IMPROVED PALM-BASED POLYOLS: POP PIONEER, POP PRIMER AND PREMIER

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hree palm-based polyols (POP) were produced from blending different oils. By varying the blending ratio and using oils with different degrees of unsaturation, a wide range of polyols (with different hydroxyl numbers and viscosity) can be produced. The wider the range of hydroxyl numbers, the more the types of polyols that can be produced for polyurethane (PU) foam products. PU foams can be rigid, semi-rigid or flexible for construction, furniture and automotives.

PREPARATION OF IMPROVED POP

The preparation of POP involves two chemical reactions - epoxidation followed by alcoholysis (*Figure 1*). The final product obtained is neutralized to pH 7.

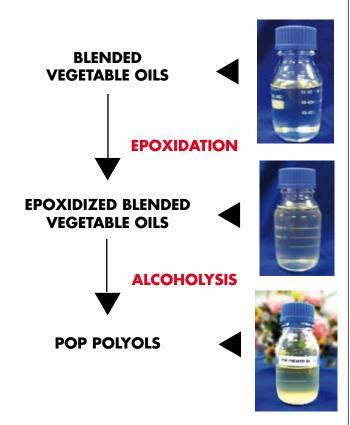


Figure 1. Process for producing improved POP.

PROPERTIES OF IMPROVED POP

• The typical properties of improved POP and Poly-EG polyol are shown in *Table 1*. Poly-EG is the first POP developed in MPOB. Further development has since improved and differentiated the polyol. *Figure 2* shows three improved POP for different applications.



POP PIONEER



POP PRIMER



POP PREMIER

Figure 2. Improved POP: POP Pioneer, POP Primer and POP Premier.



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TABLE 1. PROPERTIES OF POP

	OHV, mg KOH g ⁻¹	Viscosity @ 25°C, cP
POP Pioneer	90 – 150	1 800 – 9 000
POP Primer	100 – 130	2 000 – 9 000
POP Premier	60 – 85	600 – 1 000
Poly-EG	130 – 150	5 000 – 10 000

• Polyols with low OHV are generally suitable for flexible foams, and with high OHV for rigid foams.

STABILITY STUDY

The polyols produced were conditioned at room temperature (28°C) and 70°C for six months and their properties were then measured. *Tables 2* and 3 show the properties after storage.

POTENTIAL APPLICATIONS

- Flexible foam mattresses, pillows and automotive components; and
- Rigid foam packaging, insulation and cornices

ADVANTAGES OF IMPROVED POP

With a wider range of hydroxyl values, more types of PU products can be produced. Low viscosity

TABLE 2. PROPERTIES OF POP AFTER SIX MONTHS' STORAGE AT ROOM TEMPERATURE (28°C)

	POP PIONEER		POP PRIMER		POP PREMIER	
	Initial	Six months	Initial	Six months	Initial	Six months
OHV, mg KOH g ⁻¹	130	110	112	114	57	65
Viscosity @ 25°C, cP	10 143	8 554	3 587	3 300	510	1 076
AV, mg KOH	0.8	5.3	0.8	3.5	0.8	5.5
IV, g I ₂ /100 g	7.3	11.7	5.3	7.2	5.9	7.7

TABLE 3. PROPERTIES OF POP AFTER SIX MONTHS' STORAGE AT 70°C

	POP PIONEER		POP PRIMER		POP PREMIER	
	Initial	Six months	Initial	Six months	Initial	Six months
OHV, mg KOH g ⁻¹	130	117	112	121	57	61
Viscosity @ 25°C, cP	10 143	8 469	3 587	3 288	510	594
AV, mg KOH g ⁻¹	0.8	4.7	0.8	3.1	0.8	5.0
IV, g I ₂ /100 g	7.3	11.0	5.3	8.5	5.9	9.3

polyols offer good mixing capability and easy machine handling, resulting in better quality products.

The production process for the polyols has been filed for a patent in Malaysia under application PI20070797.

COST PER UNIT

The cost to produce 1 kg of POP is estimated at RM 7 to RM 9, based on pilot plant production

in 600 kg per batch. *Table 4* shows the estimated profitability in the PU industry from 1998 to 2002.

CONCLUSION

The development of improved POP - POP Pioneer, POP Primer and POP Premier - has opened up the field for future production of yet more types of polyols. MPOB offers this technology to the PU industry for faster progress towards green and sustainable production.

TABLE 4. ESTIMATED PROFITABILITY IN THE PU INDUSTRY, 1998-2002

Year	Turnover (RM million)	PBT (RM million)
1998	8 011	1 276
1999	8 740	1 500
2000	11 623	1 405
2001	11 373	1 250
2002 (E)	11 925	1 195

Source: IAL Consultants/industry reports.

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