Making Pharmaceuticals

Collaborative Research and Translation in Medicines Manufacturing

Clive Badman OBE

ReMediES
RE-configuring MEDicines End-to-end Supply

gsk do more feel better live longer

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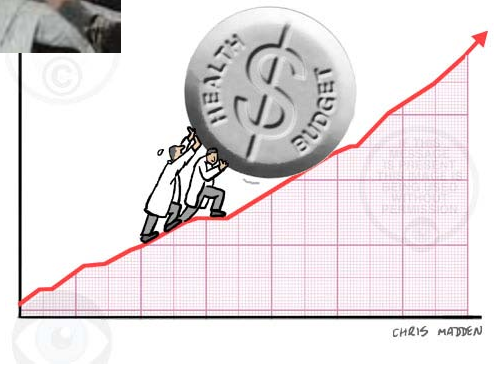
Healthcare's Challenges



Supply Chain Failings

Manufacturing challenges in support of trials

Takes far too long

R&D | Primary Manufacturing | Secondary Manufacturing | Distribution

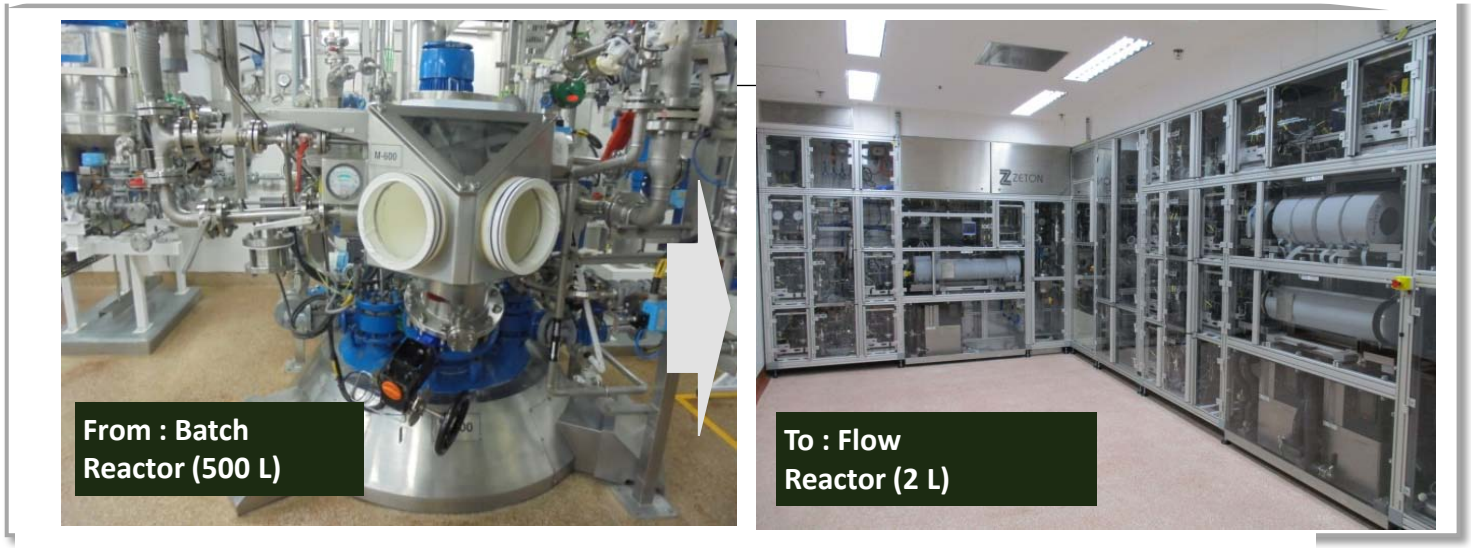
Massive inventory

Environmentally unsustainable

Waste

Supply shortages

An Answer



Benefits : Continuous vs. Batch Processing

>50%	capital reduction	75%	reduction in solvent use
75%	manufacturing lead time reduction	95%	reduction in water use
86%	working capital reduction	52%	carbon footprint reduction
90%	footprint reduction (~6 tennis courts)	5 yrs	development and industrialisation

It’s too big to do on your own

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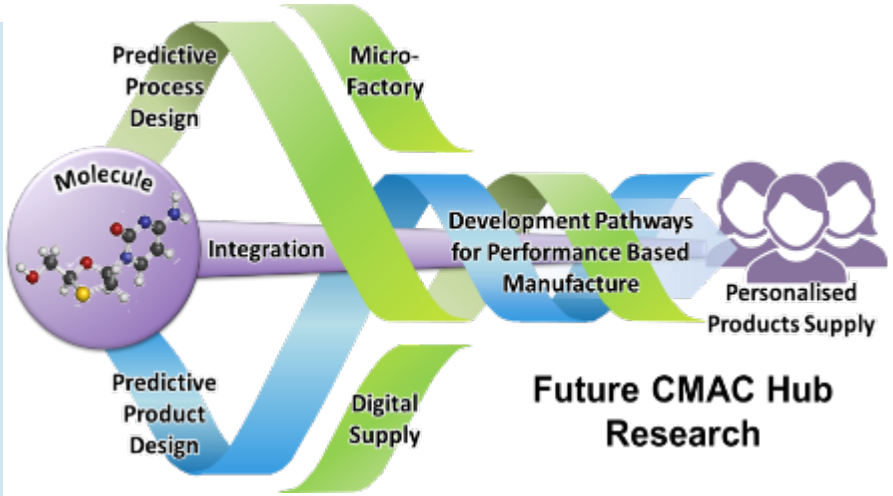
Continuous Manufacturing and Advanced Crystallisation

Co-created with industry to address key manufacturing challenges and skills needs

- World leading manufacturing research platform
- 2017-2023 £50m program
- A partnership approach for world-class:
  - Research
  - Training & Skills
  - Translation to industry & Impact
  - Facilities & Infrastructure



University of Strathclyde Glasgow
University of Bath
University of Cambridge
The University Of Sheffield.
Imperial College London
University of Leeds
Loughborough University

gsk
AstraZeneca
Novartis
Bayer
Lilly
Takeda
Roche

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Headed up by GSK

Research led by the University of Cambridge's Institute for Manufacturing (IfM)

£11.5 m contribution from industry, £11.5 m of government funding through The Advanced Manufacturing Supply Chain Initiative (AMSCI) and the Scottish Funding Council

Structure

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Clinical Platform

Commercial Platform

App A	App B	App C	App D	App E	App F
API Continuous Manufacturing	Primary to Secondary	Super Critical Fluids	Agile Packaging	Printed Electronics	Enzymes in Flow

Workstreams

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Advancing continuous manufacturing

Examining primary to secondary transition

R&D | Primary Manufacturing | Secondary Manufacturing | Distribution

Using Chiral Amines in catalysis

Finding agile ways to supply clinical trials

Supercritical fluids in particle engineering

Looking for new packaging materials

Using printable electronics

Successes

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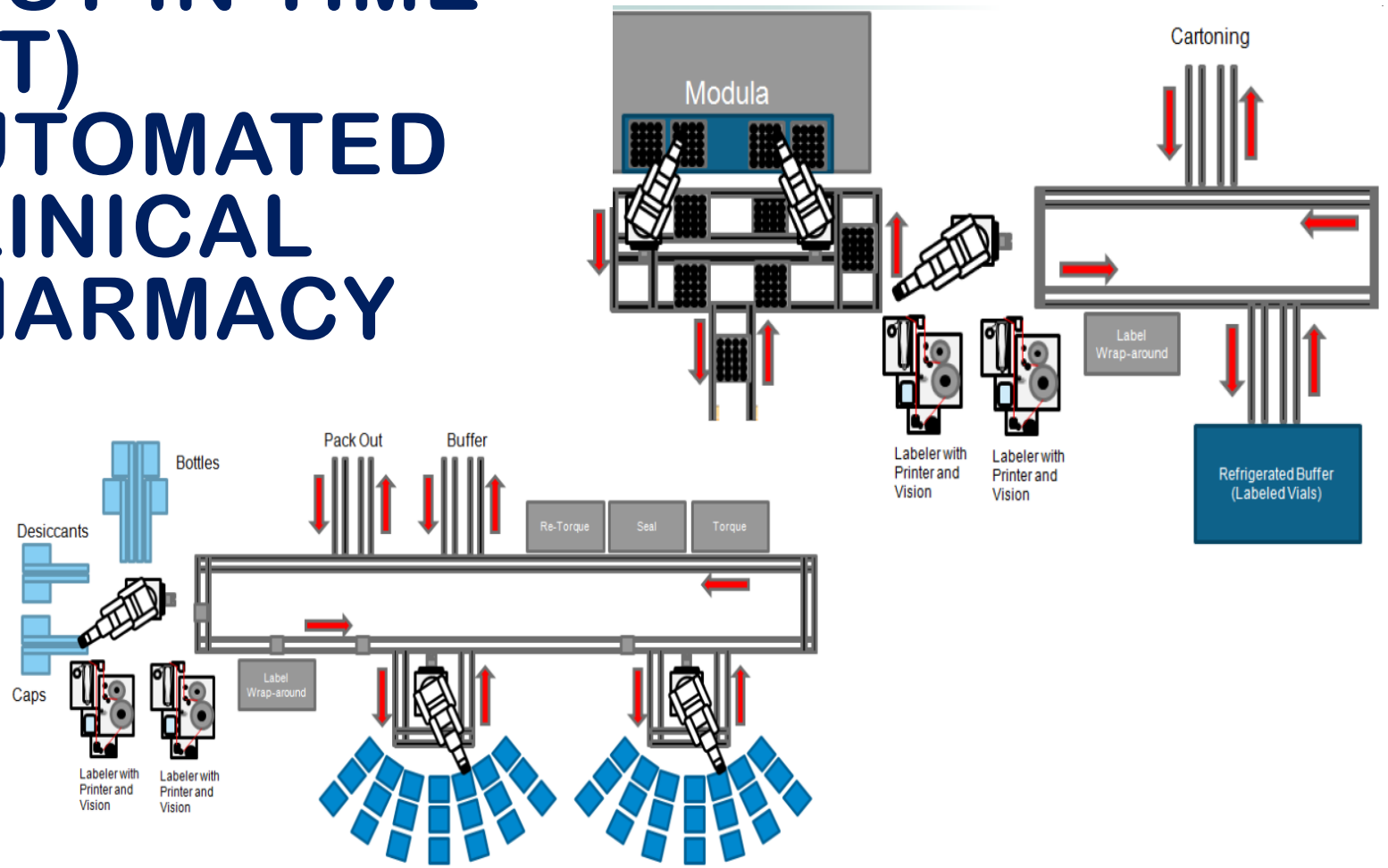
- Blacktrace launch of Titan series
- Ctech have sold 2 microwave flow reactors
- Continuous filter and washing system from AWL
- Automated Clinical Pharmacy

JUST IN TIME (JIT) AUTOMATED CLINICAL PHARMACY



- Increase speed in the supply chain (X16 -> X120)
- Increase product personalisation capability
- Increase quality assurance
- More efficient operation
- Enabler for upstream dose-to-order innovation (better medical outcomes)

- Reduce Patient Kit Wastage (£10M's – £100M+ per annum per company; equates to 25% - 70% of total CTS production)
- Reduce CTS lead time from 4-6 months to <1 week
- Reduce investments at risk via delayed decision requirements (i.e. development & manufacture)

Tough Stuff

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- Accelerating adoption of new technology
- Securing inventory reduction
- Quantifying the benefit of new commercial supply chains
- New Packaging materials

What's Next?

Medicines Manufacturing Innovation Centre

Accelerating the translation of promising research into commercial adoption in small molecule pharmaceutical manufacturing.

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The Prize

For UK plc

For clinicians & research

NHS

NHS SCOTLAND

HSE

Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

For health economies

For patients

Thank You

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