EPSRC supported EngD: Developing scale-transfer rules for semi-continuous and continuous direct compression using process analytical technology and data-driven modelling

Professor Kit Windows Yule and Dr Lisa Sun
School of Chemical Engineering, University of Birmingham
AstraZeneca

Tax free bursary of £ 28,505 per annum plus fees paid.

Project Description:
AstraZeneca is making a strategic investment in Continuous Direct Compression (CDC) to support the transition from traditional batch drug-product manufacture to agile, efficient and digitally enabled continuous processing. CDC can convert powders into tablets through integrated feeding, blending, lubrication and compression, offering potential reductions in manufacturing footprint, operating costs and development timelines. Its integration with Process Analytical Technology (PAT) enables rapid process understanding and supports real-time monitoring of product quality.

A key challenge in full CDC development is the consumption of active pharmaceutical ingredient (API), which may be costly, scarce and still evolving in its physical properties during early development. Full-line trials require feeder characterisation, and material is consumed during start-up, shutdown and transition to steady state. AstraZeneca has therefore invested in a semi-continuous direct compression (sCDC) platform. In sCDC, materials are fed by loss-in-weight feeders into a high-shear blender, blended as discrete sub-batches, lubricated and transferred to tablet compression. This approach has demonstrated high yields at scales below 1 kg.

The successful EngD researcher will develop experimentally supported rules for transferring formulations and process knowledge from sCDC to full CDC. Combining laboratory experimentation with modelling, PAT and chemometrics, they will study feeder performance, blending, lubrication and tablet quality. The work will generate publishable evidence to support future commercial development and regulatory interactions.

Funding Details:
To be eligible for EPSRC funding candidates must have at least a 2(1) in an Engineering or Scientific discipline or a 2(2) plus MSc.

For details on the Engineering Doctorate scheme visit the homepage.