

Module 8 Fluidized Bed drying

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Introduction

- Fluidized bed dryers (FBDs) are used extensively for the drying of wet particulate and granular materials, and even slurries, pastes, and suspensions, that can be fluidized in beds of inert solids.
- They are commonly used in processing many products such as chemicals, carbohydrates, foodstuff, biomaterials, beverage products, ceramics, pharmaceuticals in powder or agglomerated form, health-care products, pesticides and agrochemicals, dyestuffs and pigments, detergents and surface-active agents, fertilizers, polymer and resins, and tannins.
- They are also useful in manufacturing products for calcination, combustion, incineration, waste management processes, and environmental protection processes.
- Important advantages of fluidized bed operation include good solids mixing, high rates of heat and mass transfer, and easy material transport.
- For drying of powders in the particle size range of 50–2000 μm , fluidized beds compete successfully with other more traditional dryer types, for example, rotary, tunnel, conveyor, or continuous tray.

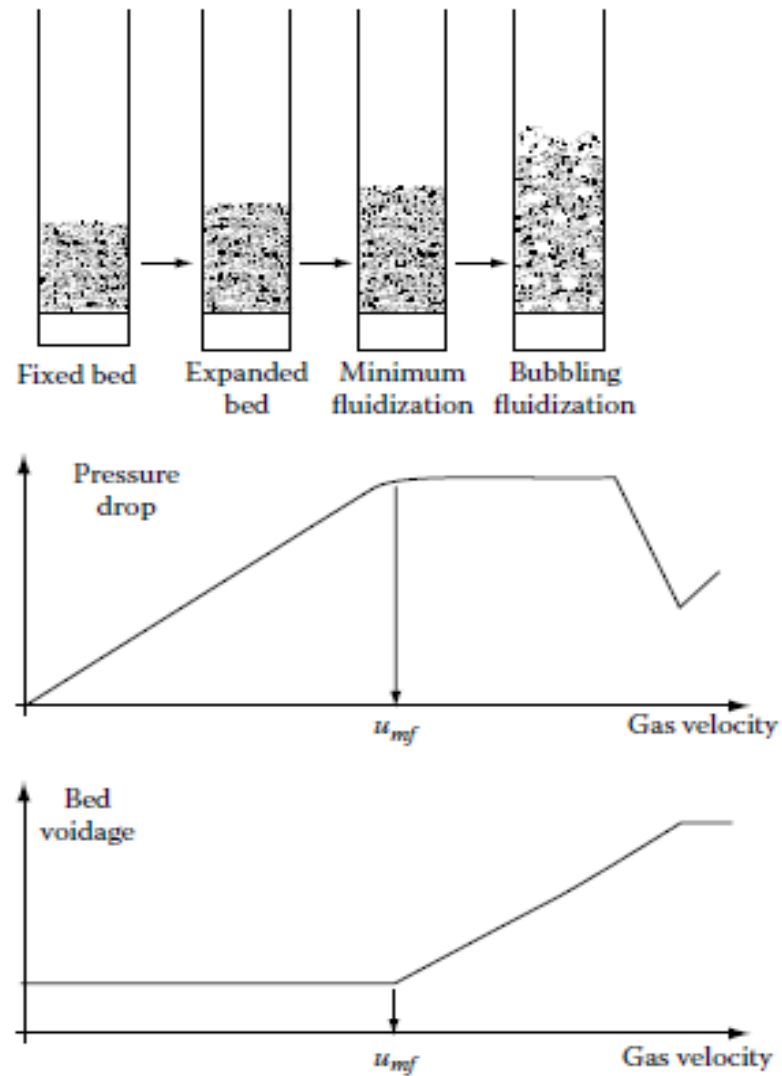


Fig. Various regimes of a bed of particles at different gas velocities

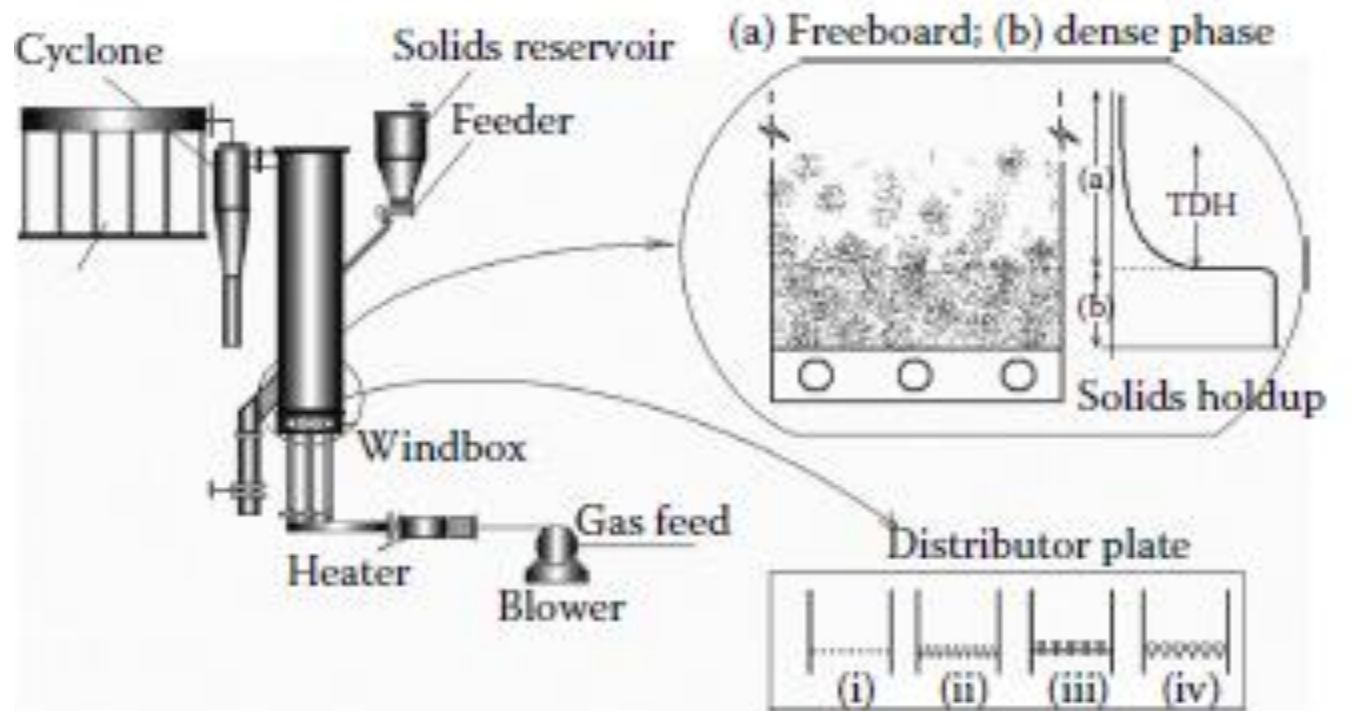


Fig. Typical fluidized bed drying setup. Zones in a fluidized bed with its corresponding solids holdup are shown in the upper right side images. Types of perforated distributor plates that can be used are shown in lower right side image.

Types of FBDs: Classification and selection

1. Conventional FBD

1. Batch FBDs
2. Semicontinuous FBDs
3. Well mixed, Continuous FBDs
4. Plug-flow FBD

2. Modified FBD

1. Multistage/Multiprocess FBDs
2. Hybrid FBDs
3. Pulsating FBDs
4. FBDs with immersed Heat exchangers
5. Mechanically assisted FBDs
6. Vibrated FBDs
7. Agitated FBD/Swirl Fluidizers
8. FBDs of Inert particles
9. Spouted Bed Dryers
10. Recirculating FBDs
11. Jetting FBDs
12. FBDs with internal baffles
13. Superheated Steam FBDs
14. Fluidized Bed freeze dryers
15. Heat pump FBDs

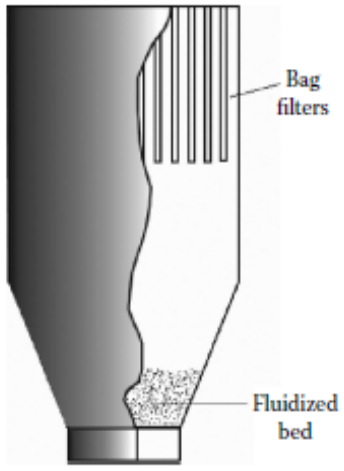


Fig. Batch FBD

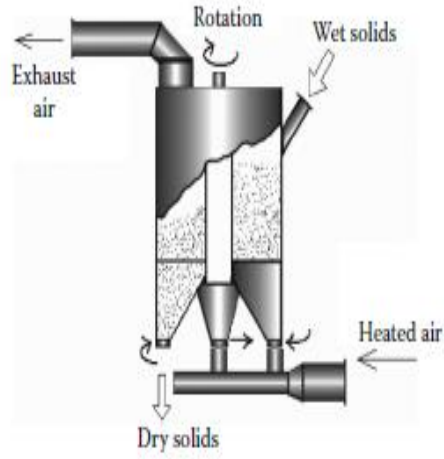


Fig. Semicontinuous FBD

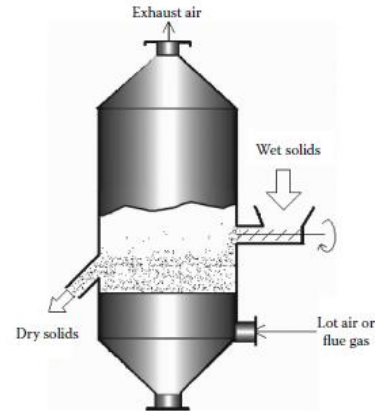


Fig. Well Mixed FBD

Conventional FBDs

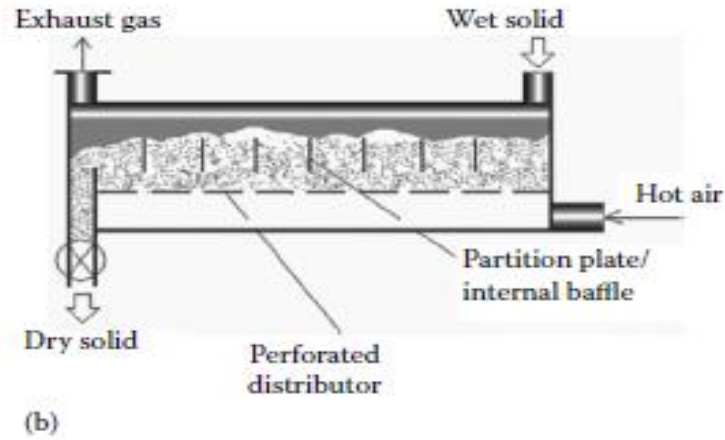
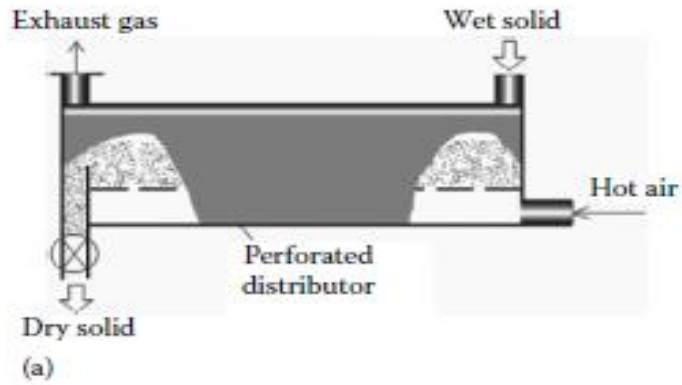


Fig. Plug flow FBDs (a) straight path (b) reversing path

Fig. Hybrid cyclone FBD

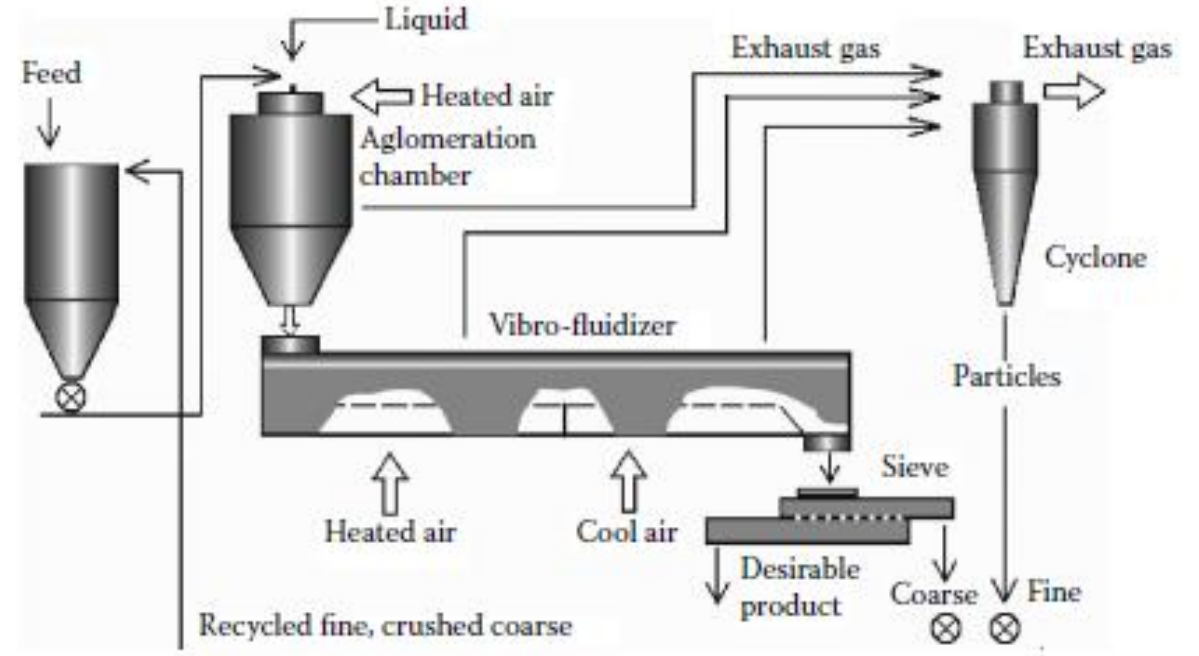
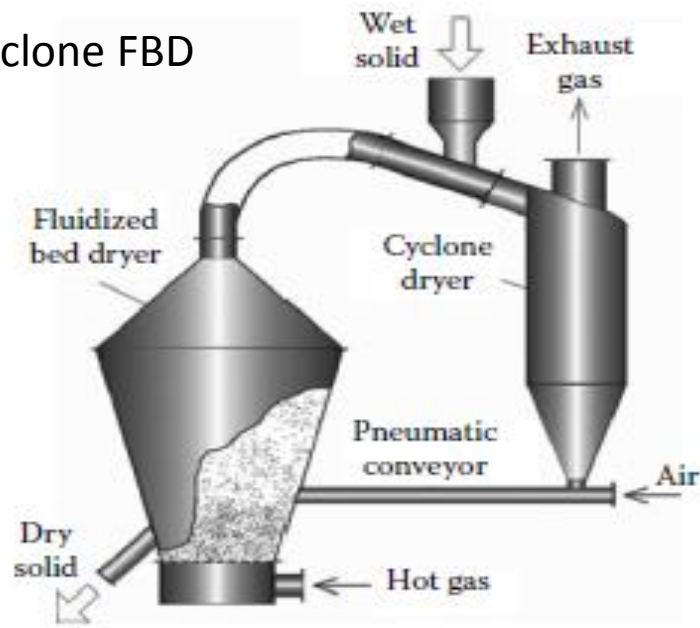


Fig. Multistage fluidized bed spray dryer

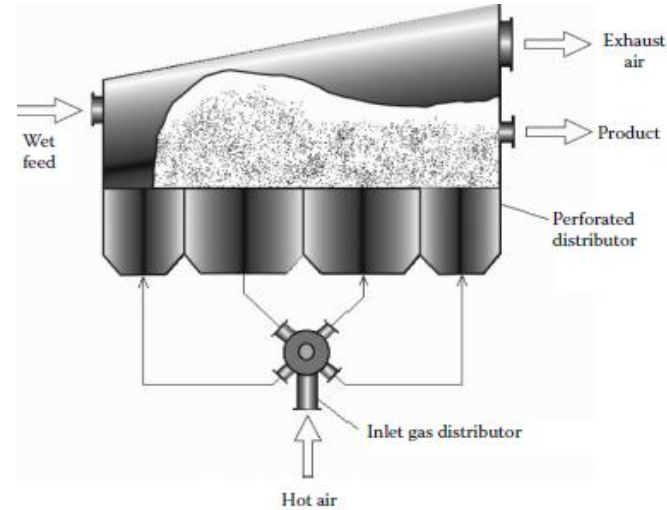


Fig. Pulsating FBD

Thank you