

Low Temperature Drying Technology by Vacuum Drum Dryer

Hideo Miki, Naohiro Wanda, Takeshi Mukai, Toshiro Satake,

Katsuragi Industry Co., Ltd., 5-4-6, Minamitsumori, Nishinari-ku, Osaka 557-0063 Japan

Drum dryers are used in various industrial fields as a drying machine which separates dry matter from feed solution by evaporating solvent. Vacuum drum dryer is good for drying foods including heat sensitive material like protein or removing solvent from low-softening-point resin solution. Though vacuum freeze dryer or spray dryer is generally used for this kind of drying process, vacuum drum dryer is more cost effective in terms of facility cost and running cost. This article shows some actual operating conditions of vacuum drum dryer.

Vacuum double drum dryer consists of hollow and cylindrical drums which rotate inward direction and scraper units which scrape off dry matter on a drum surface. Drum surface is heated by saturated steam or hot water supplied into the drum. Feed solution is supplied to the gap between the drums. The solution is heated and concentrated there. Then it adheres to the drum surface, is dried until certain water content during drum rotation, scraped off by scraper unit and collected as dry matter. Clearance between the drums are 0.1 to 0.3mm. Thin sheet or powder like dry matter is produced by appropriate operating conditions.

At drying process, thermal denaturation of protein, oxidization of fat, damage to vitamins, browning of carbohydrate and dissipation of flavor tend to happen, and material including sugar often becomes a paste state and is difficult to be a dry powder.

Drums usually rotate at rotation speed between 1 and 5rpm. Drum surface temperature and process pressure are optimized depending on property of feed material. Solvent content and dry matter shape are subject to flow rate ($\text{kg}/\text{m}^2\text{h}$) and clearance between drums. If optimizing the operating conditions doesn't help to prevent feed solution from being a paste state, proper amount of excipient like dextrin is added in some cases.