THERMAL DISINFESTATION OF WHEAT IN A SPOUTED BED

by

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Introduction

Thermal disinfestation of wheat and other grains has been shown to be a feasible alternative to chemical methods (e.g. Winterbottom, 1922; Dzhorogyan, 1957; Dermott and Evans, 1978). Its main advantages are its rapidity and its residue-free product. Disinfestation is achieved by subjecting the grain to temperatures that are lethal to all developmental stages of insects within the grain. Typically this means heating the grain to temperatures of 55 to 65°C for periods of minutes or seconds. On the other hand, over-exposure is undesirable since it could impair grain quality. These criteria require a process in which individual grains experience the same temperature-time history.

Disinfestation has been achieved by direct-contact heating of the grain by hot air in fluidized beds (Dermott and Evans, 1978; Vardell and Tilton, 1981; Evans *et al.*, 1983; Thorpe *et al.*, in press) and pneumatic conveyors (Dzhorogyan, 1957; Fleurat-Lessard, 1980). In this paper we describe the use of an alternative gas-solids contactor, known as the spouted bed, that combines features of the fluidized and pneumatic systems. Following a brief review of spouted bed operation we discuss its disinfestation capabilities.

Spouted Bed Operation

Spouted beds were developed in the mid 1950s for wheat drying, and have been used subsequently in many other applications (Mathur and Epstein, 1974). The technique requires the gas (hot air) to be introduced as a high velocity jet into the base of a conical-bottomed vessel containing the bed of particles. Provided a minimum gas velocity is exceeded a 'spout' is formed which conveys particles upwards until they leave the bed. The particles then fall back to the 'annulus' region that surrounds the spout and resembles a downward-moving packed bed. Particles therefore tend to cycle around the bed, travelling up the spout and down the annulus. The incoming gas passes up the spout and also flares radially into the annulus, so that effective gas-solid contact is achieved.

Spouted beds are well suited to particles greater than 1 mm in size and they have proved popular for grain drying. Advantages over other systems are the lower pressure drop (typically 70% of that for a fluidized bed), the regular particle motion, and the ease of operation (Mathur and Epstein, 1974).