Industry
Pharmaceutical

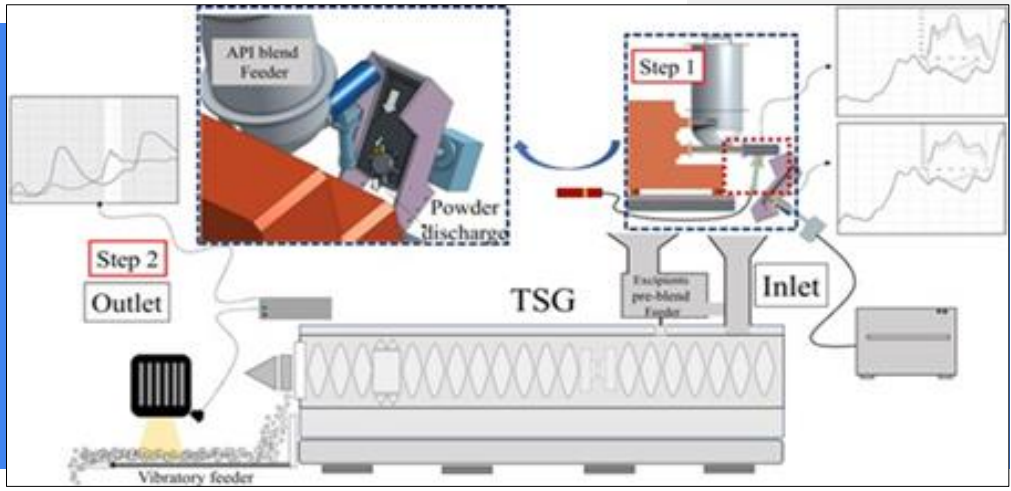
Applications
Data Modeling
Data Analytics

Solutions
Energy Efficiency

CESMII
THE SMART MANUFACTURING INSTITUTE

PROJECT CASE STUDY

Using Smart Manufacturing for the Energy-Efficient Manufacturing of Pharmaceutical Products



PROJECT LEAD

Rutgers

PROJECT TEAM

University of Delaware, Janssen Pharmaceuticals

PROJECT OBJECTIVE

Develop an integrated Smart Manufacturing platform to improve the energy productivity and reduce energy intensity of a pharmaceutical tablet manufacturing process via wet granulation (WG).

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Implementation of Smart Manufacturing Tools Reduces Energy Input for Pharmaceutical Manufacturing Process by 26%

BENEFITS TO OUR NATION

A unique benefit of increasing pharmaceutical manufacturing productivity is that it improves the nation's healthcare infrastructure and further supports overall public health and well-being. Additionally, improvements in pharmaceutical manufacturing processes stimulates job creation and grows the US economy as a whole.

BENEFITS TO INDUSTRY

Besides reducing energy consumption, transitioning from batch to continuous manufacturing will result in the following:

- Process intensification from batch to continuous can lead to a 2.5X reduction in manufacturing floor space needed to produce the same volume of product.
- Reducing material waste when transitioning from batch to continuous can result in a 33% increase in yield.
- Continuous manufacturing production times are much lower than batch production times, leading to an 80% reduction in manufacturing and testing cycle times.

All the above improvements will lead to higher inventory turns, improved productivity, and increased profitability for pharmaceutical manufacturers.

PROJECT DESCRIPTION

TECHNICAL APPROACH

- Real-time measurement and analysis of material attributes
- Develop hybrid models to perform virtual experiments and to optimize energy consumption
- Smart Manufacturing enabled model and data integration for efficient manufacturing
- Demonstrate reduction in energy consumption and re-usability of prototype components

ACCOMPLISHMENTS

- Key energy and performance metrics established for optimized batch and continuous wet granulation processes
- Establishment of an integrated Smart Manufacturing platform with process models, process and analytical data and techno-economic analysis

DELIVERABLES

- Delivered baseline for continuous and batch manufacturing energy requirements
- Developed and delivered hybrid model and flowsheet model
- Validated optimal batch production run and continuous production run showing decreased energy consumption
- Completed techno-economic analysis and comparison of batch and continuous processes

REUSABLE OUTCOMES / SM MARKETPLACE

- Wet granulation process predictive models
- Analytical methods for wet granulation
- Near-infrared sensing solutions applicable to other manufacturing processes

RESULTS

↓ 26%

Demonstrated 26% energy savings from batch to continuous process; a $28k/year savings per manufacturing line.

↓ 72%

Demonstrated 72% energy savings from batch to optimized batch processes; a $78k/year savings per manufacturing line.

↓ 83%

Demonstrated 83% energy savings from batch to optimized continuous processes; a $91k/year savings per manufacturing line.

PROJECT DETAIL
Budget Period: BP5
Submission Date: 07/01/2022
Sub-Award (contract) Number:
4550 G YA102
SOPO: 2312

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