## 1. GET IN THE RIGHT GROUP WHAT IS MOST IMPORTANT TO THE APPLICATION?

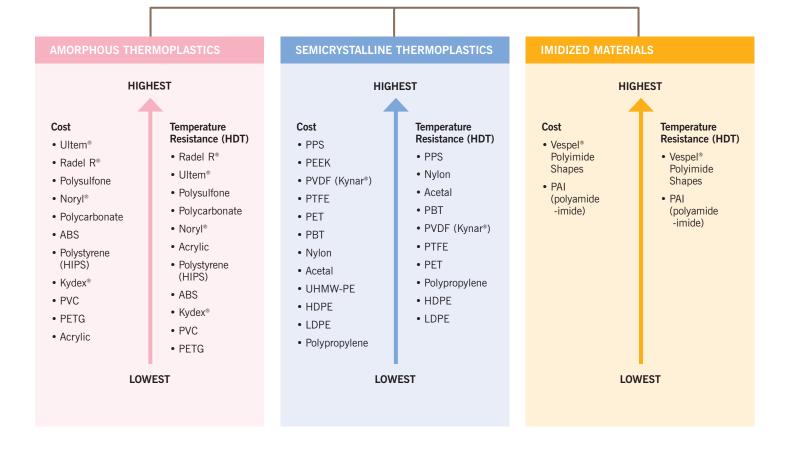
#### **GENERAL GROUP CHARACTERISTICS** AMORPHOUS THERMOPLASTICS SEMICRYSTALLINE THERMOPLASTICS **IMIDIZED MATERIALS** • Soften over a wide temperature range · Sharp melting point • Best physical properties above 400°F · Good formability Poor formability Best temperature resistance · Best bearing and wear capabilities Transparency Opaque · Good chemical resistance · Poor chemical resistance · Good chemical resistance • Bond well using adhesives · Difficult to bond using adhesives or solvents or solvents · Resistant to stress cracking · Prone to stress cracking • Poor fatigue resistance • Good fatigue resistance · Structural applications only · Good for bearing and wear (not suitable for bearing and wear) (as well as structural applications) POTENTIAL MATERIAL CHOICES POTENTIAL MATERIAL CHOICES ABS • Polystyrene (HIPS) Acetal • PET PAI (polyamide-imide) Polysulfone • HDPE Polypropylene Acrylic Vespel® • PVC • LDPE • PPS Kydex® Polyimide Shapes • Noryl® • Radel R® Nylon • PTFE • PETG • Ultem® • PBT • PVDF (Kynar®) • UHMW-PE Polycarbonate PEEK

This selector guide is intended to help you review the needs of your particular application and determine a few material candidates that can then be tested.

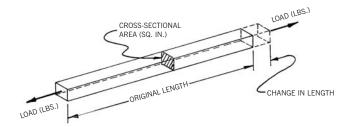
Although the information and statements herein are believed to be accurate, no guarantee of their accuracy is made. The statements and information are included for reference purposes only and are not intended and should not be construed as either a warranty of any type or representations applicable to the particular application, use or design of the buyer or user of the goods. In every case, we recommend that the purchaser or user before using or buying any product perform their own tests and make their own decision to determine to their own satisfaction whether the product is of acceptable quality, type and design and is suitable for the particular purposes under their own operating conditions.



## 2. CHOOSE THE BEST FAMILY IS TEMPERATURE A FACTOR? HOW CRITICAL IS COST?







## 3. COMPARE THE MECHANICAL PROPERTIES IS TENSILE STRENGTH (RESISTANCE TO BEING PULLED APART) IMPORTANT?

#### **AMORPHOUS THERMOPLASTICS**

#### Tensile strength - pull apart (psi)

	•
• Ultem®	15,200
<ul> <li>Polysulfone</li> </ul>	10,200
• Radel R®	10,100
Acrylic	10,000
• Noryl®	9,600
<ul> <li>Polycarbonate</li> </ul>	9,500
• PETG	7,700
• PVC	7,500
• Kydex®	6,100
• ABS	4,100
<ul> <li>Polystyrene (HIPS)</li> </ul>	3,500

#### SEMICRYSTALLINE THERMOPLASTICS

#### Tensile strength - pull apart (psi)

• PEEK	14,000
<ul> <li>Nylon (6 cast)</li> </ul>	10,000-13,500
• PPS	12,500
• Nylon (6/6 extruded)	12,400
• PET	11,500
Acetal (Homopolymer)	10,000
<ul> <li>Acetal (Copolymer)</li> </ul>	9,800
• PBT	8,690
• PVDF (Kynar®)	7,800
Polypropylene (Homo	polymer) 5,400
• HDPE	4,000
Polypropylene (Copoly	ymer) 3,800
• UHMW-PE	3,100
• PTFE	1,500-3,000

1,400

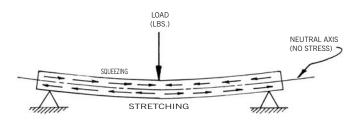
• LDPE

#### **IMIDIZED MATERIALS**

#### Tensile strength - pull apart (psi)

<ul> <li>PAI (polyamide-imide)</li> </ul>	21,000
Vespel® Polyimide SP-1	12,500
Vespel® Polyimide SP-21	9,500
Vespel® Polyimide SP-3	8,200
Vespel® Polyimide SP-22	7,500
Vespel® Polyimide SP-211	6,500





# 4. COMPARE THE MECHANICAL PROPERTIES IS FLEXURAL MODULUS (BENDING STIFFNESS) IMPORTANT?

©2016 Curbell Plastics, Inc. Unauthorized use is strictly prohibited. All other trademarks, service marks and logos

#### AMORPHOUS THERMOPLASTICS

#### Flexural modulus - stiffness (psi)

• Ultem® (30% glass-filled)	1,300,000
<ul> <li>Polycarbonate (20% glass-filled)</li> </ul>	800,000
• PVC	481,000
• Ultem®	480,000
Acrylic	480,000
<ul> <li>Polysulfone</li> </ul>	390,000
• Noryl®	370,000
• Radel R®	350,000
<ul> <li>Polycarbonate</li> </ul>	345,000
• Kydex®	335,000
• Polystyrene (HIPS)	310,000
• PETG	310,000
• ABS	304.000

#### SEMICRYSTALLINE THERMOPLASTICS

#### Flexural modulus - stiffness (psi)

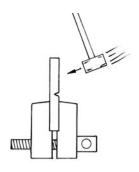
• PPS		600,000
• PEEK		590,000
<ul> <li>Nylon (6 cast)</li> </ul>	420,000	-500,000
Acetal (Homopolyme	er)	420,000
• Nylon (6/6 extrude	ed)	410,000
• PET		400,000
Acetal (Copolymer)		370,000
• PBT		330,000
• PVDF (Kynar®)		310,000
Polypropylene (Hon	nopolymer)	225,000
Polypropylene (Cop	olymer)	215,000
• HDPE		200,000
• UHMW-PE		110,000
• PTFE		72,000
• LDPE		30,000

#### **IMIDIZED MATERIALS**

#### Flexural modulus - stiffness (psi)

• PAI (polyamide-imide)	711,000
Vespel® Polyimide SP-22	700,000
• Vespel® Polyimide SP-21	550,000
• Vespel® Polyimide SP-3	475,000
• Vespel® Polyimide SP-211	450,000
Vespel® Polyimide SP-1	450,000





## 5. COMPARE THE MECHANICAL PROPERTIES IS IZOD IMPACT (TOUGHNESS) IMPORTANT?

### AMORPHOUS THERMOPLASTICS

## Izod impact (notched) - toughness (ft-lbs/in)

• Nydex	18
<ul> <li>Polycarbonate</li> </ul>	12.0-16.0
• Radel R®	13
• ABS	7.7
• Noryl®	3.5
• Polystyrene (HIPS)	2.0
• PETG	1.7
<ul> <li>Polysulfone</li> </ul>	1.3
• Ultem®	1.0
• PVC	1.0

Acrylic

#### SEMICRYSTALLINE THERMOPLASTICS

#### Izod impact (notched) - toughness (ft-lbs/in)

no break

0.7

0.5

• LDPE

• PET

• PPS

• UHMW-PE	18.0
Polypropylene (Copolymer)	12.5
• PTFE	3.5
• PVDF (Kynar®)	3.0
• PEEK	1.6
• PBT	1.5
<ul> <li>Acetal (Homopolymer)</li> </ul>	1.5
• Polypropylene (Homopolymer)	1.2
• Nylon (6/6 extruded)	1.2
<ul> <li>Acetal (Copolymer)</li> </ul>	1.0
Nylon (6 cast)	0.7-0.9

#### **IMIDIZED MATERIALS**

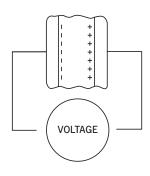
#### Izod impact (notched) - toughness (ft-lbs/in)

PAI (polyamide-imide)	2.3
Vespel® Polyimide SP-21	0.8
Vespel® Polyimide SP-1	0.8

• Vespel® Polyimide SP-3 0.4



0.4



## 6. COMPARE THE PROPERTIES IS DIELECTRIC STRENGTH (ELECTRICAL INSULATION) IMPORTANT?

425

410

380

360

#### **AMORPHOUS THERMOPLASTICS**

Dielectric strength - insulation (v/mil)

# Ultem® PVC Kydex® Noryl® Acrylic 430

PolysulfonePETGPolycarbonate

• Radel R®

#### SEMICRYSTALLINE THERMOPLASTICS

#### Dielectric strength - insulation (v/mil)

• Nylon (6 cast) 500-600 500 • Acetal (Homopolymer) • Acetal (Copolymer) 500 • PTFE 400-500 • PEEK 480 • PPS 450 • PET 400 • PBT 400 • Nylon (6/6 extruded) 300-400

280

• PVDF (Kynar®)

#### **IMIDIZED MATERIALS**

#### Dielectric strength - insulation (v/mil)

PAI (polyamide-imide) 600Vespel® Polyimide SP-1 560



#### 7. THINK ABOUT THE APPLICATION - IS FDA COMPLIANCE IMPORTANT?

#### FDA compliant grades available:

- Acrylic
- Polysulfone
- PETG
- PVC
- Polycarbonate
- Radel R®
- Polystyrene (HIPS) Ultem®

## SEMICRYSTALLINE THERMOPLASTICS

#### FDA compliant grades available:

- Acetal
- HDPE
- Polypropylene
- LDPE
- PTFE
- Nylon
- PVDF (Kynar®)
- PBT PEEK
- UHMW-PE

The virgin, natural, unfilled formulations of the sheet, rod, tube, and film products listed here are available from Curbell Plastics, Inc. in grades that comply with one or more of the FDA's guidelines for direct food contact at room temperature.

It is important to specify FDA compliant material at the time of the order to ensure that FDA compliant material is provided.

#### 8. THINK ABOUT THE APPLICATION - IS CHEMICAL RESISTANCE IMPORTANT?

#### SEMICRYSTALLINE THERMOPLASTICS

#### Good chemical resistance:

- Acetal
- PET
- HDPE
- Polypropylene
- LDPE
- PPS
- Nylon
- PTFE
- PBT • PEEK
- PVDF (Kynar®) • UHMW-PE
- See pages 76-77 for more specific information

#### **IMIDIZED MATERIALS**

#### Good chemical resistance:

- PAI (polyamide-imide)
- Vespel® Polyimide Shapes

See pages 76-77 for more specific information

