AUTOMOTIVE COMPONENTS: THERMOFORMABLE PLASTIC COMPOSITES FROM OP-FIBRE

by: RIDZUAN R, JALANI BS, ARIFFIN D, MOHD BASRI W, MOHAMAD H, KAMARUDIN H AND ASTIMAR AA

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The oil palm industry in Malaysia is producing more than 30 million tonnes of cellulosic materials from oil palm fronds (OPF), empty fruit bunches (EFB) and felled trunk (OPT) each year.

The availability of oil palm biomass amounts to seven times the total wood used in Malaysia. Therefore, the wood-based industry should consider using more sustainably-produced oil palm biomass in their traditional products. Wood can then be channelled for higher value products.

The conversion of oil palm fibre (OP-fibre) into fibre-reinforced composites is now technically feasible. The products include paper and paperboards, mattresses and reconstituted panel boards, such as particleboards and fibreboards.

With further development, the use of OP-fibre to manufacture thermoformable plastic composites has been explored for car components such as bumpers, trimmings, rear parcel shell, spare wheel cover and splash shield *(Figures 1* to *6)*.

Figure 1. Bar Bumper

Figure 2. Boot Trim

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Palm Oil Research Institute of Malaysia, Ministry of Primary Industries, Malaysia
P. O. Box 10620, 50720 Kuala Lumpur, Malaysia. Tel: 03-8259155, 8259775, Homepage: http: //porim. gov. my, Telefax: 03-8259446

Figure 3. Door Trim

Figure 6. Splash Shield

Figure 4. Rear Parcel Shell

Figure 5. Spare Wheel Cover

MANUFACTURING PROCESS

OP-fibre plastic composite products are basically formed by moulding either through compression or extrusion. The oil palm materials are ground to a fine state in a reduction mill. After drying, the materials are mixed with plastic and additives in a compounding process to produce plastic pellets. The pellets are extruded as sheets through a T-dye moulder. *Figure 7* illustrates the process flow for compounding an OP-fibre plastic admixture into a thermoformable plastic composite.

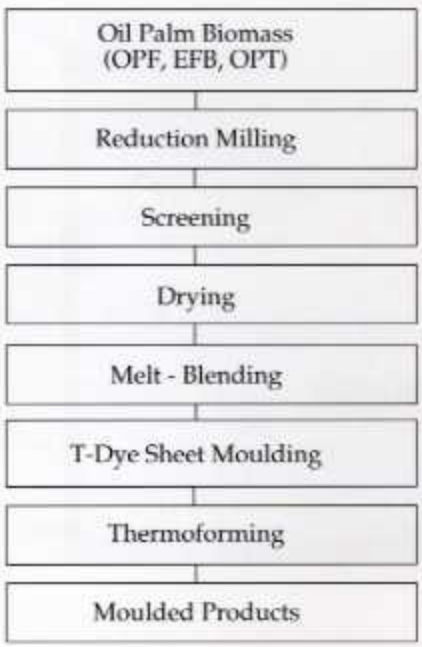

Figure 7. Process Flow of OP-Fibre Thermoformable Plastic Composites Products

PROPERTIES OF OP-FIBRE THERMOFORMABLE PLASTIC COMPOSITES

OP-fibre plastic composites are lighter but yet possess comparable mechanical properties to mineral plastic composites *(Table 1)*.

TABLE 1. COMPARISON OF MECHANICAL PROPERTIES BETWEEN OP-FIBRE PIASTIC COMPOSITES AND MINERAL PLASTIC COMPOSITES

Products	Specific Gravity	Average Modulus of Rupture (Mpa)	Average Modulus of Elasticity (Mpa)	Average Impact Strength (J/M)
Mineral Plastic Composite	0.98-1.85	12 to 90	350 to 3,300	12-20
OP-Fibre Plastic Composite	0.85-1.00	10 to 75	250 to 3,000	10-18

ADVANTAGES OF OP-FIBRE THERMOFORMABLE PLASTIC COMPOSITES AS AUTOMOTIVE COMPONENTS

OP-fibre thermoformable plastic composites have numerous advantages as automotive components. They are:

- Lighter (reduces fuel-consumption);
- Readily available and renewable material;
- Excellent weight-to-bulk ratio;
- Lower thermal expansion; and
- Low volumetric cost.

SUITABILITY FOR MANUFACTURING

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

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For more information kindly contact:

Director-General
PORIM
P. O. Box 10620
50720 Kuala Lumpur, Malaysia.