Pluss Polymers is an offshoot of Manas, established to develop and market new technologies and products developed inhouse. Pluss Polymers was incorporated in 1993 to commercialise the technology for grafted modified polymers and alloys and blends. Backed by competent technical staff, laboratory facilities, a good library and technical database with a retrievable wealth of information marketed the OPTIM™ brand of grafted polymers for the first time in India in 1996.

OPTIM™ coupling agents and compatibilisers allow plastics manufacturers of world class quality products to OPTIMise their compound properties. The ADNYL™ range of nylon alloys provide the user with extra tough nylon for increased strength.

Profiles and other rigid and flexible containers for thermal energy storage have also been introduced in India for the first time by Pluss Polymers.
GLASS FILLED PP COMPOUNDS FOR HIGH PERFORMANCE

Polypropylene is an inexpensive, ductile, low strength material with reasonable outdoor performance. The material surface is soft wax-like and scratches easily. In many ways, PP is similar to HDPE, but it is stiffer and melts at 165-170°C. PP can be processed by all the usual methods used for thermoplastics.

Glass fibers consist of silicon oxide with addition of small amounts of other oxides. Glass fibers are characteristic for their high strength, good temperature and corrosion resistance, and low price. They are produced by a spinning process, in which they are pulled out through a nozzle from molten glass (thousands of meter/min).

There are two main types of glass fibers: E-glass and S-glass. The first type is the most used, and takes its name from its good electrical properties. The second type is Soda glass and is almost out of commercial use due to the consistently reducing E-glass prices.

The various properties of Polypropylene can be improved by using reinforcements. Stiffness and strength are often improved using glass, chalk or talc. Glass fibers give PP better stiffness, although the resulting material is difficultly moldable with tight tolerances Polypropylene with small short fibers is mostly used for injection molding of small parts, e.g. FMCG, sports equipments, small components for automotive, naval sector etc.

In order to couple the mineral fillers or glass fibers to the Polymer matrix, a Coupling Agent / Compatibiliser is usually required.

**OPTIM® Coupling agent for filled PP**

OPTIM® Maleic Anhydride (MAH) grafted PP acts as a coupling agent for mineral (eg. Glass, wollastonite, talc, and mica) filled PP. MAH on the PP backbone couples to the –OH on the mineral particle. The PP tail then solubilises in the PP matrix. This results in the improvement of various properties such as stiffness (flexural modulus), notched izod impact strength, flexural and tensile strength and heat distortion temperature.

OPTIM® is recommended for glass filled PP. It is used at a level of 1.5-2% of the total compound weight. Exact percentage to be used will depend upon the formulation and the mixing efficiency of the machine. With a good twin screw extruder 1-2% of OPTIM® should be adequate.

At this level, following results have been obtained in 30% glass filled PP.

- **Density**: 1.15 gm/cc.
- **Shrinkage**: 0.55 %
- **Heat Distortion Temperature (HDT)**: 142°C (increase of about 10°C)
- **Tensile Strength at Yield**: 850 kg / cm².
- **Elongation at break**: 04-05%.
- **Flexural Strength**: 900 kg / cm².
- **Flexural Modulus**: 40500 kg / cm².
- **Notched Izod Impact Strength**: 10.5 Kg cm / cm.
- **Ash Content**: 30.2 %.

**Product Application Notes**

**GLASS FILLED POLYPROPYLENE**

At this level, following results have been obtained in 30% glass filled PP.

- **Density**: 1.15 gm/cc.
- **Shrinkage**: 0.55 %
- **Heat Distortion Temperature (HDT)**: 142°C (increase of about 10°C)
- **Tensile Strength at Yield**: 850 kg / cm².
- **Elongation at break**: 04-05%.
- **Flexural Strength**: 900 kg / cm².
- **Flexural Modulus**: 40500 kg / cm².
- **Notched Izod Impact Strength**: 10.5 Kg cm / cm.
- **Ash Content**: 30.2 %.

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