1. Problems Faced by Industry

- Climate-related legislation and United Nations SDG-12 are forcing companies to optimise their processes.
- Must reduce energy use, carbon emissions and waste.
- Largest savings possible by process design optimisation.

2. Current Technologies

- Optimising industrial geometric designs is:
  o Costly: £100,000 per new design.
  o Slow and labour-intensive: it takes years to create a single new design.
  o High risk: trial-and-error, as likely to get worse as better.
  o Out of reach for SMEs: requires human experts which are expensive and hard.
- E.g. £349,685 for single new design over 2 years

3. Our Biology-Inspired AI Technology

- World-first autonomous geometric design optimisation engine
- Discovers orders-of-magnitude performance gains, beyond what a human designer may envision – patentable designs
- Can be accessible to SMEs without dedicated R&D teams: fully automated, can be set up by a single engineer
- Discovers novel, patentable designs / redesigns existing processes
- Optimises processing conditions of existing equipment
- Scales up unit operations without building suboptimal prototypes
- All of the above, simultaneously.

4. Benefit to society

- Upon implementation, Mondelez sustainability team calculated single site savings of:
  - 4000 tonnes CO2 per year
  - £200,000 per year
- In 2022, UK industry’s energy consumption was approximately 256,000,000,000 kWh
  - If results similar to those with Mondelez were reproduced across 1% of the manufacturing sector, we could save 300,000 tonnes of CO2 per year.
- Improved throughput enables reduced operational cost and allows lower consumer price point.
- Allow industry to align with UK’s Net Zero Strategy, the Strategic Technologies for Europe Platform and US/EU Green Deals.

5. Next steps

- Patent application for core technology drafted
- Spinning out EvoPhase start-up to maximise real-world impact
- General technique for particles and/or fluids; continue active projects on: ribbon mixers, static mixers, catalyst pellet shapes, pharmaceutical powder blending

References/Acknowledgements


All simulations were executed on the BEAR Cloud service at the University of Birmingham, http://www.birmingham.ac.uk/bear.