Leveraging Automation and associated Workflows for Accelerated Process Development

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Continuous manufacturing has garnered significant attention from academia and found numerous applications in pharmaceutical companies since the early 2000s. This innovative approach has enabled the exploration and implementation of previously thought impossible transformations, leveraging the efficiency of process specificity. However, the drivers and triggering points for adopting such technology in the agrochemical industry differ slightly from those in pharmaceuticals. In agrochemistry, production scales are typically 2 to 4 orders of magnitude greater, while profit margins are 2 to 4 orders of magnitude lower. These factors have led to a more cautious and gradual deployment of cutting-edge technologies like micro-reactors in the agrochemical sector. Nevertheless, it is crucial to recognize that continuous manufacturing has been employed for decades in the bulk chemical industry, particularly when fixed costs dominate over variable costs. Indeed, certain high-volume agrochemicals have been produced continuously since their launch, driven by critical factors such as safety considerations, process windows, and fixed costs identified as major contributors to overall expenses. This presentation will focus on establishing the tools and workflows necessary to develop scalable, predictable, and transferable continuous processes. Emphasis will be placed on the importance of data quality, and automation concepts will be introduced. The drivers to continuous manufacturing in the agrochemical industry will be discussed and an example of continuous manufacturing for an active ingredient intermediate will be showcased.