OP-FIBRE MOULDED PLASTIC COMPOSITES

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Malaysia has more than 3.01 million hectares under oil palm cultivation in 1998. Besides producing palm and kernel oils, the industry also generates more than 30 million tonnes annually of biomass in the form of fronds (OPF), empty fruit bunches (EFB) and trunks (OPT) from harvesting, processing and replanting the crop, respectively.

About two fronds are pruned from each palm per month during harvesting of fresh fruit bunches (FFB). The FFB, processed in mills, yields EFB from which mesocarp fibres are the main cellulosic residues produced. In addition, approximately seven million tonnes of OPT are available yearly during felling of the crop for replanting.

PORIM had carried out trials to determine the suitability and feasibility of compounding oil palm fibres (OP-fibre) with plastics for making moulded composites commercially. This has enhanced the utilisation of biomass to produce value-added products *(Figure 1).*

Figure 1. OP-Fibre Moulded Plastic Composites (1.Desktop; 2.Drawer; 3. Chair)

MANUFACTURING PROCESS

Moulded plastic composites are basically plastics, with or without a filler that are moulded either by compression or extrusion. OP-fibre can be used as a filler advantageously. They are ground to a fine state in a reduction mill. After drying, the materials are mixed with plastics and additives and melt-blended to produce plastic pellets. The pellets are then passed through an extruder to produce the moulded products. *Figure 2* illustrates the process flow for compounding OP-fibre plastic admixtures for moulded plastic composites.

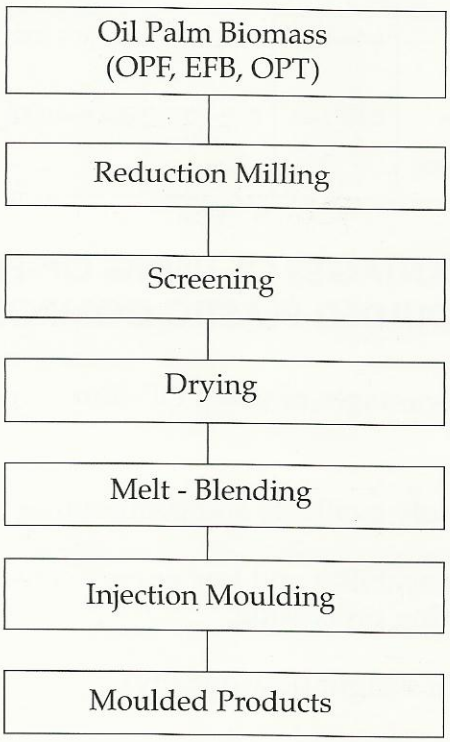

Figure 2. Process Flow for Making OP-Fibre Moulded Plastic Composites

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PROPERTIES OF OP-FIBRE MOULDED PLASTIC COMPOSITES

The processing of OP-fibre into plastic composites is smooth during both the melt-blending and extrusion process. Compared to the unfilled plastics, the OP-fibre moulded plastic composite has significantly better tensile and flexural strengths *(Table 1)*.

The OP-fibre increases the stiffness of the plastic composites but decreases the impact strength. However, addition of a coupling agent could help improve the inherently poor bonding between the hydrophilic OP-fibre and hydrophobic plastic matrix, thereby rectifying the weak impact strength.

TABLE 1.COMPARISON OF MECHANICAL PROPERTIES BETWEEN UNFILLED PLASTICS AND OP-FIBRE MOULDED PLASTICS

Products	Specific Gravity	Average Modulus of Rupture (Mpa)	Average Modulus of Elasticity (Mpa)	Average Impact Strength (J/M)
Unfilled Plastic	0.96-1.20	8 to 50	200 to 2,000	5-16
OP-Fibre Plastic Composite	0.85-1.00	10 to 75	250 to 3,000	10-18

ADVANTAGES OF USING OP-FIBRE IN MOULDED PLASTIC COMPOSITES

The advantages of using OP-fibre in plastics are:

- widely available and competitive;
- renewability and low energy consumption during processing;
- light weight (low density);
- high specific properties; and
- non-abrasive and bio-degradable

Hence, OP-fibre moulded plastic composite products have numerous advantages over unfilled plastic products, such as:

- lighter product weight;
- non-abrasiveness;
- better tensile and flexural strength; and
- easy moulding to various shapes.

SUITABILITY FOR MANUFACTURING

In general, OP-fibre moulded plastic composites could use the same commercial equipment to produce a series of plastic composite products. The costs of manufacture are comparable to those of to produce plastic products.

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