

How to Mould with Rubber

VINAMOLD – HOT MELT COMPOUNDS

Introduction

Vinamold Hot Melt Compounds are meltable vinyl compositions used for the preparation of flexible moulds as alternatives to silicone rubbers, polyurethane's, and rubber latex, in the casting of concrete, gypsum, polyester resins and glass fibre laminates. Because vinamolds are essentially craft materials, few tools and only simple equipment is required. Once the behaviour of vinamold is understood skill in producing even complicated moulds is rapidly acquired. In use vinamold is melted by heating, poured over the article to be copied, then allowed to cool.

Grades Available

For identification purposes vinamold is supplied in different colours – yellow, white and red. The three colours represent a different hardness (flexibility) yellow is the hardest, red the softest, and white intermediate. Where there is a possibility of pigment migration into a light coloured article from red vinamold, the same grade is available unpigmented.

Difference between the three vinamold types can be summarised as:

Yellow

Melting temperature 150 - 170°C (284-302°F).

Use:

- a) Where extremely thin sections are involved which could droop under their own weight.
- b) Where large moulds are required which should not deform under their own weight.

The greater hardness of yellow vinamold minimizes deflection in a) and creep in b).

White

Melting temperature 170°C (338°F). Pouring temperature 170°C (338°F).

Use:

Combining flexibility with toughness, for moulds to be used in making concrete articles. Has best resistance to damage through rough treatment. For Polyester resin casting, white vinamold is preferred to the other types of account of its better resistance to heat rise (exotherm) during setting (cure) and reduced attack by the fire retardant additives present in some polyester resins.

Red (and Natural)

Melting temperature 150 - 170°C (302-338°F). Pouring temperature 140-150°C (284-302°F).

Use:

General purpose type, and for glass fibre reinforcement (GRP) laminates.

General Properties and Precautions

Volume/weight relationship. For calculation purposes the specific gravity of all three vinamold grades may be taken as 1.0 as that 1kg equals 1 Litre, or 1 Lb equally 27.5cu. ins.

Re-use

Unlike some other flexible mould materials vinamolds are thermoplastic, that is to say they melt on heating and re-melt on re-heating. Worn or obsolete moulds may therefore be cleaned and re-used many times over, an obvious economic advantage.

Dimensional Stability

Water

Vinamold materials are not affected by water nor by high humidity.

Temperature

Maximum ambient temperature 80°C (176°F).

Storage Life

Unused material indefinite. Moulds for many months, subject to careful handling.

Mould Surface Durability

Depends on careful handling and fineness of surface detail. The number of times a mould can be used may be as many as 100.

Resistance to Solvents

Fine surface detail will be damaged by exposure to organic solvents especially acetone, MEK, tetrahydrofuran, benzene, xylene, and toluene. Many adhesives, paints, and paint removers use such solvents.

Resistance to Detergents

For cleaning dusty mould surfaces detergents should be well diluted. Strong detergents may extract some of the mould release agents incorporated in the vinamold.

Mould Lubrication

Generally the lubricants incorporated in vinamold are sufficient. Additional lubricants, if used should first be tested to ensure that no surface damage is likely to occur.

Miscibility of Vinamold Grades

All grades are miscible in any proportions to arrive at intermediate flexibility's.

Physical Form

25kg slabs.

Melting VINAMOLD

The more care and control exercised in melting vinamold the more times the material can be re-used. Alternative simple melters can be constructed in the form of air or sand baths, utilizing vessels (for example cans) one inside the other with a gap all round of at least 12.5mm (½in). It is recommended to restrict the volume of melted vinamold in these simple devices to 5kg(11Lbs).

Under no circumstances should oil be used in place of sand or air – hot oil can cause serious burns and easily ignite.

Whether thermostatic or simple melters are used the practice for melting is the same cut the material into small pieces, melt a small quantity, then add further pieces, melt these, add more pieces and so on.

Excessive fumes during melted indicate overheating which will be followed by discolouration of the vinamold, and eventual decomposition to a charred and unusable state.

Mould Making

There are essentially three types of mould for which vinamold can be used.

- a. Open moulds for flat articles.
- b. One part moulds for simple non-flat articles.
- c. Two part moulds for complex articles.

REVULTEX (MOULDTEX)

Revultex is frequently used to produce rubber moulds for products such as plaster ornaments, cast polyester resin figures, isostatic moulding bags, concrete garden ornaments, theatrical properties and ornamental wax candles. The advantage of Revultex is that strong flexible moulds with good reproduction of model detail may be made by relatively simple processes. The exact process of mould making will be determined by the size of the mould required.

1. Process

1.1 Smaller moulds

These are generally best produced by a coagulant or straight dipping process.

1.2 Coagulant

The coagulant consists of calcium nitrate ($\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$) or calcium chloride ($\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$) dissolved in industrial alcohol (IMS technical grade ethanol) at 40 crystals; 60 alcohol by weight – roughly 4lbs crystals made up to 1 gallon in alcohol. The solution requires fairly prolonged stirring to dissolve completely.

- The model is warmed to 40 – 50°C and dipped in the coagulant, removed slowly and generally after two minutes in the air, evaporation immobilizes the coagulant sufficiently to continue with Revultex dip. For model forms with a low heat content (eg, wood or plastic) it may be necessary to dry in an oven at 70°C for two or three minutes.
- Allow the Revultex to stand for several hours to de-bubble. Bubbles on the surface may be cleared by placing wet strength tissue paper over the surface and removing after a few minutes.
- Dip the former into Revultex very carefully to avoid trapping any air bubbles. Hold stationary at the required depth (“dwell”) for three minutes or more if a greater thickness is required. Withdraw slowly and repeat coagulant dip and Revultex dip until the required thickness is obtained. Allow two minutes in air between dips to set the outer surface.
Dry in an oven at 70-80°C until the rubber film becomes translucent and free from whiteness. Dust the outside with a talc powder and strip from the former dusting the inside as well to prevent sticking. Wash the product in clean water from four to twenty four hours to remove coagulant.

1.3 Straight Dipping

Moulds are sometimes made without the use of coagulant by a series of successive dips into Revultex with drying at 7- = 80°C after each dip. Typically about 10 to 12 dips are needed for about 1mm thickness. Then finally drying stripping and washing are as for (1) above.

1.4 Large Moulds

Often moulds for garden ornaments or advertising display items are too big for the dipping process to use used. Sometimes insufficient latex may be available. Therefore, for larger moulds the Revultex may be painted by brush or spray gun directly onto the model. The number of coats and drying is the same as for the straight dir method (2). Alternatively the mould may be painted with coagulant solution and then Revultex to give a faster thickness build up.

In another technique flour is dusted onto the wet Revultex surface or on to the mould to give a higher viscosity thicker coating of Revultex. Flour may also be mixed with Revultex to give a viscous paste. Sometimes cotton muslin cloth is applied to the wet Revultex coating on the former and more Revultex applied over it. This is done to reinforce certain mould areas where distortion due to the weight of in-filled moulding composition is more generally avoided by:-

- a. Making a two part plaster of Paris casting to support the outside of the Revultex mould.
- b. Supporting the outside of the mould with sand or vermiculite etc.

2. Features

Shrinkage

This is generally less than 5% but depends on the method of manufacture.

Temperature

Avoid high temperatures of mould whilst in use to increase service life.

Mould Storage

Store in darkness or at least away from direct sunlight and in a cool place.

3. Type

MR is a full ammonia pre-vulcanised natural rubber latex having medium modulus. MR Revultex can be provided both with and without a health approved antioxidant.

4. Applications

Used in the majority of dipping applications where medium modulus together with high clarity is required. Particularly suited for teat and catheter manufacture using the coagulant or straight dipping process. Finds wide use in all types of glove dipping and is also suitable for can sealing compounds and latex thread manufacture. MR Revultex provides excellent coating characteristics for textiles, metal and other surfaces and has been successfully used as a binder for rubber crumb in sports tracks and playground preparations.

5. Solvents

Do not allow contact with solvents such as benzene, toluene, xylene, petrol, Styrene Monomer also attacks Revultex and certain resins containing styrene monomer may cause damage to the mould.

6. Release Agents

Silicone release sprays, wax emulsions or soap solution may be used if necessary. A light dusting with talc is sometimes used.

7. Fine Detail

To achieve fine detail reproduction the model should first be coated with one or two coats of pure Revultex without additive. Subsequent coatings as for any of the detailed methods.

8. Typical Properties

1. Latex

Total solids content ca 61.0%

Ammonia content ca 0.6%

pH ca 10.5

Viscosity at 30°C

(Ford Cup No3) ca 35 sec's

2. Dry Film

Ambient temperature laid and leached films tested at 23°C and 50% RH

a. Un-aged

modulus 700% elongation 11.0MPa

Tensile strength 30.0MPa

Elongation at break 900%

b. Aged 14 days at 70°C

Retention of:
Modulus at 700% elongation 75% min
Tensile strength 75% min

9. Packing

MR Revultex is available in non-returnable metal drums holding 208 kilos net and also in ca 19 tonne de-mountable bulk tank quantities.

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