



The Future of Rotational Moulding

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The Future of Rotational Moulding

“Rotational moulding has the most exciting potential of any manufacturing method for plastics”

- **Quotation from an article in1966 !!**
- **Have we achieved that potential?**
- **Are we where we want to be?**



The Future of Rotational Moulding

“What is the opposition doing”

- **Injection moulding – cycle time 0.62 seconds**
- **Blow moulding – 7000 parts per hour**
- **Thermoforming – double wall parts, with kiss-offs**



The Future ???

Difficult Task !!!

- **Uncertainty of the future**
- **Easy to offend people**
- **Are predictions and speculation worthwhile?**





Approach ???

Business Approach

- Future types of product?
- Growth statistics?
- New market sectors?
- World trends in rotomoulding?





Approach ???

Technical Approach

- **Material developments**
- **Mould/Machine developments**
- **Process control / cycle time**
- **How do we make things happen?**





Strengths

- **Ability to do small production runs and very large articles**
- **Low tooling costs and short lead-times**
- **Stress-free mouldings (?)**
- **Culture of entrepreneurship**
- **Small companies with strong desire to be successful**
- **Flat management structures so that senior managers interface with customers**



Weaknesses

- **Slow cycle times and limited choice of materials**
- **Material must be in powder form**
- **Automation can be difficult**
- **Poor image and low technology culture**
- **Low barriers to entry in the industry**
- **Proliferation of very small companies**



Opportunities

- Tremendous growth potential in untapped market sectors
- Global trend towards smaller volumes and shorter production runs
- Multi-layer products easily produced
- Enhanced process control opens new doors
- Large scope for cycle time reductions
- Scope for energy efficiency improvements



Threats

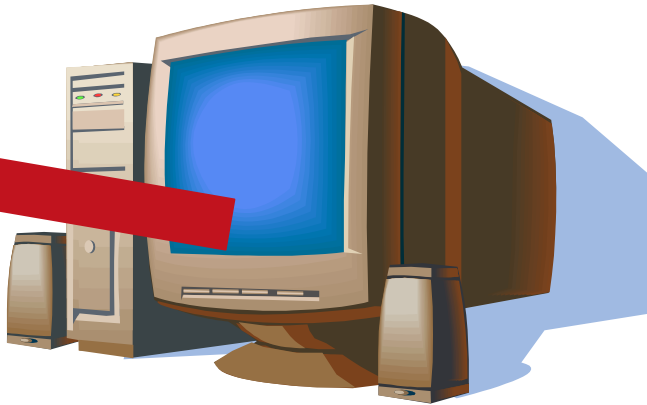
- Low technology culture, and cheap and cheerful mentality
- Easy local niche markets has blunted competitive drive
- Small industrial sector that discourages investment
- Merging of processing technologies means that hollow products can now be made in many different ways
- Billions of dollars being invested in injection moulding, thermoforming and blow moulding



Moulding Technologies - the past

?

**Injection
Moulding**



?

**Blow
Moulding**

?

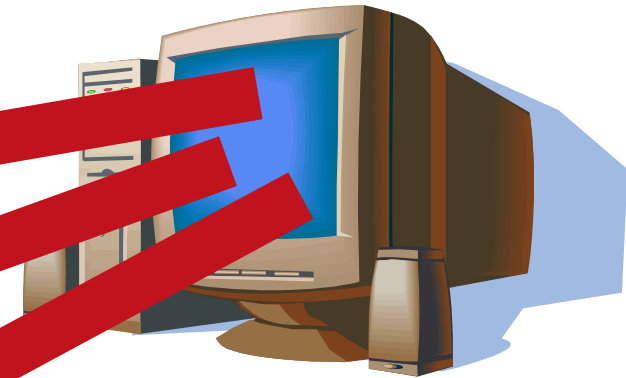
Thermoforming

?

**Rotational
Moulding**



Moulding Technologies - today



**Injection
Moulding**

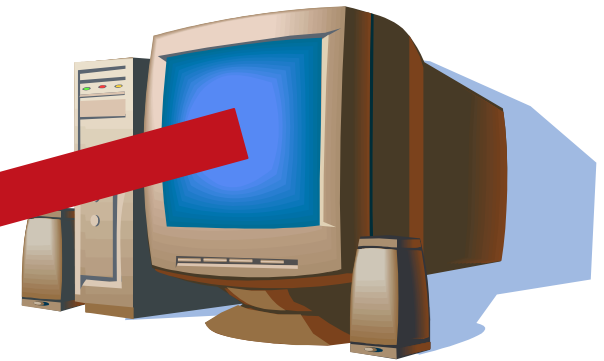
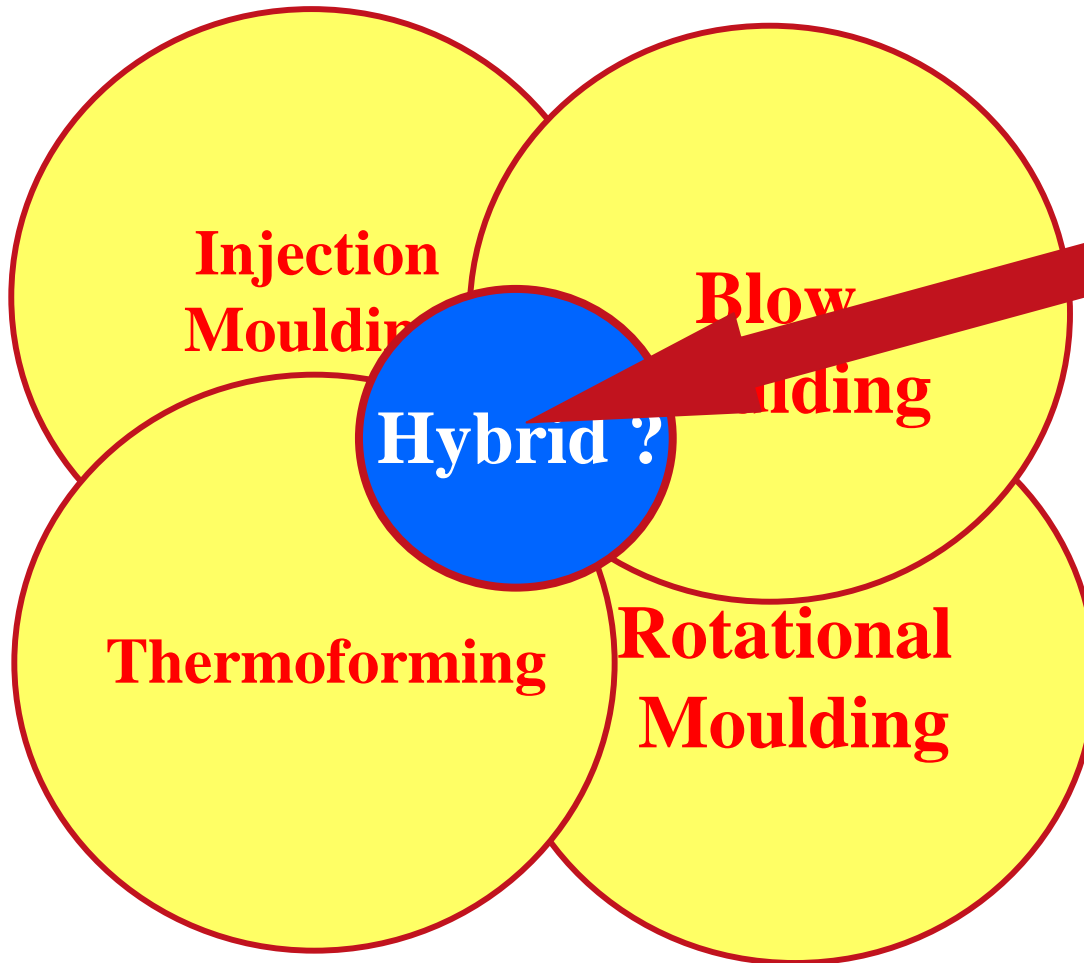
**Blow
Moulding**

Thermoforming

**Rotational
Moulding**



Moulding Technologies - the future



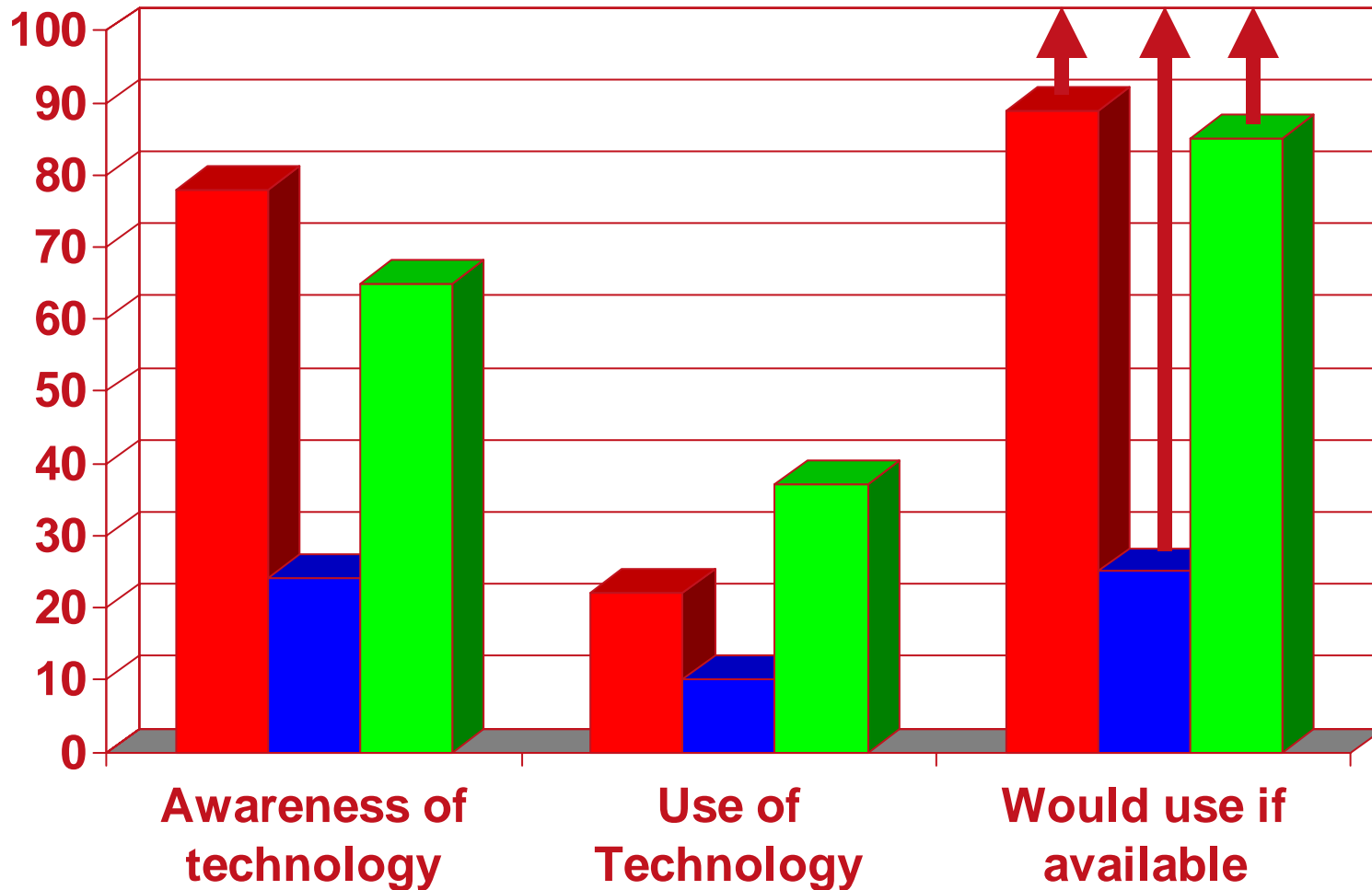


Rotomoulding Industry

Internal Temperature

Internal Pressure

Internal Cooling





Issues to be addressed

- **The process – cycle times, process control**
- **Materials**
- **Machines and Moulds**
- **Responsibilities for action**



Materials

Polyethylene is favoured for rotational moulding because the cycle times are long: OR is polyethylene the cause of the problem?

It should be possible to rotomould most thermoplastics

The process only involves melting and coalescence of the plastic as it coats a metal surface.

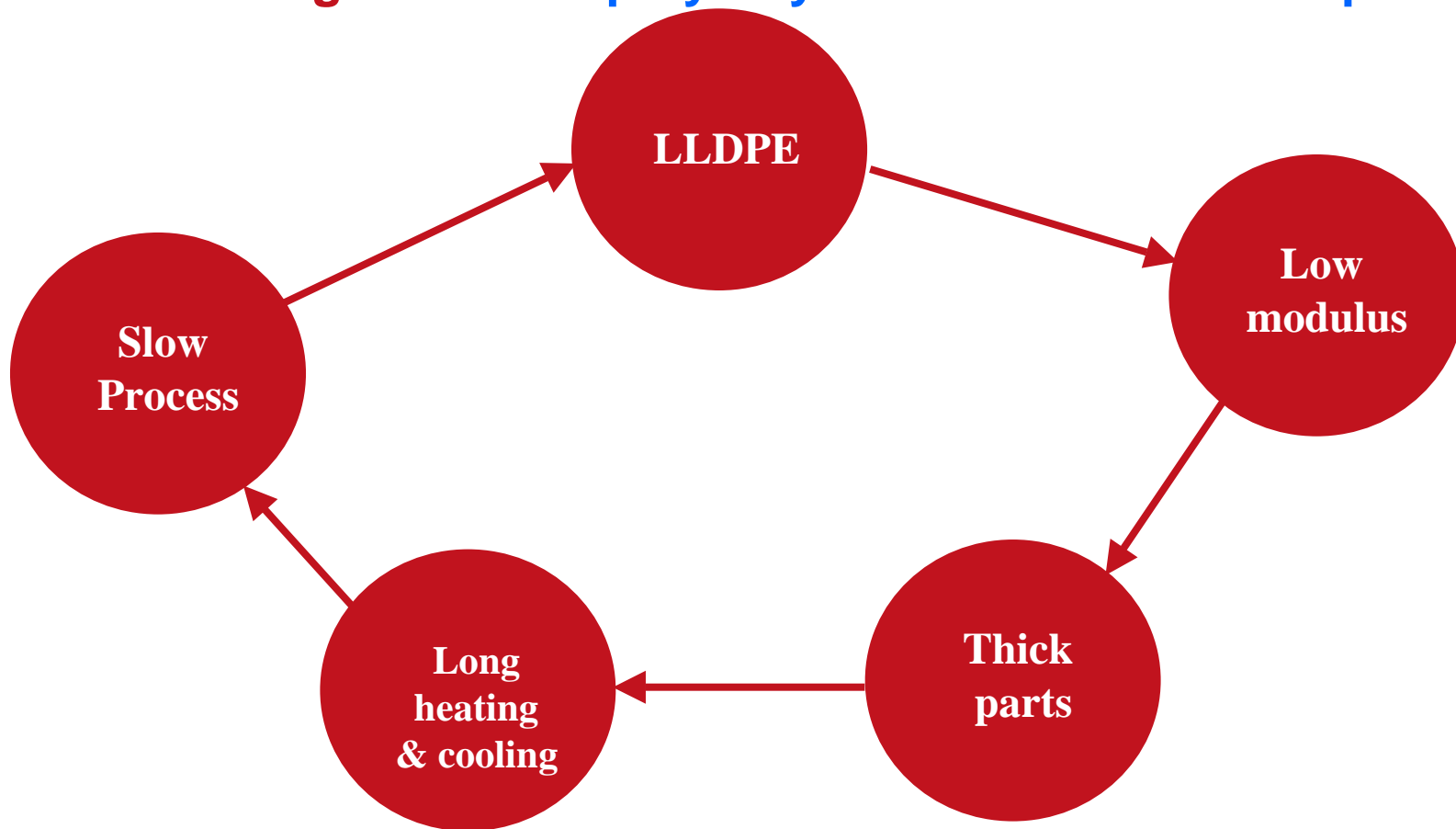
Most plastics are in fact rotomoulded around the world

The problem is PROCESS CONTROL



Materials

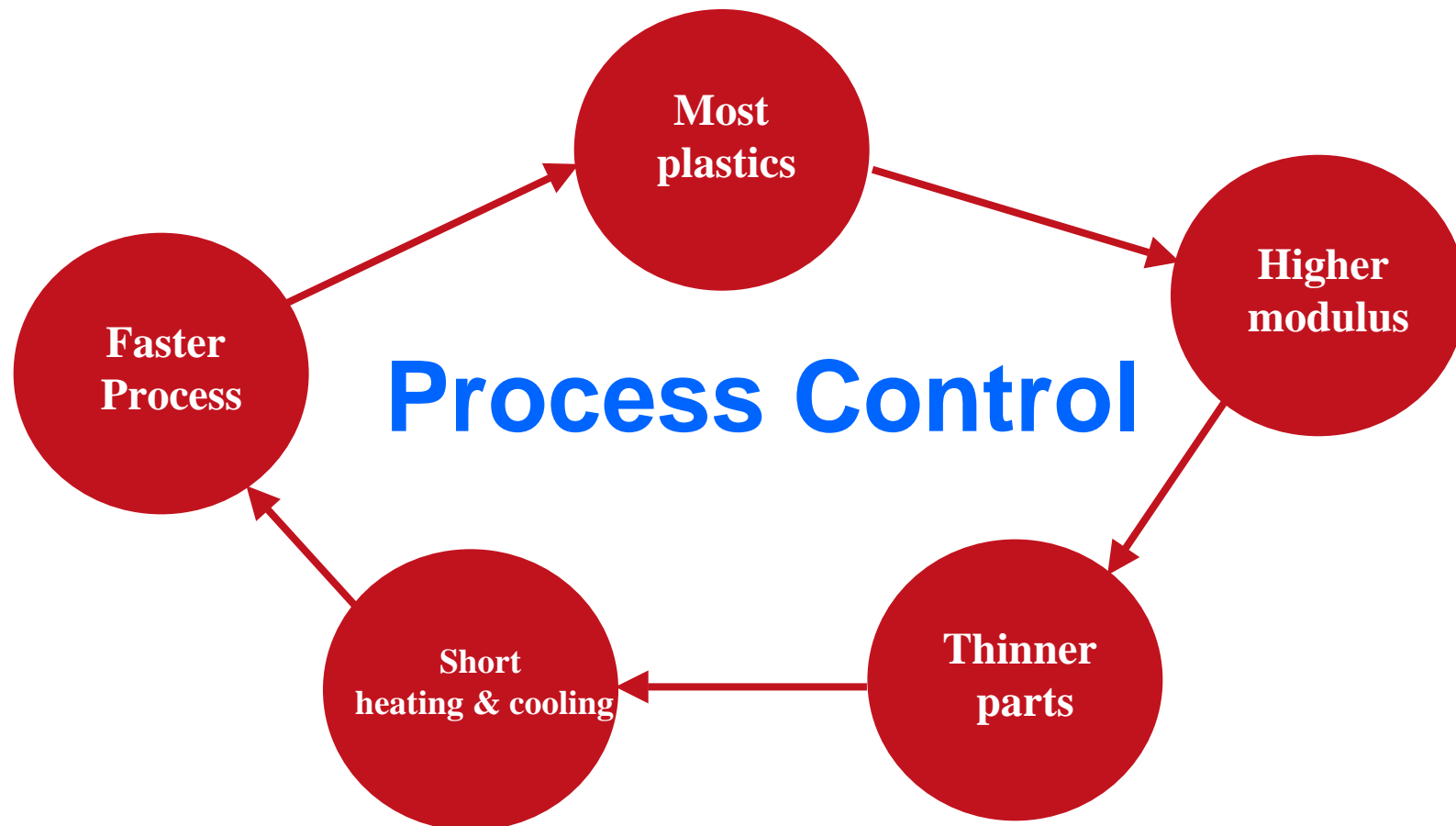
Polyethylene is favoured for rotational moulding because the cycle times are long: **OR is polyethylene the cause of the problem?**





Materials

If cycle times are reduced then other materials become more feasible:

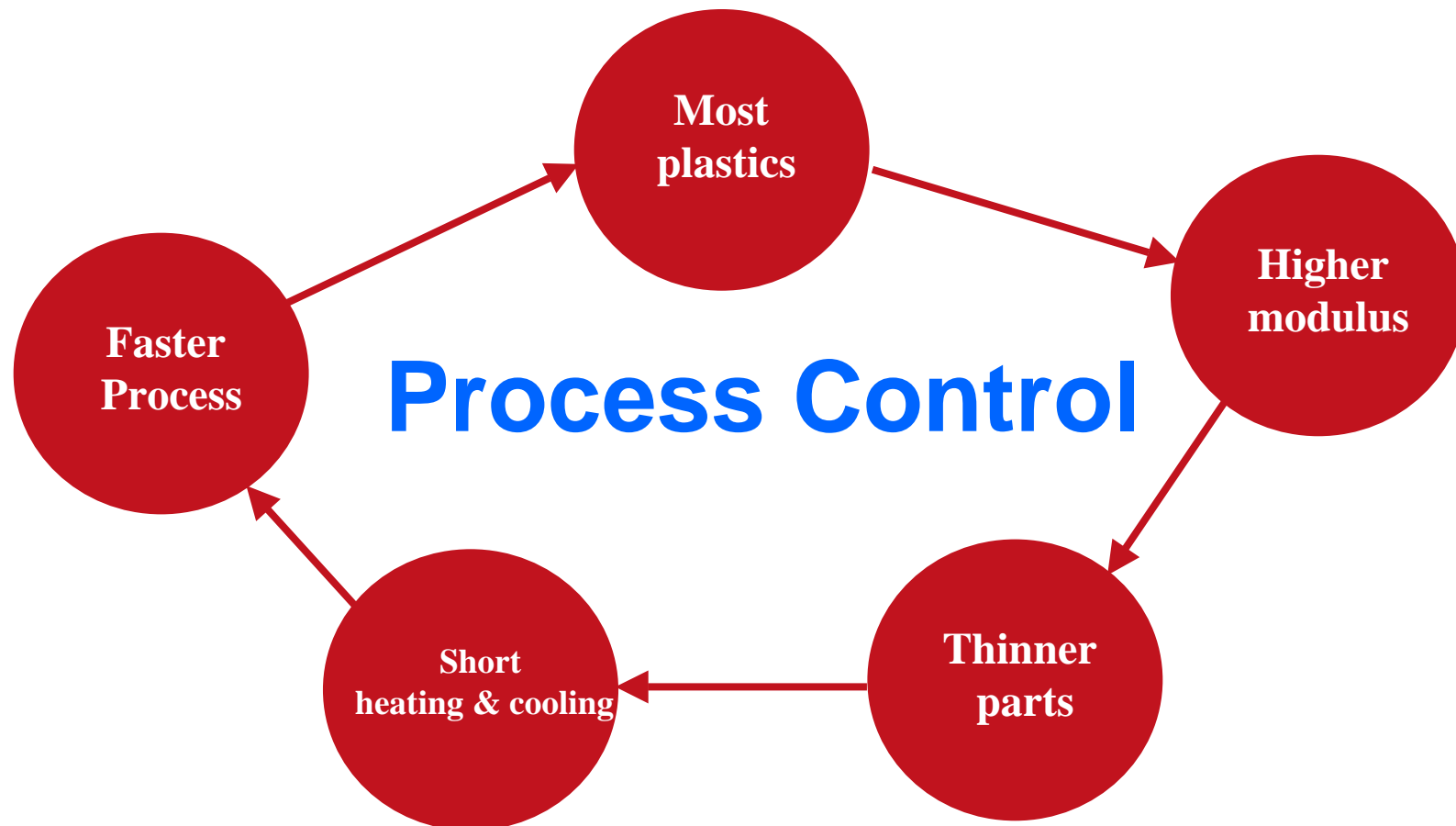


Other plastics will help us to reduce cycle times



Materials

If cycle times are reduced then other materials become more feasible:



Excellent work being done to understand rotomoulding materials



The Process

Cycle Times !!!

- Too long
- Can something be done?
- Whose responsibility?



Reducing Cycle Times

“Impossible”

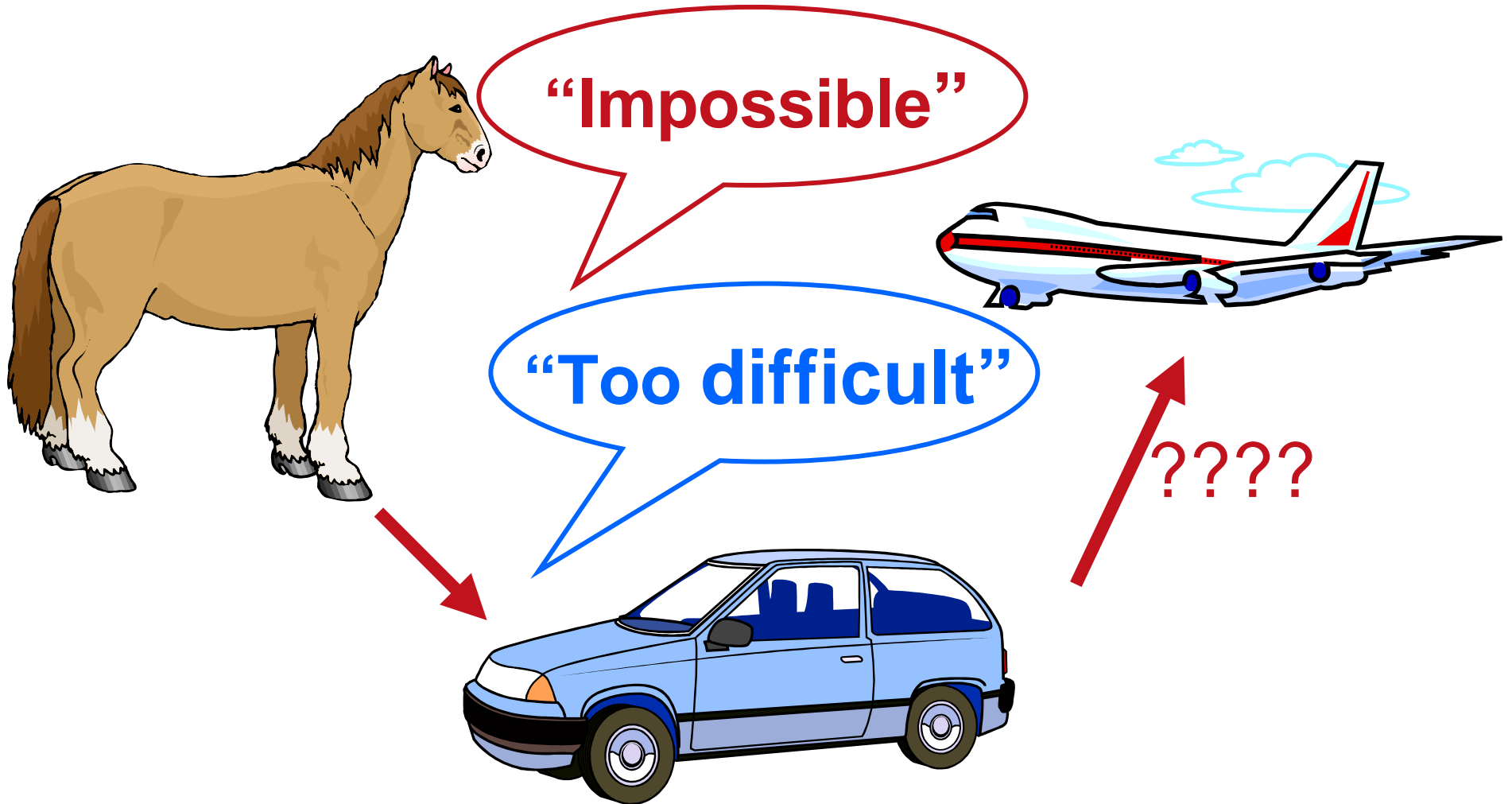
“Too difficult”

**“Cycle has reduced to
a stable value around
the world”**





Transport

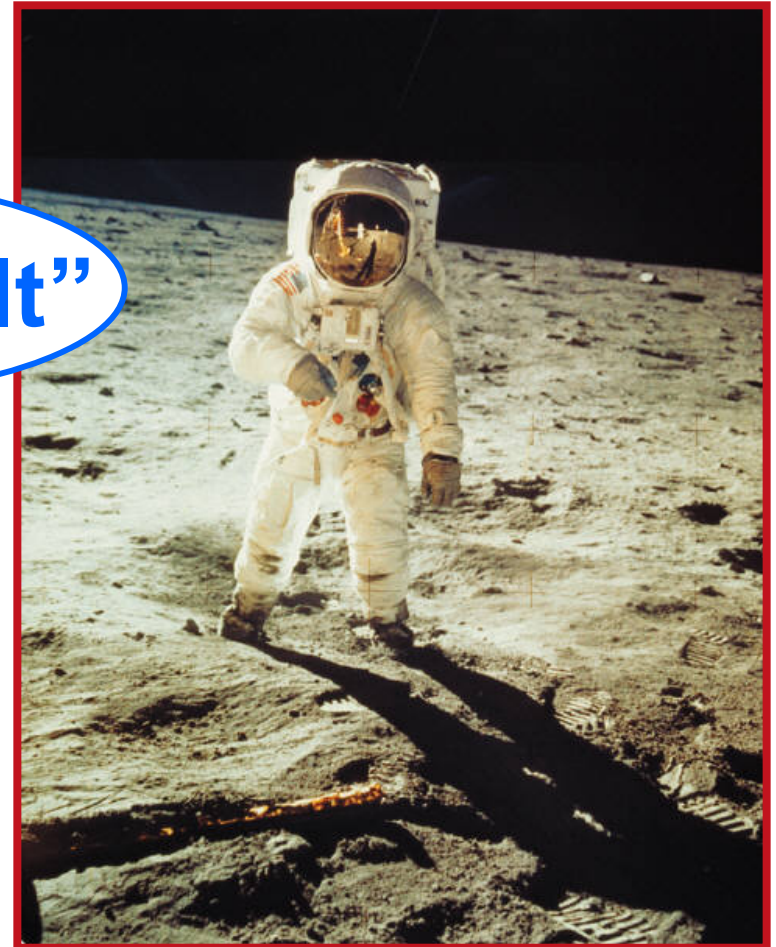




Fly me to the Moon !!

“Impossible”

“Too difficult”





Reducing Cycle Times

“Impossible”

“Too difficult”

NONSENSE

**“Cycle has reduced to
a stable value around
the world”**





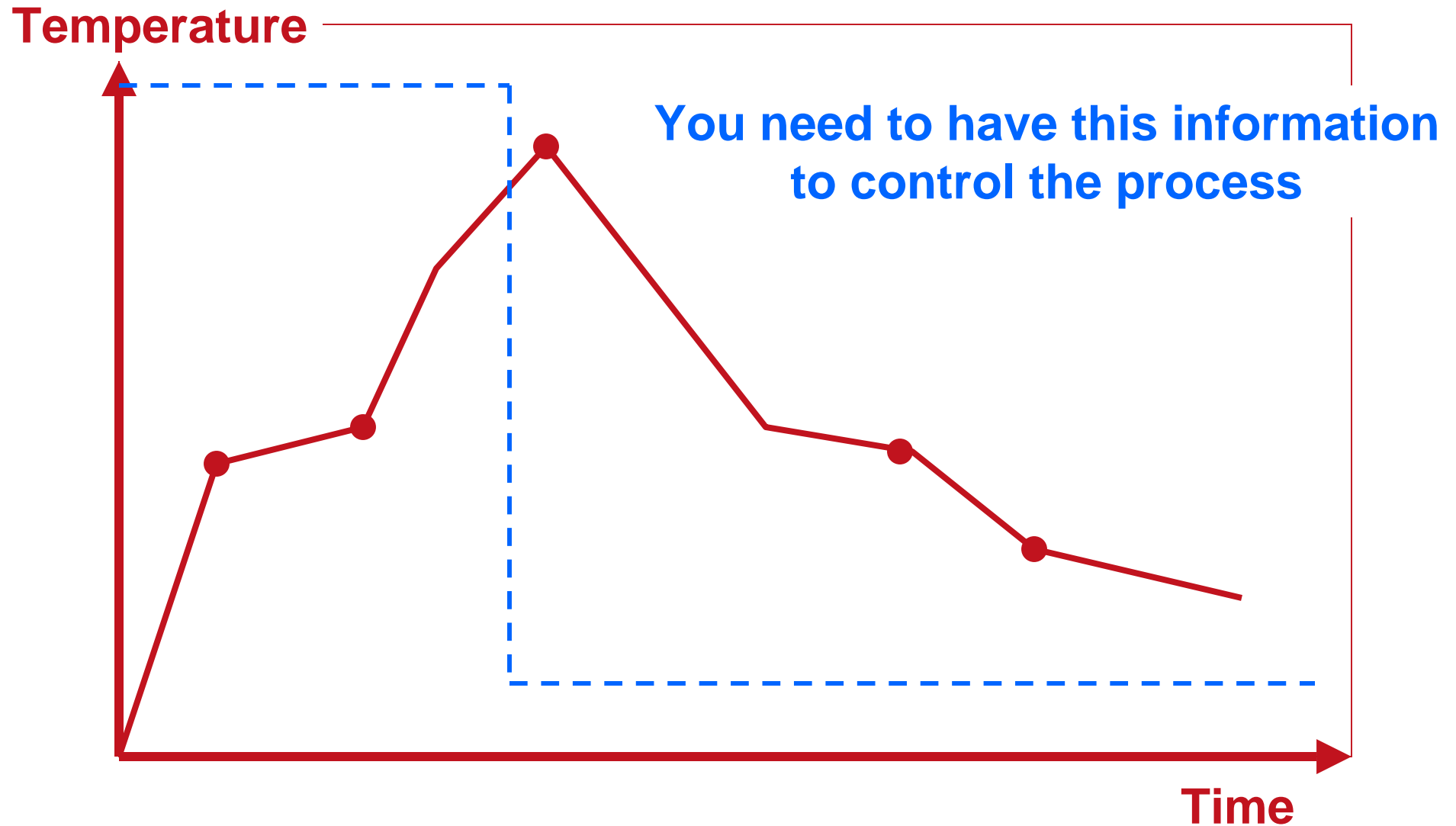
Process Control

Accurate process control is critical

- Current process control is too remote from the plastic
 - Control the air temperature inside the mould
 - Control the air pressure inside the mould
- You cannot improve what you cannot control

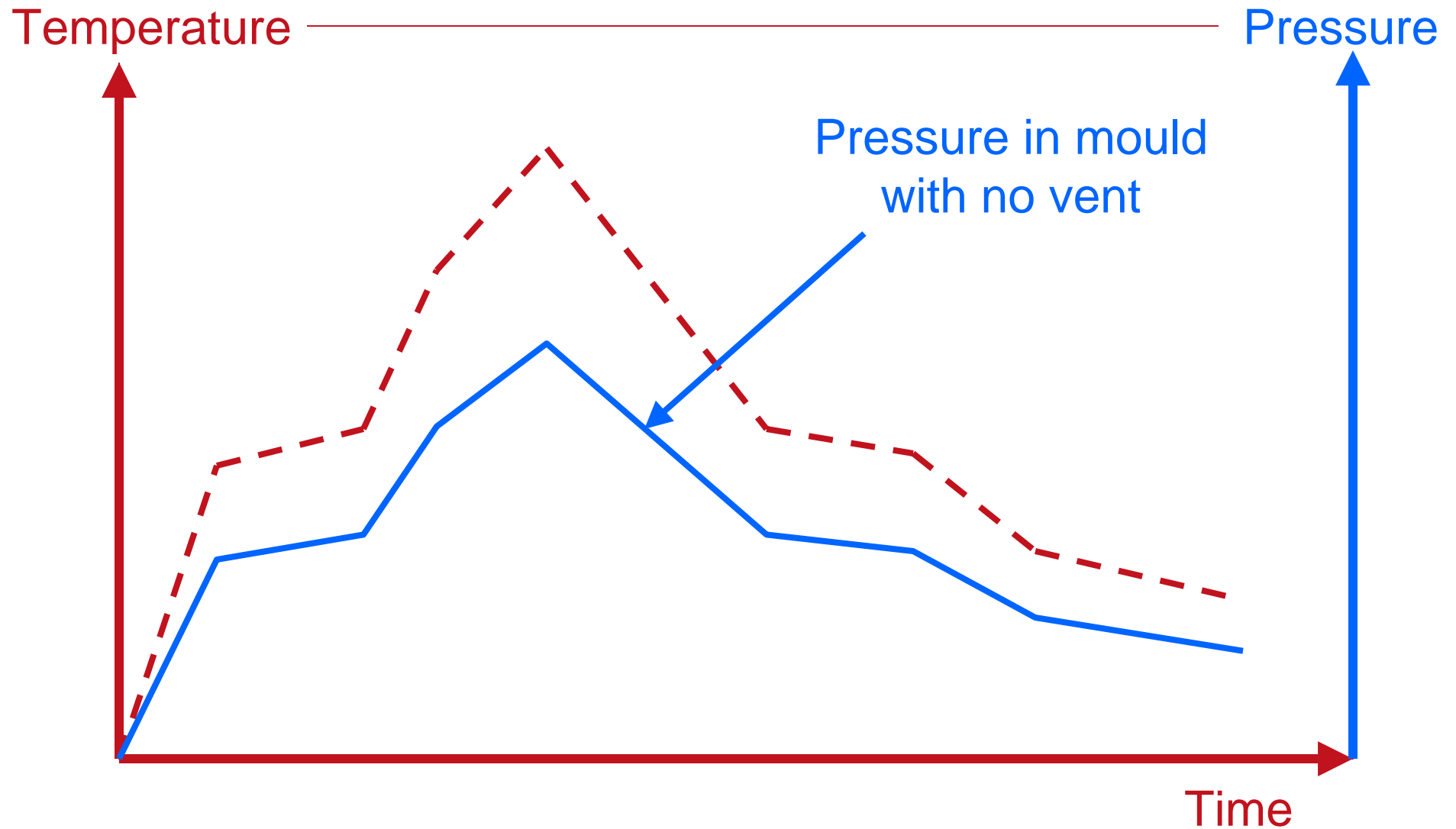


Temperature Control



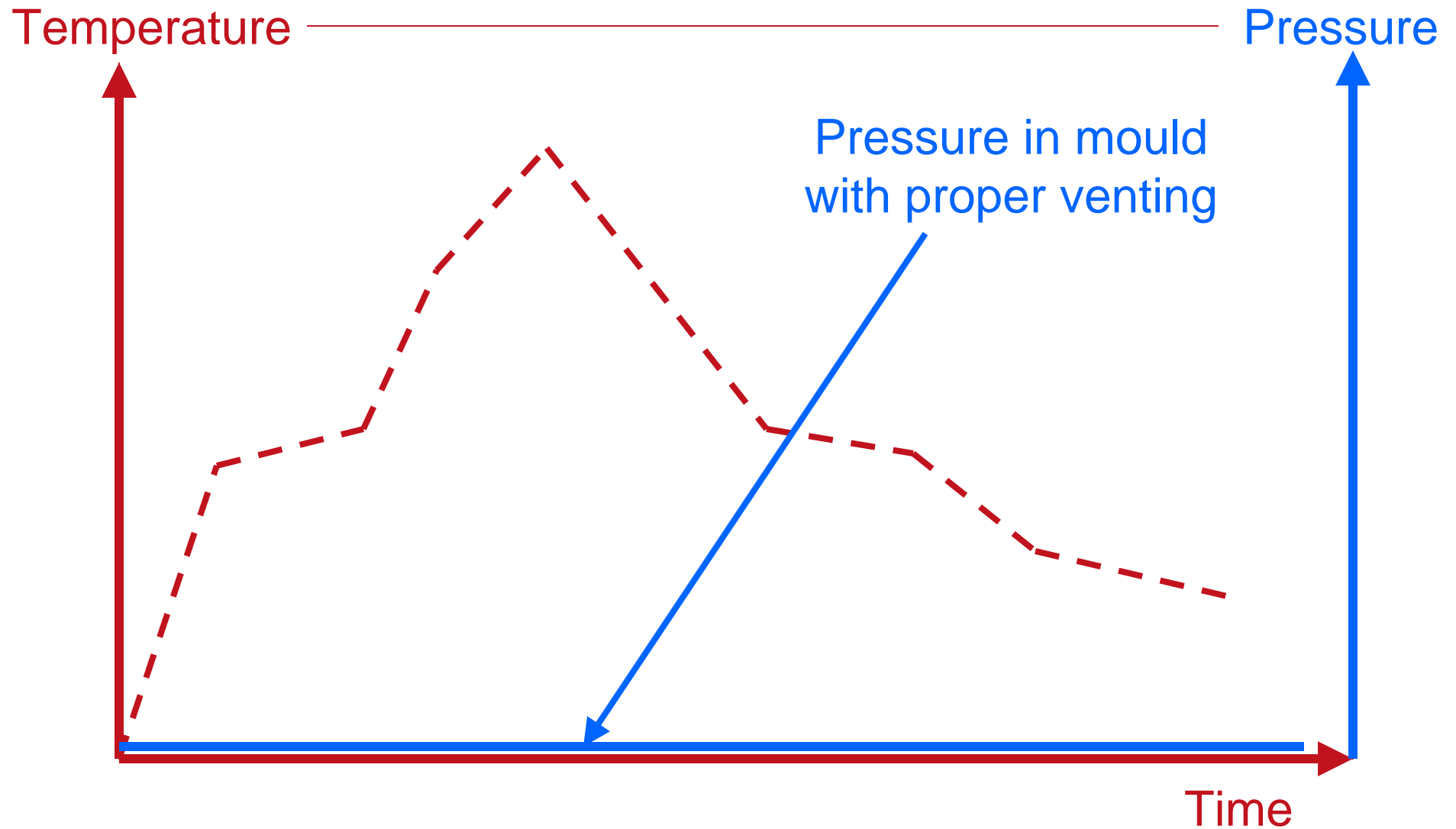


Pressure Control



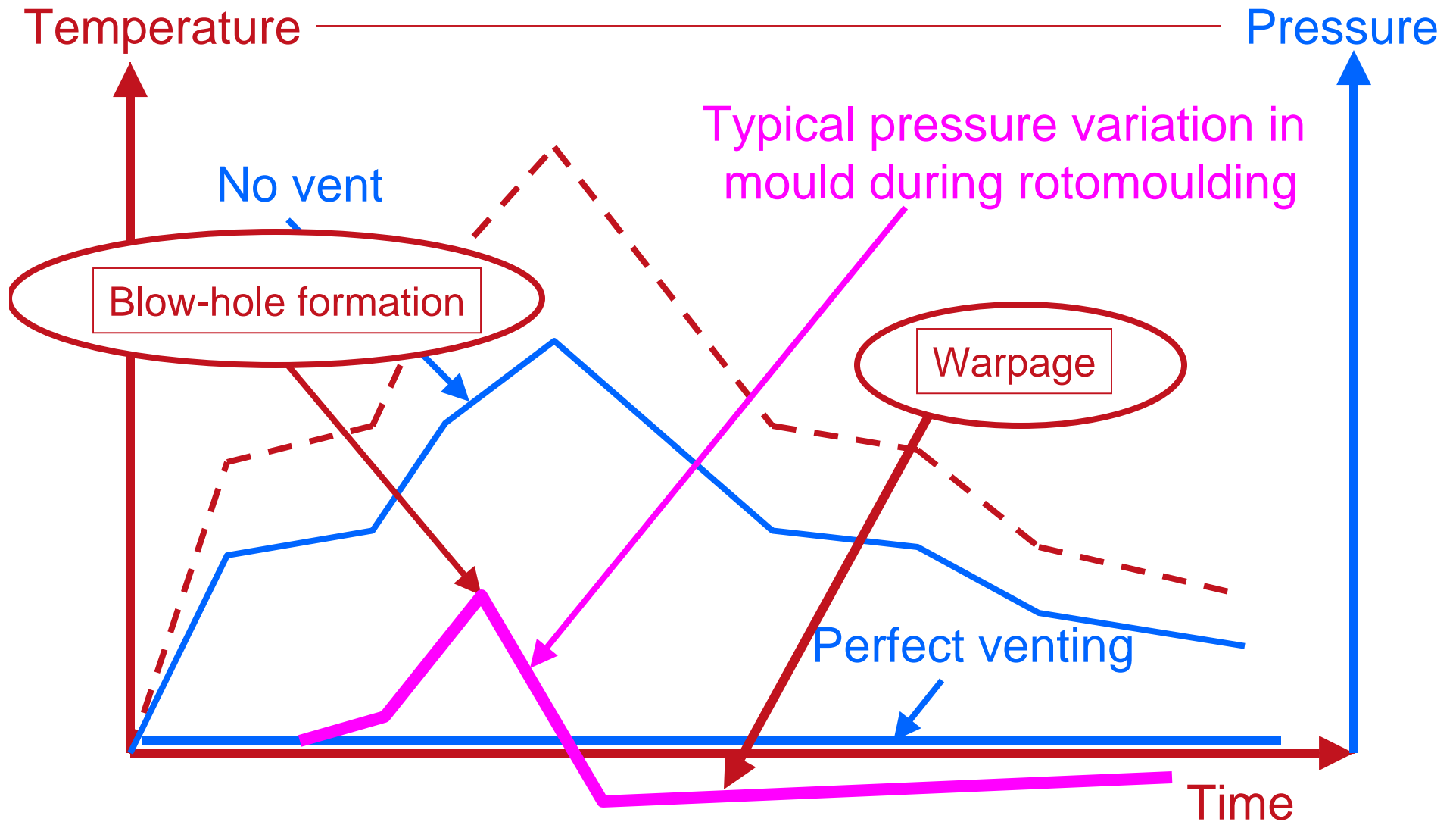


Pressure Control





Pressure Control





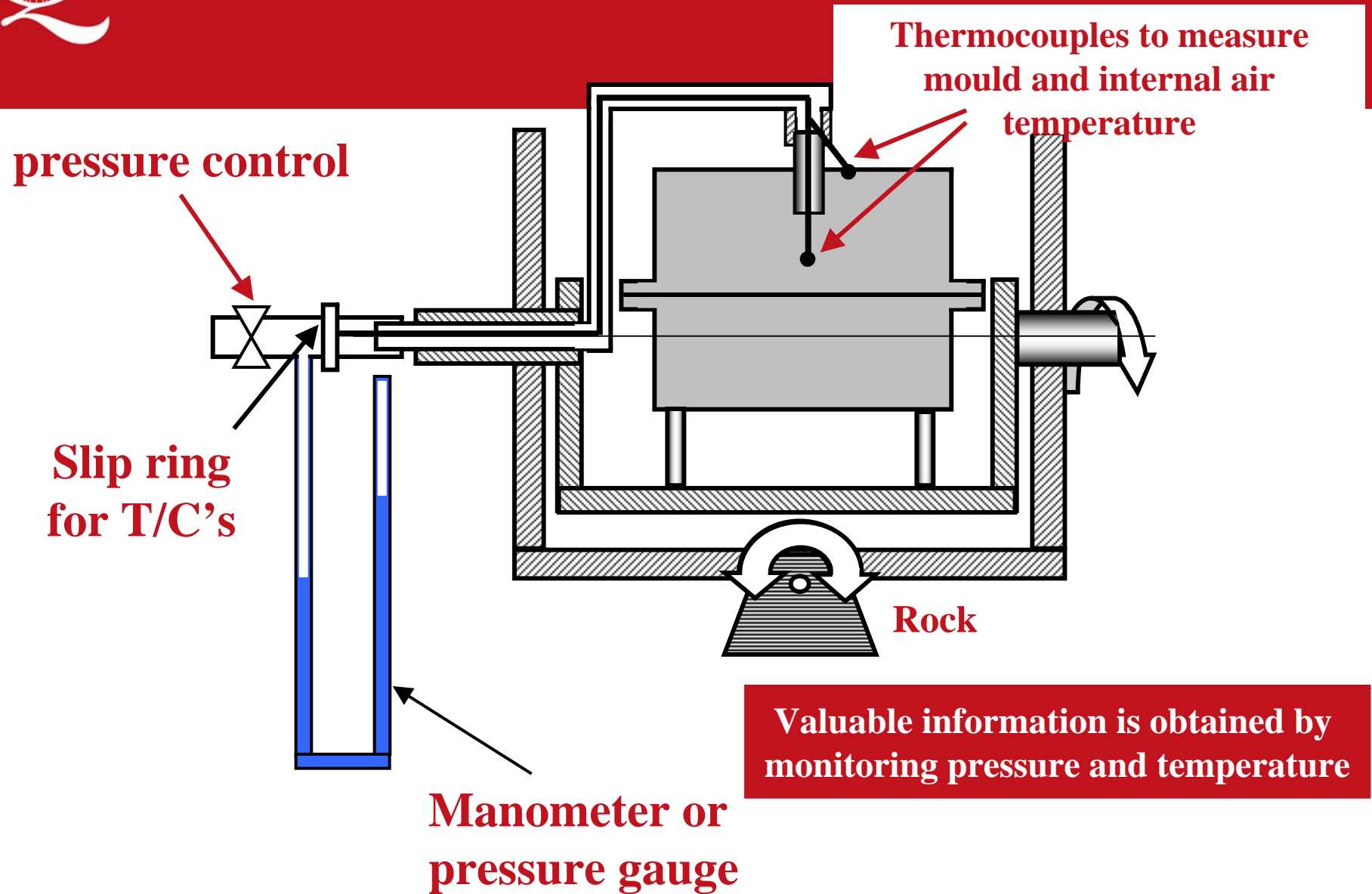
Monitoring Temperatures and Pressures

Why has the industry not adopted this technology?

- **It has been around for 15 years**
- **It must be understood**
- **It is not rocket science**
- **How can we motivate action?**

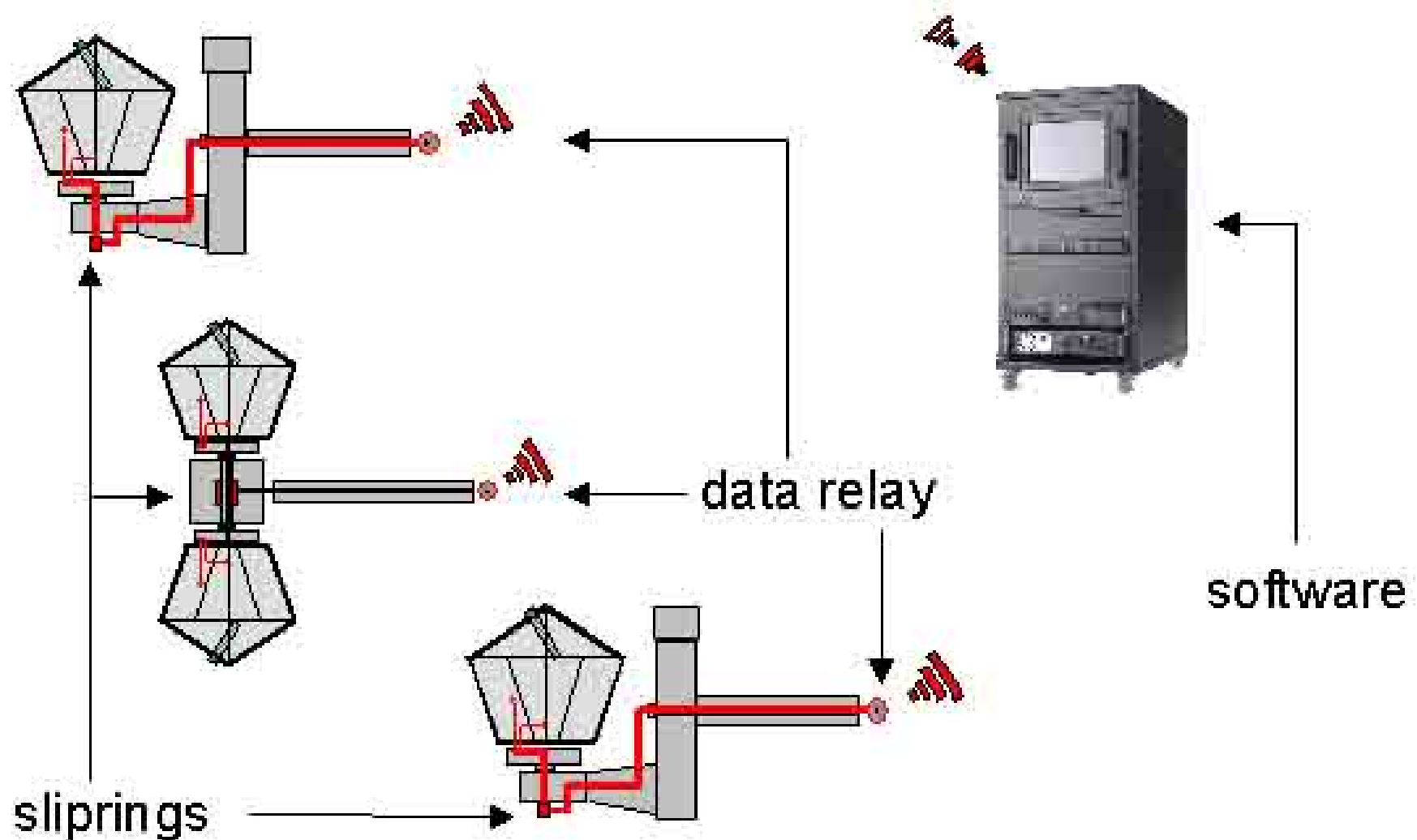


Monitoring Temperatures and Pressures





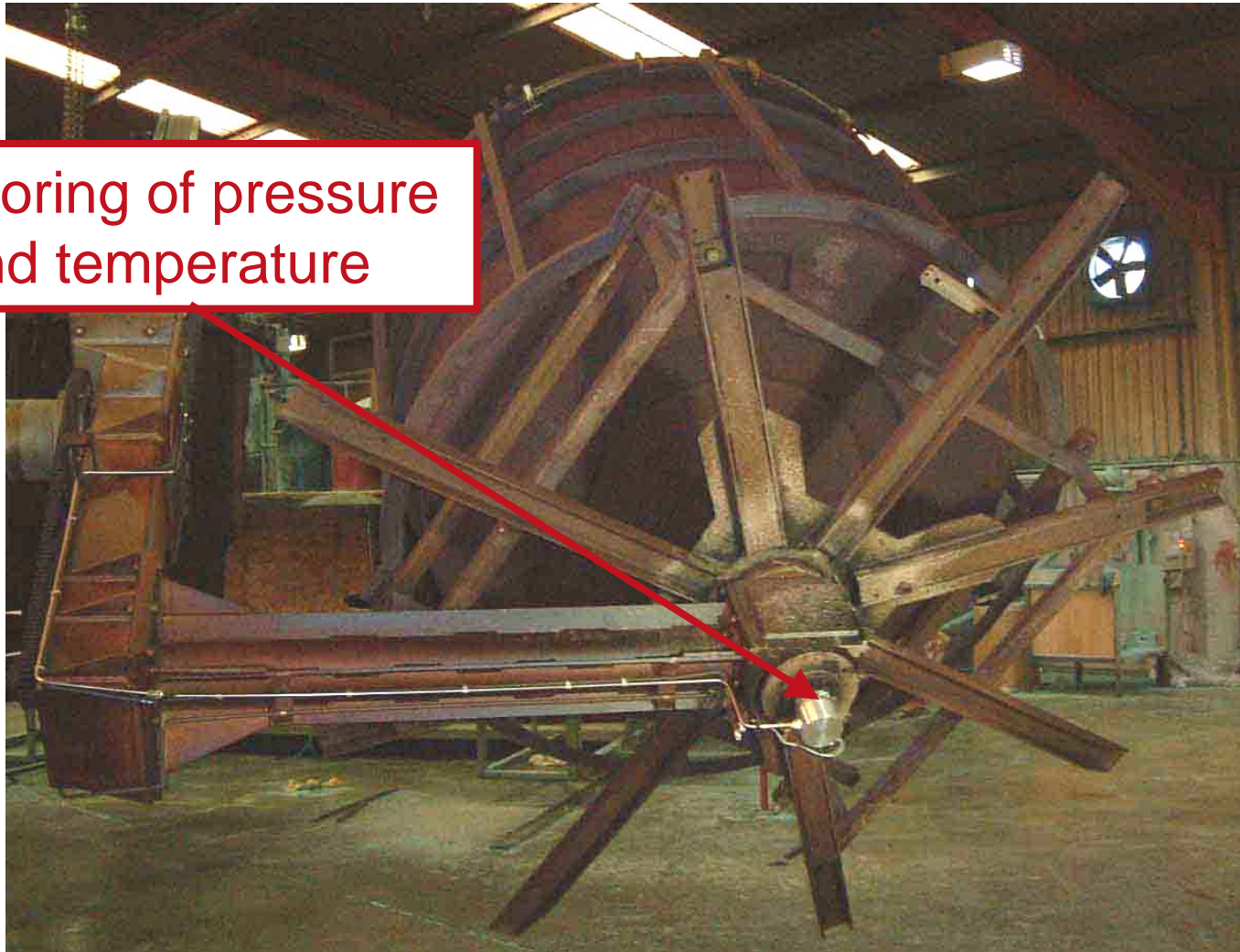
Monitoring Temperatures and Pressures





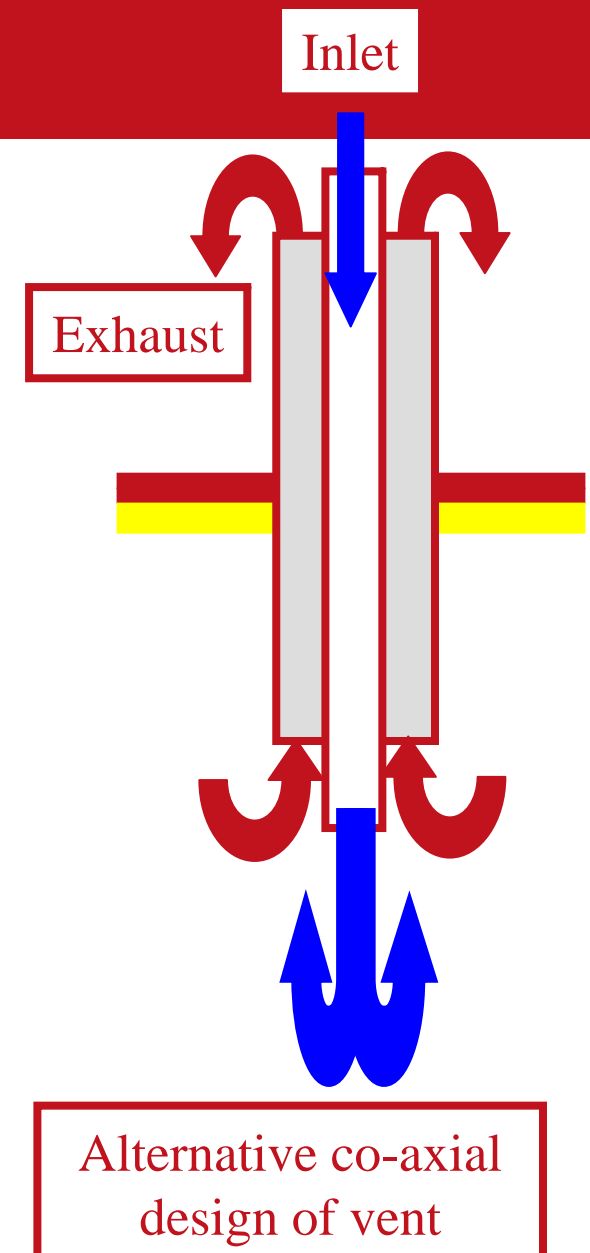
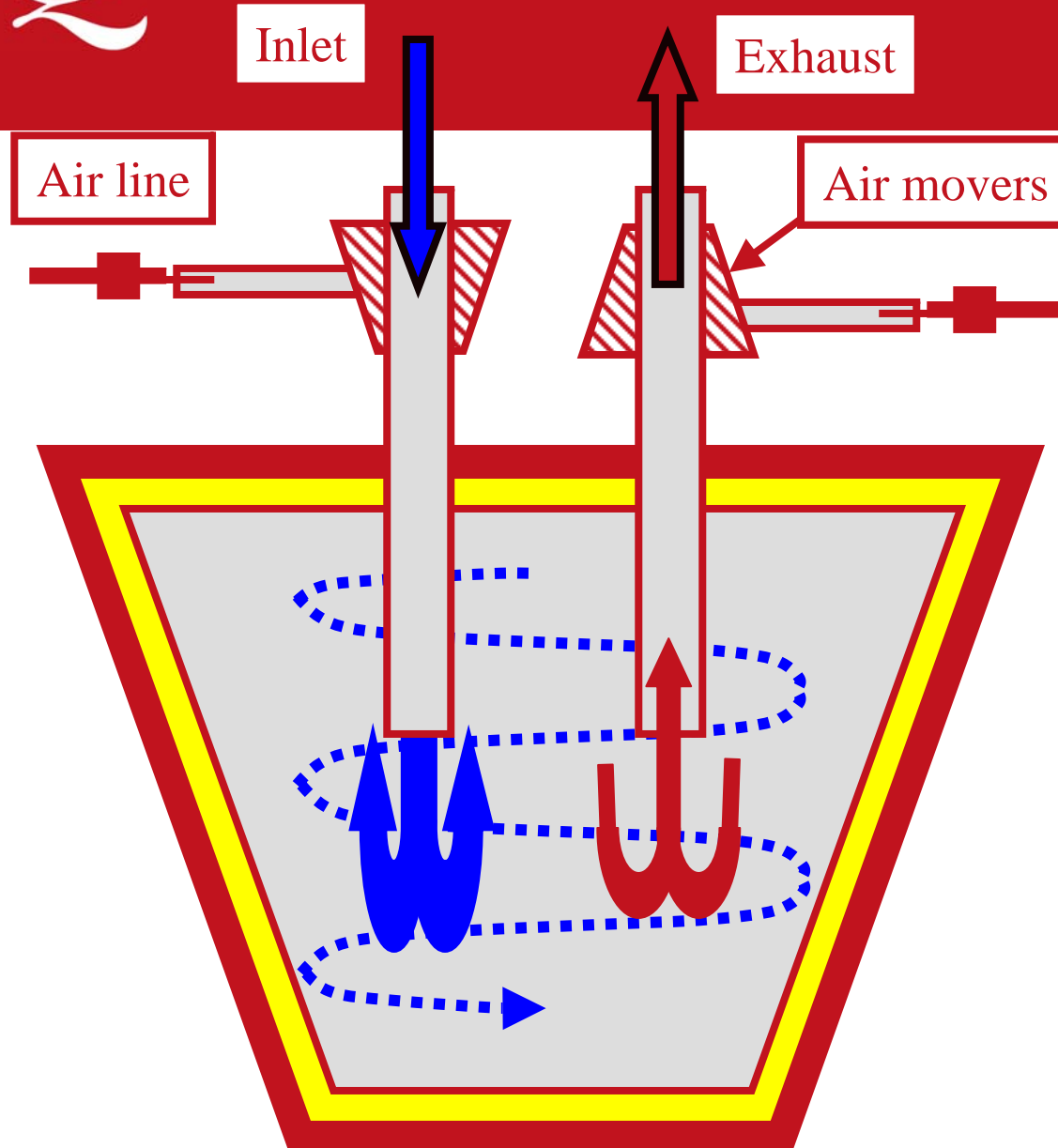
Monitoring Temperatures and Pressures

Monitoring of pressure
and temperature



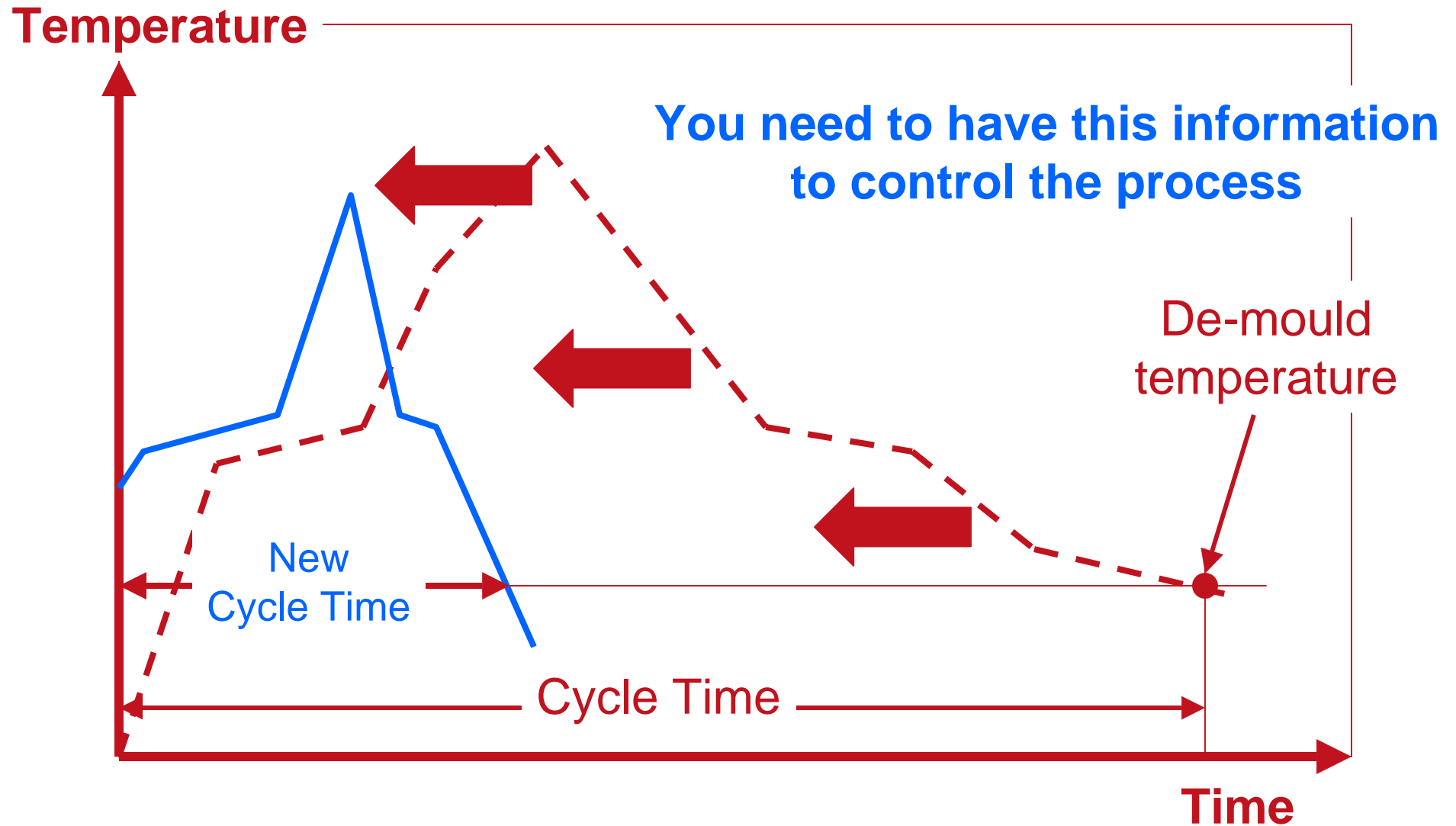


Internal Cooling





Reducing Cycle Times





Reducing Cycle Times

ARM Cycle Time Project

- **Current project has reported 50% reduction**
- **This has been ridiculed**
- *Result has been repeated on the ARM Challenger Mold on a Ferry machine*



Reducing Cycle Times

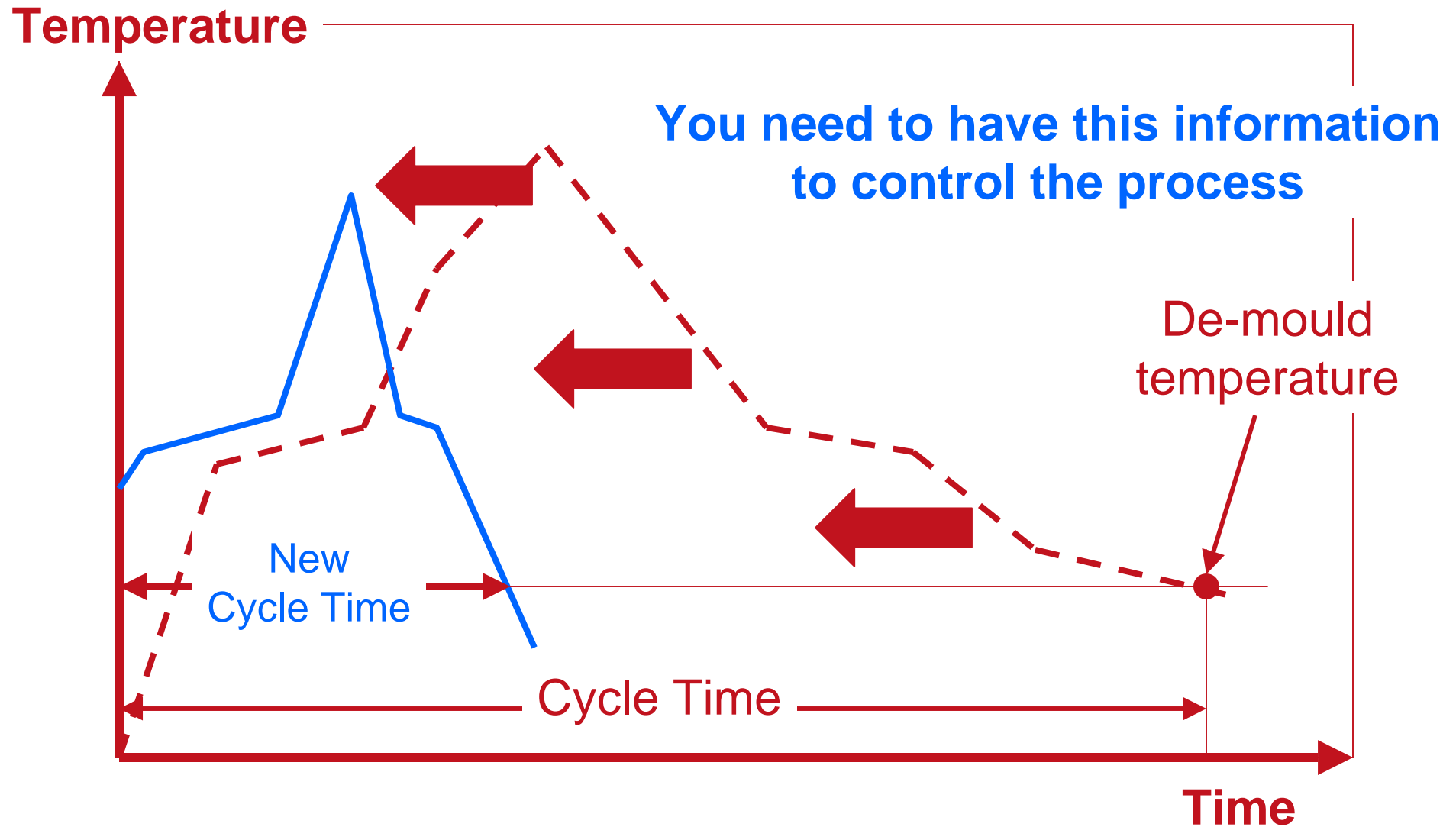
ARM Challenger Mold



ARM project has produced cycle time 40-50% better than the industry could achieve

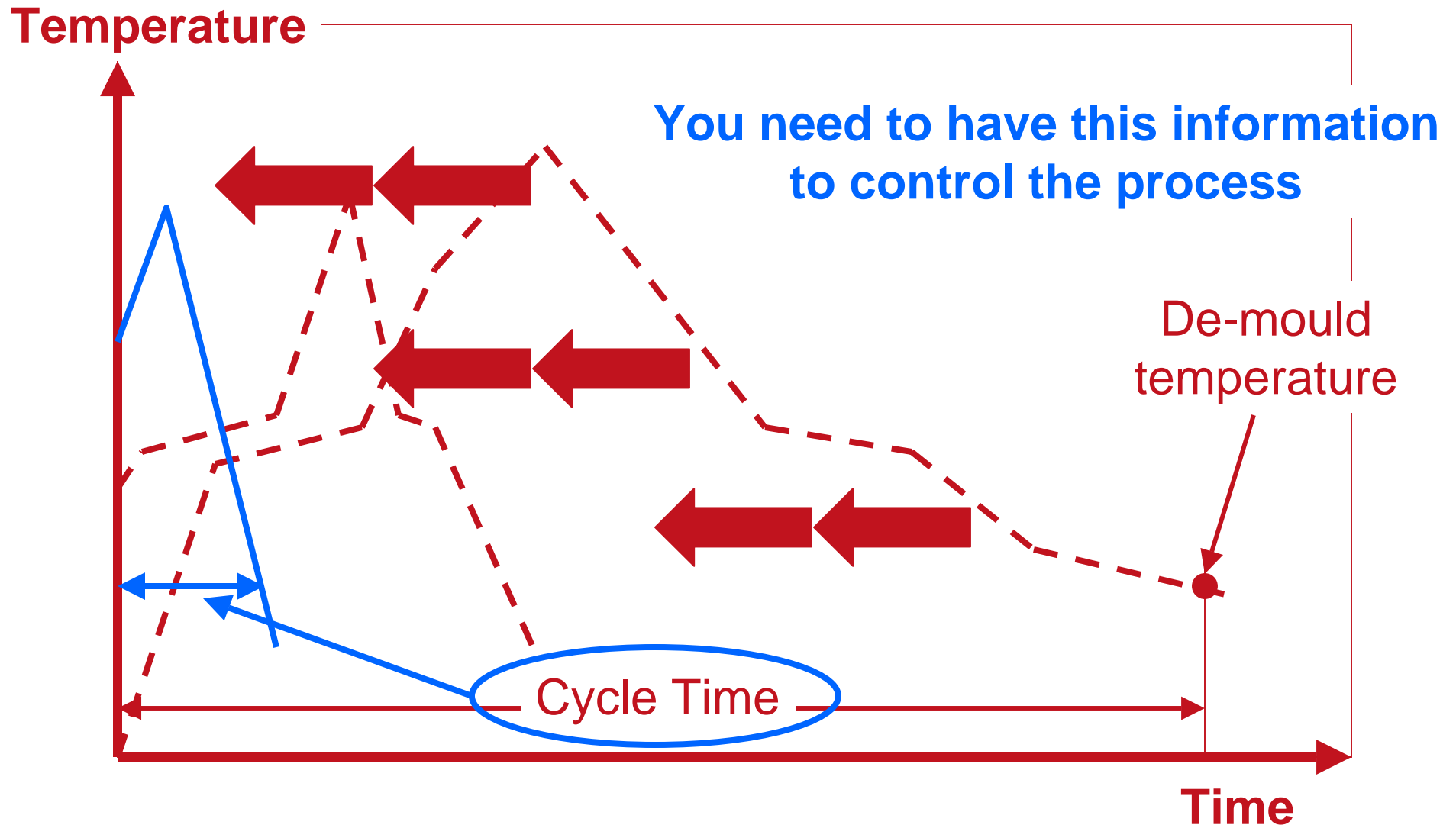


Reducing Cycle Times



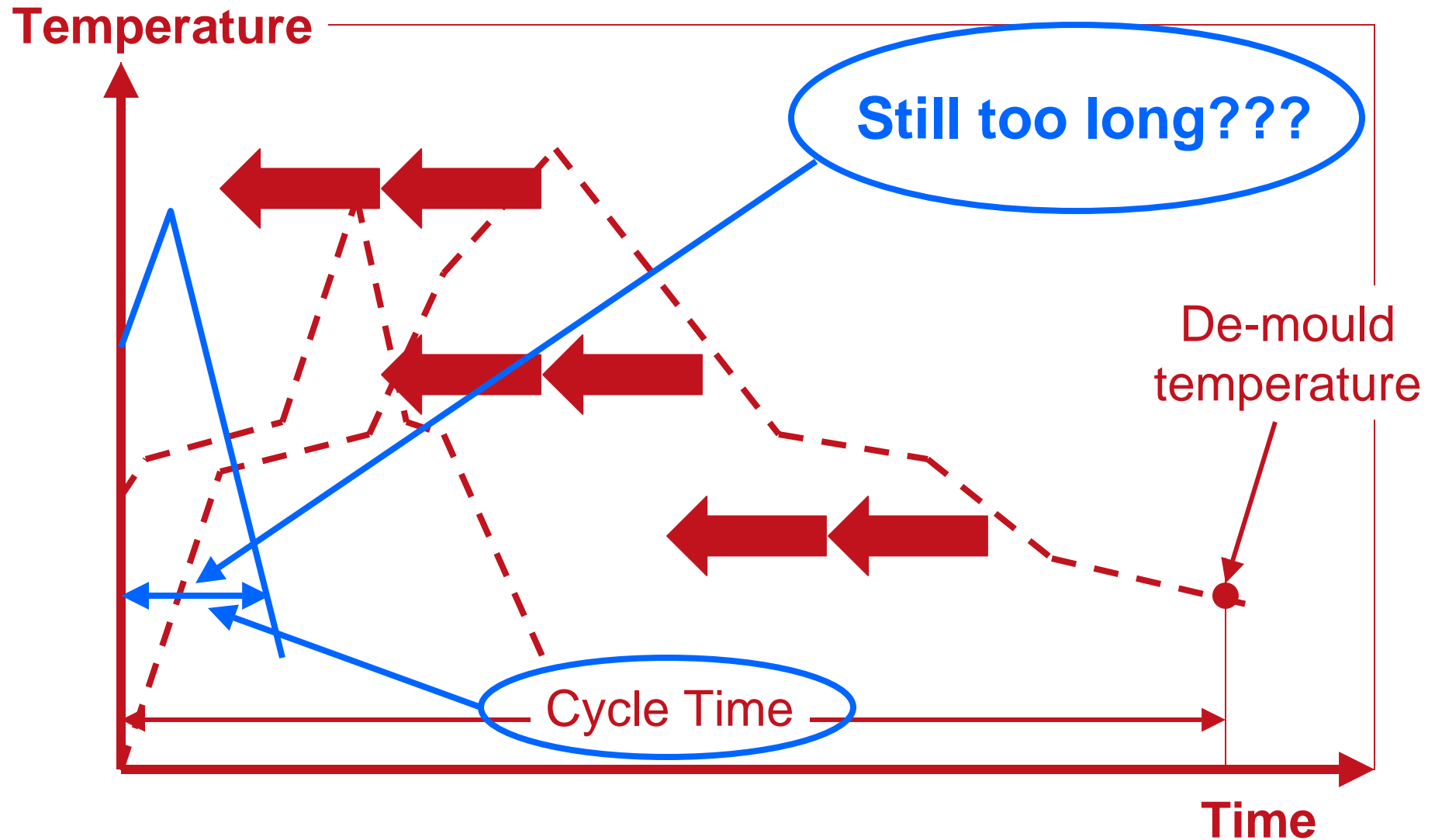


Reducing Cycle Times



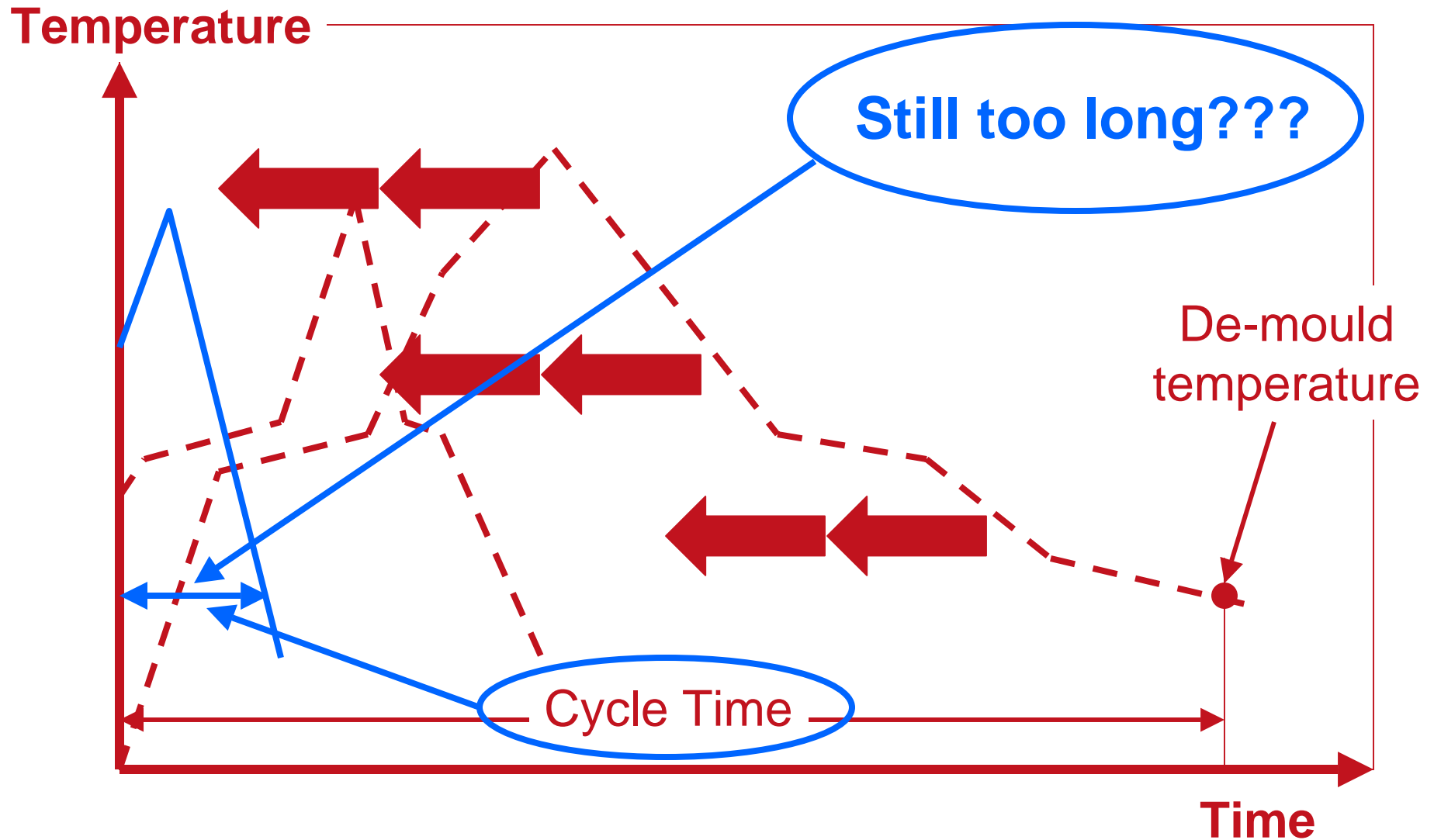


Reducing Cycle Times





Reduce Manufacturing Time





Reduce Manufacturing Time

Many industries have our problems

- **Cycle time for a fridge? Manufacturing time?**
- **Cycle time for a car? Manufacturing time?**
- **Cycle time for a plane? Manufacturing time?**



Reduce Manufacturing Time

A new approach to rotational moulding

- Simple Clamshell machine is sequential
- Carousel machine is step towards parallel processing
- This concept needs to be extended further
 - conveyor belt principle?



The Future - 2020

Actions Needed

- **Reduce cycle times to less than a quarter of what they are today.**
- **Have available a comprehensive palette of materials to offer the customer.**



The Future - 2020

Actions Needed

- **Have full control over all process variables to provide consistent part quality.**
- **Move towards full automation of all aspects of the process.**



The Future - 2020

Actions Needed

- **Reflect on new machine and mould design concepts to improve the efficiency of the process**



The Future

Moulders

- **Must chase new markets**
- **Must recognise the value of technology, rather than the price of it**
- **Must share technology for the benefit of all**
- **Must enhance the image of the industry**



The Future

Moulds

- **Standardised fittings to aid process control**
- **Direct heating/cooling of mould and plastic**
- **Better thermal and stiffness characteristics**
- **Internal pressure and internal cooling**



The Future

Moulds

- Mould as the “moulding machine”
- Fast/easy automation
- Computer designed to allow for local shrinkage



The Future

Machines

- **Controlled from internal air temperature**
- **“Active” venting to control mould pressure**
- **De-moulding outside the cycle if it is slow?**
- **Continuous conveyor belt principle?**



The Future

Materials

- **More conventional plastics amenable to rotomoulding**
- **New materials with controlled thermal characteristics**



The Future

Whose responsibility?

- **Moulders must not accept the status quo, and must recognise that changes cost money.**
- **Suppliers must lead, - take a leap of faith?**
- **Moulding Associations must come together to drive what needs to be done.**



The Future

This presentation has contained a lot of issues

BUT, when you think of **ARM**, – remember

A – Air temperature and pressure control

R – Responsibility of the industry to drive the solution

M – Materials, Moulds, Machines, Manufacturing times



Thank you for your attention

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