Scale up considerations in fluidized bed granulation: air flow rates and air pressure distribution

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Fluidized bed granulation is now well established as a method for the preparation of granulates for tableting. The influence of the composition and procedure adopted, on the granulate characteristics has been investigated for both batch production (Davies & Gloor, 1971, 1972, 1973) and continuous production (Scott & others, 1964; Rankell & others, 1964). Studies of the mixing, granulating and drying steps have also been undertaken (e.g. Thurn, 1970). Experiences during scale-up from laboratory to production equipment have been reported (e.g. Gupte, 1973) but no reliable scale-up procedure has been completely elucidated. In the work reported here, comparisons of the air flow rate and air pressure distribution in two fluidized bed granulators (models WSG 5 and WSG 30, Glatt, Haltingen, West Germany) are made.

By means of a Pitot tube linked to a Micromanometer (Furness Controls Limited, Bexhill-on-Sea) the effect of load (Lactose B.P.) on the air flow rate through each piece of equipment has been determined over a range of inlet and outlet air valve settings. In each case, it is shown that an increase in load (a) reduces the air flow rate through the equipment and (b) reduces the useful range of the inlet and outlet air valve settings. By comparing the air flow rates obtained in each apparatus a scale-up factor of 5 is indicated. This compares well with the factor obtained from the dimensions of the two models.

Static pressure measurements were made at three points in the WSG 5 and WSG 30; namely, beneath the distributor plate of the product container, in the expansion chamber and above the exhaust filter. For both models, the outlet valve had a greater effect on the air pressure than the inlet valve, and the pressure change across the distributor plate exceeded that across the exhaust filter. However, the maximum reduction in pressure achieved in the expansion chamber was greater for the WSG 30 than for the WSG 5 (approx. 500 and 350 mm water respectively); a fact which may result in different rates of drying on scale-up.

When loaded with lactose (5 and 30 kg in the WSG 5 and WSG 30 respectively) the pressure change across the exhaust filter of both models was followed during several shake cycles. It was found that the filter resistance increased during the period between shakes but returned to its original value immediately after shaking, i.e. the shaking is effective in removing fines from the bag.

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Particle size obtained on disintegration of phenylbutazone tablets and its relation to dissolution rate

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The biological availability of a drug in a solid dosage form depends upon the rate at which it achieves solution. The disintegration test for coated or uncoated tablets (B.P. 1973) is the only official method by which some assessment of bioavailability may be obtained. However, disintegration time has often been shown (Lowenthal, 1972) to be independent of dissolution rate, and Sandell & Helmstein (1971) have suggested replacement of the USP XVIII disintegration test with a refined procedure employing a wet sieving apparatus. This work examines the relationship between particle size after disintegration and the dissolution profiles obtained for phenylbutazone tablets from several manufacturers.