“An Innovative Approach to Granulation Design”

By: Robert Tinsley – Hatch

Bio:

Robert Tinsley, E.I. has over two years of experience in chemical engineering at Hatch as part of the process engineering group. He has an undergraduate degree in Chemical Engineering from the University of Florida Herbert Wertheim College of Engineering. Robert has been involved with projects in phosphoric acid plants from conceptual phases through detailed design. He has simulated equipment and processes to evaluate existing and developing designs, analyzed plant hydraulics for process systems, and completed economic and optimization evaluations of conceptual designs for chemical process plants.

Abstract:

Rotating equipment that allows for the agglomeration and growth of a uniform granule from liquid feed and dry recycle material is essential in the fertilizer industry. The granulator is widely used in modern fertilizer plants; performance of this equipment relies on a complex interaction between internal elements. Historically, the design and placement of granulator internals has largely depended on empirical design, which has evolved into a spreadsheet approach. While largely successful, this method may require some field iterations to revise the spreadsheet design. To improve this method, Hatch has developed a proprietary 1D bed profile model that mathematically determines the bed height along the length of the granulator. Unlike basic empirical residence time calculations (which are primarily based on slope, length, speed and diameter of the granulator) the bed profile model is also dependent on the flow rate of solids, solids density, dynamic angle of repose and dam configurations. Further, Hatch specializes in modeling rotating equipment such as the granulator. Software options such as Discrete Element Modelling (DEM) modeling can be used to verify existing industry assumptions on bed behavior and optimize design and placement of granulator internals such as the ammonia sparger and slurry sprays. This software can be used to predict the bed location, and how the bed movement is impacted by the ammonia sparger location and dam height. It can also be used to predict the size gradient of particles in the rotating bed. This optimization could have several benefits including increasing product quality and decreasing OPEX such as power, ammonia feed, and maintenance costs. These benefits have already been seen in other industries with similar rotating equipment.