DuPont™ Hytrel®

Thermoplastic Polyester Elastomer

QUICK GUIDE - PVC

HYTREL® AS A PERFORMANCE ADDITIVE IN PVC

PVC can be modified and compounded in many different ways to gain specific properties for targeted end uses. Hytrel® can be added to improve mechanical performance, having the major advantage of also softening the final product without the issues of migratory plasticisers. Hytrel® is a high molecular weight copolyester elastomer and can be easily blended with PVC.

Hytrel® polymer does not contain any phthalate plasticiser.

- CERTAIN GRADES OF HYTREL® ARE CHEMICALLY & PROCESS COMPATIBLE WITH PVC
- HYTREL® CAN BE PROCESSED ON CONVENTIONAL INJECTION MOLDING & EXTRUSION EQUIPMENT
- HYTREL® CAN BE USED AS A NON-MIGRATORY MODIFIER
- HYTREL® CAN BRING SUBSTANTIAL PERFORMANCE BENEFITS TO PVC

RECYCLING CODE (ISO 11469): › TPC - ET ‹
TPC - ET = THERMOPLASTIC ETHER ESTER ELASTOMER

POTENTIAL ADVANTAGES OF HYTREL® IN A PVC COMPOUND:

- Higher softness without any migration issue
- Improved low temperature flexibility
- Better impact strength at low temperature
- Better stability of mechanical performance over a wider range of temperatures
- Increased flex-life
- Improved chemical resistance, specifically oil resistance
- Consistent performance over time, especially vs conventional plasticisers

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QUICK GUIDE - PVC

APPLICATIONS FOR PVC WITH HYTREL® MODIFIER

▸ **Protective jackets for hose and tubing**

WHY: Cost effective alternative to thermoplastic urethanes plus extended operating temperature range compared to 100% PVC sheathing

▸ **Automotive Wire and Cable**

WHY: May be able to resist underbonnet temperatures which have previously required PA or other materials

▸ **Sport/ safety shoe soles**

WHY: Cost effective alternative to thermoplastic urethanes, improving chemical resistance, low temperature properties and abrasion resistance of PVC. Flexibility is inherent in the Hytrel® polymer, which will not migrate.

▸ **Fire hose jacketing**

WHY: Cost effective alternative to TPU whilst maintaining adequate performance

▸ **Hot melt adhesives working at high temperature**

▸ **Flexible PVC pipes**

WHY: Improved long term performance and flexibility over a range of temperature. Food compliant grades of Hytrel® are also available

▸ **Coil cable**

WHY: Improved elastic memory and good flex fatigue performance

SOME CONSIDERATIONS WHEN COMPOUNDING HYTREL® / PVC :

1. Recommended: Hytrel® 4056 + PVC general purpose grades (ISO:105-125)
2. Recommended to choose grades with good melt temperature compatibility.
3. PVC particle size: 100-300 micron and porous structure

COMPARISON OF PROPERTIES

Compound content				
PVC	%	100	85	75
Hytrel® 4058	%	0	15	25
DOP	%	30	30	30
Elongation at Break				
as molded	%	240	275	290
after 7days @ 100°C	%	140	280	280
Tensile Strength				
as molded	MPa	24.1	20	16.6
after 7days @ 100°C	MPa	24.5	27.5	24.6
Torsional Modulus				
23°C	MPa	53	10	7
-18°C	MPa	717	358	227
-40°C	MPa	1104	855	572
Hardness	Shore A	94	85	80
as molded	**°C**	-22	-34	-60
Heat Distortion				
121°C @ Kg	%	55	45	40

PLEASE CONTACT YOUR LOCAL DUPONT REPRESENTATIVE FOR FURTHER INFORMATION:

NORTH AMERICA
DuPont Performance Polymers
Wilmington, Delaware
Tel +1 302 999-4592

SOUTH AMERICA
DuPont do Brasil, S.A.
Barueri, SP Brasil
Tel +55 11 4166 8531/8647

ASIA PACIFIC
DuPont China Holding Co, Ltd.
Shanghai, China
Tel +86 21 3862 2888

ASIA PACIFIC
DuPont Kabushiki Kaisha
Tokyo, Japan
Tel +81 3 5521 8500

EUROPE / MIDDLE EAST / AFRICA
DuPont de Nemours International S.A.
Geneva, Switzerland
Tel +41 22 717 51 11

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QUICK GUIDE - ABS or ABS Blends

HYTREL® AS A PERFORMANCE ADDITIVE TO ABS OR ABS BLENDS

ABS can be modified, compounded and processed in many different ways to gain specific properties for targeted end uses. Hytrel® can be added to improve mechanical performance, having the major advantage of also toughening the product without the issues of migratory plasticisers. Hytrel® is a high molecular weight copolyester elastomer and can be easily blended with ABS in a pellet form.

The combination of low temperature ductility and improved chemical performance make the addition of Hytrel® beneficial for a wide range of applications, in both sheet forming as well as injection moulding and profile extrusion.

- HYTREL® IS COMPATIBLE WITH ABS BLENDS
- HYTREL® CAN BE EASILY COLOURED
- POLYMER CAN BE BLENDED AT SHEET EXTRUSION OPERATION
- CAN BE CO-EXTRUDED AS THIN, HIGH IMPACT, LAYER ON TOP OF ABS
- SHEETS CAN BE DECORATED IN THE NORMAL WAY
- VACUUM FORMING PERFORMANCE IS SIMILAR
- OPTIMUM ADDITION RATE OF HYTREL® IS BETWEEN 1-15% WEIGHT ABS

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POTENTIAL ADVANTAGES OF HYTREL® IN AN ABS COMPOUND:

- Improved **stress cracking** resistance
- Improved **impact resistance**
- Increased **ductility** and **impact strength** at low temperature.
- Increased **chemical resistance** in particular in stressed areas and weld lines.
- Increased **elongation**, depending on Hytrel® grade used.
- To provide **adhesion** as a tie layer.
- Can also be added to recycled ABS to recover original **impact** properties

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QUICK GUIDE - ABS or ABS Blends

APPLICATION IDEAS FOR ABS WITH HYTREL® MODIFIER

- Plastic Housings and Bodies

WHY: improved impact and chemical resistance

- Fasteners

WHY: improved impact resistance and ductility

- Electronics housing

WHY: Hytrel® provides both sealing and impact strength as a layer

- Vehicle fairings/cowls (motorcycles, trucks, etc)
- Bathroom furniture
- Outer skin on composite doors
- Safety shoe component

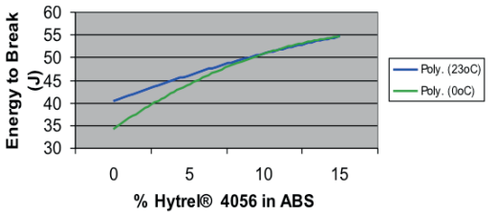
WHY: Hytrel® provides improved chemical resistance

- Panels for vehicles, caravans, etc

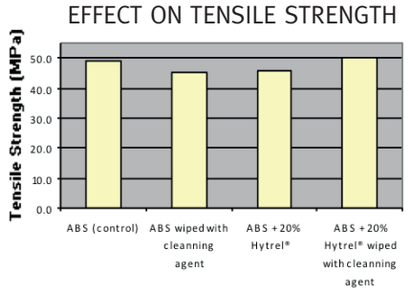
WHY: Hytrel® improves product life, resistance against thermal cycling (weather) and use of chemical agents

PROPERTIES IMPROVEMENT

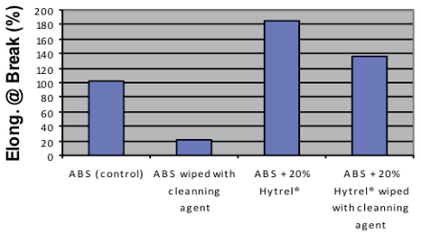
IMPACT TESTS ON 2MM SHEET (ISO 6603/2)



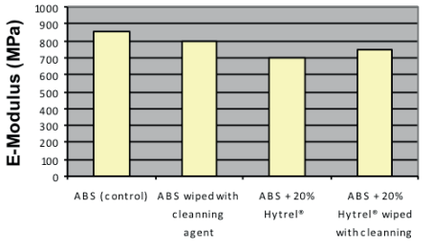
EFFECT ON TENSILE STRENGTH



EFFECT ON ELONGATION @ BREAK



EFFECT ON E-MODULUS



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NORTH AMERICA
DuPont Performance Polymers
Wilmington, Delaware
Tel +1 302 999-4592

SOUTH AMERICA
DuPont do Brasil, S.A.
Barueri, SP Brasil
Tel +55 11 4166 8531/8647

ASIA PACIFIC
DuPont China Holding Co, Ltd.
Shanghai, China
Tel +86 21 3862 2888

ASIA PACIFIC
DuPont Kabushiki Kaisha
Tokyo, Japan
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EUROPE / MIDDLE EAST / AFRICA
DuPont de Nemours International S.A.
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QUICK GUIDE - PBT or PET

HYTREL® AS A PERFORMANCE ADDITIVE IN PBT OR PET

PBT and PET are rigid thermoplastic polymers, both of which may be considered for impact modification.

Hytrel® provides an efficient impact modification system, with benefits of an improved injection moldability and better toughness and flexibility.

Hytrel® is a high molecular weight copolyester elastomer and can be easily blended with PBT or PET in a pellet form.

- HYTREL® IS COMPATIBLE WITH PBT AND PET
- HYTREL® CAN BE EASILY COLOURED
- HYTREL® CAN BE PROCESSED ON CONVENTIONAL INJECTION MOLDING & EXTRUSION EQUIPMENT
- OPTIMUM ADDITION RATE OF HYTREL® IS BETWEEN 1-40% WEIGHT

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IMPROVEMENTS TO PBT OR PET:

- Improved **impact resistance**
- Increased **ductility** and **impact strength** at low temperature.
- Can also be added to recycled PBT / PET to recover original **impact** properties

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