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May 18, 2008

From : Peter N Plimmer Ph.D.

Anticipated Life of Mouldings Based On Recycled Polypropylene in an Underground Environment

In my opinion, a moulded part based on recycled polypropylene having a reasonable degree of molecular weight (measured as a melt flow index *lower* than 50 grams per ten minutes - MFI 50), would survive at least fifty years when buried underground, without a significant loss in mechanical strength.

This is based on the fact that a polypropylene which has this level of molecular weight (MFI) will not be susceptible to further molecular weight degradation in the absence of air and/or ultra-violet light. Loss in molecular weight requires the presence of oxygen (air) since it is an oxidative process. It is also my understanding that the recycled polypropylene is black – which will also protect it from oxidative attack.

Polypropylene, like polyethylene, hates water (it is hydrophobic), hence is not affected by prolonged exposure to water. This is why polypropylene and polyethylene bags are *not* welcome in landfill, since they do not degrade in a wet *anaerobic* landfill environment - where they are protected from oxidative attack - and do not respond to exposure to water.

Suggestions
The end-use application of this particular moulded part (a domed cover) requires that it has adequate mechanical strength to act as a sacrificial 'form work' for freshly poured concrete, which it should retain until the concrete 'sets up'.

It is suggested that, if the moulded domes are stored outside prior to use, they should be covered with a tarpaulin to minimize exposure to air and sunlight. Once the concrete is poured there is no further opportunity for the dome to 'see' air.

A quality assurance test which checks the incoming MFI (maximum MFI of 50) of the polypropylene is strongly recommended.

PETER N. PLIMMER Ph.D.

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SUMMARY

Retired after a thirty-year career with the DuPont Company in the United States. This incorporated a broad spectrum of experience involving Research, Market Development, and Manufacturing of high polymers. Held the position of Manager Technology Development at retirement.

RELEVENT EXPERIENCE 1962 - 2005

Independent Consultant, 1992 - present

International

1. Developed a novel, oil-resistant thermoplastic elastomer which is currently undergoing market introduction in Europe.
2. Developed soft alloys and blends - specifically for use in foamed footwear, wire insulation, and closures.
3. Solved critical quality problems in the manufacture of fluoroelastomer seals, and in oil-resistant insulation used in submersible pumps connectors.

Domestic

Part time lecturer at Auckland University, teaching several courses on polymer technology:

1. Chemistry 750 (Novel Polymers), at graduate level.
2. PAMPITO Levels 4 and 5 - 'Polymer Technology' courses.
3. Stages 2 and 3 of the PNZ/Auckland University-promoted 'Diploma in Design and Specification of Plastics' course.

Manager Technology Development, DuPont, 1990 - 1992

1. Accelerated the development, aimed at faster penetration of technology into the marketplace, of new "barrier" technology - a recyclable, Freon-resistant, flexible polyamide- replacing non-recyclable thermoset automotive air conditioning hose. Reduced development time and cost by 30%, resulting in $1 million savings.

Senior Research Supervisor, DuPont, 1971 - 1990

Ethylene Copolymers: Worldwide responsibility for both process and product research for polymers designed for packaging, adhesives, sporting goods and industrial end uses. Specific technologies - thermoplastic elastomers, ionomers, chemically functional polymers and reactive compounding.

New Business development: Managed this arm of the Polymers Research and Development Division, test marketing significant new product technology in order to confirm its value-in-use. This included an all-plastic, low attenuation fiber optic cable, corrosion-resistant fluoropolymer/carbon fibre composites for metal replacement, and hydrocarbon-resistant blow moulded HDPE automotive petrol tank.

Fluoropolymers: Directed the process and product research for thermoplastic and thermoset fluoropolymers. This included the development of perfluorovinyl ether monomers as well as fluorinated cure site monomers.

Market Development Representative, DuPont, 1965 - 1971

Fluoropolymers: Part of a 'technical task force' charged with the responsibility of developing new, non-military markets for fluoropolymers (Teflon^R).

2 Worked closely with architectural and engineering design houses in New York City. Developed low friction, load-bearing, sliding ('bearing') pads used in curtain walls, bridges and tunnels.
3 Introduced non-burning insulation for signal and power cable for the NYC Transit system.

Research Chemist, DuPont, 1961 - 1965

Fluoropolymers:

1 Corrected a 20-year old colour (end group stability) problem peculiar to Teflon^R TFE.
2 Developed the aqueous polymerization process for Teflon^R PFA.

EDUCATION

Ph.D Organic Chemistry, 1962, "Telomerization and Polymerization of Fluorinated Olefins", University of Durham (England)
B.Sc. (Honours) Chemistry, 1959, University of Durham (England)

PATENTS

US Patent 3,419,512 (1966) 'Non-graying, non-yellowing polytetrafluoroethylene moulding powder'
US Patent 4,503,192 (1985) "Cured elastomers with improved high temperature tear strength"
Pending European patents (1995): 'Compositions of elastomers dispersed in thermoplastic matrices', and 'Process for increasing the crosslinking density of TPE's made by solid state grafting of thermoplastics'