Technical Application Report

RTV Silicone Moulding Rubber

Silicone rubber has been in use as a moulding material for several decades. These elastomers have natural properties which make them ideally suited for use as a moulding medium:

- Cold cure
- Fine detailed reproduction
- Excellent release (no need for release agents)
- Durable
- Good tear strength and elongation
- Low shrinkage
- Simple to use

RTV silicone rubbers use two different types of silicone chemistry to form an elastomer: condensation cure systems which use a tin based catalyst and addition cure systems which use platinum based catalyst. Although the end products can be very similar they do have some key differences which should always be considered when making your product selection.

Addition Cure vs Condensation Cure

The differences between the two systems should not be referred to in terms of positives and negatives but rather properties that will provide benefits for different applications.

Key differences:	Addition Cure	Low shrinkage, below 0.1% Marginally higher tensile strength Slightly tougher rubber Need for careful and accurate mixing Platinum catalyst can be poisoned (*see note below) Good abrasion resistance Can be accelerated using heat Tolerant to the addition of silicone fluid as a softener
	Condensation Cure	Lower costs Broader product range Less sensitive to exact mix ratio Easy to use thixotroping agent available Accelerator catalysts available to speed up cure Mixing of grades possible to achieve desired hardness

Where the application demands good dimensional stability, such as precision moulding, prototyping, making masters or very large objects, then addition cure would be the preferred choice however, the shrinkage levels for a good condensation cure are still very low at about 0.5%. The reproduction and release properties of both materials are excellent as is the transfer of very fine detail.

**The platinum catalyst used in all addition cures is susceptible to attack from certain chemical compounds which in turn will lead to inhibition of cure and results in a partially cured product. Bringing the uncured material into contact with the following chemical compounds should be avoided during the manufacturing process: nitrogen, sulphur, phosphorus, arsenic, organotin catalysts, PVC stabilizers, epoxy resin catalysts, sulphur vulcanised rubbers and condensation cure silicone rubbers.*

Catalyst's

Platinum

As already explained, addition cure rubbers use a platinum catalyst and the A and B parts are manufactured together as a balanced kit. For this reason only use the A and B parts from the same kit and always weigh out and mix to the correct ratio. The catalyst can be contained in either the A or B part of the system, as this may vary from supplier to supplier, it is important to check first if using a new material with automated dispensing equipment. We strongly advise purging and cleaning equipment before changing to a new material to avoid cure taking place in the pump and pipe work.

Tin

Condensation cure or tin catalyst systems are not manufactured as a balanced kit so it is possible to use different catalyst from separated batches provided they are recommended for each other. To adjust the cure speed it is possible to use catalyst with a higher tin content which will increase cure speed or you can add a booster or accelerator to a standard catalyst, but there are some precautions.

All ACC Silicones data for their condensation cure systems are based upon using a standard speed catalyst. If faster catalysts are used there may be some changes in the long term physical properties of the cured rubber. This may result in some post hardening and loss of tear strength over a period of months or years.

We do not recommend using higher amounts of catalyst than stated on the data sheets as this will result in result serious long term damage to the rubber.

New Code	Description	Feature	Colour	Mix Ratio	De-Mould Time Hrs	Pot Life mins
HIGH TEAR CATALYST						
MMTA2	Catalyst	Thixotroping Additive	Clear	100:2	N/A	N/A
MMCat L8W	Catalyst	Slow Cure Clear	Clear	20:1	<24	120
MMCat L6W NT	Catalyst	Standard Cure Clear	Clear	20:1	<24	45
MMCat B5 NT	Catalyst	Standard Cure Blue	Blue	20:1	<24	45
MMCat R5 NT	Catalyst	Fast Cure Red	Red	20:1	2	15
MMCat W	Catalyst	Booster	Clear	100:1	1-2	15
LOW TEAR CATALYST						
MMCatW	Catalyst	Booster for rapid cure	Clear	100:1	1-2	15
MMCatL5IV	Catalyst	Shoe moulds low hazard	Green	20:1	<24	45
MMCatVEI	Catalyst	Shoe moulds fast cure	Green	20:1	2	15
MMCatVE	Catalyst	Shoe moulds standard cure	Green	20:1	<24	45
MMCatL5I	Catalyst	Leather reproduction fast cure	Clear	20:1	2	15
MMCatL5	Catalyst	Leather reproduction Std cure	Clear	20:1	<24	45

Low Tear Rubbers

Resistance to tear is normally an important feature of any moulding rubber as it will enable the rubber to be stretched and pulled and retain is original shape, it also will ensure a longer usable life of the mould. To produce high tear resistant rubber requires careful selection of quality silicone polymers and fillers which are generally more expensive. Some applications, which are very basic in shape and may only be used a few times, do not require high tear strength rubbers. Two typical examples of these are the manufacture of shoe sole moulds/masters and the reproduction of leather.

In order to keep production costs to a minimum low tear silicone rubbers, such as the ACC 800 series have been formulated. These are low cost rubbers with low tear strength but will provide high quality reproduction.

Special Effects

Film and theatre use silicone moulding rubbers to create props, special effects, animations, prosthetics and stage scenery. Condensation cure rubbers, such as ACC 900 series, are used extensively to create plaster mock ups of interiors.

For example, a replica of a wooden panelled wall or plaster cornice in a stately home can be reproduced using ACC 900 series rubber with TA2, thixotroping agent or MM4400 moulding paste. Plaster is then poured into the mould and after setting is finished to replicate the original wall on a stage set. A similar process may be used to reproduce artefacts, sculptures, natural rock etc

General Moulding

Silicone moulding rubbers find applications for moulding a variety of materials, such as:

Material	Application
Wax	Candles and use in the lost wax process for bronze casting
Polyurethane	Mirror and picture frames, architectural mouldings
Plaster	Covings and cornices, film studios, figurines
Polyester resin	Giftware, figurines, sculptures
Ceramics	Earthenware pottery
Low melt alloys	Toys, models
Glass	Auto windscreens
Stone filled resins	Replication of works of art

Rapid Prototyping

The fast and cost efficient production of accurate prototype parts is an essential ingredient for the effective introduction of new products in today's rapidly developing markets. Technologies used to produce masters from 3D CAD images have revolutionised the prototyping industry over the last 10 to 15 yrs. Once a master has been created there is usually a need for further copies to be made for ongoing evaluation and development. A fast cost effective method uses a silicone mould into which quick curing resins are injected.

The silicone rubber used for this application is normally a translucent addition cure, such as ACC MM240TV. A translucent material is used because it enables the master to be completely encased in silicone then using a knife, the silicone can be cut open to remove the master. The mould can be reassembled and resin injected to recreate the original. Being translucent it not only enables the cutting open of the mould but also provides a visual check to see if the resin has been effectively injected.

Prototypes are often used to assimilate the fit of several components, the use of a low shrinkage addition cure is essential.

Tampo Print Pads

Tampo print pads can be produced using either condensation cure or addition cure rubbers. For a detailed discussion of the process please refer to the specific Tampo Print Pad Application Sheet available from ACC Silicones.

ACC Silicones Moulding Rubbers

The list below details many of the standard ACC Silicones moulding rubbers. Before selecting a material careful consideration should be given to the relevant Technical Data Sheet.

Product	Cure Type	High / Low Tear	Colour	Mix Ratio	Viscosity Mixed mPas	Duro Shore A	Tensile MPa	Elongation %	Tear kN/m
MM4400	Condensation	High	Yellow	20:1	Paste	16	1.50	400	8.00
MM50T	Condensation	Low	Grey	20:1	12000	47(00)	1.70	700	6.00
MM709	Condensation	Low	Translucent	20:1	18000	20(00)	0.30	600	3.00
MM810	Condensation	Low	Green	20:1	<6000	11	0.80	250	2.00
MM816	Condensation	Low	Green	20:1	<8400	16	1.00	250	2.50
MM820	Condensation	Low	Green	20:1	<4800	20	1.76	150	2.45
MM828	Condensation	Low	Green	20:1	<10800	28	1.00	150	2.50
MM830	Condensation	Low	Grey	20:1	<10800	27	1.50	200	2.00
MM850	Condensation	Low	Grey	20:1	40000	55	3.10	100	6.00
MM854	Condensation	Low	Grey	100:2.5	13000	52	4.63	89	4.37
MM903	Condensation	High	Blue	20:1	9000	3	1.40	900	9.00
MM906	Condensation	High	Blue	20:1	6000	6	2.61	688	13.58
MM911	Condensation	High	Blue	20:1	26500	11	2.30	600	14.00
MM913	Condensation	High	Blue	20:1	11000	15	2.80	622	20.18
MM918	Condensation	High	Blue	20:1	16500	18	3.11	539	23.49
MM922	Condensation	High	Blue	20:1	19000	22	3.64	497	26.24
MM925	Condensation	High	Blue	20:1	25000	24	3.00	400	18.00
MM928	Condensation	High	Blue	20:1	26000	27	4.03	401	30.31
MM940	Condensation	High	Blue	20:1	37000	37	4.86	349	25.00
MM282	Condensation	High	Tanslucent	20:1	21000	14	2.60	460	14.10
MM230	Addition	High	Various	10:1	20000	30	4.00	650	25.00
MM242	Addition	High	Various	10:1	11000	40	5.43	562	11.50
MM240TV	Addition	High	Translucent	10:1	45000	40	5.40	330	22.00
QM260	Addition	High	Blue	10:1	70000	60	5.17	190	14.80
QM270	Addition	High	Beige	10:1	50000	70	6.90	100	12.20