A New Era in Polyurethane

# FOAMS

NATA
WORLD RECOGNISED
ACCREDITATION

NQS INTERNATIONAL
CERTIFIED QUALITY
MANAGEMENT SYSTEM

version 2.0

# CONTENT PAGE


Era Polymers ***is an Australian owned and operated company, specialising in the field of polyurethane chemistry.***

The company was established in April 1986 and since that time has grown to be the largest independent Systems House in Australia.

Our range of polyurethane foam systems has become the industry standard. These foam systems are complimented with a complete range of ancillary products such as pigments and mould release agents.

Our NATA registered laboratories, and extensive testing equipment, are constantly expanding the horizons of polyurethane chemistry.

**Era Polymers**, being owned and operated by Industrial Chemists, has built an enviable reputation for outstanding product quality and customer service. We also have the unique ability to modify existing formulations as necessary, to tailor make products to meet new and demanding applications.

This brochure is intended firstly as an introduction to polyurethane foam and secondly, more specifically to our **Erathane, Greenlink** and **Ecofoam** polyurethane foam systems.

| Industry | Applications |
|---|---|
| **Automotive** | Steering wheels, dashboards, seating, roof linings, rear view mirrors, underlay, sound deadening, sun visors, roof insulation, jounce bumpers, filters. |
| **Footwear** | Work boots, sport shoes, shoe in-soles, mid-soles, out-soles. |
| **Furniture** | Domestic and office seating, frames, armrests, bedding, foam laminates. |
| **Insulation** | Refrigeration, truck body panels, pipe sections, ducts, roofs, buildings, vibrational-sound proofing, hot water tanks. |
| **Leisure Industry** | Surfboards, windsurfers, water skis, wakeboards, snowboards, boats. |
| **Medical** | Nasal masks. |
| **Void Filling** | Buoyancy, structural, packaging, horticultural, boat floatation |
| **Movie Making** | Movie props, carnival floats, decorative sets. |

Photo courtesy of **Weta Workshop**

Photo courtesy of **Cruise Craft Boats**

**Polyurethane foam** is a large and very diverse section of the polyurethane world. In categorising the types of properties applicable, it is made much more difficult by the fact that the materials can be rigid, flexible and microcellular. The examples below highlight the diversity of properties.

## 1. HARDNESS

**Era Polymers** polyurethane foams offer a very wide range of hardness types from hard rigid foams to soft flexible foams. The flexible ranges from soft Shore A flexible foam (10 - 15A), which is softer than a gum eraser, to 55 - 60A elastomeric foams of a hardness similar to car tyre treads. At the other much stiffer end are the rigid foams, which can be used for light weight structural parts.

*Analog*
*Hardness Testing Machine*


*Digital*
*Hardness Testing Machine*

## 2. ABRASION RESISTANCE

In applications where severe wear is a problem, **Era Polymers** polyurethane foams offer outstanding durability when compared with other rubbery plastics, an example being the **Greenlink** foams used for shoe soles, which have outstanding abrasion resistance. In many applications the unusual combination of properties has made it possible to design and fabricate products from **Era Polymers** polyurethane foams using less material than has been possible with other elastomers.

It should be emphasised that abrasion resistance is a complex property. Selection of the correct polyurethane foam should be based on actual experience or simulated service tests.

## 3. COMPRESSION PROPERTIES

The *rigid foams* have excellent load-bearing weight capability compared to many other plastics of natural products such as wood. This property is a highly important factor in many designs, e.g. use in boats, building panels or other composite parts.

The *flexible foams* have an excellent load-bearing weight capability but the emphasis is different; comfort is the key feature for a wide assortment of applications such as seating or bedding.

## 4. RESILIENCE

Resilience in conventional rubbers is generally a function of hardness. This often undesirable relationship does not hold true with the *flexible foams*. Formulations are available in a wide range of resilience.

For high shock absorbing uses, low rebound foams are usually used i.e. rebound value of 0 - 10%. For high frequency vibrations or where quick recovery is required, compounds in the 20 - 40% rebound value are used.




*1. DIN Abrasion Testing Machine*
*2. Taber Abrasion Testing Machine*
*3. Foam Resilience Testing Machine*

## 5. FLEX PROPERTIES

**Era Polymers** flexible foams can be designed to resist cracking under repeated flexing. As with any elastomer, the rate of cut growth under flexing may be reduced by decreasing the thickness of the part. Unlike other elastomeric materials however, **Era Polymers** flexible foams can be utilized practically in thin sections because of their strength and toughness. This is a necessary property for polyurethane shoe sole systems.

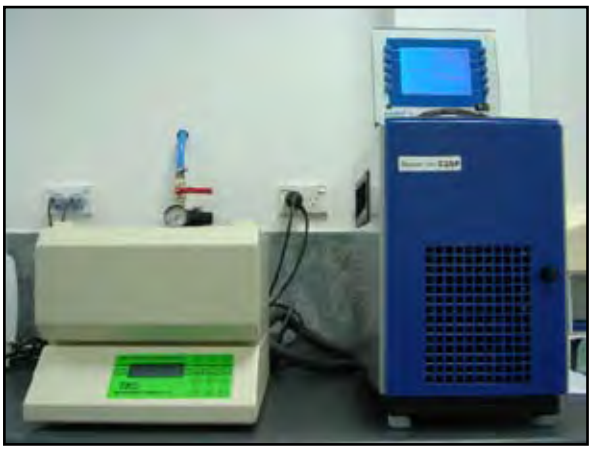
## 6. LOW TEMPERATURE PROPERTIES

Many **Era Polymers** *flexible foams* remain flexible at very low temperatures and possess outstanding resistance to thermal shock. The low temperature resistance of Erathane has led to many applications in sub-zero conditions.

**Era Polymers** *rigid foams* can be designed to remain dimensionally stable at very low temperatures for use in low temperature insulation applications.

## 7. DRY HEAT RESISTANCE

Whilst many **Era Polymers** polyurethane foams are only suitable for continuous operation at ambient temperatures, intermittent use up to 120°C is possible. With specially formulated rigid foam materials, continuous operation up to 120°C may be achieved. Advice on the most suitable material for any particular application should be sought from our Technical Service Department.



*K-Factor Machine*

Photo courtesy of **Plastek**

## 8. WATER RESISTANCE

Depending on the type, polyurethane rigid foams are very resistant to the swelling and deteriorating effects of water immersion and have excellent long-term stability in water up to 50°C. Continuous use in direct contact with hot water over 80°C is not recommended.

Water absorption is very low, in the range of 1 - 3% by weight. Volume swell is negligible for many rigid foams.

## 9. OXYGEN AND OZONE RESISTANCE

Products made from **Era Polymers** polyurethane foam are highly resistant to degradation by atmospheric oxygen and ozone. Tests on samples, aged over 500 hours in an atmosphere containing 3ppm ozone, show no attack. Past experience has shown that materials which resist this concentration for several hundred hours are virtually immune to attack by normal atmospheric concentrations.

*Weather-O-Meter Testing Machine*

## 10. OIL, GREASE AND CHEMICAL RESISTANCE

Whilst many rubbers and plastics have excellent resistance to one or more specific solvents, oils or chemicals, the wide resistance of some polyurethane foams to chemical attack means that they can be used in a multitude of environments. This makes them an excellent choice for shoe sole materials on industrial work boots used in the chemical and food industries.

As with all materials being examined for oil and chemical resistance, it is best to place a sample of the material in actual service. If this is not practical, tests should be devised which simulate actual service conditions as closely as possible.

## 11. FLAME RESISTANCE

**Era Polymers** polyurethane foams can also be formulated with special flame retardants to pass many self-extinguishing or non burning specifications. Consult Era Technical Service Department for information on systems to pass specific test requirements.

## 12. MOULD, MILDEW, FUNGUS RESISTANCE

Suitably compounded **Era Polymers** polyurethane foams do not support fungus growth and are generally resistant to such attack. This makes them particularly suitable for tropical environments. Advice on the most suitable material should be discussed with our Technical Service Department.

## 13. BONDING TO OTHER MATERIALS

During the moulding process and under controlled conditions, Era Polymers polyurethane foam can be bonded to a wide variety of materials. Strong bonds can be obtained to substrates such as metals, wood and many plastics. Bond strengths often exceed the tear strength of the foam itself.

It is more difficult to bond cured polyurethane foam sheets or mouldings to other materials but special techniques have been developed to satisfy most requirements. We supply a complete range of bonding agents and primers to meet specific requirements.

## 14. NOISE REDUCTION

A large part of the automotive industry is based on polyurethane foams for sound deadening and anti-vibration applications. These foams, often called NVH (Noise Vibration and Harshness) foams, are part of the **Era Polymers** polyurethane foam range. As well as this market, polyurethane foams can be used for many other diverse sound deadening applications.

Photo courtesy of **Bondor Australia**

Photo courtesy of **Thermal Insulation**

The properties of polyurethane foams will change with formulation and processing conditions. The conditions will include the type of equipment, temperature of components, mould temperature and flow pattern of foam. Standardized test methods enable the formulator to check the reproducibility of the foam in production and determine the suitablility of foam for an application.

## METHODS FOR MEASURING PHYSICAL PROPERTIES OF RIGID CELLULAR POLYURETHANES

| PHYSICAL PROPERTIES | UNITS | METHOD |
|---|---|---|
| Density determination | $Kg/m^3$ | AS 2282.3<br>AS 2282.4 |
| Compressive stress @ 10% deformation | kPa | AS 2498.3 |
| Dimensional stability (width, length and thickness) | % | AS 2498.6 |
| Determinatioin of flexural properties | MPa | AS 2132 |
| Closed cell content | % | ASTM D 2856 |
| Thermal resistance K-value | $m^2K/W$<br>W/mK | ASTM C 518 |
| IZOD impact resistance | $KJ/m^2$ | AS 1146.1 |
| Tensile strength | kPa | AS 2282.6 |
| Tumbling friability of performed block-type thermal insulation | % | ASTM C 421 |

## METHODS FOR MEASURING PHYSICAL PROPERTIES OF FLEXIBLE CELLULAR POLYURETHANES

| PHYSICAL PROPERTIES | UNITS | METHOD |
|---|---|---|
| Tensile strength | kPa | AS 2282.6 |
| Elongation at break | % | AS 2282.6 |
| Determination of tear strength | N/m | AS 2282.7 |
| Compression set | % | AS 2282.9 |
| Determination of resilience | % | AS 2282.11 |
| Density determination | $Kg/m^3$ | AS 2282.3<br>AS 2282.4 |
| Force deflection (Method B) | N | AS 2282.8 |

## 1. STORAGE

The components should be stored in sealed drums at storage temperatures of 18-25°C.

I**socyanate** - to preserve the integrity of the isocyanate content so that the NCO does not decrease, do not expose the isocyanate to moisture, amine containing groups or oxidizing agents or heat (unless otherwise specified as part of the processing conditions for the product). Isocyanate reacting with water, amine containing groups of oxidizing agents will cause an exothermic reaction and will liberate gases such as carbon dioxide resulting in an expansion of the drum.

**Polyol** - this component may contain a low boiling point solvent. At elevated temperatures, pressure will build up in the drums. When opening the drums exercise care in releasing the internal pressure slowly.

## 2. TOXICITY

Before handling the isocyanate or polyol components consult the Material Safety Datasheet. Contact with skin or eyes must be avoided. Safety goggles and protective gloves should be worn when handling both of these chemicals.

## 3. GENERAL PROCESSING

### Machine Mixing

The Erathane series can be machine dispensed by low or high-pressure polyurethane dispensing equipment, or hand mixed. Please contact one of our equipment specialists for a comprehensive assessment and recommendations on equipment such as **CANNON** or **GRACO/GUSMER.**

### Hand Mix Procedure

There are a number of ways to successfully produce a foamed article. The method incorporated will inevitably contribute to the final finish. In void filling applications the end result may also require structural properties.

In such applications attention is placed on the container encapsulating the foam. It is recommended that the container be strengthened to withstand the expanding pressures exerted by the reacting foam. The processing of moulded articles is not exempted from these pressures. Moulds used should be heavily reinforced to withstand such pressures and composed of materials suitable for the high temperatures reached during the foam reaction.

The hand mixing process will be explained in the following section, with emphasis placed on the mixing.

### List of Equipment Required

1. Drill or hand mixer. Drill should be capable of reaching at least 3,000 RPM.
Note: The mixer size and power is related to the amount of system one intends to mix at a time. Consult one of our foam specialists for recommendations.
2. High speed impeller
3. Container
4. Scales (preferably digital)

*Era Polymers is an Australian GRACO/GUSMER agent*

*Era Polymers is an Australian CANNON agent*

### Mixing Procedure

1. Precondition the system to the desired working temperatures.
Note: Decreasing the temperatures less than 15°C will slow the reaction rate and reduce the foams final yield. Elevated temperatures will speed up the foaming reaction to a point where it may seem to be out of control. Care must be taken.

2. Weigh out the correct amount of Isocyanate into a dry clean mixing container.

3. Follow with the correct amount of Polyol.

4. Drill stir the mixture for the recommended mix time noted on the Technical Data Sheet.

5. Pour the mixed material into the mould or cavity.

6. Mould demould time is related to the overpack and bulkiness of the foamed article and also the cure temperature.

*Hand Mixer*

## 4. PROCESSING SOLUTIONS

### Incorrect Stoichiometry

Maintaining the correct mix ratio of polyol to isocyanate is referred to as stoichiometry. It is vital in producing reproducible parts of good quality. This can be achieved by following the points outlined below.

- *Hand mixing* - the speed of the drill to reach at least 3,000 rpm - Low mixing speed will cause the foam to rise too slowly and not fill a cavity correctly and the foam will have a coarse cell structure.
- *Calibrate scales regularly (preferably digital)*
- *Weighing* - Isocyanate and polyol must be weighed accurately with calibrated scales. The reaction between the isocyanate and polyol will begin when the two products meet.
- *Mixing time* - The isocyanate and polyol must be mixed before the cream time begins.
- *Containers* - The containers are to be clean and dry before pouring liquid polyurethane into them.

### Temperature

- *Isocyanate and polyol* - If chemical temperatures are too high, the reaction profile of the foam is faster. If the temperature for the components is too low, the reaction profile is slower.
- *Moulds* - Ideally the mould temperature should be 20°C higher at least than the chemical temperature for moulded parts (flexible and rigid). The urethane reaction is exothermic and a cold mould or substrate will act as a heat sink and the foam will not expand as much.
- *Demould time* - is affected by temperature of the mould and temperature of the isocyanate and polyol.

*Types of mixer*

## Pre-treatment of polyol component

The polyol component should be mechanically mixed prior to use. The polyol component contains catalysts, blowing agents, polyols, surfactants, pigments and other additives which will settle with time. It is good practice to mechanically stir the blend to ensure a homogenous solution.

## Batch Size

A larger batch of material mixed will react faster than a smaller batch. Consider this when hand processing the foam. If too large a batch is mixed the stirrer may not produce sufficient mixing or quality mixing which will enable the fine cell to form in the foam.

## Post- Cure

Although the initial reaction is complete when a foam article is demoulded, for products such as the flexible foam it may be several days to a week (depending on the type of foam) for the cross-linking to be complete and for a moulded part to reach the full physical, maximum properties.

Foams will still be 'green' after being demoulded. Handle foam carefully (in particular flexible foams) so as not to introduce a permanent set.

## Moulding

- *New moulds* - fabricated from metal, plastics, fiberglass and timber. Any porous surface should be sealed first. A mould release e.g. a wax based release agent should be used before each moulding. Conditions of a new mould will require at least 2-3 coats of release agent, applied one after another, with sufficient time between each coat to allow for solvent evaporation. The preference for foams is a wax based release agent.

- *Venting* – Foams will generate pressure inside a mould. Incorporate a few small vent holes (about 1 mm) in the mould, when foaming time must be given to allow some air and gas to escape. Only allow a minimal amount of material to escape. If too large amount of material escapes through vent holes or through the side of the mould, this may impact on voids forming in the mould.
- *Positioning of mould* – If a void free space is required, angle the mould so the vents are at the highest point.

## Release Agent

- Quality of release agent is important. Contamination of release agent can cause shrinkage, voids or other problems. Be aware that as the release agent is used, it becomes more concentrated if the carrier is a solvent and a wax build-up in the mould can result in surface imperfections on the moulded article.
- Clean the wax from the mould as part of general maintenance.

## Overpacking foam in the mould

The mass of material to mix to fill a space will depend on the type of foam, the density of the foam, mould and component temperatures and the volume of the space the foam is required to fill.

The table below lists commonly experienced problems and their solutions

## POSSIBLE CAUSES

| PROBLEMS | Low temperature of iso and / or polyol | Substrate temperature too low | Loss of blowing agent from polyol | Off ratio - the amount of Isocyanate used is high | Insufficient mixing | Moisture in the polyol | Off ratio - the amount of polyol used is high | Moisture in the substrate | Moisture contamination - water in air supply | Check for contamination by silicone or grease lubricants | Check polyol reactivity | Raise temperatures of iso and polyol | Look for errors in machine metering | Catalyst deactivation | Check for lead/lag conditions | Mould temperature | Release agent quality | Wax-build-up | Optimize pour pattern and/or size of vent holes | Tilt the mould when pouring | Shot size | Increase rate of polymer gelation | Reduce air entrapment during liquid laydown | Lower temperature of components |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Density is high | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | | | | | | | | | |
| Density is low | | | | | | ■ | ■ | ■ | ■ | | | | | | | ■ | | | | | | | | |
| Underpacked cavity | | | ■ | | ■ | | ■ | | | | | ■ | | | | ■ | | | ■ | | ■ | | | |
| Friable- crumbles and lacks strength | | | | | ■ | | ■ | | | | ■ | | | | | | | | | | | | | |
| Voids | | | | ■ | ■ | ■ | ■ | ■ | | ■ | ■ | | ■ | | | | | | ■ | | | | ■ | |
| Foam is slow to cure | | ■ | | | ■ | | | | | | ■ | ■ | ■ | ■ | | ■ | | | | | | | | |
| Smoking | | | | ■ | | | | | | | | | ■ | | | | | | | | | | | |
| Sticky spots | | | | | ■ | | ■ | ■ | | ■ | | | ■ | | ■ | | | | | | | | | |
| Striations | | | | | ■ | | | | | | | | | | ■ | | | | | | | | | |
| Foam rises and then collapses | | | | | ■ | | | | | ■ | ■ | | | | | | | | | | | | | |
| Large bubbles bursting on surface | | | | | | | | | | ■ | ■ | | | | | | | | | | | | | |
| Coarse surface cells | | | | | ■ | | | | | | | | | | | ■ | ■ | ■ | | | | | | |
| Air entrapment | | | | | | | | | | | ■ | | | | | | | | ■ | ■ | | | | |
| Excessive flash | | | | | | | | | | | | | | | | | | | ■ | | ■ | ■ | ■ | |
| Blowholes -small voids through part | | | | | ■ | | | | ■ | ■ | | | | | | | | | ■ | ■ | | | | |
| Blistering | | | | | | | | ■ | ■ | ■ | ■ | | | | | ■ | ■ | ■ | | | | | | ■ |
| Loose skin | | | | | ■ | | | | | ■ | | | | | | ■ | ■ | ■ | | | | | | |
| Poor green strength | ■ | | | ■ | ■ | | ■ | | | | | | ■ | | ■ | | ■ | | | | | ■ | | |
| Shrinkage | | | ■ | | ■ | | | | | ■ | ■ | | | | | | ■ | | | | | | | |
| Tacky part surface | | | | | ■ | | ■ | | | | ■ | | ■ | | | ■ | | | | | | | | |
| Irregular cells under skin | | | | | | | | | | ■ | | | | | | | | ■ | | | | | | |
| Thick skin | ■ | ■ | | | | | | | | | ■ | ■ | | | | ■ | | | ■ | | ■ | | | |

Polyurethanes form a part of our everyday lives. **FOAMS** in particular play a vital role in industries ranging from refrigeration to automotive. The types of polyurethane foams available are constantly making the market grow and thus diversify.

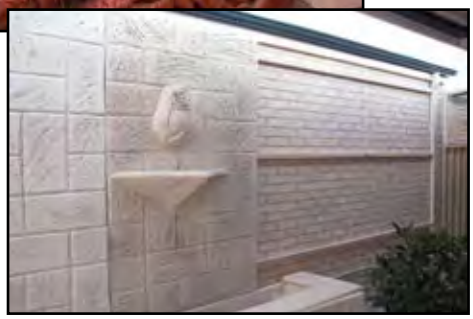
A simple way of categorizing foams is to label them as **RIGID** and **FLEXIBLE**.

**A RIGID** polyurethane foam can have excellent thermal insulation properties. This explains their widespread use as an insulator in domestic and commercial appliances such as refrigerators and hot water systems.

**A FLEXIBLE** polyurethane foam can be extremely comfortable. This explains their extensive use in automotive and furniture seating industries.

There are three brands of foam systems manufactured by Era Polymers Pty Ltd: **ERATHANE, GREENLINK** and **ECOFOAM**. The **Erathane** trade name includes products whereby foams are blown with a low boiling point solvent. The products falling under the **Greenlink** name are water blown foams containing no CFC's or HCFC's. **Ecofoam** is the trademark for products containing HFC blowing agents.

Chemically speaking, polyurethane foams are formed from the reaction of an Isocyanate (ISO) with a Polyol (POLY). These two components combine to form an exothermic reaction. The secret is in all the additives contained in the ISO and POLY, which combine together to produce a blown foam with specific properties. Examples of additives are: catalyst, pigments, surfactants and blowing agents.

Photos courtesy of
Tates Coating Services, WA


## The "Green" Foam

Era Polymers is offering a full range of **non-ODP (Ozone Depleting Potential)** foams. We are leading the way by offering to our customers these new products. Era Polymers' Green Foam is noted by the trade names **Greenlink** and **Ecofoam**.

Our sales team will be out there selling our new generation foam. Please contact us for more information.

## THE RIGID POLYURETHANE FOAMS

# ERATHANE SR SERIES

### ERATHANE SR SERIES

The **Erathane SR (Spray Rigid) Series** is a range of two component high density rigid spray systems. The series includes products that range in density from 30 to 150 kg/m$^3$ with an array of applications.

The **Erathane SR Series** has many advantages over other spray foam systems, for instance:

- High performance
- High yield
- Compression strengths
- High insulation level
- Good surface finish
- Fire retardant grades available
- Easy to process due to low component viscosities

### Applications:

The product is designed to be sprayed at a 1:1 ratio by volume through the use of a high pressure, plural dispensing spray machine such as those supplied by the **GRACO/GUSMER**.

### Typical Uses:

The majority of spray foams are applied to an environment which needs to be insulated. The product line is commonly used in buildings for roof insulation, for the insulation of tanks and animal sheds and to maintain temperature in refrigerated containers or rooms.

### Typical Products:

The **Erathane SR Series** includes the following products: SR80, SR205, SR215, SR301 and SR650.

Also available is a complete run of enviromentally friendly "GREEN" spray foams. These are proven products from **Stepan Company USA**, made locally at **Era** for Australian conditions. These include Stepan Foam RS2011 and RS3011.

*Before Spray Foam Application*

*After Spray Foam Application*

# ERATHANE GP SERIES

## ERATHANE GP SERIES

The **Erathane GP (General Purpose) Series** is a range of two component rigid polyurethane systems that are used to produce general purpose foam. The series includes products that range in free rise density from 32kg/m$^3$ to 300kg/m$^3$ to suit a number of applications.

The **Erathane GP Series** has many advantages over other general purpose foam systems, including:

- Good insulation properties
- Good fire properties
- Good flow ensuring easy processing

### Applications:

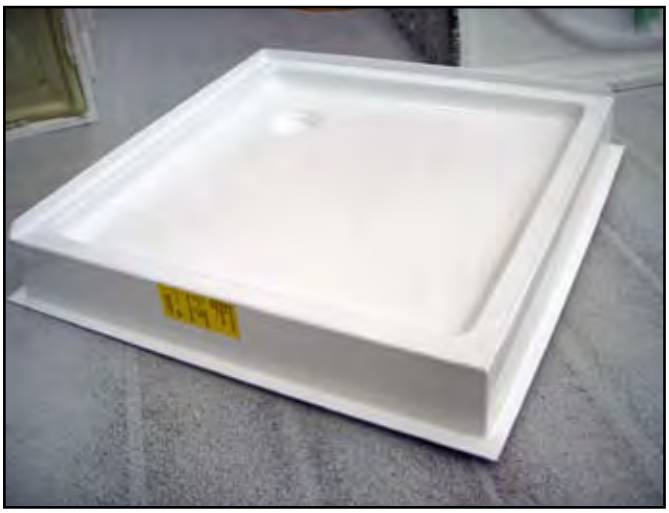
The **Erathane GP Series** can easily be machine dispensed by either high or low pressure equipment such as those supplied by **Cannon** or **Gusmer**, but is also easily processed by hand for pour-in-place applications.

### Typical Uses:

The GP series is the most versatile foam from the **Erathane** range. It can be used for insulation, buoyancy, structural support or void fill.

### Typical Products:

GP2, GP6, GP30, GP35, GP45, GP70 and GP160



# ERATHANE BS SERIES

## ERATHANE BS SERIES

The **Erathane BS (Block Stock) Series** is a range of high density two component systems used to produce rigid polyurethane block foam. The system is specifically designed for block production, whereby blocks of any size can be made and the only limitation is the size of the mould.

The **Erathane BS Series** has some clear advantages over other block polyurethane foams, such as:

- Excellent compression strengths
- High insulation properties
- Good cell structure
- Versatile processability as the system can be hand or machine mixed
- Excellent flow properties
- Cast foam is cuttable
- Contains fire retardants

### Typical Uses:

The main application is for block production, however the foam can also be used for insulation, buoyancy and void fill. The **Erathane BS Series** can also be used for a number of pour-in-place applications.

### Typical Products:

The **Erathane BS Series** includes, BS22, BS30, BS32, BS33, BS37, BS80 and BS96. Each product varies in free-rise density.

Photo courtesy of **Plastek**

# ERATHANE AF SERIES

## ERATHANE AF SERIES

The **Erathane AF (Appliance Foam) Series** is a range of two component systems that are used in the appliance foam market. The series includes products that range in free rise density from 26 to 35 kg/m$^3$ with an array of applications.

The physical properties of **Erathane AF Series** include:

- Good compressive strength
- High insulation properties
- Good cell structure
- Good flow ensuring easy processing

### Applications:

The **Erathane AF Series** is best processed by either high or low pressure polyurethane dispensing machinery, or they can be hand mixed which is applicable for pour-in-place applications particularly used in the whitegoods industry.

### Typical Uses:

The main applications are for appliance insulation, however the systems can be used for water heaters and cold display cabinets.

### Typical Products:

AF32, AF200, AF201, AF330 and AF350

Photo courtesy of **Peter Sachs Industries**

Photo courtesy of **Austral Refrigeration**

Photo courtesy of **Solco Ltd.**

# ERATHANE MF SERIES

## ERATHANE MF SERIES

The **Erathane MF (Moulding Foam) Series** is a range of two component rigid foam systems specifically designed for closed moulding applications. The series includes products that range in free rise density from 62kg/m$^3$ to 200 kg/m$^3$.

The **Erathane MF Series** has many advantages over other moulding systems which includes:

- Good reproduction
- Excellent skin
- Fine cell structure for detailed reproduction

### Applications:

The **Erathane MF Series** is best suited to closed moulding applications however they can also be processed as a free-rise foam. The product can be hand mixed or dispensed through high or low pressure units supplied by **Cannon** or **Gusmer**.

### Typical Uses:

The products are typically for intricate detailed work such as imitation wood, picture frames, fishing lures, ornaments and special effects.

### Typical Products:

MF62, MF75, MF95, MF100, MF115 and MF165

# ERATHANE R SERIES

## ERATHANE R SERIES

The **Erathane R (Rigid) Series** is a range of two component rigid foam systems which produces high density rigid foam. The series includes products that range in free rise density from 25kg/m$^3$ to 320kg/m$^3$.

The **Erathane R Series** has many advantages over other high density rigid foam systems which include:

- Good dimensional stability
- Good skin formation
- Fine cell structure

### Applications:

The **Erathane R Series** is best suited to closed moulding applications however they can also be processed as a free-rise foam. The product can be hand mixed or dispensed through high or low pressure units supplied by **Cannon** or **Gusmer**.

### Typical Uses:

The products are typically for intricate detailed work such as imitation wood, rifle stocks, special effects items and computer cabinets.

### Typical Products:

R1.7, R1.8, R2, R3, R4, R4.5, R4.78, R5, R7 and R10.

# ERATHANE SF SERIES

## ERATHANE SF SERIES

Photo courtesy of **OZ Roll**

The **Erathane SF (Shutter Foam) Series** is a range of two component rigid foam systems which produce rigid foam of free rise densities of 37 kg/m$^3$ to 65 kg/m$^3$.

The **Erathane SF Series** offers a number of advantages including:

- Good dimensional stability
- Fine cell structure
- Fast cure profile for machine processing

### Applications:

The **Erathane SF Series** is best suited to machine processing by high or low pressure polyurethane dispensing equipment. The foam is intended to fill cavities or spaces where a high turn around time in a sense of mass production is required.

### Typical Uses:

The main application for the **Erathane SF Series** is for the production of roller shutters and/or slats for windows.

### Typical Products:

SF370 and SF650

# GREENLINK PFA SERIES

## GREENLINK PFA SERIES

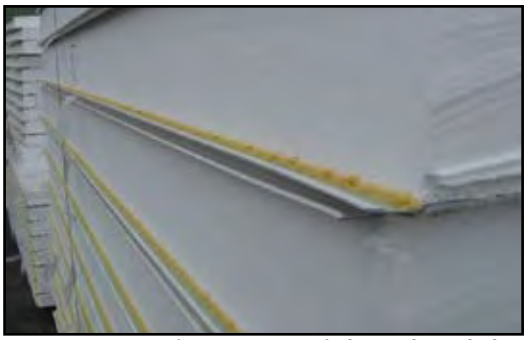


Photo courtesy of **Thermal Insulation**

The **Greenlink PFA (Panel Foams Adhesive) Series** is a range of two component polyurethane systems that are used as an adhesive for bonding Expanded Polystyrene (EPS) to colour-bond steel for use in the insulated panel market.

The **Greenlink PFA Series** displays excellent insulation properties.

### Applications:

The product is designed to be dispensed with low-pressure plural component polyurethane equipment or the traditional gravity fed 'drip and smear' panel process.

### Typical Uses:

The **Greenlink PFA Series** is mainly used in the production of metal faced insulated panels in the building and cool room industry.

### Typical Products:

PFA140 and PFA170

# GREENLINK SB SERIES

## GREENLINK SB SERIES

Photo courtesy of **Eskimo Industries**

The **Greenlink SB (Surfboard) Series** is a range of two component rigid foam systems specifically designed for surfboard blank applications. The **Greenlink SB Series** includes products that range in free rise densities.

The **Greenlink SB Series** has many advantages over other surfboard foam systems, including:

- Very fine cell structure
- Brilliant white colour
- Excellent stability
- Excellent physical strength

### Applications:

The **Greenlink SB Series** is designed for hand pour applications, making them user friendly to all budding surfboard makers. This foam can also be machine dispensed.

### Typical Uses:

The **Greenlink SB Series** is used for the production of rigid surfboard foam blanks.

### Typical Products:

SB300, SB401, SB450 and SB466

# GREENLINK HDR400

## GREENLINK HDR SERIES

The **Greenlink HDR400 (High Density Rigid)** is a two component polyurethane rigid foam system. The **Greenlink HDR400** has a free rise density of 400 kg/m$^3$.

The **Greenlink HDR400** has many properties, including:

- Excellent skin
- Fine celled foam

### Applications:

The system can be hand mixed and/or processed through polyurethane foam dispensing equipment such as those supplied by Cannon and Gusmer.

### Typical Uses:

Typical applications include structural self skinning components such as computer cabinets, shoe heels and imitation wood.

# GREENLINK ERAPAK

## GREENLINK ERAPAK

The **Greenlink Erapak** is a range of high yield semi-rigid two component polyurethane foam system specifically designed for packing applications. The MDI based system has been formulated to produce a free rise density of 9kg/m$^3$.

The **Greenlink Erapak** has many advantages over other foam packaging systems as it offers:

- Economical and efficient means to packaging solutions
- Free forms to the shape of the product offering maximum protection
- Convenient mix ratio

### Applications:

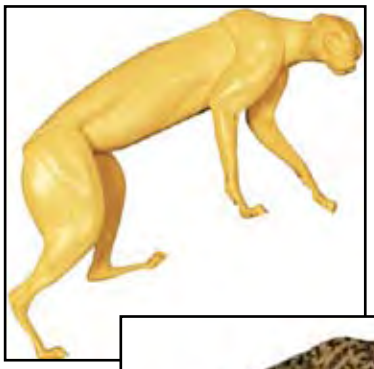
The product is best used when dispensed through plural dispensing equipment at a 1:1 ratio. Please speak to our machinery department as to the best machine to suit your application.

### Typical Uses:

The **Greenlink Erapak** foams are designed to be used as packaging foam but can also be used as a low density cavity fill.

# GREENLINK TX56

## GREENLINK TX56



The **Greenlink TX56 (Taxidermy)** is a range of high yield rigid two component polyurethane foam system for taxidermy applications. The system has been formulated to produce 56kg/m$^3$ free rise density.

The **Greenlink TX56** offers a number of advantages including:

- User friendly
- Quick and easy mould pouring
- Cost effective

### Applications:

Machine dispensed or hand mixed.

### Typical Uses:

Although the **Greenlink TX56** was specifically designed for its use in taxidermy applications, the products are increasingly being used in a number of moulding applications.

## THE FLEXIBLE POLYURETHANE FOAMS

# ERATHANE ISF SERIES

### ERATHANE ISF SERIES

The **Erathane ISF (Integral Skin Foam) Series** is a range of two component polyurethane system used to produce flexible integral skin foam. The series includes products that range in free rise density from 100 kg/m$^3$ to 190 kg/m$^3$ to suit a number of applications.

The **Erathane ISF Series** has many advantages including:

- Exceptional tear strength
- Excellent versatility
- Good reproduction of surface detail
- Excellent skin achieved when using enclosed moulds

### Applications:

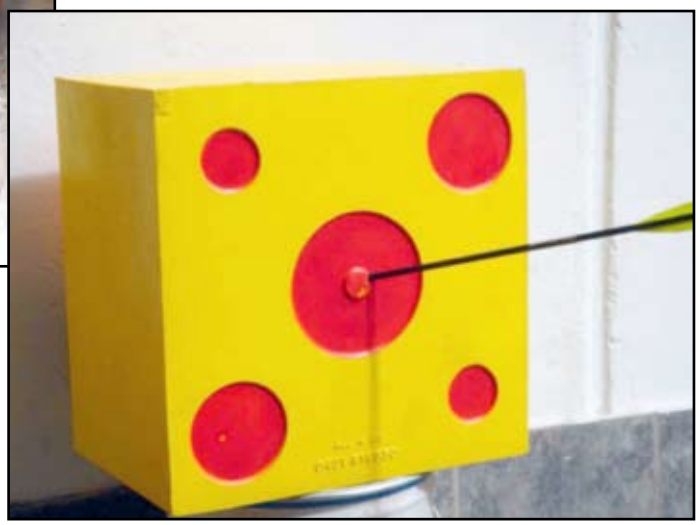
The system can be hand mixed and/or processed through a plural component polyurethane dispensing machine.

### Typical Uses:

The system is specifically designed for the production of soft moulded articles such as bicycle seats, armrests, headrests, bump stops and any article where skinned foam is required.

### Typical Products:

ISF100, ISF101, ISF120, ISF135, ISF400, ISF401 and ISF500



# ERATHANE EF SERIES

## ERATHANE EF SERIES

The **Erathane EF (Elastomeric Foam) Series** is a range of two component polyurethane system used to produce high resilience ester flexible foam for closed moulding applications. The series includes products that range in free rise density from 50kg/m³ to 160 kg/m³ to suit a number of applications.

The **Erathane EF Series** has many advantages, including:

- Excellent skin
- Void free moulded parts
- Very high cut and tear strength
- Good abrasion resistance

### Applications:

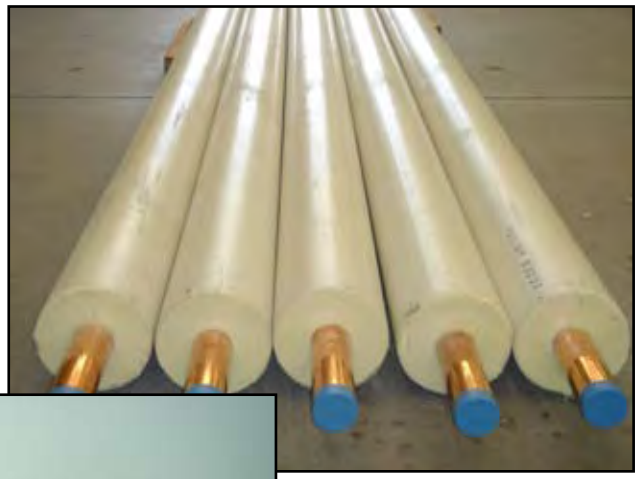
The system can be hand mixed and/or processed through a low pressure polyurethane dispensing machine such as those in the Cannon range.

### Typical Uses:

The system is specifically designed for automotive mouldings such as bump stops, jounce bumpers, shock absorbers and pipeline pigs.

### Typical Products:

EF505, EF507, EF510, EF511, EF1001, EF1002, EF1003, EF1005, EF2000, EF2010, EF4001 and EF4002



# GREENLINK HR SERIES

## GREENLINK HR SERIES

The **Greenlink HR Series (High Rigid)** is a range of two component rigid polyurethane systems used to produce high resilience flexible foam for closed moulding applications. The series includes products that range in free rise density from 50kg/m³ to 160 kg/m³ to suit a number of applications.

The **Greenlink HR Series** has many advantages including:

- Excellent surface skin on moulded part
- Consistent void free moulded parts

### Applications:

The system can be hand mixed and/or processed through a low pressure polyurethane dispensing machine such as those in the Cannon range.

### Typical Uses:

The system is specifically designed for the production of soft moulded articles such as bicycle seats, armrests and headrests but can also be used as a general purpose flexible foam.

### Typical Products:

HR48, HR50, HR80, HR3504, HR3505, HR3508, HR3510

# GREENLINK ESS SERIES

## GREENLINK ESS SERIES

The **Greenlink ESS Series** is a microcellular polyurethane foam formulated for shoe sole systems. The system can be easily pigmented to a range of colours.

### Applications:

This system can only be processed through suitable polyurethane dispensing equipment.

### Typical Uses:

Shoe sole industry

### Typical Products:

Products in this series vary in density and flexibility as they are often produced to meet individual customer specifications.

Fomo Products, Inc.
A Member of the FLM Group of Companies

Era Polymers Pty Ltd is the Australian distributor for Fomo Products Inc. of Ohio, USA. Fomo Products is part of the FLM group of companies, the largest global manufacturer of the one and two component polyurethane foam systems in pressurized disposable packaging.

**Handi-Foam** one and two component systems form a permanent, crack resistant barrier and bond quickly to almost any surface, including wood, masonry, metal, glass and plastic.

**One-Component Handi-Foam**; a moisture cure foam is best suited for smaller application gaps of 3" (7.6 cm). It is tack free in approximately 10 minutes, cuttable within 1 hour and fully cured in 24 hours. It is available for use in a single can or cylinder. The product is intended to fill and insulate small cracks and voids in and around air conditioners, outlets, pipes conduits, heating ducts and other spaces between building products. It can seal cracks at wall and floor joints, amend small holes and damages, block insect and rodent pathways and can seal plumbing penetrations.

Also available in the **One-Component Handi Foam** range are:

**Handi-Foam FIREBLOCK sealant**: has a ASTM E-84 Class 1 fire rating and is best used to stop the penetration from room to room and floor to floor of flame and smoke in residential dwellings. The Handi-Foam FIREBLOCK product is orange in colour making it easily recognised by inspectors as an approved fireblock product.

**Handi-Foam Multi Purpose Black Foam**: was developed for areas where appearance is an important factor, such as landscaping and water feature designs. It can still be used in the same way as the standard cream coloured one component foam.

All **One-Component Handi-Foam** products are available in both straw and gun applicators.

The general rule for expansion of one and two component foam is:

One-component: apply this much . . .

. . . to expand this

Use two-component for all areas larger than your fist

**Two-Component Handi-Foam**; a chemically cured foam is better suited to larger applications, tack free in 30-60 seconds, cuttable in 2-5 minutes and fully cured within an hour. It can be sprayed or poured into cavities/voids and onto surfaces.
The two-component systems are available in disposable cylinders or tanks in a variety of densities and sizes. The foam provides a cost effective way to insulate an entire house. This spray-in-place system offers a permanent air barrier to the elements that can last for the life of your home and does not settle or sag overtime. It can reduce energy bills by up to 50%, improve indoor air quality by reducing allergens, act as a pest deterrent, it is fire rated and helps control moisture content.
Once cured, the foam can be trimmed, sanded and painted.

HANDI FOAM

To complement **Era Polymers** expertly created vast array of polyurethane foam formulations, we also provide an equipment division to support our foam products. The equipment we offer is a natural step up from hand pouring. Some advantages of equipment processing are:

- Improved mixing quality → Better foam cell structure
- More accurate dispensing → Foam is always "on ratio"
- Less wastage → Lower overall costs
- Less messiness
- More efficiency

*GRACO/GUSMER A20*

## The two types of machine mixing available are:

### LOW PRESSURE

The foam is mixed in a mixing chamber with a propeller. When the pouring is stopped the chamber needs to be flushed for cleaning. Excellent for high viscosity liquids such as surfboard foams (**The Erathane SB Series**) and for entry level machinery.


*GRACO/GUSMER H-2035*

### HIGH PRESSURE

Mixing is done through "impingement" whereby the two chemical streams are mixed by colliding at high pressures. There is no need to flush the mixing chambers after pouring as the high pressure heads are self cleaning.

**Era** is proud to support two machinery brands for foam dispensing. Our machinery division has in-depth knowledge of both brands and keeps a spare parts inventory on hand at our Sydney head office.

Our entry level brand is the **GRACO/GUSMER** range from the USA. These machines can be used to SPRAY or POUR foams depending on the machine combination chosen. We supply the AIR and HYDRAULICALLY operated proportioners and a multitude of dispensing guns.

*Cannon B System*

Our other brand of foam machine is **CANNON** from Italy. Their main products are the low pressure "B System" and the high pressure "A System" machines. Each of these machines is completely made to order so that it can be suited to your exact specifications. Options include flow rates, tank sizes, pump sizes, mass flow meters, etc.

*GRACO/GUSMER AR-C/D Pour Gun*

*GRACO/GUSMER D Spray Gun*

*Cannon A System*

**ADDITIVE** - A material which does not take part in the chemical reaction but is included to modify the properties, processing characteristics or end use of the final product eg. fillers, pigments, flame retardants, etc.

**ALIPHATIC** – A term to describe a chain-like molecule made up of carbon and hydrogen groups.

**AMINE** – A class of compounds used as catalysts in polyurethane foam reactions. Amines are characterised by N, NH or NH2 groups in the molecule.

**ANTIOXIDANTS** – Materials added to a foam formulation to improve the resistance of the foam to oxidative type reactions.

**ANTISTATIC AGENTS** – Additives which impart a degree of electrical conductivity to foam and thus prevent the accumulation of electrostatic charges.

**AROMATIC** – loosely, a term to describe molecules that include at least one benzene ring.

**BACKBONE** – The portion of the molecule that is relatively non-reactive compared to the reactive end groups attached to it.

**BALL REBOUND TEST** – A method for comparing the resilience of flexible foams. A steel ball specified is dropped from a fixed height onto a foam sample and the height of the ball rebound is recorded. The rebound height is divided by the original height to give a percentage.

**BLOCK** – see BUN

**BLOWING AGENT** - An additive to a foam mixture with the purpose of producing a "blown" foam through the production of a gas. The selected blowing agent also influences the insulation quality of the foam.

**BLEND** - A combination of two or more materials. Eg. the polyol in a foam system.

**BOARDINESS** – A term describing foam that feels stiff and not flexible but still classified as flexible foam.

**BOARD STOCK** – Flat sheets of flexible foam cut from large blocks of buns of foam.

**BUN** - A portion of foam cut from a larger, usually continuous slabstock.

**CASTING** - The filling of essentially open moulds with liquid polyurethane.

**CATALYST** - An additive which accelerates the chemical reaction.

**CELL** - The individual cavities of a foam formed by the nucleation and growth of bubbles within the reacting mixture.

**CELL MEMBRANE** – The thin, intact film that forms the bubble walls in closed cell foam. Also called cell windows.

**CELL STRUCTURE** - *Open Cells* - Cells in a foam with no barrier in between. This allows gases and liquid to flow through the foam.

*Close Cells* - Cells enclosed by a continuous membrane so there are no passageways to airflow.

**COARSE CELLS** – Large cells averaging more than 20 to 30 cells per lineal inch.

**COLLAPSE** – The sudden loss of height occurring after a foam has partially or completely expanded.

**COMPONENT** - A separately metered stream of liquid which will be directly introduced in to the mixing head.

**CORE** - The internal portion of a moulded foam which is free from a skin. This portion is usually used for checking the density of the foam.

**CREAM TIME** - A measure of the beginning of the foam reaction. Usually characterised by a change in the liquids colour as it begins to rise.

**CROSS LINKING** - The formation of chemical bonds between different polymer chains.

**CRUSHING** - Usually a mechanical procedure to open the closed cells of a high resilience foam after demoulding.

**CUP FOAM** – The volume of foam from mixing 100 – 300 grams of ingredients together, using a simple air or electric-driven stirrer.

**CURE** - A term which refers to the completeness of the chemical reaction.

**CYCLE TIME** - A term most commonly used in situations where many items are being manufactured on an automatic or semi-automatic production line. It includes the time required for mould preparation, including release agent application, dispensing of components, reaction, cure and demould.

**DEAD TIME** - A foam which only slowly regains its original shape after deformation.

**DEMOULD TIME** - The time between dispensing the liquid components into the mould and removing the article being produced.

**DENSITY** - The weight per unit volume of the foam normally expressed in $kg/m^3$.

*Core Density* - Density at or near the centre of the foam

*Overall Density* - Density of the foam including any moulded skin.

*Free Rise Density* - Usually measured in kg/m3. It can be free rise or packed into a mould.

**EXOTHERM** - The heat released by the foam reaction. The heat can accelerate the foaming process.

**FILLER** - An unreactive material added to the polyurethane mixture. They are usually solid materials such as glass and silica.

**FINE CELLS** – A term to describe foam with a cell count of 80 or more per lineal inch.

**FLAME RETARDANT** - A substance purposely added to inhibit the initiation or speed of flame.

**FLASH** – A thin section of extra material formed when foam forces itself into crevices between mating mould surfaces.

**FRIABLE** - Refers to the crumbling or powdering of a foam when the surface is rubbed.

**FUNCTIONALITY** – The number of reactive groups/sites per molecule.

**GEL TIME** - The time when the foam has developed enough gel strength to be dimensionally stable.

**GREEN STRENGTH** – Initial strength properties of the demoulded part.

**HARDNESS** - The surface property relating to the resistance of identation.

**HYDROLYSIS** - The breakdown of polymers in the presence of water.

**HYDROXYL GROUP** - The combined oxygen and hydrogen radical (-OH) which forms the reactive group in polyols.

**IMPINGEMENT** - A technique of mixing through high velocity contact of the two streams.

**IN MOULDING COATING** – A lacquer-based coating sprayed into a mould prior to foaming which adheres to the foam, providing a base for further finishing steps. E.g. also referred to as barrier coating.

**ISOCYANATE** - The family name of chemical compounds having one or more NCO groups attached to the main chain.

**K VALUE** - The heat transfer coefficient commonly used to compare the insulation values of different materials. The lower the k value, the better the insulator.

**MDI** - An abbreviation for diphenylmethane diisocyanate.

**MICROCELLULAR** - An elastomer of cellular structure having a density between 1.3 and 1.2

**MIX TIME** - Time in seconds a foam mixture has to be mixed before pouring into a mould.

**MOULDED DENSITY** - The density of a foam when expanded and cured in its final shape.

**MOULDING** - The process of producing a finished article from a closed mould.

**OPEN POUR** - The dispensed foam mixture is placed in an open mould, allowing it to free-rise.

**OVER PACKING** - Purposely adding more material to the mould than is required to just fill it. This technique is used for increasing the density of the finished moulded part.

**PIR** - **P**oly **I**socyanu **R**ate. A different type of polyurethane foam, with better resistance to high temperatures and relatively low combustibility.

**PLASTICIZER** – Materials (non reactive) which can be used to soften a foam.

**POLYESTER** - Polymeric compound, with the reactive hydroxyl groups containing ester linkages.

**POLYMER** - A high molecular weight compound, natural or synthetic, whose chemical structure can be represented by a repeated small unit.

**POLYOL** - A chemical compound with more than one reactive hydroxyl group attached to the molecule.

**PORE SIZE** – The number of cells per lineal inch.

**POST CURE** - The period of cure after the product has been removed from the mould. In some cases, accelerated curing at elevated temperature is used.

**PREPOLYMER** - A chemical intermediate manufactured by reacting all the isocyanate with part or all of the polyol.

**PU** - Abbreviation for polyurethane.

**RELEASE AGENT** - Applied to a mould to allow the foam to be demoulded easily.

**RESILIENCE** – A measure of foam elasticity or springiness.

**RIM** - Reaction Injection Moulding. A process of injecting a reacting mixture of polyurethane into a mould.

**RISE TIME** - The time when the freely rising foam stops growing.

**SELF SKINNING** - A foam mixture which forms a skinned surface on moulding.

**SEMI FLEXIBLE MOULDED FOAMS** – Foams used in automotive industry in safety padding and interior trim applications.

**SEMI RIGID FOAMS** – Foams that are friable in nature and do not fully recover after deformation.

**SKIN** - The outer surface of a foam which occurs from the surface cooling more rapidly than the core. It is normally higher in density than the core.

**SLABSTOCK** - A polyurethane foam which is made into a continuous block.

**SURFACTANTS** – A term describing a substance that provides resilience and stability to thin films and that markedly lower the surface tension of liquids, thus permitting easier bubble formation.

**SYSTEM** - A rather ambiguous term used to describe almost any combination of mechanical parts or chemicals which have some relationship to each other. Often used to describe the supply of all chemical components needed to produce a polyurethane.

**TACK FREE TIME** - The time between the beginning of the foam pour and the point at which the outer skin of the foam loses its stickiness.

**TDI** - An abbreviation for toluene diisocyanate.

**THERMAL CONDUCTIVITY** - The rate of heat transfer through a thickness of foam with a known area. The lower the value, the better the insulator. (see "k value")

**THERMOPLASTIC** - A material which can be melted and solidified an indefinite number of times without permanent chemical change.

**THERMOSET** - A material which does not change on heating until it reaches the decomposition point.

**VAPOUR PRESSURE** – The pressure of a vapour above the liquid from which it formed. Vapour pressure is temperature dependent.

**VENTING** - The controlled release of gasses (such as air) from a mould through holes, slots, etc.

**VISCOSITY** - The fluidity of the material. A lower viscosity material will be thinner than a high viscosity material.

**VOIDS** – The undesirable formation of large pockets in a foam structure. Voids caused by poor mouldability or incorrect mould filling. In case of foam buns, voids occur when the blowing and polymerization reactions are out of balance.

**THICKNESS**
1 mil = 25 microns = 0.025 mm
1 mm = 40 mils = 1000 microns

**AREA**
1 $m^2$ = 10.76 $ft^2$
1 $ft^2$ = 0.093 $m^2$

**LENGTH**
1 m = 3.28 feet
1 cm = 0.4 inches
1 foot = 0.305 m
1 inch = 2.5 cm

**PHYSICAL PROPERTIES**
1 kN/m = 0.175 x pli
1 $N/mm^2$ = 145psi = 1 MPa

**WEIGHT**
1 kg = 2.2 lbs
1 lb = 0.455 kg

**VOLUME**
1 US Gallon = 3.8 Litres
4 US Gallon = 15.1 Litres
44 US Gallon = 166.3 Litres
55 US Gallon = 208.1 Litres

**TEMPERATURES**
$^oC = 5/9 \times (^oF - 32)$
$^oF = (9/5 \times ^oC) + 32$

**PRESSURES**
100 kPa = 0.1 MPa = 14.5 psi = 1 bar

**DENSITY**
1 g/L = 0.062 $lb/ft^2$
1 lb/sq.ft = 4.82 $kg/m^2$
1 $ft^3$ = 0.028 $m^3$
$kg/m^3 = lb/ft^3 \times 16$

**GEOMETRIC FORMULAE**

**CIRCLE**


Area = $\pi r^2$ or $\pi D^2 / 4$

Circumference = $\pi D$ or $2\pi r$

(r = radius, D = diameter, $\pi$ = 3.1416)

**SPHERE**

Surface Area = $4 \pi r^2$ or $\pi D^2$

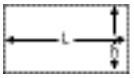
Volume = $4/3 \pi r^3 = 1/6 \pi D^3 = D^3 \times 0.5236$

**CYLINDER**


Volume = $\pi r^2 h$

(h = height)

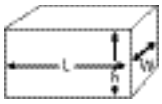
**RECTANGLE OR SQUARE**




Area = L x H

(L = Length)

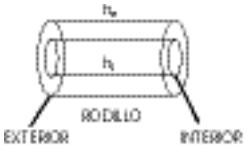
**BOX**




Volume = L x W x h

(W = width)

**ROLLER**




[Volume(outer) = ( $\pi r_o^2 h_o$] - [Volume(inner) = ( $\pi r_i^2 h_i$]

**VOLUME TO MASS CALCULATION**

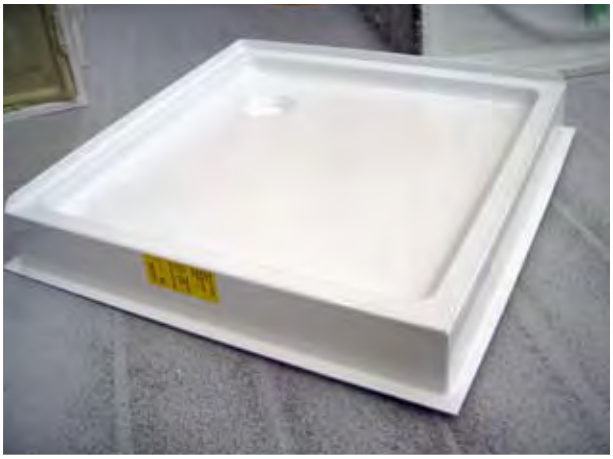
mass = density x volume

**APPROXIMATE VISCOSITIES OF COMMON MATERIALS**

Material Viscosity in Centipoise

| | | | | |
|---|---|---|---|---|
| Water<br>1 cps | SAE 20 Motor Oil<br>140 - 420 cps | Castor Oil<br>1,000 cps | Chocolate Syrup<br>25,000 cps | Sour Cream<br>100,000 cps |
| Milk<br>3 cps | SAE 30 Motor Oil<br>420 - 650 cps | Karo Syrup<br>5,000 cps | Ketchup<br>50,000 cps | Peanut Butter<br>250,000 cps |
| SAE 10 Motor Oil<br>85 - 140 cps | SAE 40 Motor Oil<br>650 - 900 cps | Honey<br>10,000 cps | Mustard<br>70,000 cps | |


BOMBORA
250
BOMBORA



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***"Let's Imagine The Future, Together!"***

### *QUALITY POLICY*

*Era Polymers is a manufacturer and distributor of quality polyurethane and ancillary products. Our company is dedicated to the principal that;*

*"BUSINESS is PEOPLE doing business with PEOPLE"*

*We are committed to training and fostering our people to the highest technical and ethical standards so that we can provide the best products and service to meet our customers' needs.*

*Our commitment to excellence will ensure that the word QUALITY will penetrate into the culture of the company.*

Goddess Hera

(H)**Era** in Greek religion, wife of Zeus,
Queen of the Olympian Gods
and patron Goddess of the Isle of Samos.

A father's passionate love of the island
prompted his son to commemorate its history
in the naming of our company.