Introduction

The Hungarian MOL Petrochemicals Co. Ltd. and Slovak SLOVNAFT, a.s. are an integrated part of the Downstream division within the MOL Group which is the biggest chemical complex in the region producing ethylene and propylene from naphtha and gas oil and processing them into low, medium and high density polyethylene and polypropylene through the application of up-to-date technologies.

MOL Group considers petrochemicals as an important strategic field. We can highly lean on the refinery integration benefits in the MOL Downstream Division: the secured feedstock supply, the robust financial background and strong position in the regional markets, together with the high quality products of the optimized production capacities. We keep operational reliability up by regular maintenance programs, carried out at our production units.

Our prime objective is maintaining our petrochemical leadership in the Central and Eastern European polymer market by taking advantage of the synergies provided by the ownership structure and making the names of MOL Petrochemicals and Slovnaft as the symbol of stable and reliable quality via exploiting optimized refinery and petrochemical production processes in accordance with the group’s philosophy “from crude oil to plastics”.

Our advantageous location in the Central European markets and our competitive portfolio of high quality polyolefin products provide a firm basis for exploiting the opportunities arising from the surge of demand for polymers in Central and Eastern Europe.

Optimising operation with refining, the Division runs its production plants on 2 production sites in Tiszaújváros (the plants of MOL Petrochemicals Co. Ltd.) and Bratislava (the polymer plants of SLOVNAFT, a.s.), 3 olefin plants and 7 polymer units. We are one of the ten biggest polymer market players in Europe and more than half of our products are sold abroad. We have several sales offices throughout Europe, in Austria, Germany, Italy, Poland, Romania and the Ukraine. These offices deal with the sales of the products of both companies.

CORPORATE HISTORY

1999 MOL acquired minority stake in former TVK Plc.
2001 MOL became majority owner in former TVK with a stake over 33.34%
2004 MOL acquired majority stake in TVK (44.31%) and in SLOVNAFT (98.4%)

MOL Petrochemicals Division established: the product range has been streamlined and the sales channels integrated in order to provide competitive edge to our customers on their markets.

2011 Petrochemical business integrated into the Downstream Division of MOL Group
2015 MOL acquired 100% of shares in TVK and renamed the company to MOL Petrochemicals Co. Ltd.

The petrochemical production operates on an integrated Group level (MOL Group), using a unified brand name and international background.

TIPPLEN is the registered trademark of MOL Petrochemicals Co. Ltd. and TATREN is the registered trademark of SLOVNAFT, a.s. Our product portfolio includes isotactic homopolymers, impact copolymers and random copolymers.
Polypropylene

General Information

Polypropylene is a colourless and odourless thermoplastic polymer, translucent in the natural state and can be pigmented in a number of colours and shades.

All types of TIPPLEN and TATREN grades are first of all characterized by high polymer purity and consistent quality. This is due to the highly sophisticated production process in which Ziegler-Natta catalysts are used.

The Most Important Properties of the Polypropylene Grades are the Following:

- Low density
- High hardness, abrasion resistance and rigidity
- Good heat resistance (up to 100 °C if not subjected to mechanical stresses)
- Versatile, easy processability
- Outstanding resistance to several chemicals
- Good impact strength
- Low water absorption and water-vapour permeability

These properties, which vary according to certain parameters (melt flow rate, etc.), differ between homopolymers and copolymers. The essential difference between copolymers and homopolymers is that copolymers have good impact strength even at low temperatures.

Polypropylene has very good mechanical properties which result from regular structure and molecular weight distribution.

Polypropylene is a good insulator with very low dielectric constant and low dissipation factor. Dielectric strength depends on the temperature and the wall thickness of an item. Dielectric strength of thin wall items is very high.

Chemical resistance of polypropylene is excellent. Diluted and concentrated mineral acids and bases, polar solvents, high-molecular aliphatic compounds and inorganic salts and their solutions practically have no effect on polypropylene. This property is preserved even at high temperatures. However, it is swollen by low-molecular aliphatic, aromatic and chlorinated hydrocarbons. Strong oxidizing agents attack it at room temperature.

UV radiation and higher temperatures of the environment negatively affect physical and mechanical properties of polypropylene. Therefore it is necessary to protect PP products against these effects, mainly in outdoor applications.

Application

The wide range of grades and the consequent variation of their characteristics allow TVK, Plc. and SLOVNAFT, a.s. polypropylene to be used in highly different fields of application, which are briefly described as follows:

- PIPES (RIGID AND FLEXIBLE, PRESSURE PIPES, CORRUGATED, ETC.) AND THEIR RELATIVE FITTINGS
- EXTRUDED AND CAST SHEETS, CORRUGATED SHEETS, PROFILES
- EXTRUDED SHEETS FOR THE THERMOFORMING OF CONTAINERS
- RIGID AND FLEXIBLE STRAPS
- MONOFILAMENTS, FIBRES, STAPLE FIBRE, ETC., SLIT AND SPLIT FILM YARN, ROPES AND TWINES
- NON-WOVEN FABRICS (SPUN BONDED)
- HOUSEHOLD ARTICLES, TOYS
- PARTS FOR HOUSEHOLD APPLIANCES, BATTERY CASES
- ARTICLES AND PARTS FOR THE ELECTRICAL, AUTOMOTIVE, ELECTRONICS AND TEXTILE INDUSTRIES
- INJECTION OR BLOW MOULDED CONTAINERS FOR FOODSTUFFS, COSMETICS, TOILETRIES, DETERGENTS AND PHARMACEUTICALS
- HIGH SPEED INJECTION MOULDED FOOD-GRADE CONTAINERS
- TRANSPARENT CAST AND BLOWN FILM, BIORIENTED FILM
- FURNISHING (CHAIRS AND CHAIR BACKS, TABLE TOPS, ETC.)
**Coding system Tatren**

**TATREN COMMERCIAL GRADES ARE CODED BY TWO LETTERS AND TWO GROUPS OF DIGITS.**

- The first letter represents the structure of the material:
  - H = Homopolymer
  - I = Impact copolymer
  - TPO = Thermoplastic Olefin
  - R = Random copolymer

- The second letter represents typical application:
  - G = General purpose
  - M = Moulding
  - T = Textile
  - F = Film

- The first group of numbers represents the MFR:
  - HT: 25 11

**Coding system Tippllen**

**TIPPLEN STANDARD GRADES ARE CODED USING A SYSTEM OF A LETTER, THREE OR FOUR DIGITS AND ONE / TWO LETTERS.**

- The first letter denotes the chemical nature of the polymer:
  - H = Homopolymer
  - K = Impact copolymer
  - R = Random copolymer

- The melt flow index range of the polymer is indicated by the first digit in three-digit numbers and by the first two-digits in four-digit numbers.

- The second group of numbers represents internal code:
  - Internal code

- The last letters indicate the specific properties of the polymer.
  - POSSIBLE SPECIFIC PROPERTIES
    - A = antistatic
    - F, FH = film or fibre grade
## Homopolymers

<table>
<thead>
<tr>
<th>Grade/Parameter</th>
<th>Melt Mass-Flow Rate (MFR) 230 °C/2.16 kg</th>
<th>Flexural Modulus *</th>
<th>Modulus of Elasticity in Tension *</th>
<th>Tensile Stress at Yield *</th>
<th>Tensile Strain at Yield *</th>
<th>Notched Izod Impact at 23 °C *</th>
<th>HDT 0.45 MPa *</th>
<th>Hardness Rockwell *</th>
<th>Special features</th>
<th>Special additives</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Units</td>
<td>g/10 min</td>
<td>MPa</td>
<td>MPa</td>
<td>%</td>
<td>kJ/m²</td>
<td>°C</td>
<td>R scale</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test methods</td>
<td>ISO 1133-1</td>
<td>ISO 178</td>
<td>ISO 527-1.2</td>
<td>ISO 527-1.2</td>
<td>ISO 180/A</td>
<td>ISO 75-1.2</td>
<td>ISO 2039/2</td>
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<tr>
<td>H 880</td>
<td>0.30</td>
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<td>1750</td>
<td>40</td>
<td>10</td>
<td>9</td>
<td>113</td>
<td>93</td>
<td>good mechanical properties, excellent long-term heat stability</td>
<td>SA</td>
<td>extrusion, pipes, thick sheets</td>
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<tr>
<td>H 781 F</td>
<td>0.70</td>
<td>1750</td>
<td>1450</td>
<td>37</td>
<td>10</td>
<td>13</td>
<td>104</td>
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<td>excellent processability, balanced mechanical properties</td>
<td>SA</td>
<td>extrusion, blow moulding, sheets</td>
</tr>
<tr>
<td>H 681 F</td>
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<td>1650</td>
<td>1500</td>
<td>36</td>
<td>10</td>
<td>6.5</td>
<td>98</td>
<td>96</td>
<td>good mechanical properties, excellent processability</td>
<td>SA</td>
<td>extrusion, sheets for thermoforming, blown bottles</td>
</tr>
<tr>
<td>H 659 F</td>
<td>1.7</td>
<td>1900</td>
<td>1800</td>
<td>40</td>
<td>8</td>
<td>6</td>
<td>120</td>
<td>102</td>
<td>excellent optical properties, outstanding stiffness</td>
<td>NA</td>
<td>extrusion, sheets for thermoforming, blown bottles</td>
</tr>
<tr>
<td>H 649 F</td>
<td>2.5</td>
<td>1700</td>
<td>1600</td>
<td>38</td>
<td>9.5</td>
<td>6.5</td>
<td>108</td>
<td>99</td>
<td>bimodal, for high-speed production, metallisable grade, excellent optical properties</td>
<td>SA</td>
<td>- biasedly oriented film</td>
</tr>
<tr>
<td>H 650 F</td>
<td>3.0</td>
<td>1700</td>
<td>1600</td>
<td>38</td>
<td>9.5</td>
<td>5.5</td>
<td>105</td>
<td>100</td>
<td>bimodal, for high-speed production, metallisable grade, excellent optical properties</td>
<td>SA</td>
<td>- biasedly oriented film</td>
</tr>
<tr>
<td>H 543 F</td>
<td>4.0</td>
<td>1700</td>
<td>1600</td>
<td>38</td>
<td>9</td>
<td>5</td>
<td>105</td>
<td>101</td>
<td>low water carry-over</td>
<td>NA</td>
<td>- extrusion, weaving tapes, split film yarns</td>
</tr>
<tr>
<td>H 583 F</td>
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<td>1500</td>
<td>37.5</td>
<td>9.3</td>
<td>4.6</td>
<td>100</td>
<td>99</td>
<td>low water carry-over, improved tensile strength</td>
<td>SA</td>
<td>monofilaments, split film yarn, geotextile</td>
</tr>
<tr>
<td>H 483 F</td>
<td>6.5</td>
<td>1700</td>
<td>1550</td>
<td>37.5</td>
<td>9</td>
<td>4</td>
<td>94</td>
<td>98</td>
<td>good mechanical properties</td>
<td>SA</td>
<td>monofilaments, split film yarns</td>
</tr>
<tr>
<td>H 145 F</td>
<td>28</td>
<td>1800</td>
<td>1750</td>
<td>39</td>
<td>8</td>
<td>2.5</td>
<td>109</td>
<td>104</td>
<td>high gas-fading resistance</td>
<td>SA, AGF</td>
<td>low denier staple fibre, BCF and CF multifilaments</td>
</tr>
<tr>
<td>H 949 A</td>
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<td>1900</td>
<td>1800</td>
<td>39.5</td>
<td>9</td>
<td>2</td>
<td>118</td>
<td>104</td>
<td>controlled rheology, outstanding processability for shorter cycle times</td>
<td>NA, A5</td>
<td>thin wall injection moulding, DVD-shells, household and camping articles</td>
</tr>
</tbody>
</table>

**Additives:**
- SA: slip agent
- AB: antiblocking agent
- NA: nucleating agent
- A5: antimisting agent
- AGF: anti gas-fading

**Notes:** * Values have been measured on standard injected moulded specimens prepared in accordance with ISO 1873-2.

**Application:**
- SA: extrusion, pipes, thick sheets
- SA: extrusion, blow moulding, sheets
- SA: extrusion, sheets for thermoforming, blown bottles
- NA: extrusion, sheets for thermoforming, blown bottles
- SA: extrusion, weaving tapes, split film yarns
- SA: monofilaments, split film yarn, geotextile
- SA: monofilaments, split film yarns
- SA, AGF: low denier staple fibre, BCF and CF multifilaments
- NA, A5: thin wall injection moulding, DVD-shells, household and camping articles
## Homopolymers

<table>
<thead>
<tr>
<th>Grade/Parameter</th>
<th>Melt Mass-Flow Rate (MFR) 230 °C/2.16 kg</th>
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<th>Tensile Stress at Yield</th>
<th>Tensile Strain at Yield</th>
<th>Notched Izod Impact at 23 °C</th>
<th>HDT 0.45 MPa</th>
<th>Hardness Rockwell</th>
<th>Special features</th>
<th>Special additives</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Units</td>
<td>g/10 min</td>
<td>MPa</td>
<td>MPa</td>
<td>%</td>
<td>kJ/m²</td>
<td>°C</td>
<td>R scale</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Test methods</td>
<td>ISO 1133-1</td>
<td>ISO 178</td>
<td>ISO 527-1.2</td>
<td>ISO 527-1.2</td>
<td>ISO 180/A</td>
<td>ISO 75-1.2</td>
<td>ISO 2039/2</td>
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<tr>
<td>HT 3 06</td>
<td>3.0</td>
<td>1900</td>
<td>1900</td>
<td>36</td>
<td>8.5</td>
<td>6</td>
<td>102</td>
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<td>low water carry-over</td>
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<td>HT 3 22</td>
<td>3.0</td>
<td>1650</td>
<td>1700</td>
<td>34</td>
<td>10.5</td>
<td>5.5</td>
<td>94</td>
<td>100</td>
<td>high speed BOPP lines, excellent optical properties, metalized</td>
<td>-</td>
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</tr>
<tr>
<td>HG 10 07</td>
<td>10</td>
<td>1850</td>
<td>1850</td>
<td>36</td>
<td>8</td>
<td>4</td>
<td>96</td>
<td>105</td>
<td>good colour stability, superior spinning characteristics, good optics</td>
<td>AGF</td>
<td></td>
</tr>
<tr>
<td>HT 25 11</td>
<td>25</td>
<td>1450</td>
<td>1550</td>
<td>32</td>
<td>10</td>
<td>3.5</td>
<td>78</td>
<td>103</td>
<td>controlled rheology, low smoke</td>
<td>AGF</td>
<td></td>
</tr>
<tr>
<td>HM 50 46</td>
<td>50</td>
<td>1800</td>
<td>1900</td>
<td>36</td>
<td>8</td>
<td>3</td>
<td>97</td>
<td>106</td>
<td>controlled rheology, enhanced stiffness and good dimensional stability</td>
<td>NA, AS</td>
<td></td>
</tr>
</tbody>
</table>

**Additives:**
- NA: Nucleating agent
- AS: Antistatic agent
- AGF: Anti gas fading

**Notes:** *Values have been measured on standard injected moulded specimens prepared in accordance with ISO 1133/2.
### Random Copolymers

#### Grade/Parameter

<table>
<thead>
<tr>
<th>Grade/Parameter</th>
<th>Melt Mass-Flow Rate (MFR) 230 °C/2.16 kg</th>
<th>Flexural Modulus</th>
<th>Modulus of Elasticity in Tension</th>
<th>Tensile Stress at Yield</th>
<th>Tensile Strain at Yield</th>
<th>Notched Izod Impact at 23 °C</th>
<th>HDT 0.45 MPa</th>
<th>Hardness Rockwell</th>
<th>Haze **</th>
<th>Special features</th>
<th>Special additives</th>
<th>Application</th>
</tr>
</thead>
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<tr>
<td>Units</td>
<td>g/10 min</td>
<td>MPa</td>
<td>MPa</td>
<td>%</td>
<td>J/m²</td>
<td>°C</td>
<td>R scale</td>
<td>%</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Test methods</td>
<td>ISO 1133-1</td>
<td>ISO 178</td>
<td>ISO 527-1,2</td>
<td>ISO 527-1,2</td>
<td>ISO 180/A</td>
<td>ISO 75-1,2</td>
<td>ISO 2089/2</td>
<td>ISO 14782</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Notes:**
- Values have been measured on standard injected moulded specimens prepared in accordance with ISO 1873-2.
- Values have been measured on specimens with 1 mm wall thickness.

**CLEAR:**
- C: Clarified by last generation clarifying agent
- L: Low odor and C-emissions
- E: Economical processing conditions
- A: Attractive appearance, fresh look of packed products
- R: Reactor grade

### Special Features
- automotive components, foamed sheets
- extrusion, blow moulded bottles, injection stretch blow moulding
- cast and blown film for foodstuffs, stationery, clothes packaging
- injection moulding for packaging cosmetics, herbs, household articles
- thin wall injection moulding for packaging cosmetics, sweets, household articles
- thin wall injection moulding for packaging cosmetics, sweets, household articles
- thin wall injection moulding, food packaging, media boxes, household articles
- thin wall injection moulding especially food packages, household articles, cups, closures, media boxes
- thin wall injection moulding especially food packages, household articles, cups, closures, media boxes

### Special Additives
- SA slip agent
- CA clarifying agent
- AR antiaclashing agent
- AS antistatic agent
- NA nucleating agent
- OW optical whitener

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**RM 60 CLEAR**
- Reactor grade, excellent organoleptic properties, good resistance to warping
- SG, CA, OW thin wall injection moulding for packaging cosmetics, sweets, household articles

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**RM 45 CLEAR**
- Reactor grade, excellent organoleptic properties, excellent transparency, high gloss, very good processing stability
- CA, AS thin wall injection moulding especially food packages, household articles, cups, closures, media boxes

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**RM 85 CLEAR**
- Reactor grade, excellent organoleptic properties, excellent transparency, high gloss, very good processing stability
- CA, AS thin wall injection moulding especially food packages, household articles, cups, closures, media boxes

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**CLEAR**
- Reactor grade
- Antiaclashing agent
- SA slip agent
- CA clarifying agent
- AR antiaclashing agent
- AS antistatic agent
- NA nucleating agent
- OW optical whitener

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**Notes:**
* Values have been measured on standard injected moulded specimens prepared in accordance with ISO 1873-2.
** Values have been measured on specimens with 1 mm wall thickness.
# Impact Copolymers

<table>
<thead>
<tr>
<th>Grade/Parameter</th>
<th>Melt Mass Flow Rate (MFR)</th>
<th>Flexural Modulus</th>
<th>Modulus of Elasticity in Tension</th>
<th>Tensile Stress at Yield</th>
<th>Tensile Strain at Yield</th>
<th>Notched Izod Impact at 23 °C</th>
<th>Notched Izod Impact at -20 °C</th>
<th>HDT 0.45 MPa</th>
<th>Hardness Rockwell C</th>
<th>Special Features</th>
<th>Special Additives</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Units</td>
<td>g/10 min</td>
<td>MPa</td>
<td>MPa</td>
<td>%</td>
<td>kJ/m²</td>
<td>kJ/m²</td>
<td>°C</td>
<td>R scale</td>
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<td>ISO 1133-1</td>
<td>ISO 178</td>
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<td>ISO 527-1,2</td>
<td>ISO 180/A</td>
<td>ISO 180/A</td>
<td>ISO 75-1,2</td>
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<td>36</td>
<td>8</td>
<td>42</td>
<td>5</td>
<td>116</td>
<td>85</td>
<td>excellent heat and detergent resistance, very high stiffness and good weldability</td>
<td>SA, NA</td>
<td>extrusion, corrugated sewage pipes, gisettes, sheets</td>
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<tr>
<td>K 880</td>
<td>0.35</td>
<td>1550</td>
<td>1300</td>
<td>30</td>
<td>10</td>
<td>56</td>
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<td>57</td>
<td>7</td>
<td>88</td>
<td>76</td>
<td>very high impact strength</td>
<td>SA</td>
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<td>30</td>
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<td>56</td>
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<td>82</td>
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<td>SA, NA</td>
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<td>1450</td>
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<td>5</td>
<td>88</td>
<td>79</td>
<td>high impact strength and stiffness</td>
<td>SA</td>
<td>corrugated cardboard, corrugated pipes, extrusion, sheets, blow moulding, injection moulding</td>
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<td>30</td>
<td>9</td>
<td>20</td>
<td>4.5</td>
<td>88</td>
<td>83</td>
<td>good mechanical properties, low gel content</td>
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<td>cast film, corrugated cardboards, sheet for thermoforming</td>
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<td>48</td>
<td>7</td>
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<td>70</td>
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<td>SA</td>
<td>injection moulding, automotive components, battery cases</td>
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<td>K 499</td>
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<td>5</td>
<td>94</td>
<td>83</td>
<td>excellent resistance to heat and chemicals</td>
<td>SA</td>
<td>injection moulding, automotive components, battery cases, crates, boxes, dowels</td>
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<td>K 395 A</td>
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<td>5</td>
<td>7</td>
<td>4</td>
<td>106</td>
<td>90</td>
<td>high stiffness</td>
<td>NA, AS</td>
<td>injection moulding, household articles, pails, boxes, garden furniture</td>
</tr>
<tr>
<td>K 295 A</td>
<td>20</td>
<td>1600</td>
<td>1550</td>
<td>29</td>
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<td>5</td>
<td>4</td>
<td>115</td>
<td>92</td>
<td>high stiffness</td>
<td>NA, AS</td>
<td>thin wall injection moulding, household articles, garden furniture</td>
</tr>
<tr>
<td>K 199</td>
<td>30</td>
<td>1400</td>
<td>1350</td>
<td>26</td>
<td>5</td>
<td>5</td>
<td>3.5</td>
<td>105</td>
<td>87</td>
<td>reactor grade, low C-emissions and odour, good flow</td>
<td>NA</td>
<td>high-speed injection moulding, thin-walled packaging containers, pails, covers, garden furniture, automotive components</td>
</tr>
<tr>
<td>K 948</td>
<td>45</td>
<td>1450</td>
<td>1400</td>
<td>27</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>97</td>
<td>88</td>
<td>reactor grade, excellent organoleptic properties, low C-emissions</td>
<td>NA, AS</td>
<td>injection moulding of parts for household appliances, auto battery cases and technical items where long term heat resistance is required</td>
</tr>
<tr>
<td>TPO 12 76</td>
<td>12</td>
<td>900</td>
<td>1000</td>
<td>18</td>
<td>11.5</td>
<td>45**</td>
<td>32**</td>
<td>68</td>
<td>-</td>
<td>controlled rheology, extra high impact strength, good impact/stiffness balance</td>
<td>NA</td>
<td>compounding, automotive applications and bumpers, injection moulding</td>
</tr>
<tr>
<td>TPO 20 77</td>
<td>20</td>
<td>950</td>
<td>1000</td>
<td>18.5</td>
<td>10</td>
<td>42**</td>
<td>30**</td>
<td>70</td>
<td>-</td>
<td>controlled rheology, extra high impact strength, good impact/stiffness balance</td>
<td>NA</td>
<td>compounding, automotive applications and bumpers, injection moulding</td>
</tr>
<tr>
<td>IM 5 66</td>
<td>6.0</td>
<td>1500</td>
<td>1550</td>
<td>28</td>
<td>6</td>
<td>10</td>
<td>4</td>
<td>94</td>
<td>90</td>
<td>excellent long-term heat stability, high stiffness and good impact resistance</td>
<td>AS</td>
<td>injection moulding of parts for household appliances, auto battery cases and technical items where long term heat resistance is required</td>
</tr>
<tr>
<td>IM 12 59</td>
<td>12</td>
<td>1400</td>
<td>1400</td>
<td>24.5</td>
<td>5</td>
<td>10</td>
<td>5</td>
<td>88</td>
<td>80</td>
<td>high stiffness, good impact resistance</td>
<td>NA</td>
<td>injection moulding of rigid packaging, household articles, garden furniture and technical items</td>
</tr>
<tr>
<td>IM 22 63</td>
<td>22</td>
<td>1350</td>
<td>1350</td>
<td>24</td>
<td>5.5</td>
<td>10</td>
<td>4.5</td>
<td>82</td>
<td>80</td>
<td>controlled rheology, high stiffness, good impact resistance</td>
<td>NA, AS</td>
<td>injection moulding of rigid packaging, household articles, garden furniture and technical items</td>
</tr>
<tr>
<td>IM 25 75</td>
<td>25</td>
<td>1150</td>
<td>1200</td>
<td>21</td>
<td>5.5</td>
<td>40**</td>
<td>6**</td>
<td>80</td>
<td>63</td>
<td>controlled rheology, excellent organoleptic properties, high stiffness, good impact resistance and good stiffness</td>
<td>NA, AS</td>
<td>heavy-duty injection moulded products, medical and transport containers, crates, boxes, technical items, compounding</td>
</tr>
<tr>
<td>IM 55 80</td>
<td>55</td>
<td>1400</td>
<td>1450</td>
<td>23</td>
<td>4</td>
<td>7</td>
<td>4</td>
<td>88</td>
<td>82</td>
<td>reactor grade, excellent organoleptic properties, high stiffness, good impact resistance, good flow</td>
<td>NA, AS</td>
<td>high-speed thin wall injection moulding of rigid packaging, household articles, garden articles and technical items</td>
</tr>
<tr>
<td>IM 75 81</td>
<td>75</td>
<td>1450</td>
<td>1450</td>
<td>23</td>
<td>4</td>
<td>6</td>
<td>3.5</td>
<td>88</td>
<td>85</td>
<td>reactor grade, excellent organoleptic properties, high stiffness, good impact resistance, good flow</td>
<td>NA, AS</td>
<td>high-speed thin wall injection moulding of rigid packaging, products of complicated shapes, household articles, garden articles and technical items</td>
</tr>
</tbody>
</table>

Additives:
- SA slip agent
- NA no slippage
- AS antistatic agent

Notes:
- * Values have been measured on standard injection moulded specimens prepared in accordance with ISO 1873-2
- ** Values have been measured on standard injection moulded specimens prepared in accordance with internal method
**Product selection criteria**

Based on the type of polypropylene

<table>
<thead>
<tr>
<th>Selection criteria</th>
<th>Homopolymer</th>
<th>Random copolymer</th>
<th>Impact copolymer and TPO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stiffness</td>
<td>first choice</td>
<td>not recommended</td>
<td>second choice</td>
</tr>
<tr>
<td>Toughness &gt;0 °C</td>
<td>second choice</td>
<td>second choice</td>
<td>first choice</td>
</tr>
<tr>
<td>Toughness &lt;0 °C</td>
<td>not recommended</td>
<td>second choice</td>
<td>first choice</td>
</tr>
<tr>
<td>Transparency</td>
<td>second choice</td>
<td>first choice</td>
<td>not recommended</td>
</tr>
</tbody>
</table>

**Stiffness**
- First choice
- Not recommended
- Second choice (recommended)

**Toughness**
- Second choice
- First choice (recommended)
- Not recommended

**Transparency**
- Second choice
- First choice (recommended)
- Not recommended

**Effect of nucleation on technical properties**

<table>
<thead>
<tr>
<th>Technical properties</th>
<th>Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stiffness</td>
<td>+</td>
</tr>
<tr>
<td>Impact resistance</td>
<td>=</td>
</tr>
<tr>
<td>Transparency*</td>
<td>+</td>
</tr>
<tr>
<td>Cycle time</td>
<td>+</td>
</tr>
<tr>
<td>Shrinkage (total)</td>
<td>-</td>
</tr>
<tr>
<td>Processability</td>
<td>+</td>
</tr>
</tbody>
</table>

* Nucleating agent slightly improves transparency of homopolymers and random copolymers. Much better optical properties using special type of nucleator – clarifying agent – are achieved. Nucleated impact copolymers are never transparent, they are opaque.

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**Supplementary information**

Miscellaneous properties of polypropylene resins*

- **Density (ISO 1183-1)**: 0.9 g/cm³
- **Bulk Density (ISO 60)**: 0.46-0.58 g/cm³
- **Melting point (ISO 11 357-3)**
  - Homopolymer: 156-165 °C
  - Impact copolymer: 158-165 °C
  - Random copolymer: 130-150 °C
- **Water absorption (ASTM D570)**: <0.03%
- **Mould Shrinkage (ISO 294-4)**: 1.1-2.5%
- **Thermal Conductivity (ASTM C518)**
  - Solid: 0.23 W/(m·K)
  - Melt: 0.16 W/(m·K)
- **Coefficient of Linear Expansion**
  - at 20 °C: 1.1 ·10⁻⁴ K⁻¹
  - at 80 °C: 1.7 ·10⁻⁴ K⁻¹
- **Specific heat (ASTM D2766)**
  - at 23 °C: 1.68 J/(g·K)
  - at 100 °C: 2.10 J/(g·K)
- **Dielectric Constant (DIN 53 483)**: 2.27 (at 50 Hz)
- **Dielectric Strength (DIN 53 481)**: 500 kV/cm
- **Volume Resistivity (DIN 53 482)**: >10¹² Ω·cm
- **Surface Resistivity (DIN 53 482)**: 10¹⁴ Ω
- **Dissipation Factor (DIN 53 483)**: <4 ·10⁻⁶ (at 50 Hz)

* Properties of individual product shipments may vary slightly from published properties. This information is provided upon the condition that users should make their own test to determine the safety and suitability of each product for their own purposes.
Pellets are packed in 25 kg PE-LD bags and transported on shrink-wrapped or stretch-wrapped pallets at eligible load of polymer 1375 kg. We use adhesive between the bags in order to avoid their slipping. Pay attention to this fact during the removing of the bags from the pallets. The preferred method is to lift the bag at first without rotation. Heat treated pallets are available as well. Transportation in a road silo or rail silo is also available. For more detailed information please contact SLOVNAFT and MOL Petrochemicals sales representative.

Since polypropylene is a combustible substance, the fire safety rules applicable for combustible materials in warehouses and store rooms should be observed.

If polymer is stored in conditions of high humidity and fluctuating temperatures, then atmospheric moisture can condense inside the packing. If it happened, it is recommended the pellets to be dried before use. During the storage polypropylene should not be exposed to UV radiation and temperatures above 40 °C. Producer does not take responsibility for any damages caused by adverse storage.

Storage & Handling

Reach Statement

Polymers are exempt of REACH registration. However, their raw materials which mean monomers and relevant additives have been registered. SLOVNAFT, a.s./MOL Petrochemicals Co. Ltd. is committed to fully respect this legislation and will only use REACH compliant raw materials. At this point in time PP TATREN/TIPPLEN does not contain any substances specifically identified as SVHC at levels greater than 0.1%.

Application for foods

Most TIPPLEN and TATREN grades satisfy the regulations applied by the European countries (EEC). Because several European countries apply restrictive regulations for the allowed migration values of additives in packaging material in contact with food, it is recommended that customers contact MOL Petrochemicals and SLOVNAFT for some special information or product licenses for food industry.

Disclaimer

The information provided in this publication has been compiled to the best of our present knowledge. However, in view of the various applications of polypropylene resins and the equipment used, the processing conditions may differ.

The recommendations and data herein are to be construed as informatory only and do not relieve users from carrying out their own tests and experiments prior to processing in order to check suitability for a specific use. It is the responsibility of those to whom we supply our products to ensure that any proprietary rights and existing laws and legislation are observed. Our products are under continuous development, therefore we reserve the right to change the information presented in this brochure at our own discretion.

The REACH statement herein does not constitute legal advice. The REACH statement is provided for informational purpose only.

SAFETY
Under normal circumstances, polypropylene is not regarded as hazardous material when in contact with the skin or when inhaled. However, any contact with the molten polymer or the inhalation of the released gases should be avoided in processing. It is recommended to install exhaust units over processing machines and to secure good ventilation of the place. For further information see Material Safety Data Sheet.

RECYCLING
Polypropylene resins are suitable for recycling using modern recycling methods. In-house production waste should be kept clean to facilitate direct recycling.

Reach Statement

PRODUCT CATALOGUE Polypropylene

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Disclaimer

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