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## DRUM GRANULATION OF SINGLE SUPER PHOSPHATE FERTILIZER: EFFECT OF PROCESS VARIABLES AND OPTIMIZATION

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### Abstract

In this work we investigated the effects of the drum rotation speed, liquid-phase ratio, granulation time, and drum hold-up on the single super-phosphate granulation performance in a rotary drum. Regression techniques were used to quantify the effects of those variables on the granulation efficiency and product properties. Equations to predict these responses as functions of the studied variables were proposed. Sequential Quadratic Programming (SQP) algorithm was used for the optimization study. The results showed that the levels of the process variables that led to the highest efficiency were not the same for the highest granule hardness. From the results of this study it is possible to identify conditions that improve the granulation efficiency and the physical properties of the final product.

**Keywords:** single super phosphate; granulation; rotary drum

### 1. Introduction

The granulation of powders by size enlargement is desirable or necessary in many industrial processes. Segregation of powder constituents can be reduced by binding the powders together, in this way improving solid flowability and reducing dust, which facilitate the product handling [1]. Approximately 60% of chemical industrial products are produced in granular form [2]. In the fertilizer industry, granulation is a key process. The handling of granules is more desirable than the powder because less suspension particles are formed both inside the factory and/or during plantation. In addition, granulated fertilizers are more beneficial and functional than the powder products. Powder products easily dissolve in soil during irrigation and are not able to supply sufficient nutrients to the crops.

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