

The APR Design® Guide for Plastics Recyclability

Supplemental Guidance

The following supplemental information is intended to be used alongside the Circular Packaging Assessment Tool. The information within is consistent with the APR Design® Guide [HDPE Rigid – Colored](#) and [HDPE Rigid - Natural](#).

Melt Flow Rate Calculation for HDPE blends

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Introduction – Scope, Significance and Use

For HDPE, LLDPE, and LDPE closures attached to HDPE containers the melt index (MI) of the closure and base resin blend needs to be less than 4.00 g/10 min to be considered APR Preferred. The MI of the blend can be measured experimentally using ASTM D1238. Alternatively, the Melt Flow Rate (MFR) of the closure and base resin blend can be calculated in lieu of laboratory testing.

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Calculation

APR Guidance given in the Critical Guidance method [HDPE-CG-01](#) is that the MFR of a 50/50 blend of control resin with an innovation should be less than 0.75 units greater than the control alone. The following calculation is offered and can be employed as an alternative to laboratory testing to determine the MFR of a blend of two different polyethylene resins:

$$\log(MFR_{blend}) = \sum w_i \log(MFR_i)$$

Using the lowest MFR control choice in the [O-P-01](#) of 0.25 g/10 min MFR and targeting 1.00 g/10 min (0.25 + 0.75 = 1.00 g/10 min) as the maximum MFR of the blend of closures and container base resin, one solves to determine the MFR for the blend of closures with base resin:

$$\log(MFR_{blend}) = 0.5 \log(4.00) \text{ (Closure + base resin blend)} + 0.5 \log(0.25) \text{ (Control)} = 0.00$$

$$MFR_{blend} = 1.00 \text{ (< 0.75+0.25 per CG criteria)}$$

The table below gives some illustrative closure/container blends that do not exceed the < 4.00 g/10 min limit.

Cap (wt%)	Cap MFR (190/2.16)	Bottle (wt%)	Bottle MFR (190/2.16)	Blend Final MFR (<4.0 g/10 min)
0.10	15	0.90	0.25	0.38
0.20	20	0.80	0.70	1.37
0.30	30	0.70	0.35	1.33

. Document Version History

Version	Publication Date	Revision notes
1	3/04/2024	Initial publications
2	09/09/2024	Changed naming convention for testing protocol to match; Updated hyperlinks to match new website