Mathematical Modelling

1. Real-world problem
2. Mathematical model
3. Solution to model
4. Predictions

Simplify

Yes: solved!
No: adjust

Maths techniques

Analyse

3. Solution to model
**Preform Extrusion (Steps 1 and 2)**

Extrusion process

- **Force**
- **Heat**
- **Ram**
- **Billet**
- **Die**

**Extruded preform**

- Very viscous.
- Long thin geometry.
- Distorted channels.
- Gravity.
- Die effects, welding?
- Surface tension?

**First attempt**

Model as a slender very viscous fluid with surface tension and gravity.
Modelling Extrusion (Steps 3 and 4)

- Lots of techniques used to solve equations.
- Validated model for stretching (no extrusion).
- Model does not capture all features in extrusion.

Model vs experiment

Modelled preform
Future Work (Back to 2)

1. Real-world problem
2. Mathematical model
3. Solution to model
4. Predictions

Simplify Maths techniques

Analyse
Yes: solved!
No: adjust

Need to improve model: include missing physics.
Include transition from die.