

## REVIEW ON PROCESS ANALYTICAL TECHNOLOGIES FOR TABLET GRANULATION PROCESS

Kulkarni D. M.\*, Dhakne R. B.

Received: 12 Sept. 2022 / Accepted in revised form: 15 Sept. 2022 / Published online: 23 Sept. 2022

### ABSTRACT:

The advancement of process analytical technologies (PAT) has revolutionized the pharmaceutical industry by providing faster, more accurate and cost-effective methods for analyzing drug quality. One particular application that has greatly benefited from PAT is tablet granulation processes, which are used to create tablets with uniform size and shape. Online PAT refers to the real-time monitoring of process parameters and quality attributes during granulation. It helps to optimize the process by reducing variability and improving product quality. The use of process analytical technologies (PAT) in the tablet granulation process can help to optimize and control the process, ensuring consistent quality of the final product. There are some drawbacks to using PAT, such as the need for specialized knowledge and skills and high initial investment costs. With further advances in this field, it is expected that PAT will become increasingly utilized by pharmaceutical companies worldwide.

**Key words:** *Process Analytical Technologies, PAT, Tablet Granulation Process.*

**Corresponding author:** Mrs. Dipali M. Kulkarni, Yash Institute of Pharmacy, Aurangabad (M.H.) India. 431136

**Email-** [dipa.manikr@yahoo.com](mailto:dipa.manikr@yahoo.com)

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### INTRODUCTION:

The advancement of process analytical technologies (PAT) has revolutionized the pharmaceutical industry by providing faster, more accurate and cost-effective methods for analyzing drug quality. One particular application that has greatly benefited from PAT is tablet granulation processes, which are used to create tablets with uniform size and shape. In this blog article, we will review some of the most important PAT tools available for tablet granulation processes and provide an overview of the benefits they offer.

### TYPES OF PAT:

PAT can be classified into three types: online, offline and *in situ*. Online PAT refers to the real-time monitoring of process parameters and quality attributes during granulation. It helps to optimize the process by reducing variability and improving product quality [1]. Offline PAT is used to monitor batch-to-batch variation and understand the link between process parameters and product quality attributes [2]. *In situ* PAT is used to monitor the dynamic behavior of process parameters and quality attributes in real time.

### PROS AND CONS OF PAT:

Process analytical technologies (PAT) is a system used to design, analyze, and control

pharmaceutical manufacturing process. It can be used in various stages of drug development and production [3].

PAT has many benefits, such as reducing manufacturing costs, improving product quality, and increasing process understanding and control. However, there are also some drawbacks to using PAT. These include the need for specialized knowledge and skills, high initial investment costs, and the potential for data overload [4].

#### **APPLICATION OF PAT IN TABLET GRANULATION PROCESS:**

The use of process analytical technologies (PAT) in the tablet granulation process can help to optimize and control the process, ensuring consistent quality of the final product [5]. Various techniques such as near-infrared spectroscopy, Raman spectroscopy, and X-ray fluorescence spectroscopy can be used for real-time monitoring of the granulation process [6]. These techniques can provide information on parameters such as particle size, moisture content, drug loading, and binder concentration. The data collected can be used to control the process variables in order to produce tablets with desired physical and chemical properties.

#### **CONCLUSION:**

The application of process analytical technologies for tablet granulation is a promising technique that enables the production of quality tablets with minimal effort. These techniques provide valuable real-time data which can be used to optimize formulation and processing parameters in order to obtain improved product quality. This review has highlighted the potentials and challenges associated with these technologies, as well as potential strategies for their implementation in an industrial setting. With further advances in this field, it is expected that PAT will become

increasingly utilized by pharmaceutical companies worldwide.

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