

TRIDENT

FOAMS LIMITED










'Tripor 227' is a low density, rigid foam system which may be used to manufacture mouldings. It is also suitable for structural infill of fibreglass components, and relies on the thorough mixing of two low viscosity liquids by either hand or machine mix techniques.

'Tripor 227' contains no CFC's or HCFC's and therefore has an Ozone Depletion Potential (O.D.P.) of zero.

FOAM MANUFACTURE

The foam is produced by the mixing together of the two Components A and B at a ratio of 1 to 1.06 by volume, or preferably 1 to 1.2 by weight. It is vitally important that quantities are accurately measured before mixing thoroughly. In hand mixing the Component A should be pre-mixed for at least one minute to aerate it, before mixing with the Component B. After mixing the foam should be immediately transferred to the mould or cavity to be filled, pouring should be finished before there is any significant amount of expansion. Best results are obtained if the foam rise is restricted, but it may be free-risen if necessary.

The foam should be processed between the temperatures of 18 - 23°C, temperatures lower than 18 °C will give unsatisfactory results, it is recommended that the components are kept in a warm environment for several hours before use. Lower temperatures will give a slower reaction, higher temperatures faster. Reaction times will also be affected by the bulk mixed, larger amounts will give shorter times, small amounts longer times. Best results are given if the surfaces in contact with the rising foam are at a temperature of at least 25°C.

The following times are typical for a Quality Control procedure for the checking of cream, string and rise times, and measurement of the free rise density. The test should be conducted at a temperature of 20°C, using 31.8 grams of Component A and 38.2 grams of Component B mixed together in a cup of approximately 660ml. volume, stirred intensively for 10 seconds using a bench stirrer rotating at 2000 rpm. Immediately after mixing, the chemicals are transferred to a second 660ml cup.

Cream Time	25-35 seconds	(from start of mixing to start of rise)
String Time	150-170 seconds	(from start of mixing to when a thread can be drawn from rising foam with an inserted rod)
Rise Time	180-230 seconds	(from start of mixing to end of rise)
Tack Free Time	300-360 seconds	(from start of mixing till surface can be lightly touched without foam sticking)
Density (Free rise)	48-50 kg/M ³	(weight of cups contents divided by volume of cup)
Core Density	41- 43 kg/M ³	(density of piece cut from foam core)
Ratio	1:1.2	(by weight)

STORAGE & HANDLING

It is extremely important that the containers should be re-sealed immediately after use to prevent the entry of moisture which will adversely affect the resultant foam. The shelf life of the materials is four months when stored in sealed drums within the recommended temperature range of 10 - 30°C, but users are recommended not to hold in stock longer than necessary.

PLEASE SEE THE SEPARATE MATERIAL SAFETY DATA SHEETS BEFORE USING THESE PRODUCTS.

The data contained in this sheet is to our knowledge true and accurate but recommendations are made without guarantee or warranty since application and conditions are outside our control. It is suggested that users should carry out their own tests to ensure 'Tripor' meets their requirements.

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✂TRIPOR ✂TRICAST ✂TANCAST ✂AUTOFROTH ✂AUTOPOR ✂MHD

GENERAL INFORMATION ON MIXING AND USING TRIPOR SYSTEMS

TRIPOR IS A RANGE OF 2-PACK POLYURETHANE POUR-IN-PLACE SYSTEMS, SOLD IN PACKAGES FROM 5 kg TO 250 kg IN WEIGHT. ALMOST ALL SYSTEMS USE THE SAME COMPONENT B (ISOCYANATE), THE CHARACTERISTICS OF THE FOAM PRODUCED ARE DETERMINED BY THE CHOICE OF COMPONENT A.

WHILST IT IS POSSIBLE TO MEASURE OUT THE COMPONENTS BY VOLUME, IT IS NOT GENERALLY RECOMMENDED BECAUSE IT IS NOT STRAIGHT FORWARD TO CALCULATE THE VOLUMES REQUIRED AND IT IS VERY EASY TO BE A LONG WAY OFF RATIO AND END UP WITH INFERIOR IF NOT UNSTABLE FOAM. IT IS THEREFORE BEST TO MEASURE BY WEIGHT, AND, IF POSSIBLE, TO WEIGH THE SECOND COMPONENT INTO THE FIRST, TO AVOID THE NECESSITY TO WET-OUT THE POURING CONTAINER.

BEFORE USING THE COMPONENT A IT SHOULD BE PRE-MIXED TO AERATE IT WHICH WILL HELP GIVE A BETTER MIX AND A FINER CELLED FOAM STRUCTURE.

THE CHOICE OF MIXER TO BE USED WILL BE DETERMINED BY THE AMOUNT TO BE MIXED, THE MIXING VESSEL AND THE AVAILABILITY OF POWER. MIXING BY HAND, ALTHOUGH POSSIBLE, IS NOT RECOMMENDED.

FOR QUANTITIES UP TO 25kg, AN ELECTRIC DRILL OF 550 WATTS OR GREATER, REVOLVING AT 2000rpm OR GREATER, SHOULD BE ADEQUATE, WHEN COMBINED WITH A SUITABLE STIRRER. THE MAJOR D.I.Y. CHAINS SELL A REASONABLE MODEL, DESCRIBED AS A BLACK & DECKER PAINT STIRRER.

QUANTITIES LARGER THAN 25kg WILL REQUIRE A MORE POWERFUL MOTOR, AND AS THIS WILL USUALLY MEAN A REDUCTION IN ROTATIONAL SPEED THERE WILL HAVE TO BE A CONSEQUENTIAL INCREASE IN STIRRER DIAMETER, TRIDENT USE A 1200W DRILL REVOLVING AT 1025rpm WITH AN 8" DIAMETER PROPELLER TO MIX UP TO 60kg.

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A USEFUL GUIDE TO THE SUITABILITY OF THE STIRRER IS THAT IT SHOULD MIX THE RELEVANT AMOUNT OF COMPONENT A TO A WHITE FROTHY CONSISTENCY IN THE MIXING TIME WHICH WILL BE USED FOR FOAMING.

TEMPERATURES ARE A SIGNIFICANT FACTOR IN MIXING, 15-25 Deg. C IS THE RECOMMENDED RANGE. LOWER TEMPERATURES GIVE HIGHER MATERIAL VISCOSITIES, BUT MIXING CAN BE CARRIED OUT FOR LONGER, WHEREAS HIGHER TEMPERATURES GIVE LOWER VISCOSITIES BUT FASTER REACTIVITY, 18-20 Deg. C IS USUALLY A GOOD COMPROMISE.

THE ACTUAL MIXING TIME TO BE USED WILL BE A COMPROMISE BETWEEN THE TIME TAKEN TO GIVE THE BEST POSSIBLE MIX AND THE TIME REQUIRED TO POUR THE MIXTURE INTO THE CAVITY. FOR SMALLER QUANTITIES (<5kg) AT 20 Deg C THE TOTAL MIXING TIME SHOULD NOT BE MUCH MORE THAT THE CREAM TIME STATED ON THE TECHNICAL DATA SHEET, LARGER QUANTITIES WILL HAVE TO BE ASSESSED BY TRIAL AND ERROR, BUT ALL FOAM PRODUCED SHOULD HAVE A FINE EVEN CELL STRUCTURE.

CONTAINERS OF CHEMICALS SHOULD BE KEPT SEALED WHEN NOT ACTUALLY IN USE, AS THE COMPONENT A WILL ABSORB ATMOSPHERIC MOISTURE CAUSING LOWER DENSITY FOAM AND POSSIBLE INSTABILITY, WHILST THE COMPONENT B WILL REACT WITH MOISTURE TO GIVE A SOLID PRODUCT, GIVING SKIN ON THE LIQUID SURFACE OR LUMPS IN THE CONTAINER.

POLYURETHANE FOAM WILL GIVE BETTER PROPERTIES AND PERFORMANCE IF IT IS ðOVERPACKEDð OR RESTRAINED AS MUCH AS IS REALISTICALLY POSSIBLE RATHER THAN ALLOWED TO RISE WITHOUT ANY RESTRICTION.

BEFORE USING ANY SYSTEM IT IS IMPORTANT TO READ THE RELEVANT MATERIAL SAFETY DATA SHEETS AND ENSURE THAT THE MATERIALS ARE USED SAFELY.

COMMON PROBLEMS ASSOCIATED WITH HAND OR BATCH MIXING TWO PART POLYURETHANE FOAM

The following is a collection of several of the most common problems arising from the mixing of two part Polyurethane systems. Whilst it is not always possible to achieve absolutely perfect foaming conditions, a repeatable satisfactory result can be arrived at by bearing the following points in mind.

INCORRECT TEMPERATURES

Polyurethane chemicals are temperature sensitive in that the viscosities of the two components vary significantly in the range 5-30°C and the reaction rate is dramatically affected. Chemicals below 15°C will be significantly more viscous than above, and this will translate into a much greater difficulty in mixing the components sufficiently well. Temperatures much above 22°C will speed up the reaction enough to make foaming difficult. The recommended temperature range will be given in the technical information, but will probably be 18-22°C. The surface contact temperature of the material the foam is reacting against is also very important, it is no good warming the chemicals to the correct temperature and then pouring them into a very cold cavity, for example. As a general rule the contact temperatures should be at least 20°C more if the thermal mass of the object which is being foamed is high..

INCORRECT RATIO

Two component Polyurethane systems require that the materials are mixed in the correct ratio, usually expressed in the terms of weight, and given in the technical information. It is important to understand that it is not a case of one component being a curing agent or catalyst and therefore being variable. An excess of the Polyol component will give a soft feeling foam, often light and fine celled in appearance, which will probably shrink in time. An excess of Isocyanate will give hard feeling foam, often dark and coarse celled, which will be more brittle and less resilient than foam made at the correct ratio. Weighing is much easier to do accurately than measuring by volume, but it is vitally important that what is actually mixed together is the correct ratio, rather than what is initially measured out. This means that where one component is poured into another, allowance must be made for the amount left in the container that it was poured from, it is much better to weigh one component directly into the other on the scales.

The relevant quantities to be weighed out to give the correct ratio can be calculated as follows. For a system with a ratio (A:B) of 1:1.2 by weight, where a total weight of 2,700 grams is required:-

Quantity of A required = (total weight divided by total of ratios) multiplied by A ratio.

i.e. 2,700 divided by 2.2 multiplied by 1

= 1,227 grams.

Quantity of B required = weight of A multiplied by B ratio.

i.e. 1,227 multiplied by 1.2

= 1,473 grams.

A final check is to make sure that the two quantities add up to the required total amount.

CONTAMINATION

Both components are affected by atmospheric moisture. The Isocyanate component reacts slowly to give a hard plastic product and Carbon Dioxide gas, the hard product is the "skin" which forms on Isocyanate left open to atmosphere. The Polyol component absorbs water vapour very quickly, but shows no visible difference, however, when the two components are mixed the water reacts with the Isocyanate component to give Carbon Dioxide gas and a plastic called urea. The Carbon Dioxide gas blows the foam to give a lower density than specified for the system, and the Isocyanate which has reacted with the water is not available for

reaction with the Polyol component, resulting in a foam which is under density and short of Isocyanate, both of which will give unstable foam.

Various other contaminants will give difficulties, for example, oils or excessive wax type release agents will cause cellular collapse, and foam which is reacted against insufficiently cured fibreglass will have a weak “furry” layer caused by the free styrene in the surface of the fibreglass.

CORRECT DENSITY

Most Polyurethane systems are not designed to be allowed to react totally “free rise”, i.e. usually they should be subject to a certain amount of restraint to give the required density throughout the foam and particularly to avoid the “stretching” of the foam cells which can occur in free rise foams. The required density will vary from system to system, and for any given system a relatively small thin moulding with a lot of surface area will require a much higher density than a large compact moulding. Generally once the required amount for a particular moulding has been decided upon, it should be adhered to, with only slight variations to accommodate extremes of ambient temperature.

It should also be remembered that the reaction is an exothermic one, and that there can be a considerable build up of heat immediately after the foam has reacted. Given their insulating nature, low density foams in particular can be much hotter in the core of the mass than the surface suggests, quantities as low as 80 grams can give a temperature in excess of 140°C in the centre. This high temperature will obviously give a dimensional change to the foam as it is lost, and uneven contraction due to this temperature loss can only be combated by “overpacking” the moulding sufficiently well. Overpack rates will usually be at least 15-20%, i.e. the overall density of the finished moulding will be at least 15% higher than the nominal free rise density of the system.

EFFICIENT MIXING

Generally the more efficient and forceful the mixing, the better the quality of foam. A guideline to the time available will be given in the technical data, the cream time is the time from the start of mixing to the point at which the foam starts to react and rise. This time will vary depending on temperatures, efficiency of mixing and the total amount mixed, but it is best to have mixed the foam and poured it into the cavity to be filled before it is rising significantly. It is best to mix air into the Polyol component before mixing the two components together, and as a guideline if the mixing method in use can significantly aerate the Polyol component in the mixing time to be used to mix the two components, then it is sufficient, anything less will not give the best results. A propeller type agitator in a high speed air or electric drill is usually suitable for quantities up to 20kg.

POURING METHOD

As soon as the foam is sufficiently well mixed it should be poured into the cavity to be filled. Obviously this must be done as quickly as possible, ensuring that all foam is poured, and can reach the bottom of the cavity, before any significant amount of rise. If the materials must be weighed out a small distance away from the pouring position, then it is preferable to carry the unmixed components to a position as close as possible to the pouring point before starting mixing.

It is also vitally important that the foam is placed in the correct position in the cavity, the ideal scenario is for the liquid foam to start rising from the bottom of the cavity, pushing the displaced air in front of it towards a breather point at the highest point in the cavity. Whilst it is not often possible to realise this ideal completely it is important to ensure that the foam can push all of the air out of the cavity through suitably sited breathers.

FOAM MIXING

1. IS THIS THE CORRECT SYSTEM FOR THIS JOB?
2. ARE THE VESSELS TO BE USED CLEAN AND DRY?
3. HAVE THE CHEMICALS BEEN KEPT SEALED FROM MOISTURE?
4. IS THE AMOUNT REQUIRED FOR THIS JOB KNOWN, AND CAN THE AMOUNTS BE MEASURED SUFFICIENTLY ACCURATELY? REMEMBER IT IS THE AMOUNTS WHICH ARE MIXED TOGETHER WHICH ARE IMPORTANT.
5. ARE CHEMICALS AT THE RIGHT TEMPERATURE? 18-22⁰C IS MOST SUITABLE, 16-24⁰C MAY BE USABLE.
6. DOES THE MIXING METHOD TO BE USED GIVE A SUFFICIENTLY GOOD MIX LEAVING ENOUGH TIME TO POUR THE FOAM BEFORE IT RISES SIGNIFICANTLY?
7. IS THE CAVITY FREE FROM CONTAMINATION (RELEASE, OIL, WATER ETC), AND IS THE FIBREGLASS PROPERLY CURED?
8. REMEMBER TO PREMIX AIR INTO COMPONENT A.
9. ENSURE RISING FOAM WILL NOT TRAP AIR IN CAVITY, BREATHER MUST BE LARGE ENOUGH TO ALLOW AIR OUT BUT NOT ALLOW EXCESSIVE FOAM LEAKAGE WHICH WILL RESULT IN LOW FOAM DENSITY.