

# ZLZ High Speed Centrifugal Spray Congealer



## . Advantages and Shortages of Centrifugal Spray Congealer

### . Main advantages

1. The completion of the market are very intensive these days. It is necessary to increase the processing capacity with plant. It is very difficult to increase the capacity with traditional design, while Centrifugal spray congealer could be very large, such as 20 tons per hour.

2. Powder and irregular flake materials are very hard to compete with the domestic and overseas suppliers. Regular pellets has the characteristics of lowest flying powder, good flowability and easy metering, well dispersion and easy dissolution, as well as stability, so the product is very competitive.

3. Centrifugal spray congealing technology is used to improve the operating conditions and environment, control the flying powder in the processes of granulation, transportation and packaging.

4. Compare to the traditional technology, centrifugal spray congealer has the advantages of large capacity, uniform pellets, high yield and convenient operation.



### . Main shortage

The investments on equipment and workshop are higher.

### . Design

The congealing process of melted material is generally divided into three stages: the first stage is pre-cooling process. The melted material is cooled from feeding temperature to melting point. The second stage is solidification, the melted material liquid will be solidified, and the temperature normally keeps almost the same in this period. The third stage is cooling and hardening of the solid material. The product will be cooled in this stage.

The time of the above three stages differs from each other according to the properties of different materials. In terms of the conversion process of the materials from liquid state to solid state inside the spray tower, we build a data model, which guides us to calculate the diameter of the tower body, so to choose the specification of the equipment.

To simplify the calculation, we make an assumption: a drop of material is to heat exchange with infinite cold air. We have got the following relative calculation:

Pre-cooling time of Melted material:  $\theta_d(s) = (T_d - T_k) / (T_c - T_k) = \text{Exp}(H_d \theta_d / D_c P_d)$

Solidification time:  $\theta_c(s) = D P_c L_f / H_c (T_c - T_k)$

Cooling and hardening time:  $\theta_s(s) = (T_c - T_k) / (T_s - T_k) = \text{Exp}(H_s \theta_s / D C_s P_s)$

$T_d, T_c, T_s, T_k$ : the congealing temperature, solidifying point of melted material, discharging temperature of pellet product and cooling air temperature ( $^{\circ}\text{C}$ )

$H_d, H_c, H_s$ : the heat transfer factors between the material and cooling air during the periods of pre-cooling, solidification, cooling and hardening ( $\text{Kcal}/\text{m}^3 \cdot \text{s} \cdot ^{\circ}\text{C}$ )

$L_f$ : Latent heat of solidification

$P_d, P_c, P_s$ : The constant pressure density of the material when it is melted material liquid, during solidification, and already solidified ( $\text{kg}/\text{m}^3$ )

$D$ : Diameter of pellets (mm)

So we get the total time:

$\theta(s) = \theta_d + \theta_c + \theta_s$

Calculate based on the density of the product to calculate the lowering down speed  $V_t$ , so the height of the tower should be:  $H = \theta \cdot V_t - L$

Calculate the running distance of material under centrifugal force ( $L$ ), and decide the diameter of the tower.

$D = 2L$



## . Main Factors relating to congealing process

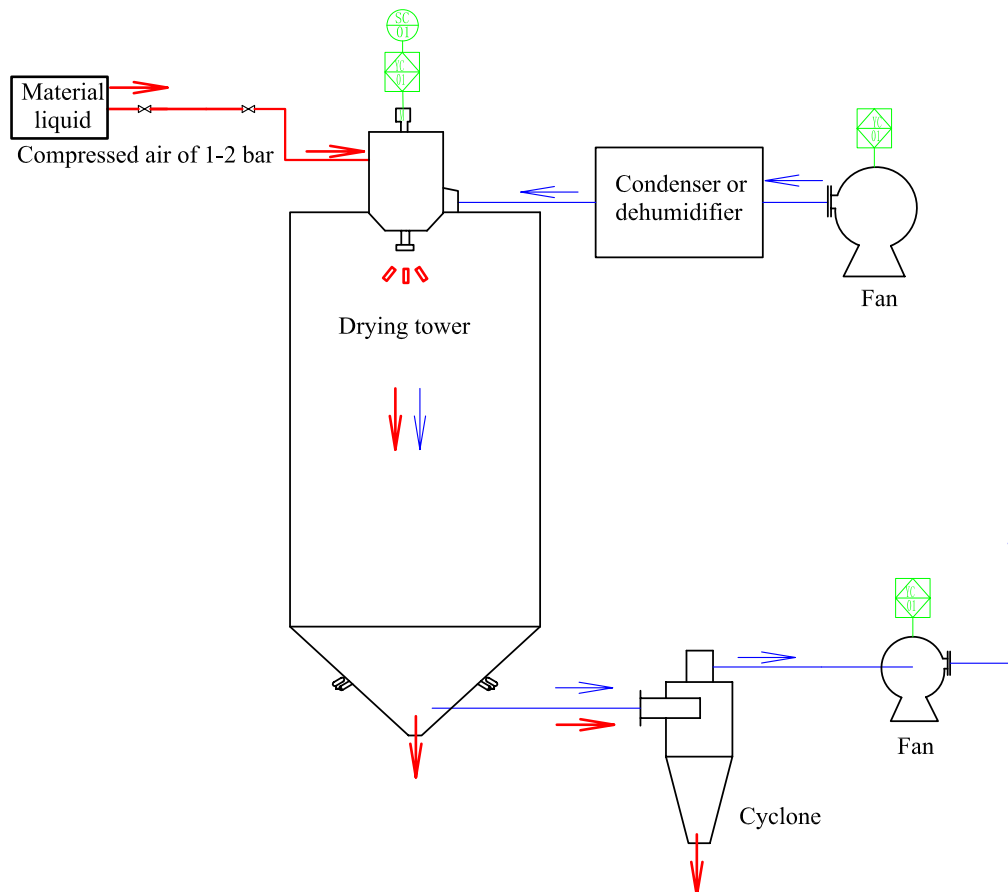
1. Material temperature: the material temperature influences the working capacity of the equipment. We normally consider the temperature between the melted material feeding temperature and melting point, or solidification temperature. The capacity is lower when the feeding temperature is higher. When the melted material temperature is too high (such as the temperature is more than 50 ° C higher than melting point or solidification temperature), it is suggest to cool the product before feeding, so to fully utilize the capacity of the equipment.

2. Property of the material. The solidification properties of different products are always different. The main properties that influences the congealing processes are melting point (or softening point), density, heat transfer factor, crystallization property, and viscosity (or surface tension) etc. The viscosity and surface tension mainly influence the quality of pellets, and others influence the cooling and solidifying speed, so to influence the capacity. Generally speaking, The higher melting point and density, the bigger heat transfer factor, the smaller latent heat, the bigger capacity, and vice versa.

**Special Note:** This kind machine has a extremely high collecting rate, almost no dust exhausted with the air. Some of our customers have produced hundreds tons of materials; the cyclone only collects less than 1kg fine powder. So there is need for one cyclone + bag filter. We normally suggest only one cyclone, or exhaust air directly from the drying tower.

## . Flowchart

### . Open System





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## . Technical Parameters

Specification	ZLZ-500	ZLZ-1000	ZLZ-2000	ZLZ-3000	ZLZ-5000	ZLZ-10000
Air Inlet Temp	-20°C -20°C , Adjustable					
Air Exhaust Temp	20-40°C (depend on the properties of the product, and URS)					
Nominal Processing Capacity (Kg/h)	500	1000	2000	3000	5000	10000
Main Pellets Diameter Range (µm)	100-2000	100-2000	100-2000	100-2000	100-2000	100-2000
Cooling method	Cooling dehumidifier					
Cooling Tower Diameter (mm)	6500	8000	8500	9000	9500	10000
Overall Dimensions (m)	According to the specification and plant layout					
Collection rate	99-99.99% , depend on the properties of the product and configurations					

### Remarks:

1. The above parameters are calculated according to the most popular congealing material (stearic acid). Provided that the material is different, the parameters will also be different. Please contact us before choose the specifications. And it is suggested to make trial before finalize the order

2. Cooling source: when the cooling source is different, the capacity of the same equipment could be very different. Please make sure use the cooling source required by us.

