



Capa™ in cast & thermoplastic elastomers

One molecule.
Millions of opportunities.

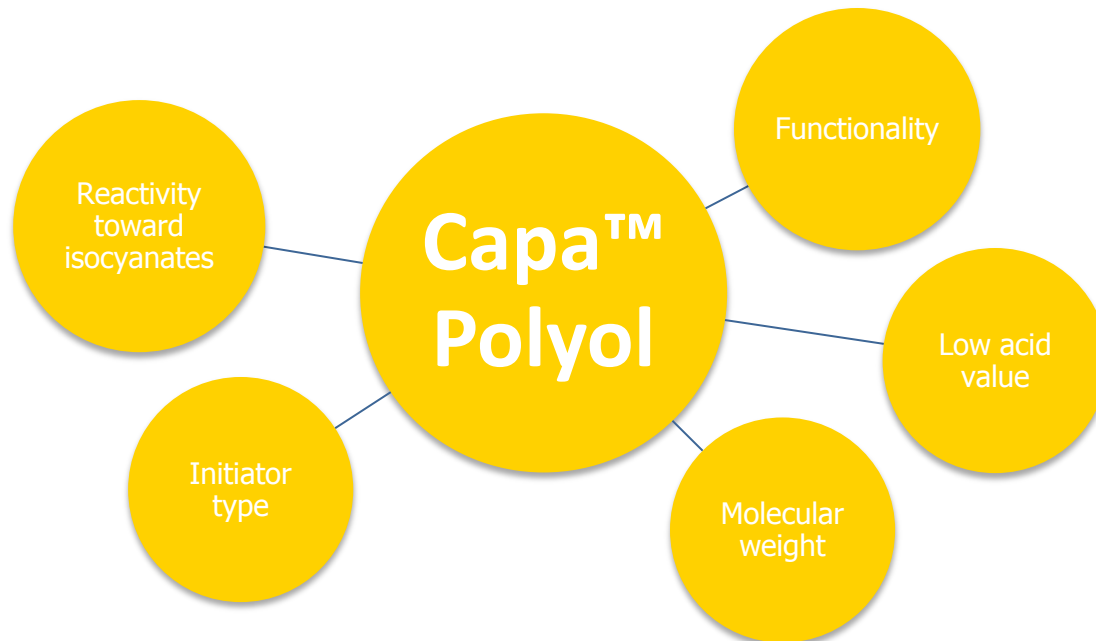
New Focus

- ➔ Caprolactone derivatives marketed as Capa™ by Perstorp
- ➔ Production of monomer, polyols and thermoplastics, in Warrington, UK
- ➔ Cast PU elastomers and TPU are key markets for Capa™ Polyols
- ➔ Perstorp is committed to support the growing demand from these markets and has recently invested in more capacity to meet customers' expectations



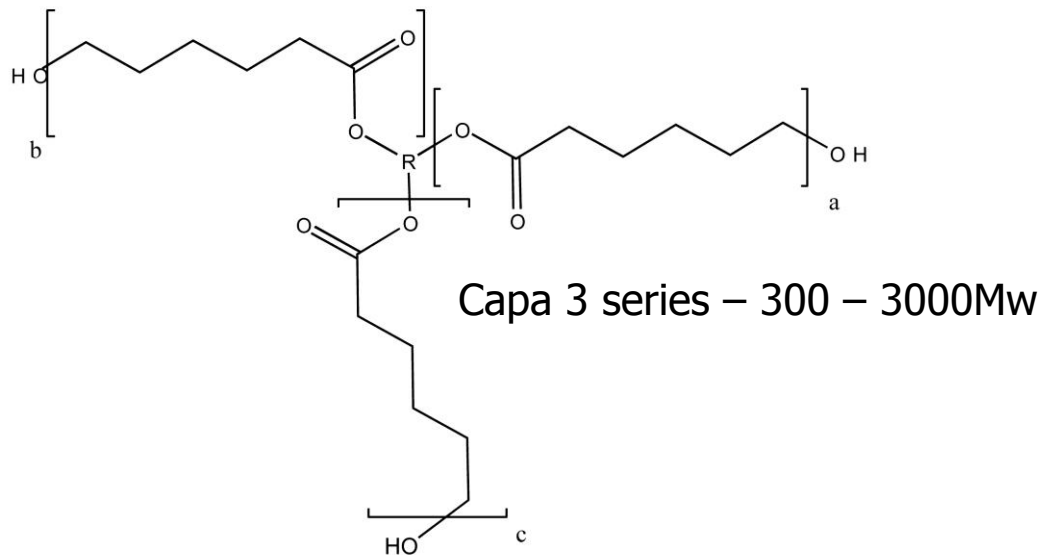
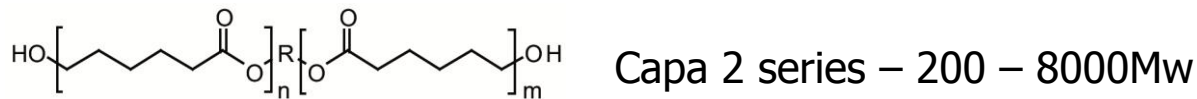
Caprolactone Polyols

- ➔ Unique aliphatic polyester polyols
- ➔ Made via ring opening polymerisation – no by-products
- ➔ This gives a tighter manufacturing specification than most other polyols
- ➔ Very low acid values with premium grades having a negligible acid content
- ➔ Controlled poly-dispersity
- ➔ Relevant molecular weight ranges and functionalities for any PU system



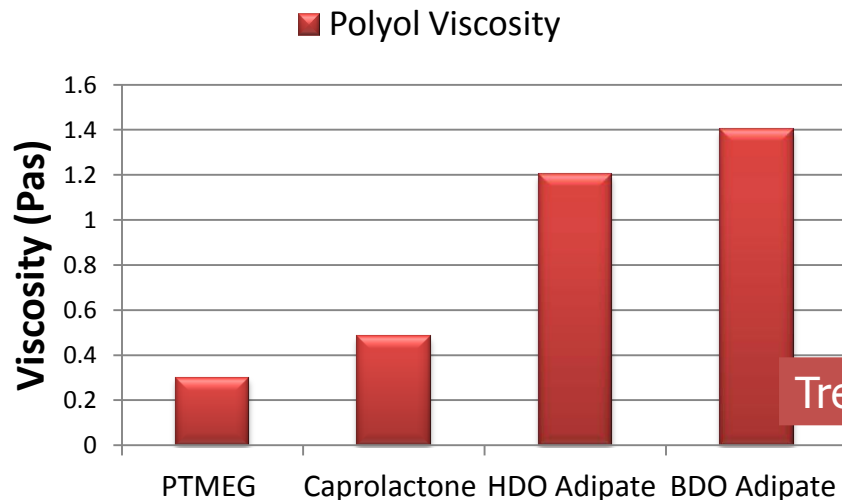
The caprolactone offer

- ➔ Wide range of products for both cast and TPU systems
- ➔ Chain extenders, cross linkers and soft segment polyols all covered in our versatile offering
- ➔ Special grades include copolymers and low acid value grades
- ➔ Grades can be tailored depending on the type of initiator



Processing

- ➔ Capa™ Polyols have a very low melt viscosity
- ➔ This continues into the prepolymer system making Caprolactone polyols one of the lowest viscosity polyester prepolymers on the market
- ➔ Combining this with the low melting point of the polyols is what makes Capa™ very easy to use
- ➔ Modifying the initiator of a caprolactone polyol can also help to perfect the processing conditions



2000Mw Polyol	MDI prepolymer viscosity (Pas) @40°C
PTMEG	8
Caprolactone	11
HDO Adipate	14
BDO Adipate	22

Trend continues into the prepolymer

Thermoplastic Polyurethanes

Current sales of Capa™ into the market are based on a number of excellent properties this polyol offers. The TPUs are then sold into high performance applications where basic esters and ethers do not function or endure.

Features:

- ➔ Low viscosity for easy processing both for the producer and the subsequent end user
- ➔ Achievable compression set is very low.
- ➔ Consistently high tear strengths even in softer TPU.
- ➔ Low temperature flexibility is excellent, approaching the level of polyether.
- ➔ Hydrolysis resistance is much improved over standard polyester adipates especially in our low acid diols



TPU

Capa™ TPU

Mechanical performance
UV stability
Hydrolytic stability
Ease of processing

Polyether TPU

Ease of processing
Hydrolytic stability

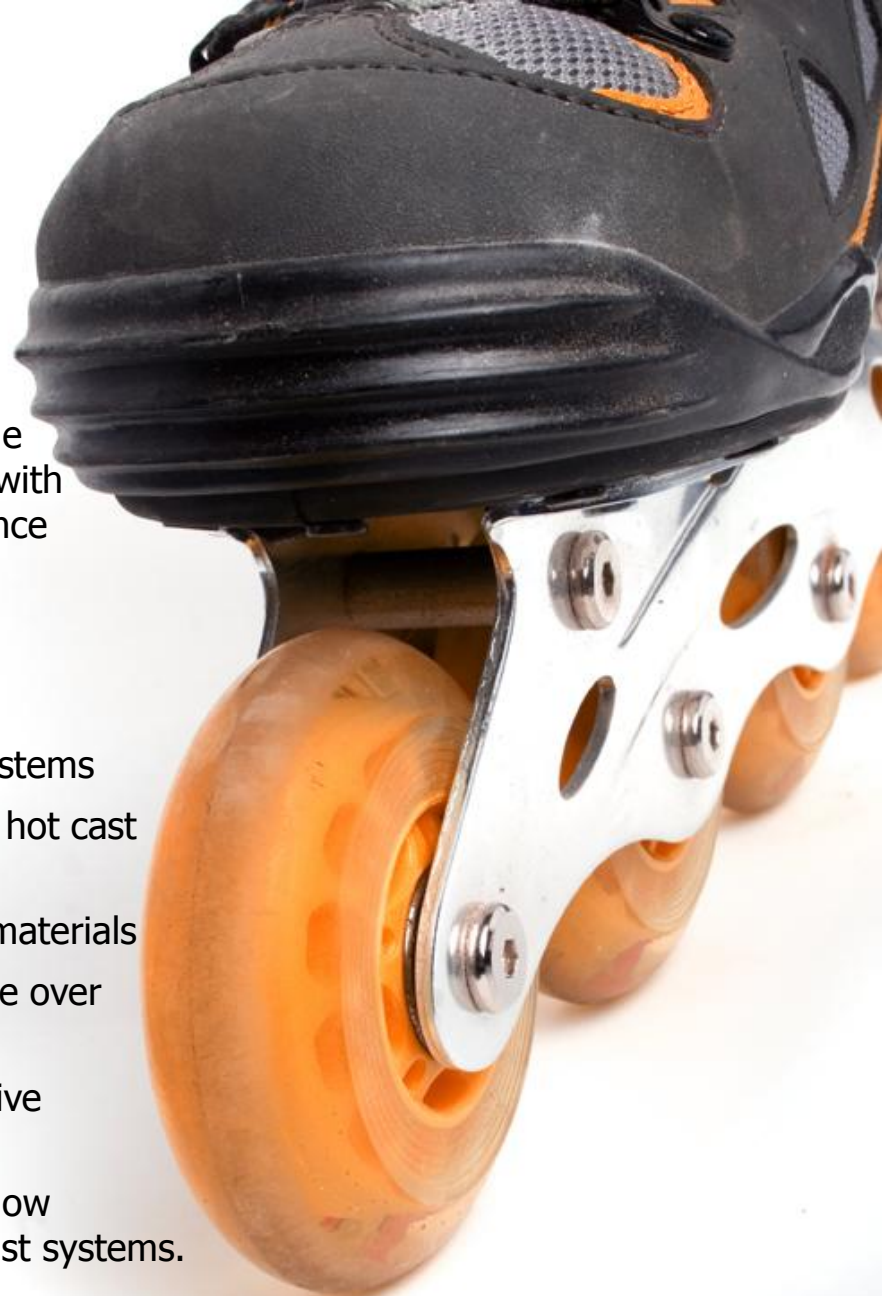
Polyester TPU

Mechanical performance
UV stability

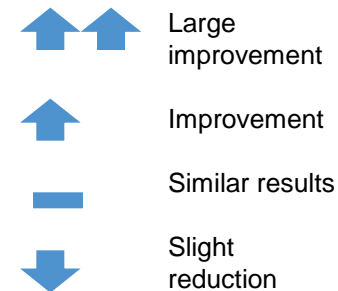
Cast Elastomers

Caprolactone polyols are sold worldwide into a number of interesting and diverse cast systems. They are used 100% in the most demanding applications where a durable PU system is required. They are also used in conjunction with other polyols to improve certain properties as a performance enhancer.

- ➔ The exceptionally low viscosity pre-polymers that are formed means that processing and casting is easy
- ➔ Low molecular weight liquid products for cold cast systems
- ➔ Medium molecular weight semi crystalline polyols for hot cast systems
- ➔ Improved hydrolysis resistance over other polyester materials
- ➔ Increased UV stability and thermo oxidative resistance over polyether polyols
- ➔ Excellent mechanical properties for demanding abrasive applications
- ➔ Tailor made reactivity toward isocyanates. Fast and slow reacting grades to give extended pot life for large cast systems.



Summary

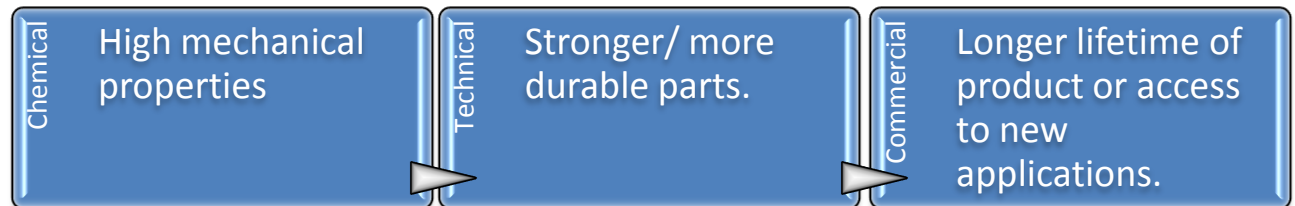
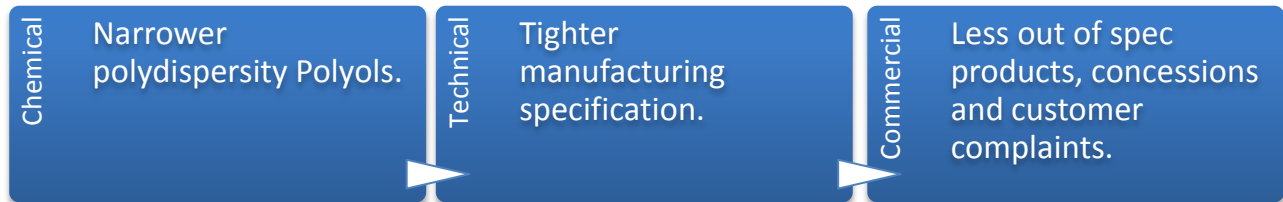
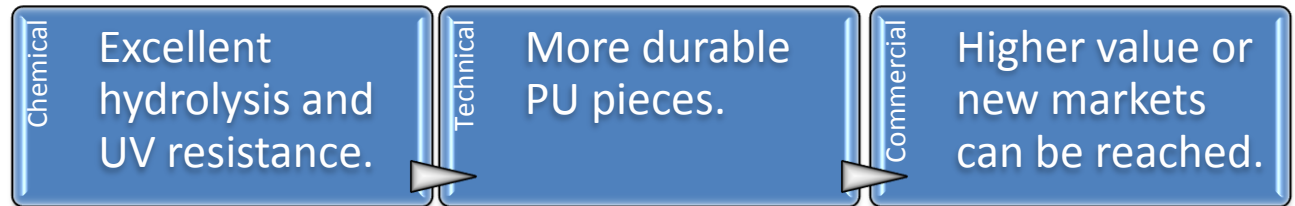
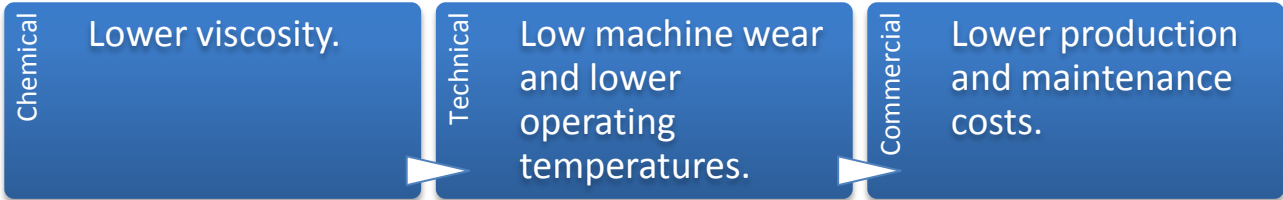


- ➔ Full or partial substitution of polyether and polyester grades for selected performance enhancements
- ➔ Aliphatic polyester polyols meaning mechanical properties will always be high
- ➔ Advantage of easy processing, hydrolysis resistance and low temperature flex of polyethers
- ➔ Good balance between an ester and an ether material which give Caprolactone PU its unique position in the market
- ➔ This comparison table highlights the potential performance advantages of using Capa™ versus polyester or polyether

Capa™ performance comparison versus polyether or polyester

Property enhancement	Polyether	Polyester
Tensile strength	↑	↑
Elongation at break	—	—
Tear strength	↑ ↑	↑
Abrasion resistance	↑ ↑	↑
Compression set	↑ ↑	↑ ↑
Hydrolysis resistance	↓	↑
UV stability	↑ ↑	—
Oil and chemical Resistance	↑	—
Low temperature flex	—	↑ ↑
Viscosity/processability	—	↑ ↑

Summary



Product Suggestion

TPU

Product	Reason
Capa™ 2100 (and the A grade)	Soft segment, low crystallinity, low acid value for extra hydrolysis resistance
Capa™ 2200 (and the A grade)	Soft segment, low crystallinity, low acid value for extra hydrolysis resistance
Capa™ 2202A	Soft segment, high crystallinity for added tear strengths, low acid value
Capa™ 2302	Soft segment, high molecular weight

Cast Elastomer

Product	Reason
Capa™ 2201 (and the A grade)	Soft segment, low crystallinity (low acid value for extra hydrolysis resistance)
Capa™ 2101 (and the A grade)	Soft segment, low crystallinity, low acid value for extra hydrolysis resistance
Capa™ 3031	Cross-linker, liquid grade for high cross-linked and abrasion resistance
Capa™ 7201A	Soft segment, copolymer of PTMEG for synergistic properties, high hydrolysis resistance and mechanical properties