PALM-BASED POLYURETHANE FOR AUTOMATIVE COMPONENTS - PART 1

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Vegetable oils like palm oil, being the triglycerides of fatty acids, have a number of excellent properties and can be used to produce valuable polymers. Many of us may not realize that we are surrounded by polymeric materials such as polyethylene, polypropylene and polyurethane (PU).

The nature of PU foams and products depends very much on their formulations. The foams can be rigid, semi-rigid or flexible, and their characteristics determine their applications either in furniture and mattresses, construction and building materials, adhesives and coatings, thermal insulators, automotive industry, *etc*. The major reactants are polyols and isocyanates. The polyols are mostly from petrochemicals, but now some can be replaced by natural-based resources like palm oil polyols. Some catalysts and the appropriate additives are also added to give the complete formula, or recipe for a PU foam.

RESEARCH ON PALM-BASED POLYOLS IN MPOB

The quest to make palm-based PU products from palm-based polyols in MPOB began in the early 1990s, and today, this patented technology has been fully tested. The research started by looking at the production of palm-based polyols one of the major ingredients in making PU. To date, MPOB has produced several blends of palm-based polyols (POP) which can be formulated into a variety of PU foams. All the polyols have been produced at pilot plant scale, at about 400-500 kg per batch. Some of the properties of POP polyols are given in *Table 1*.

PU FORMULATIONS

A number of trials on PU formulations for pad dash panels and carpet underlays were carried out. The formulae comprised POP polyol, petroleum-based

TABLE 1. SOME PROPERTIES OF PALM-BASED POLYOLS (POP)

	POP PIONEER			POP PRIMER		POP PREMIER	
	80	90	95	90	95	80	90
OOC %	0.02	0.02	0.02	0.08	<0.01	0.02	0.01
Water	0.02-0.08	0.02-0.04	0.04-0.05	0.03-0.1	0.04	0.04	0.05
AV	0.5-0.7	0.5-0.7	0.6-0.8	0.7-0.8	0.57	0.73	0.69
IV	5-7	7-9	9-11	10-12	6-10	10-12	6-8
OHV	135-150	115-129	115-118	117-123	60-70	80-90	70-80
Viscosity cP 25° C	9 170-9 600	3 015-3 052	7 251	3 820	663	3 582	617
35°C	3 900-4 300	1 480-1 520	456	1 815	257	375	1 672

Note: OOC= oxirane oxygen content, AV= acid value (mg KOH g^{-1} sample), OHV= hydroxyl value (mg KOH g^{-1} sample) and IV= iodine value (g I_2/100 g sample).

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Cup Test

Cream time 29 s
Top of cup 34 s
Gel time 42 s
Rise time 4 min 30 s
Tack-free time 11 s

polyol, catalysts, surfactants, cross-linkers and a blowing agent. Water was used as the sole blowing agent and the isocyanate was MDI-based. Factory trials were then carried at Rokisar Sdn Bhd in Teluk Gong, Klang to further test the PU formulae developed in the laboratory.

PRODUCTION OF PAD DASH PANELS

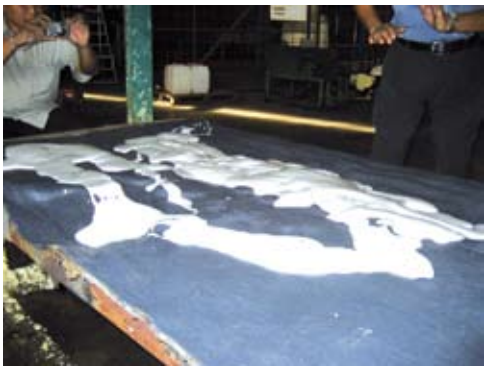
1

2

3

4

PRODUCTION OF CARPET UNDERLAYS



1

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CONCLUSION

The technology provides the PU industry with the option to use alternative raw materials which are renewable, cheaper and more environment-friendly than the present petrochemicals. The polyols and PU products produced in this study have had customer acceptance.

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