processor (SSP) can be used for drying and/or heat treatment of many products.

**Indirect heating**
The transport steam is superheated indirectly via a tubular heat exchanger using medium pressure steam, flue gases or thermal oil. Alternatively, electrical heating may be used.

**Fast drying**
In the subsequent drying ducts, moisture is vaporized from the product, forming excess transport steam and lowering its degree of superheat. Normally, the residence time in the system is only 5-60 seconds. For some materials a second superheater is necessary to achieve the required dryness.

**Cyclone separation**
Transport steam and the dried material are separated in a high efficiency cyclone and the product is discharged from the dryer by means of another pressure tight rotary valve.

**Fan Circulation**
From the cyclone, the transport steam is recycled by a centrifugal fan to the inlet of the first heat exchanger. The excess steam generated is continuously bled off.

**Steam generation**
The generated excess steam is normally at a pressure of 0-4barg. It can be reused either directly or after a re-boiler generating clean steam.

**Steam recompression**
If there is no external use for steam from the dryer, it may be recompressed to 10-20bar by using a screw or turbo steam compressor and used as the heating media in the superheater. This type of energy recovery is called Mechanical Vapor Recompression (MVR). Power consumption is usually 150-200kWh/ton evaporated water.

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**Dried Products (SSD)**
- Paper pulp
- Cellulose derivatives
- Mineral wool
- Wood chips
- Peat
- Sawdust
- Bark
- Biomass
- Sewage Sludge
- Manure
- Grass
- Luzern
- Straw
- Bagasse

**Heat Treated Products (SSP)**
- Corn byproducts
- Grain
- Distillers grain
- spent brewers grains
- Sugar beet pulp
- Potato waste
- Fish meal
- Tobacco
- Citrus peel and pulp
- Coffee grounds
- Spices
- Minerals

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**SSD with backmix system and re-boiler for sticky sludge-like materials**

**SSP for the oilseeds industry**
Advantages

Superheated Steam Dryer (SSD)™

Energy recovery
Primary consumption is about 750kWh/ton evaporated water without any heat recovery. 70-90% of the energy is recoverable by reusing generated steam in another process, for heating purposes, or by using MVR. With a condensing turbine the generated steam can produce about 200kWh electricity per ton evaporated water.

Safety and environment
Steam atmosphere eliminates the risk of fires or explosion, since no oxygen is present. Using a closed pressurized steam system there are no particles or volatile compounds vented to the atmosphere, nor any visible steam plume. The possible volatiles form the product can easily be handled or treated in the condensate, where they are collected by condensation of the generated steam.

Ease of operation
Rapid startup, shutdown and response are some benefits of using indirectly heated steam systems. Also, the control of a low and uniform moisture content is easily achieved.

Excellent product quality
The unique drying conditions in the Superheated Steam Dryer™ are favorable for the drying of many products where quality is important. There are no air or flue gases that can oxidize or contaminate the product. Controlled temperatures and short residence times (5-60 seconds) make the technology suitable for drying of sensitive products. Due to the drying principle, a very uniform dryness of the product is achieved. The conditions in the dryer make it possible to provide heat treatment and/or effective sterilization of products.

Superheated Steam Processor (SSP)

Conditioning
The Superheated Steam Processor can be used for conditioning of whole seeds or beans in only 5-10 seconds. Also, cracked, de-hulled or flaked raw material can be treated. The unique concept of using the steam provides a way to deactivate enzymes and to optimize moisture content before expelling the extraction. The impact on oil quality after water de-gumming is obvious to the industry, but also the protein for ruminants can be improved.

Quality of oil and lecithin after simple water de-gumming
Enzymes are completely deactivated due to the immediate rise in temperature and the uniform treatment at high turbulence. An excellent oil quality can be produced by a simplified physical refining and further savings achieved in the chemical refining:
- very low content of NHP after water de-gumming
- easily refined oil
- increased oil yield from chemical refining
- reduced P and COD from chemical refining
- low mineral content

Rumen protected protein
Due to the heat treatment in a moist atmosphere at high temperature but short duration, the protein utilization will be increased when fed to ruminants. The amount of protein bypassing the rumen will increase by about 50% to be used in the intestine for increased milk production and weight gain (meat). It is assumed this effect is due to a change of protein molecular structure to a less water soluble open protein compared to the native global structure. The protein is not denatured during the Superheated Steam Process and the intestine digestibility is maintained.

Additional benefits
- 50% higher utilization of protein
- healthier cows, higher fertility
- reduced pollution from nitrogen output
- no salmonella or other bacteria in the feed
- reduction of anti-nutritional factors, trypsin inhibitor and urea activity, etc.
- gelatinization of starch for piglets
- no reduction in feed quality for swine and poultry

Added Value

Energy recovery
Integration in CHP plant with SSD for biomass pellet production. 90-95% of the energy recoverable as electricity and district heating.

Chemical recovery
Stripping of chemicals from solids, for example acetylated fibers. Better Chemicals are recovered as condensate.

Less taste change
Drying and expansion of tobacco without change of taste and quality.

Increased protein value
Increased bypass protein value in cattle feed – more milk and meat per kg of feed.

Increased oil value
Better quality of oil and longer shelf life.

Sterilization
Complete killing of all bacterial in animal feed, fertilizer and sludge.
We live our values.
Excellence • Passion • Integrity • Responsibility • GEA-versity

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