Mid Michigan Plastics

Ultra High Flow Polypropylene

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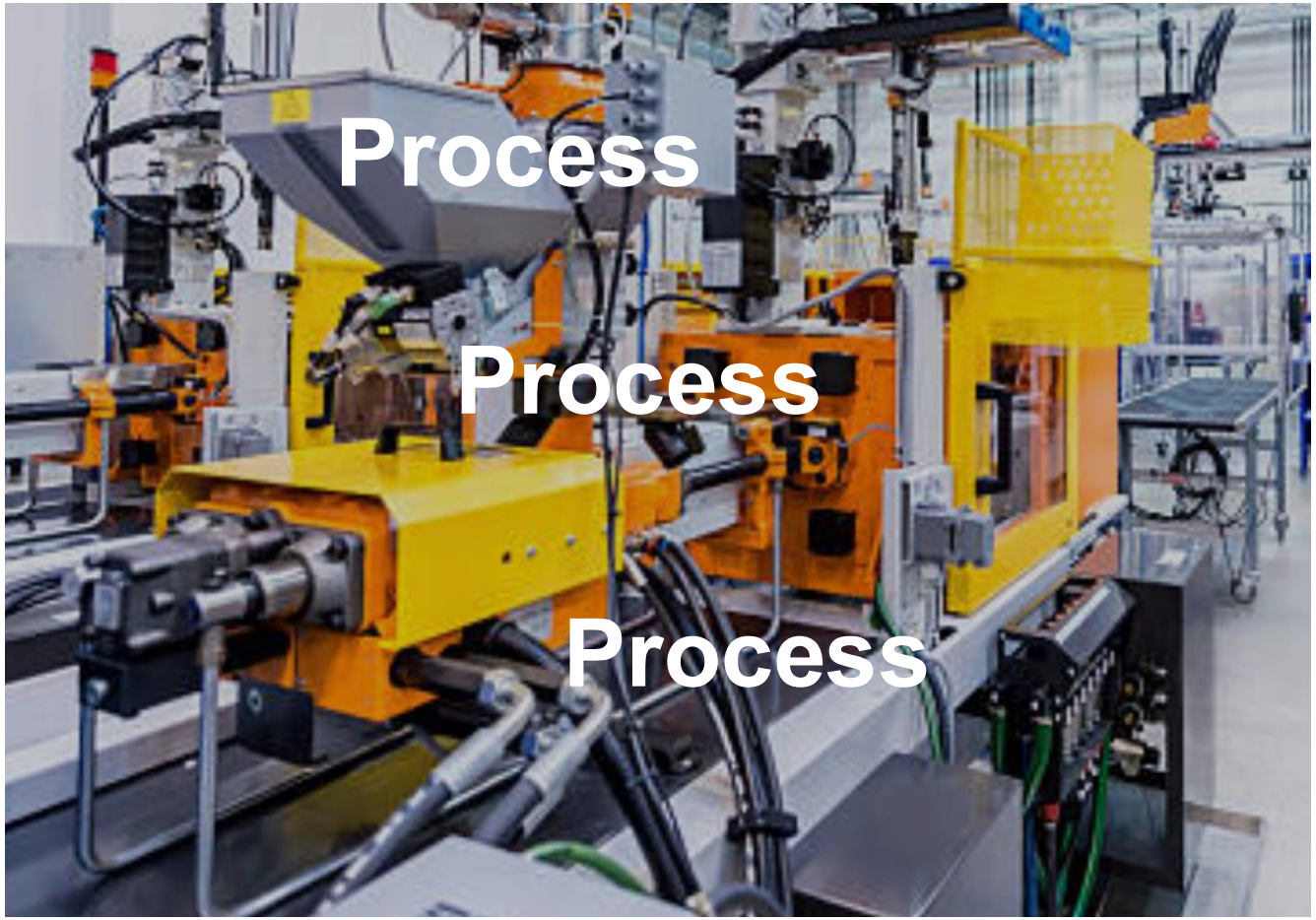
Why Polymer Flow is Important ?



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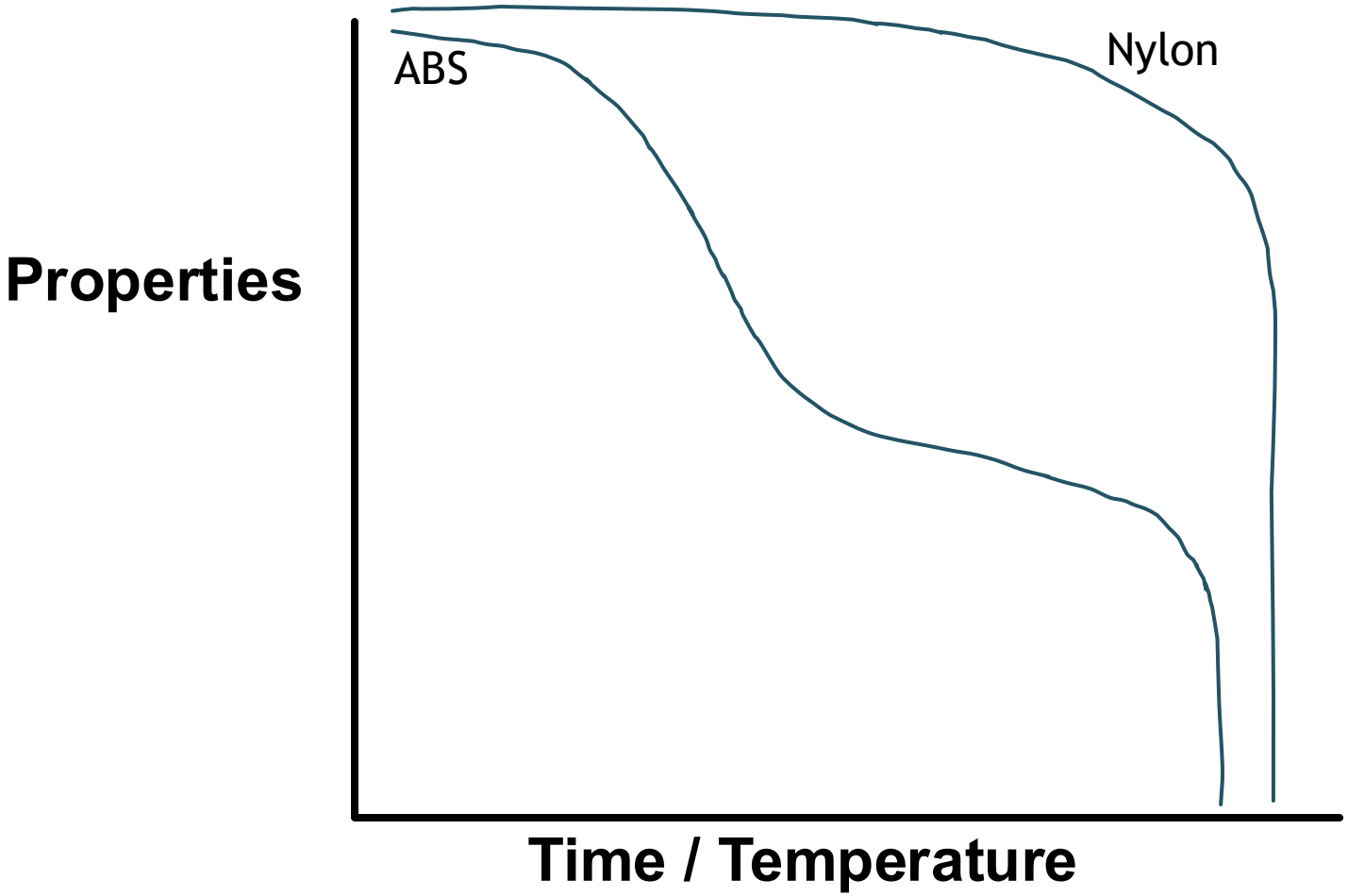
Properties vs. Time/Temperature



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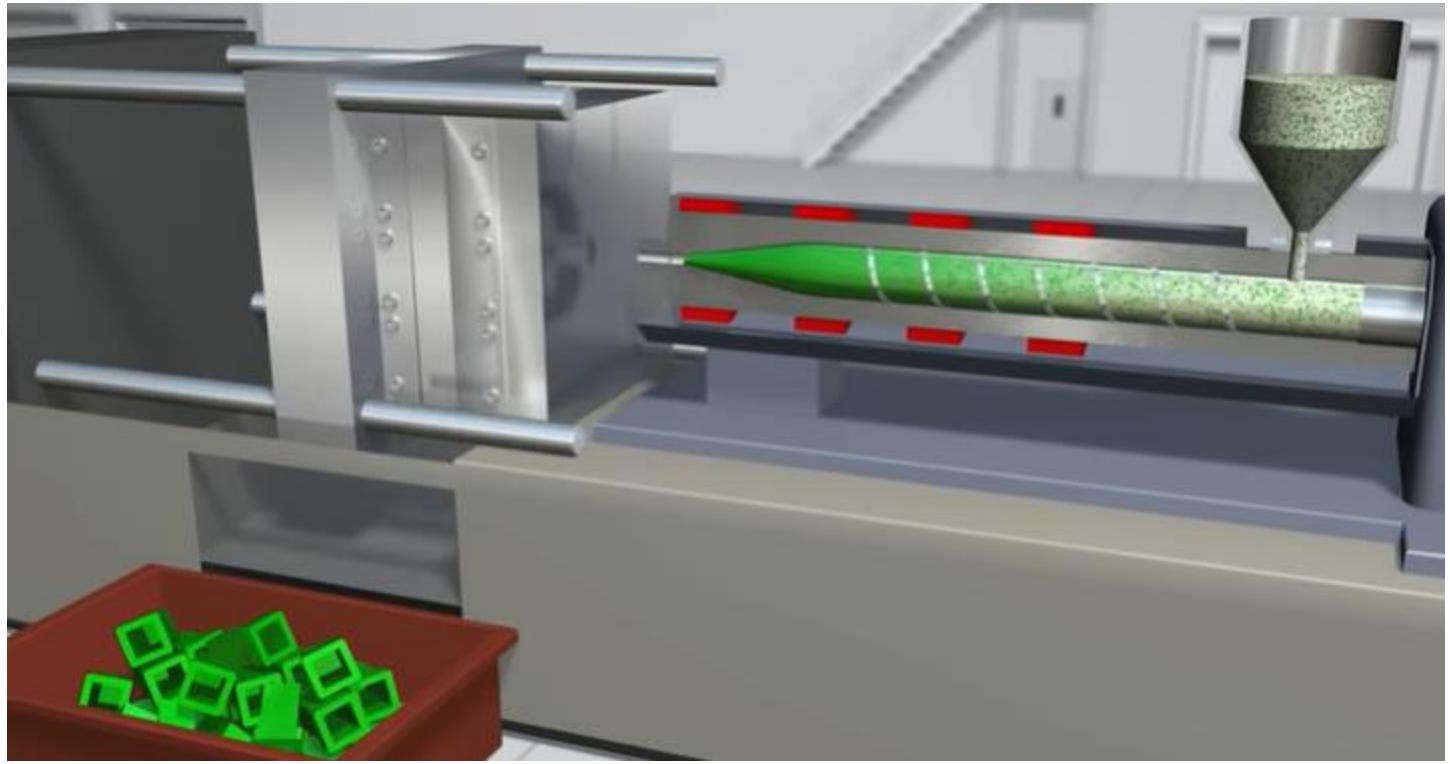
Injection Molding

Injection Molding Process



- Closed Tool
- High Pressure
- Part Thickness
- Flow Length
- # of Gates
- Cooling Time

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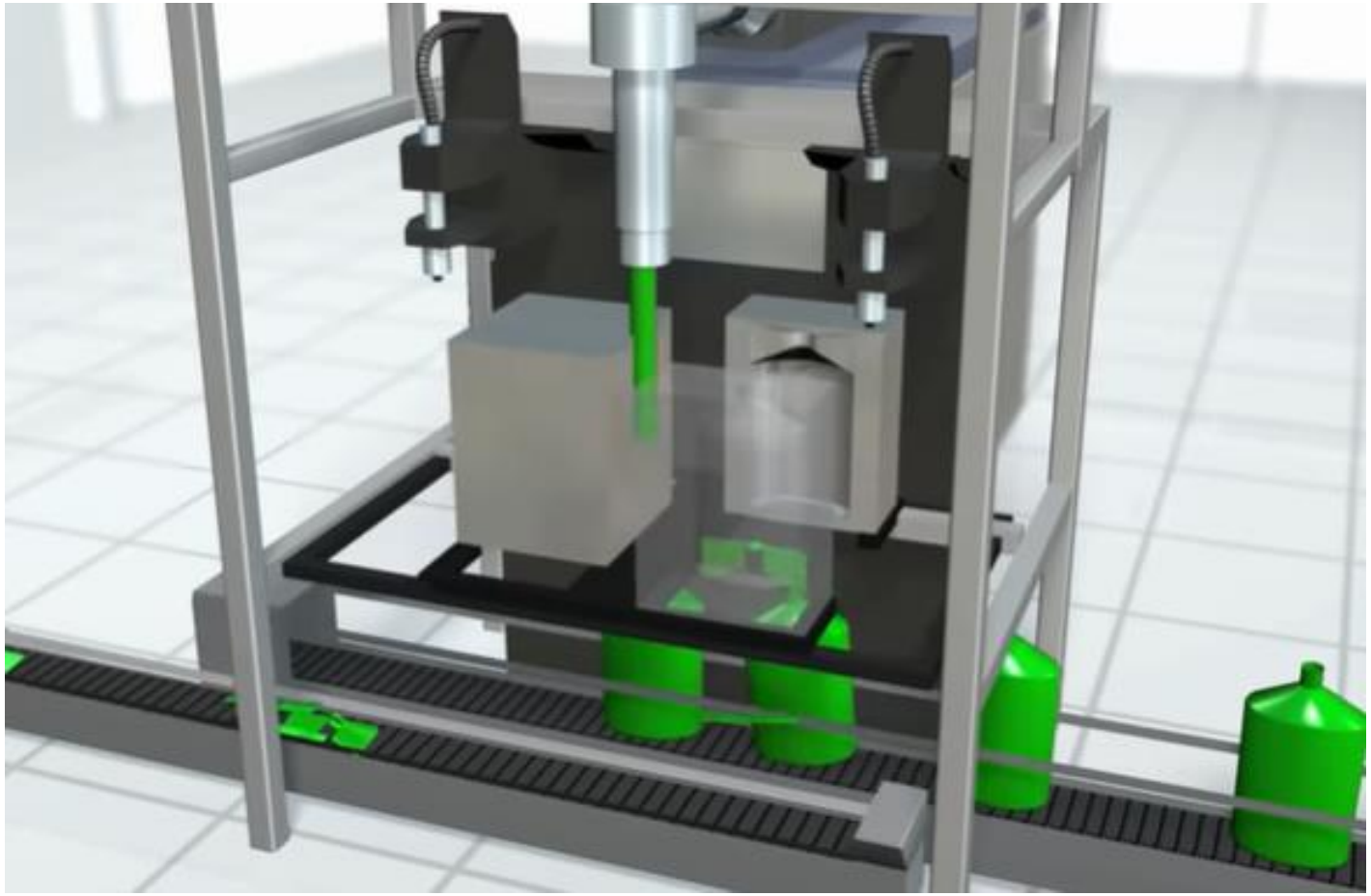
Blow Molding

Blow Molding Process



- Closed Tool
- Low Pressure
- Part Thickness
- Melt Strength
- Expansion Ratio
- Cooling Time

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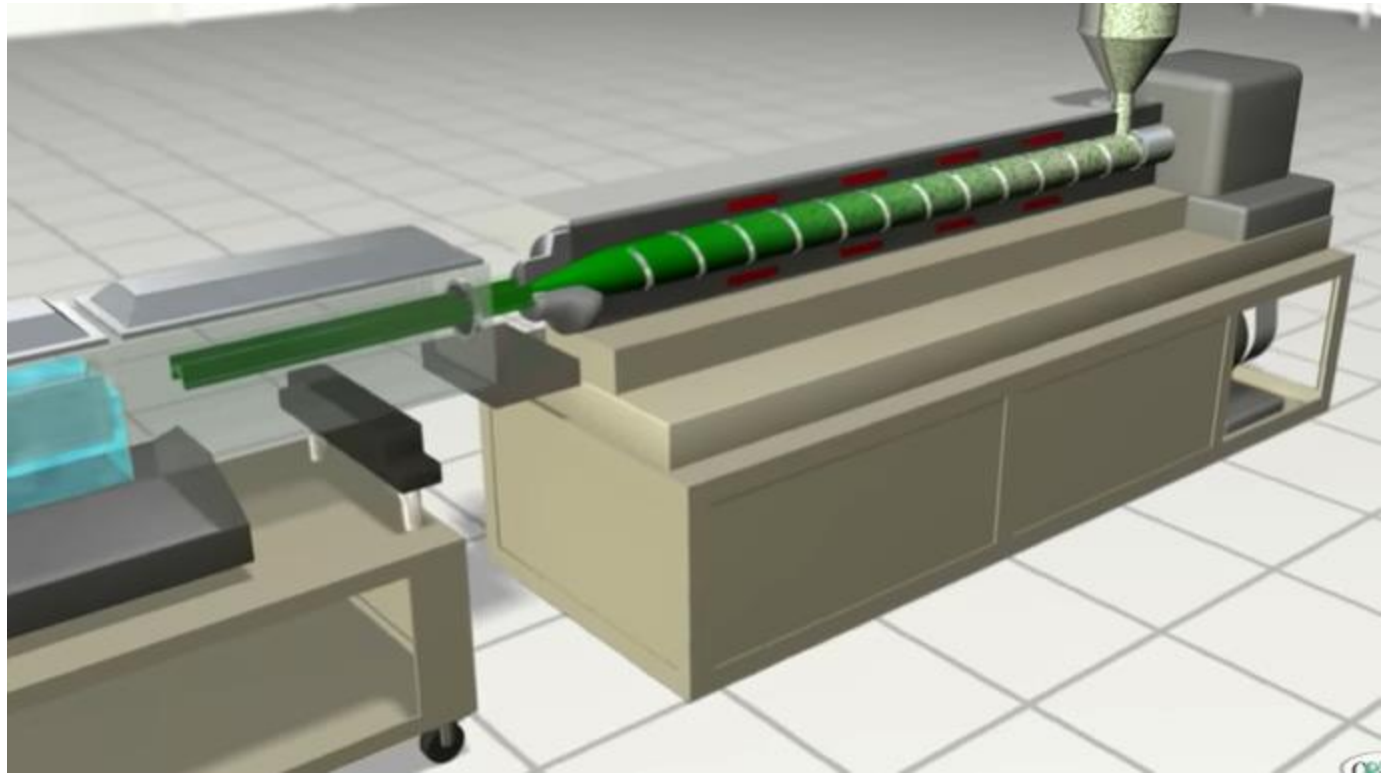
Extrusion

Extrusion Process



- Open Die
- Low Pressure
- Form Thickness
- Melt Strength
- Cooling Time

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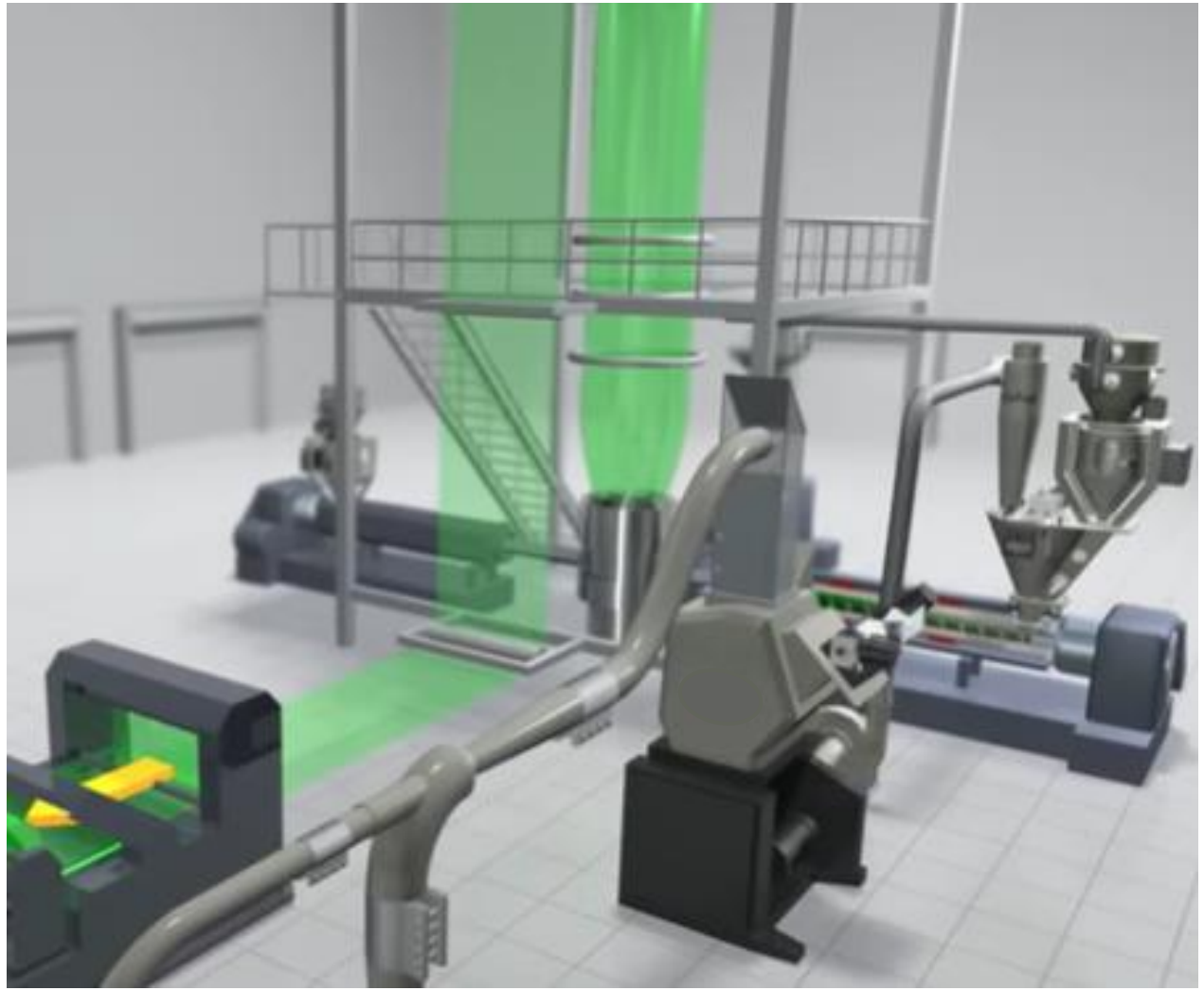
Polymer Flow Classification

Blown Film Extrusion



- Open Die
- Low Pressure
- Film Thickness
- Melt Strength
- Cooling Time

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Polymer Flow Classification

Fractional Melt	Flow < 1 gr/10 min.	Blow Molding
Low Melt	9 >Flow >1 gr/10 min.	Blow Molding
Medium Melt	40 >Flow >10 gr/10 min.	Injection Molding
High Melt	100 >Flow >41 gr/10 min.	Injection Molding
Very High Melt	500 >Flow >101 gr/10 min.	Thin wall Inj. Mldg.
Ultra High Melt	1500 >Flow >501 gr/10 min.	Melt Blown Fiber

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Ultra High Flow Polypropylene Property

Physical Properties	Metric	English	Comments
Specific Gravity	0.905 g/cc	0.905 g/cc	ASTM D1505
Melt Flow	1300 g/10 min	1300 g/10 min	ASTM D1238, L

Thermal Properties	Metric	English	Comments
Melting Point	165 °C	329 °F	DSC

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UHF PP is it a Polymer or and Additive?

UHMF PP is a Polymer used for many special applications such as melt blown micro fiber application.

UHMF PP is an additive for other polymers to ease processing. It acts as a processing aid additive

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Why Develop a UHMF PP?

- ❑ Improved Processability
- ❑ Faster Cycle Time
- ❑ Good melt strength
- ❑ Mechanical Properties

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How it is Made?

UHMF PP is made by addition of hydrogen.

Challenge is the balanced hydrogen level to achieve the high melt flow yet minimizing undesirable solubles.

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What are the Applications?

Packaging

Automotive

Consumer Products

Thin wall Injection Molding

Melt Blown Fibers

Extrusion

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What are the expected Properties?

Increased melt flow rate

Good tensile strength

Good impact resistance

Good melt strength

Improved thermal properties

Thermal	Nominal Value	Unit	Test Method
Melting Point	161	°C	DSC
Physical	**Nominal Value**	**Unit**	**Test Method**
Density	0.92	g/cc	ISO 1183
Mechanical	**Nominal Value**	**Unit**	**Test Method**
Tensile Modulus	180,000	psi	ISO 527-2
Tensile Strength	5,000	psi	ISO 527-2
Impact	**Nominal Value**	**Unit**	**Test Method**
Notched Izod	0.14	ft-lb/in	ISO 180
Rheological	**Nominal Value**	**Unit**	**Test Method**
Melt Index	~1500	g/10 min	230°C, 0.0825" ID,2.16 kg
Modified MFR	5.5	g/10 min	230°C, 0.0200" ID,2.16 kg
Melt Viscosity	61	poise	190°C, 100 sec^{-1}

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Future Development

Development of many more grades of UHMF homo polymer as well as co-polymer PP between 500 - 1500 gr/10 min. region

Development of processing techniques to produce UHMF PP

Development of new applications

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Acknowledgement

Author would like to recognize the many years of development efforts by PolyVisions research and development team in the area of UHMF PP development as well as follow up testing and molding trials by their engineering and sales team.

Individuals involved with the development, production and sale of UHMF PP at PolyVisions

- **Jim Lochary, President**
- **Rick Wilson, Processing and Sales Engineer**
- **Troy Blankenbiller, Process Technician**

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Thank you

Any Questions?

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