Control valves enhancing polymerization processing

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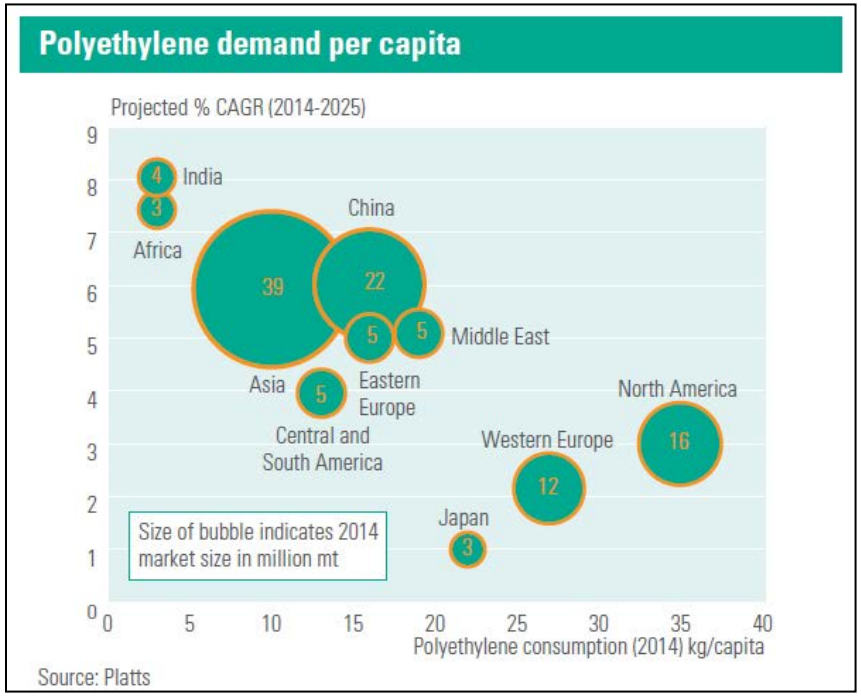
Metso Flow Control

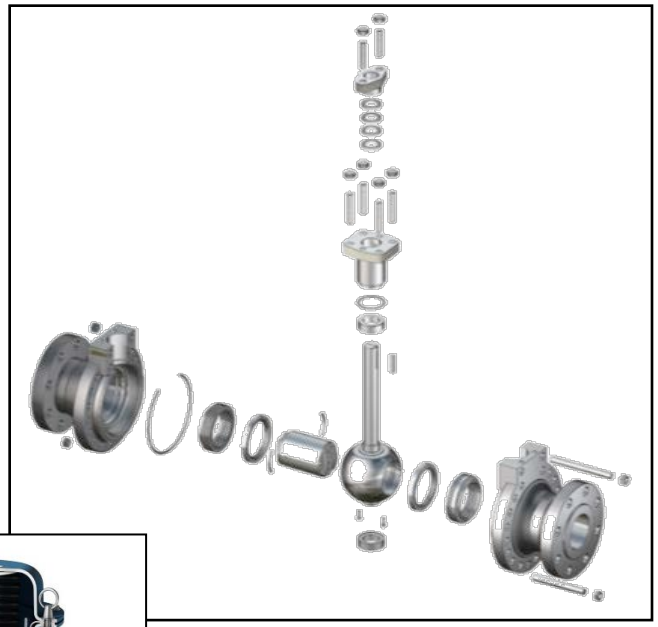
Polyolefin market overview

- Global olefin market is growing with Asia dominating the demand
- Several licensed technologies available to produce polyolefins
- Essential elements for polyolefin production:
  1) monomer / co-monomer
  2) catalyst / activator
  3) reactor
  4) control valves



Standard, severe, engineered valves..?

- How to choose?
  - Variety of valve types and requirements
  - Custom-made, engineered valves
- What about modular valves?
  - Standard construction
  - Variety of features
  - For standard applications
  - Any good for demanding polyolefin applications?



Application examples

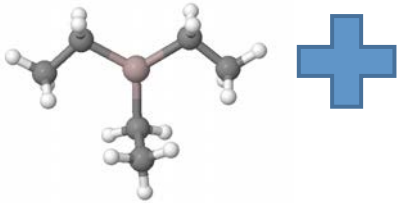
1) Organoaluminium co-catalysts
2) Reactor cooling
3) High-cycle polymer discharge

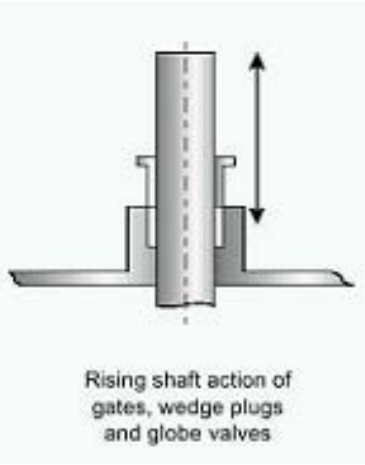
1) Organoaluminium co-catalysts

- Commonly used in polyolefin processing as catalyst activators
- Necessary compound for the process
- Safety risk at the plant
- Extremely flammable when exposed to air

Organoalumium challenges for control valves

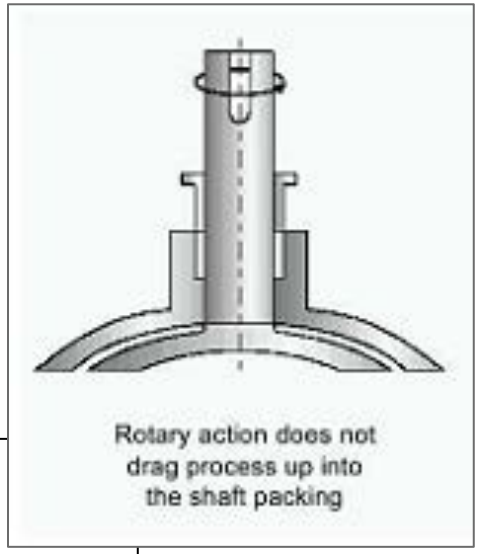
- Crystallizing to rising valve stems
- Forms surface like sand paper
- Packing leakage
- Small, fast starting fires when exposed to air
- Valve sticking and failing to control
- Required a back-up valve

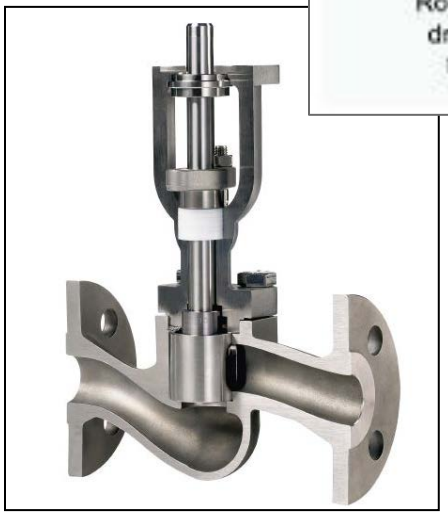




How to reduce risks related to organoaluminium catalysts?

- Modular, rotary control valve
  - No rising stem
  - Seat desing clearing the debris
  - No sticking and crystallizing
- Reliable performance
  - No need for back-up valves
  - Hardware and repair cost savings
  - Improved plant uptime
  - Safety concerns resolved





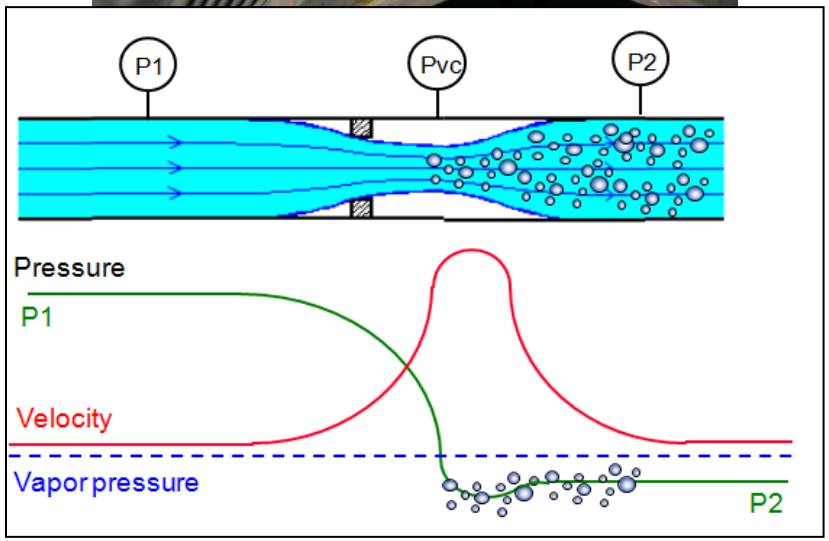
2) Reactor cooling

- Highly exothermic reactions
- Polyolefin reactors produce tremendous amounts of heat
- 200 000 tonns polyethylene plant generates heat equal to 25 MW in 8000 operating hours
- Efficient heat removal is a key-concern in all reactors

Flashing challenge

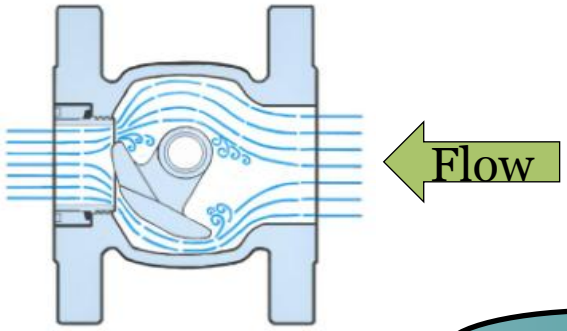
- Cooling water jackets is a common method
- Flashing in tubular reactor cooling tank valves
- Small 'bubbles' forms at P2, below vapor pressure with high flow velocity
- → **severe erosion for control valves and piping**

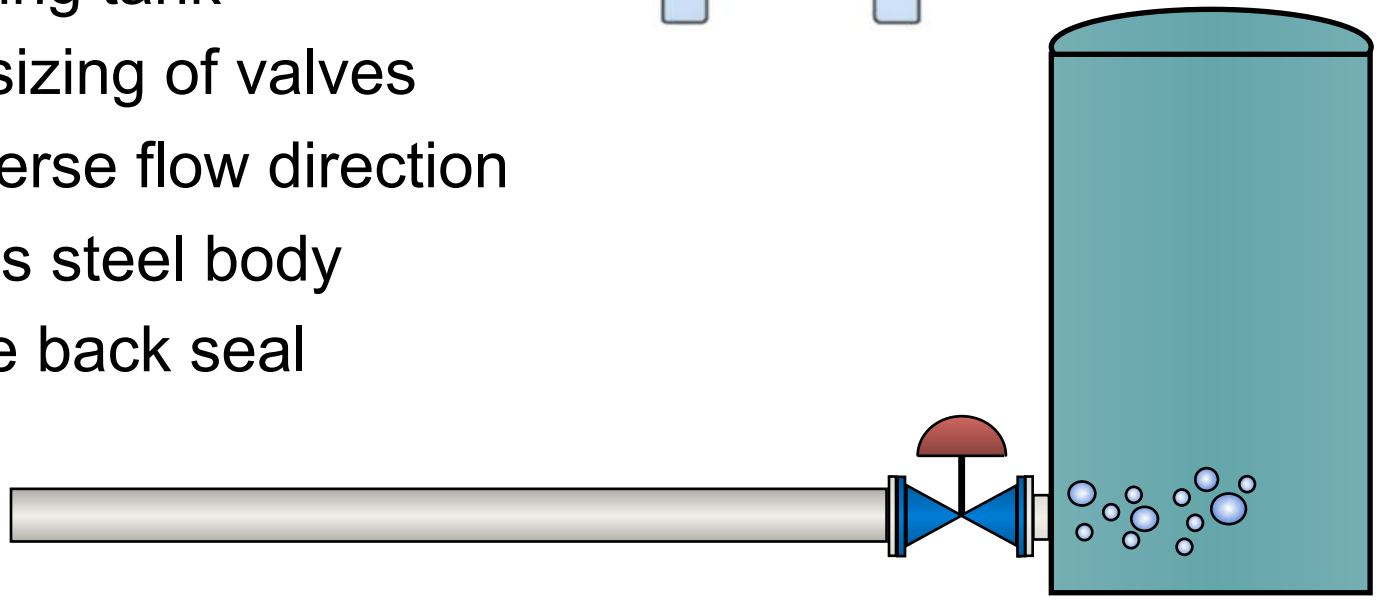
Slit flow erosion



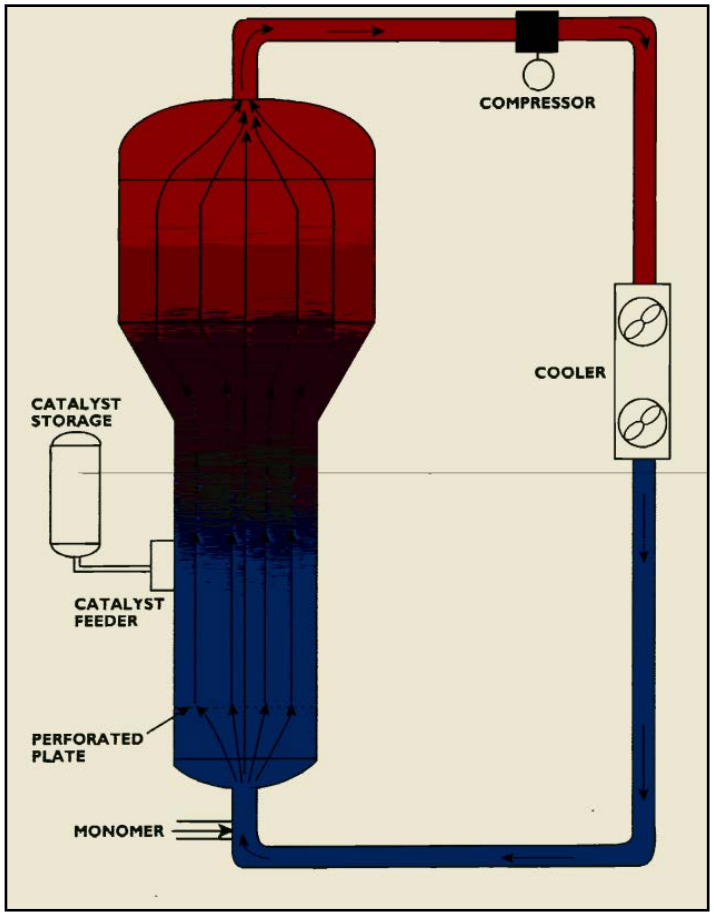
Reliability to reactor cooling in flashing conditions

- Eccentric plug valves with balanced trim
- Install the valves close to the cooling tank
- Proper sizing of valves
- Use reverse flow direction
- Stainless steel body
- Graphite back seal





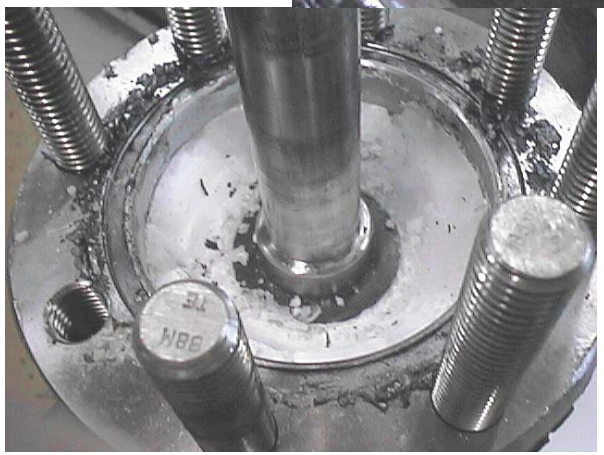
3) High-cycle polymer discharge



- Fluidized bed gas-phase reactors are commonly used for polyolefin production
- Requires a complex product discharge piping and valves
- Continuous switching between reactor discharge piping known as discharge 'legs'

High-cycle polymerization – valves in extreme conditions

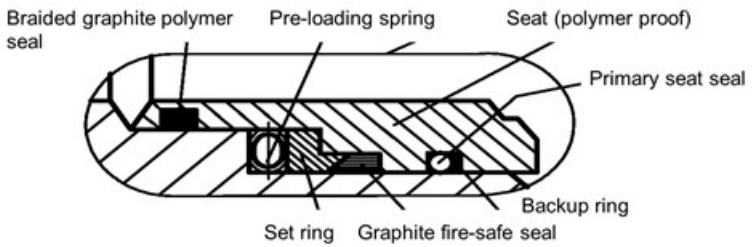
- High-cyling rate over 200 000 cycles annually
  → stresses the packing and actuation
- Fast cycle time, less than 2 seconds
- Abrasive flow media → erosion
- Polymer growth and plugging in cavities and seating



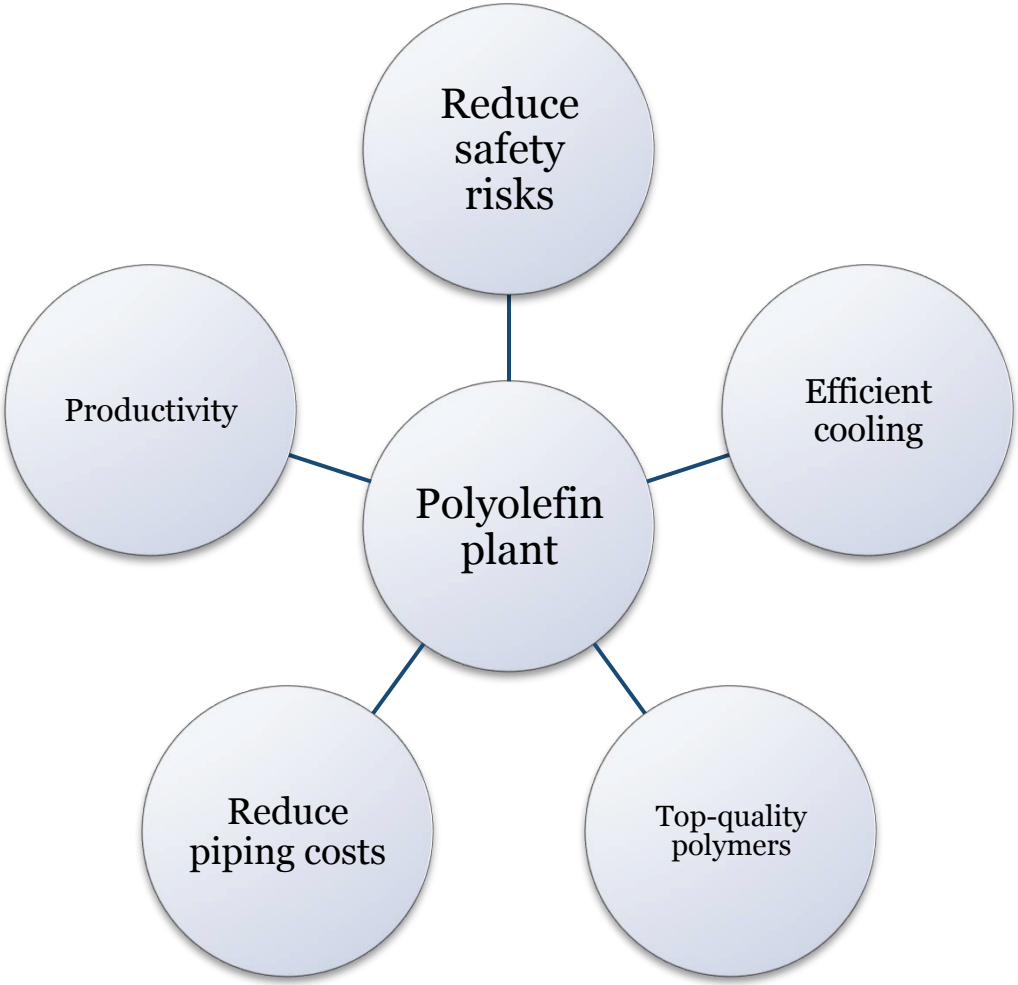
High-cycle polymerization performance

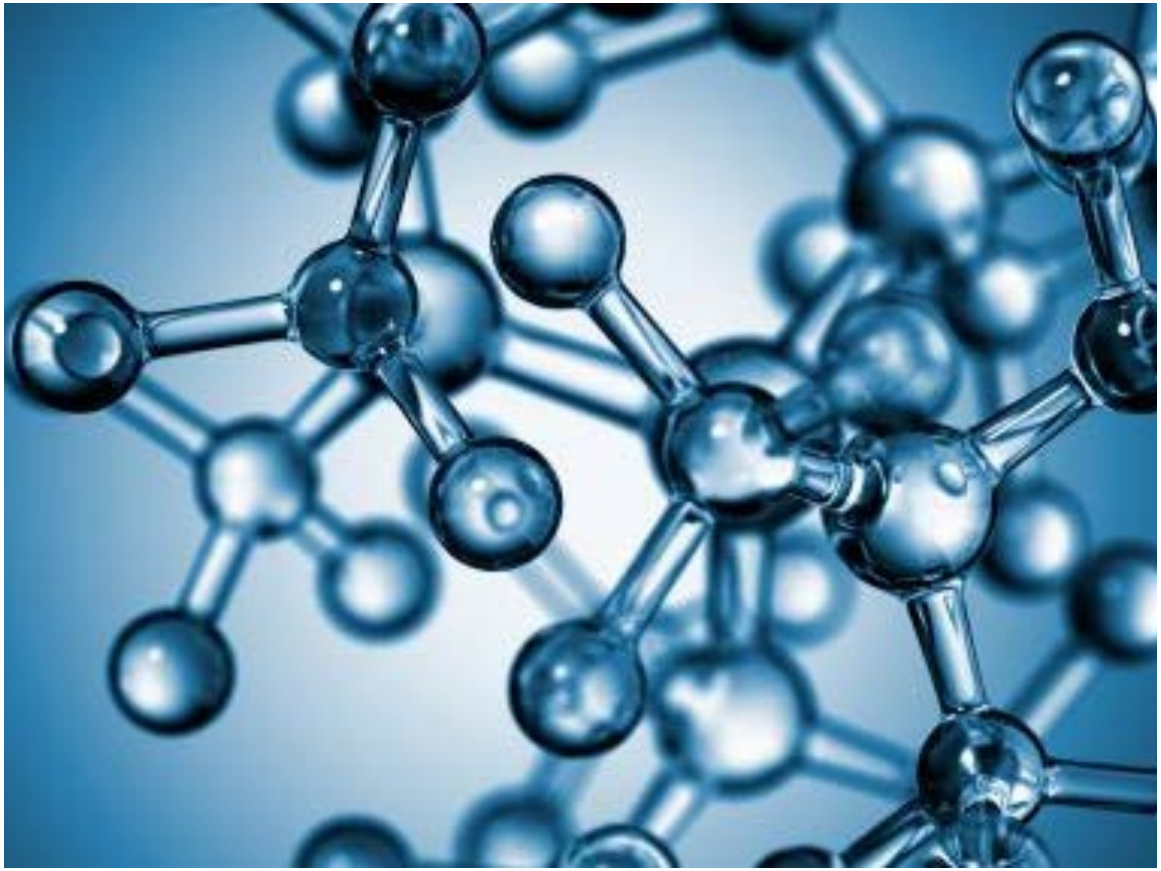
- Modular, high-cycle actuated ball valves
- Polymer proof seating
- Continous, wiping contact between ball and seat
- Hard, carbide coatings

→ Long lasting tightness, resisting polymer build-up, erosion and high-cycle demands



Control valves boosting polyolefin performance





Modular, reliable polyolefin flow control valves

Supports growing markets and diverse polyolefin technologies