

INEOS

Olefins & Polymers Europe

Your partner in

POLYPROPYLENE POWDERS

When Powder
becomes
Power

www.ineospolyolefins.com

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Special Care

Powders should be stored either in their original bags in an area with normal ventilation and protected from excessive sunlight exposure, or in silos with vents. The maximum recommended storage temperature is 60°C.

Although ELTEX® P powders are non-explosive as received, this does not rule out a potential explosion hazard. An explosion can occur if fines are left to accumulate over long periods of time and are exposed to an ignition source. Therefore, good housekeeping is mandatory for the safest product utilisation..

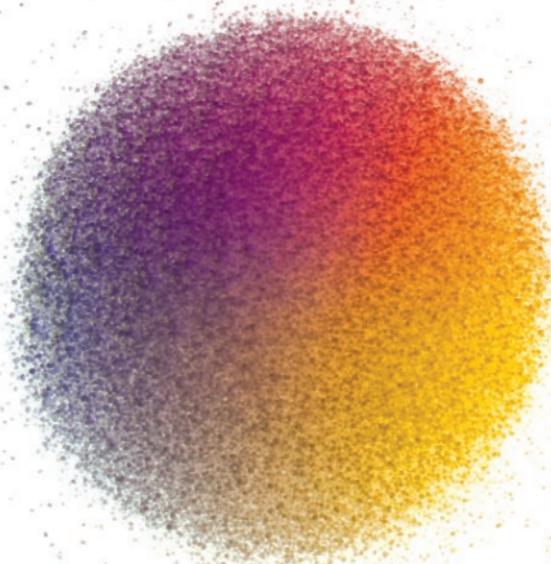
All leaks in conveying equipment must be sealed and areas above and around extrusion equipment should be swept and cleaned as needed.

If the powders are conveyed pneumatically, special care should be taken to prevent dust explosion or ignition from static electricity. Silos and transport equipment should be earthed; no pipes should be made of non-conductive material. The rate of pneumatic conveying should be maintained inferior to 25 m/s. Powder concentration in air should not exceed 10 kg/m³ air. Storage and handling systems should be inspected regularly for possible accumulation of fines.

ELTEX® P Powders

INEOS Olefins & Polymers Europe, thanks to its proprietary catalyst and process, is offering selected polypropylene resins in powder (flake) form to complement its full range of polypropylene resins in pellet form.

- ELTEX® P polypropylene powders have a unique spherical morphology associated to a narrow particle size distribution. As a result, they are easy and safe to handle free flowing powders with virtually no fines.
- The excellent mixing behaviour of ELTEX® P polypropylene powders with polymer additives, pigments, fillers and reinforcing agents have lead to their wide usage for the production of additive master-batches, mineral filled master-batches and compounds, elastomer modified compounds, glass fibre or wood flour (woodstock) reinforced compounds.



Commercial Range

INEOS Olefins & Polymers Europe offers a range of non-formulated homopolymer and ethylene random copolymer polypropylene powders.

Homopolymer powders have melt flow indexes ranging from 2.15 to 45 g/10min associated with a high stiffness and a high melting temperature while the ethylene random copolymer powder has a melt index of 4.5 g/10min associated with a low stiffness and a very low melting temperature.

Commercial Range

Grade*	MFI <i>230°C/2.16kg g/10min</i> ISO 1133	Flexural Modulus <i>23°C MPa</i> ISO 178	Melting Temperature <i>10°K/min °C</i> ISO 11357-3
ELTEX® P HL001PF ¹⁾	2.15	1600	161
ELTEX® P HV001PF ¹⁾	10	1600	161
ELTEX® P HY001P ¹⁾	45	1700	161
ELTEX® P KS001PF ²⁾	4.5	700	134

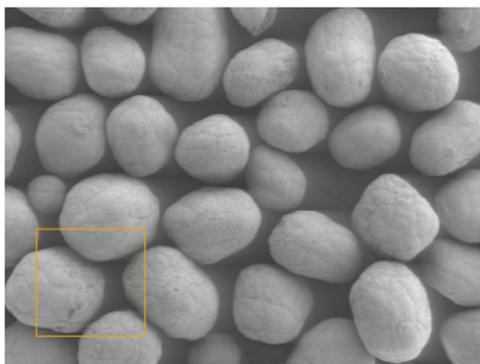
¹⁾ P = powder, F = low gel content

¹⁾ Homopolymer

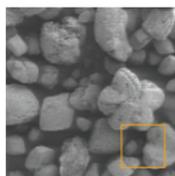
²⁾ Random copolymer

Morphology

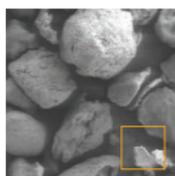
INEOS Olefins & Polymers Europe's proprietary catalyst produces powders with very regular and spherical particles, combining a narrow particle size distribution with very little amount of fines. The Scanning Electron Microscopy photographs show the unique morphology of ELTEX® P powder in comparison with two other polypropylene powders produced with standard catalysts (samples A and B) and with ground PP pellets.



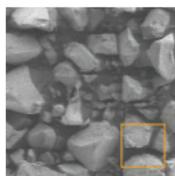
ELTEX® P HV001PF



Powder sample A



Powder sample B

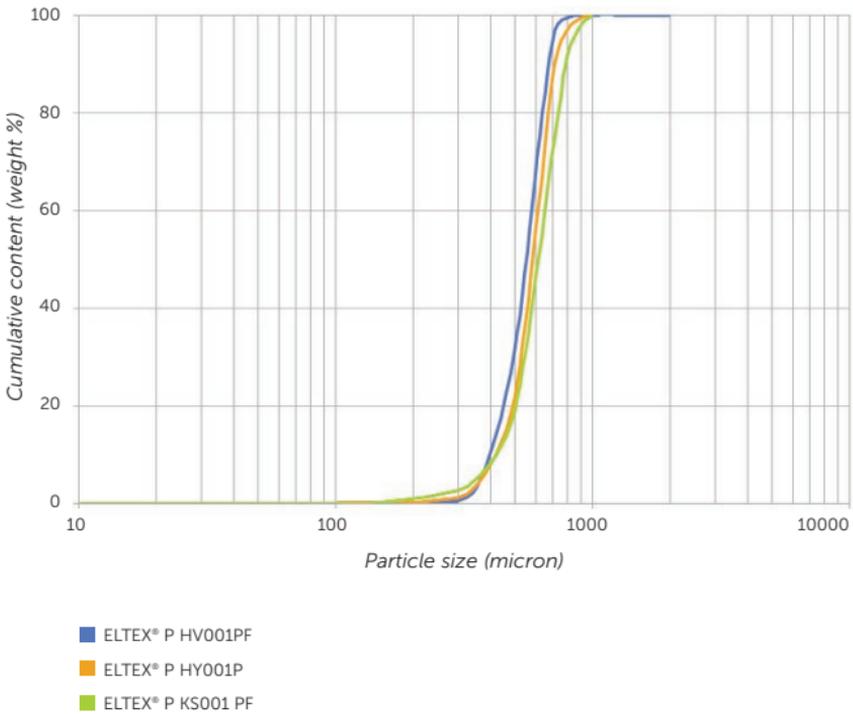


Ground PP pellets

Particle Size Distribution

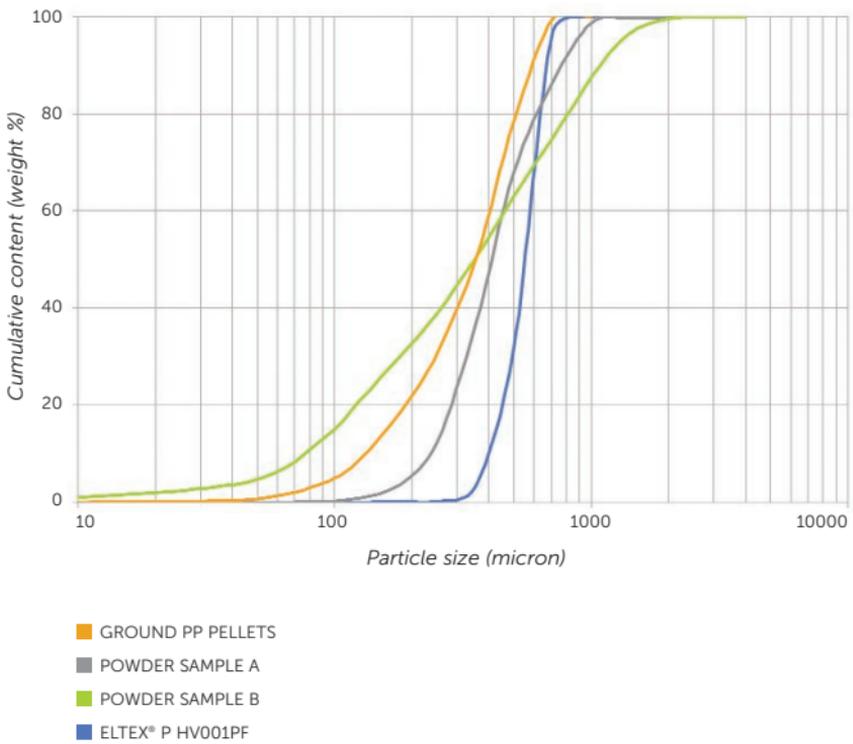
ELTEX® P powders have an average particle size of about 600 microns, and a narrow particle size distribution. Typically, 60 per cent of the material falls between 500 and 700 microns, and 90 per cent of the material between 350 and 1000 microns. Melt flow index and composition have minor effects on the morphology of the powders.

Particle Size Distribution of ELTEX® P Powders



The next graph clearly shows the difference in particle size distribution and average particle size between ELTEX® P powder, other commercial powders (samples A and B) and ground PP pellets.

Comparative Particle Size Distribution



Bulk Handling

The spherical shape and the narrow size distribution of ELTEX® P powder particles lead to an enhanced flow-ability and a higher bulk density compared to competitive powders.

Therefore, conventional pellet silos, surge bins, vacuum pumps and hoses can be used to handle ELTEX® P powders with only minor modifications. Due to the finer particle size of powders compared to pellets, all leaks along the conveying lines must be carefully sealed.

Moreover, the relatively high bulk density of ELTEX® P powders leads to flow rates through transfer lines that are equivalent to pellets.

Bulk Handling

Sample	Bulk Density <i>kg/m³</i> INEOS method	Flowability* <i>s</i> INEOS method
ELTEX® P HV001PF	515	12.6
Sample A	487	14.4
Sample B	391	22.8
Ground PP pellets	405	23.8

* Time required for 90g of powder to flow through a funnel with specified dimensions

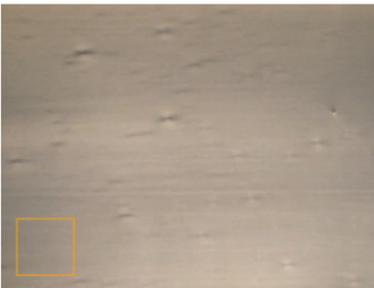


Blending and Colouring

Very good dispersion of additives, pigments, liquid colours or mineral fillers in polypropylene is sometimes difficult to achieve when starting from pellets. For this reason, some producers of colour concentrates or highly loaded filler master-batches have chosen to either grind pellets, or use expensive extrusion techniques.

With ELTEX® P powders, concentrates and master-batch producers can obtain superior dispersion. This has been confirmed with in-house studies, as shown below.

Homopolymer PP cast films containing 1 per cent silica introduced via 10 per cent master-batches, observed under polarised light



Master-batch produced with homopolymer PP pellets



Master-batch produced with ELTEX® P HV001PF powder

When blended with liquids, ELTEX® P powders „wet out“ extremely well. The large surface-to-volume ratio of the powders together with the regular geometry of their particles, allow for achieving very intimate and homogeneous blends.

When blended with solid pigments or additives, ELTEX® P powders can be conveyed with minimum segregation of the additives.

In compounding operations, better dispersion of elastomers and mineral fillers is observed with ELTEX® P powders versus polypropylene pellets. The net result are better mechanical properties.

Processing

All ELTEX® P powders have to be thermally stabilised via addition of primary and secondary antioxidants and neutralized via addition of anti-acid prior to processing.

Given the smaller particle size of ELTEX® P powders as compared with the pellets, it may be necessary to adopt different processing conditions, depending on the equipment.

For extruders having short feed sections, it is advisable that maximum throat cooling be used to minimise bridging caused by premature melting. A lower first zone temperature and a grooved barrel in the feed throat section may also be helpful.

Generally, the output of an extruder slightly increases with the use of powders, providing precautions are taken to prevent early melting and bridging.

Melt Flow Index Measurement

Although ELTEX® P powders can be stored for months under normal weather conditions, they can show some degradation at 230°C when molten in the melt flow indexer.

Therefore, we recommend over-stabilisation of the sample to be tested by premixing the powder with the below types of additives.

Recommended Additive Package

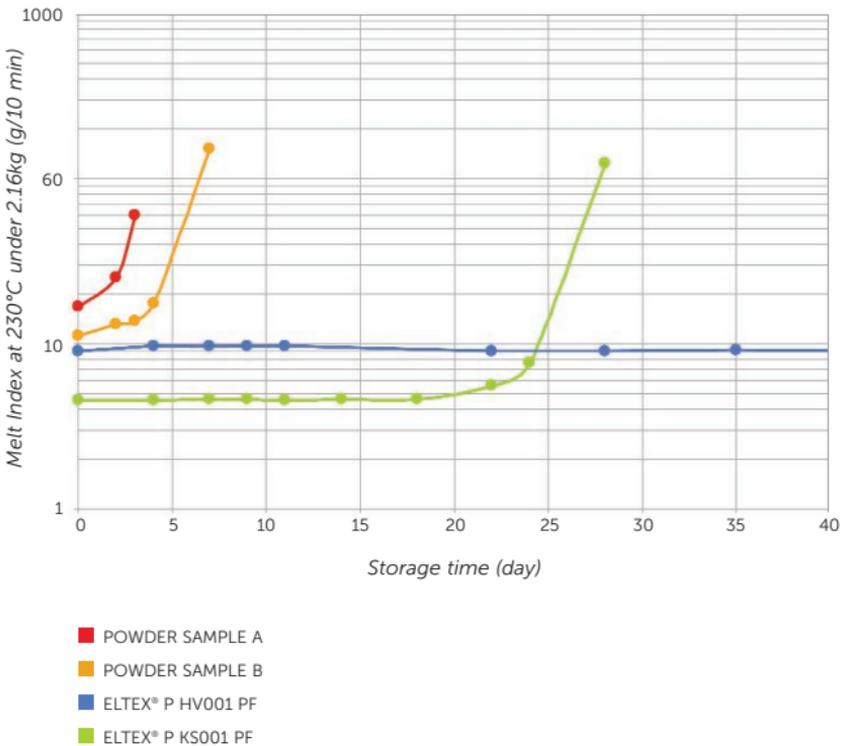
Additive	Nature	Dose (<i>weight %</i>)
Primary anti-oxidant	Phenolic	0.25 - 0.50
Secondary anti-oxidant	Phosphite	0.25 - 0.50
Acid scavenger	Calcium stearate	0.05 - 0.10

Thermal Stability & Storage

Thanks to their specific manufacturing process, ELTEX® P powders are quite stable under normal storage conditions. The graph below shows the stability of homopolymer and ethylene random copolymer ELTEX® P powders at 70°C. There is no change in the melt flow index of the powder after more than 20 days for ELTEX® P KS001PF and after more than 50 days for ELTEX® P HV001PF.

This is generally not the case with competitive powders produced with standard catalysts.

Thermal Stability of Powder at 70°C



INEOS is one of the world's largest chemical companies. Founded in 1998, the company employs 15,000 people and has turnover of around 47 billion US Dollars.

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INEOS Olefins & Polymers Europe is a business leading European producer of olefins and polyolefins.

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INEOS Olefins & Polymers Europe offers a full range of high valued polyolefins solutions for selected market applications such as pressure pipes & fittings, sewage and drainage pipe and fittings and automotive, through dedicated sales and technical service teams focused on each market segment.



INEOS is a safe and environmentally responsible company. We are engaged on developing our sustainable agenda to improve our operations and to implement sustainable solutions for our customers. This is mostly via products that offer lightweighting, energy efficiency, durability (extended lifetime) or conservation of resources. We care.

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