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Theory of solid gas separation, cyclone separators, Bag Filters

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Outline

- Introduction
- Powder separation systems
- Cyclone
- Bag filters
- Wet scrubbers
- Electrostatics Precipitators



Introduction

Powder Separation systems

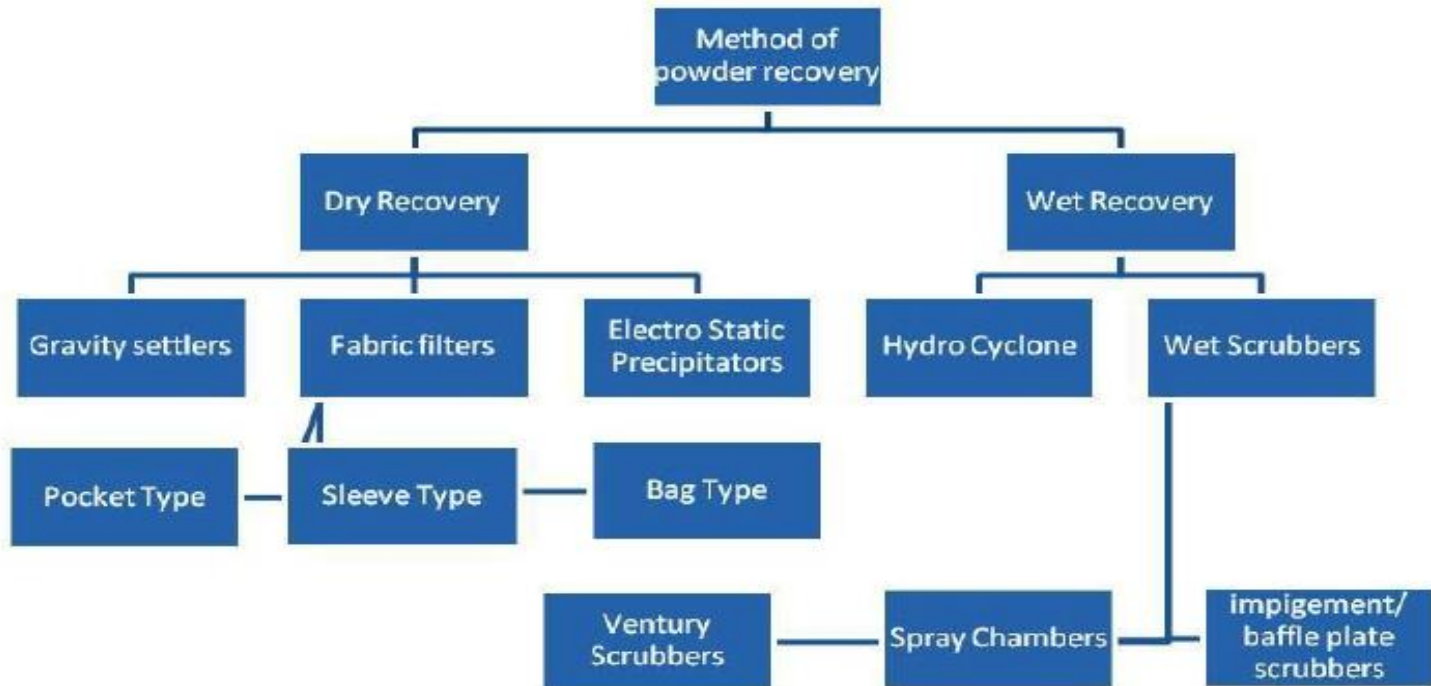


Fig. Classification of method of powder recovery



The most used separators in the milk powder industry are:

Cyclone

Bag filter

Wet Scrubber

Cyclone

- 1) The critical particle diameter
- 2) The cut size
- 3) The overall cyclone efficiency

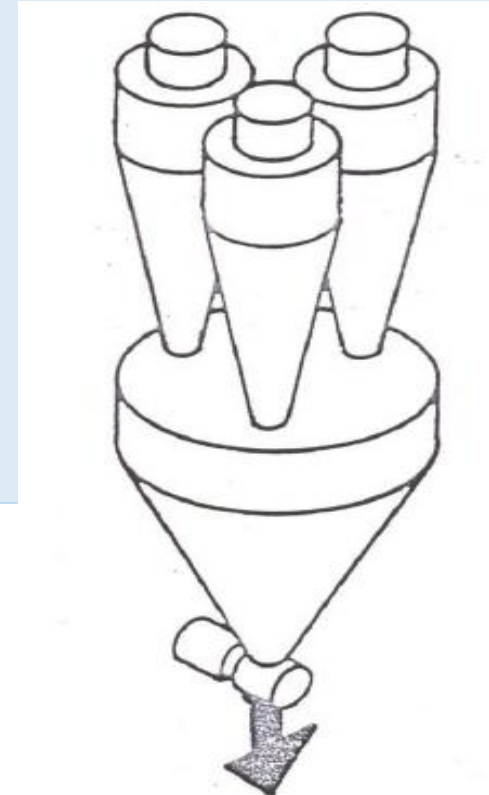
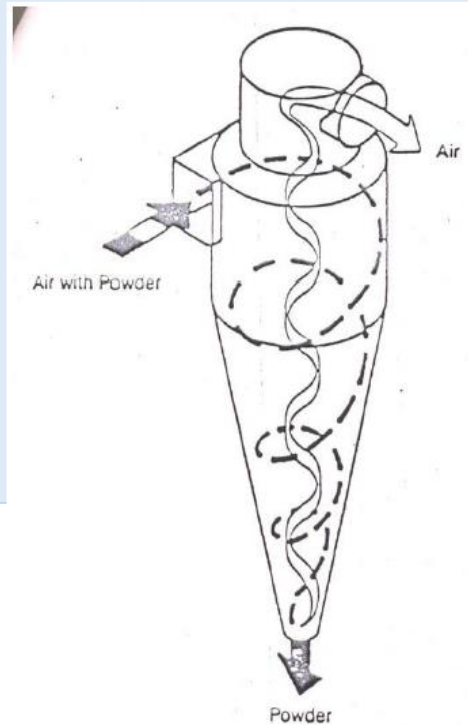


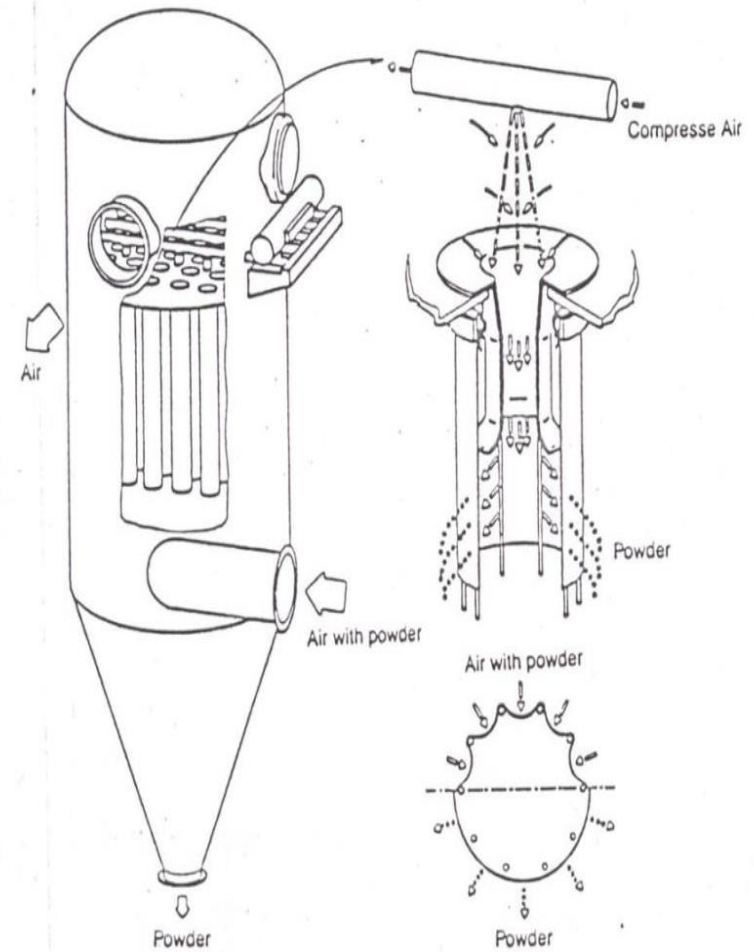
Fig. 15.2.1 Cyclone separator



Bag Filters

Average powder loss from a normal high-efficient cyclone should not exceed 0.5% when spray drying skimmilk. However, local authorities may conclude that 0.5% is too high due to pollution, thus requiring a final cleaning of the air.

- High collection efficiency for smallest size particles. For particles up to 1 micron size it provides 99% collection efficiency. However, it can remove a substantial quantity of particles as small as 0.01 micron size
- Moderate pressure drop of the order of 7-15 cm of water gauge.
- Dry recover, and
- Absences of corrosion and rusting problem.





Wet Scrubbers

The wet scrubber has now been known for many years in the chemical industry. It is based on the venturi scrubber principle. When introduced in the dairy industry, it proved especially efficient, i.e. an efficiency very close to 100%.

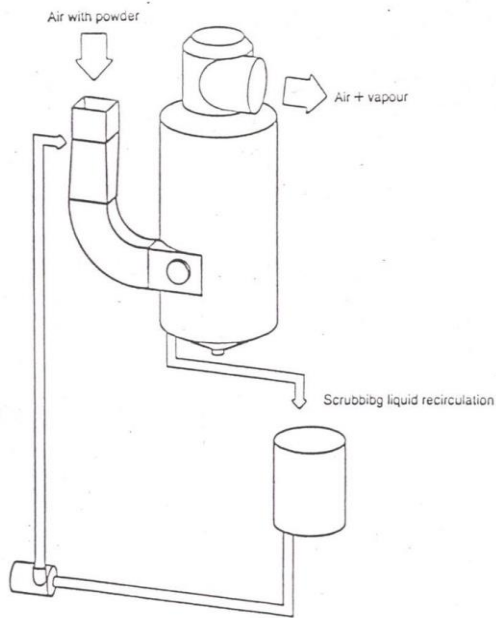


Fig. Sanitary Wet Scrubber

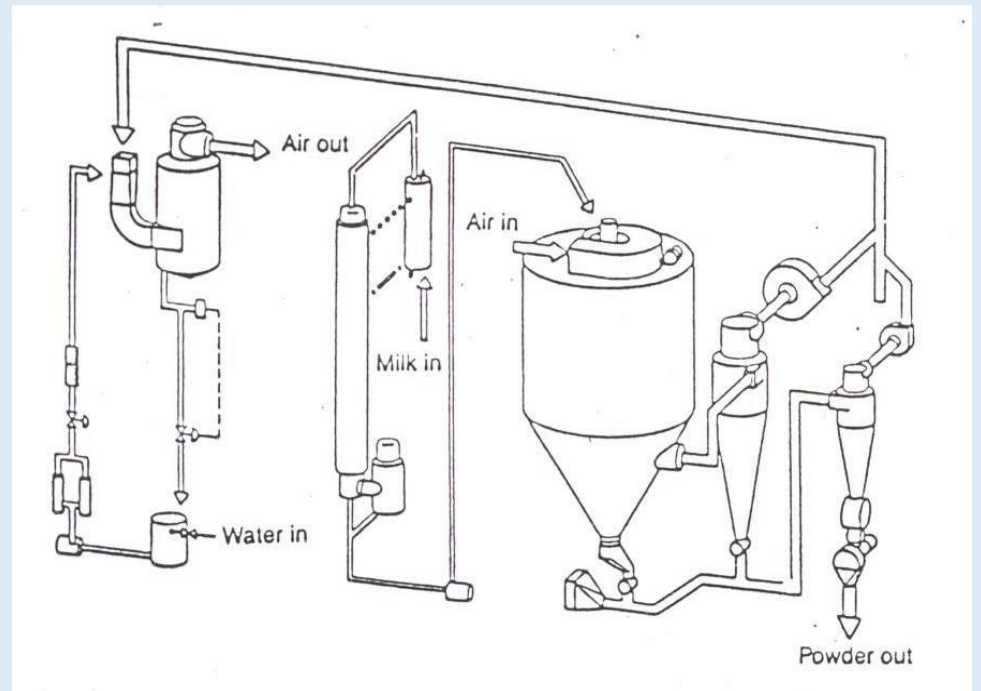


Fig. Wet scrubber recycled with water



Advantages and disadvantages of wet scrubbers

Advantage	Disadvantages
1.Ability to recover solids as well as liquids.	1.May create liquid disposal problem if the same is hot reused.
2.Ability to handle high temperature, high humidity gas streams.	2.Product is collected wet which subsequent drying.
3.Initial cost is usually low.	3.Pressure drop is higher. Thus operating cost is more.
4.Small space requirement.	4. Sever corrosion and maintenance problem.



Electrostatic Precipitators

- The device works on the principle that if one or more of the materials in a mixture can be imparted surface charge, on or before entering the electrostatic field, those charged grains will be repelled from one electrode and attracted towards other depending upon the polarity of the electrode.
- Thus in ES precipitator, strong electric field is created with the help of rectifier and transformer unit and dust laden air flows, that chamber.
- Powder particles develop negative polarity by combination with air ions. These particles move towards positively charged collecting plates where from they fall in separate chute after getting neutralized.
- High D.C voltage of the order of 50,000 volt is used.



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Thank you