Rotathene® SUPA UV
Making Tanks Built to Last

What is SUPA UV?
Rotathene® SUPA UV has been created to meet the exacting needs of the Australian water tank market. Australia experiences some of the highest levels of UV radiation in the world requiring polyethylene developed with leading edge technology to ensure water tanks are durable and reliable for their long lives.

Rotathene®, used by National Poly Group, provides a much higher level of protection than the industry standard and is referred to as SUPA UV for this reason.

Through careful selection of a high quality Polyethylene base polymer specifically designed for tank use, advanced additives such as UV stabilises and antioxidants, National Poly Group and their supplier, Matrix Polymers, can ensure it uses the best materials from which to manufacture water tanks.

Rotathene® SUPA UV incorporates advanced additive technology to provide superior protection for rotomoulded products.

Outstanding UV Protection
Australia has one of the highest levels of UV radiation in the world and Matrix Polymers supplier of Rotathene® SUPA UV is at the forefront of developments in UV stabilisation of polyethylene for rotomoulding.

Australia receives over 200 kilolangleys of UV radiation annually compared to 80 – 100 kilolangleys for SE Asia, Europe and most of North America. **(Figure 1)**

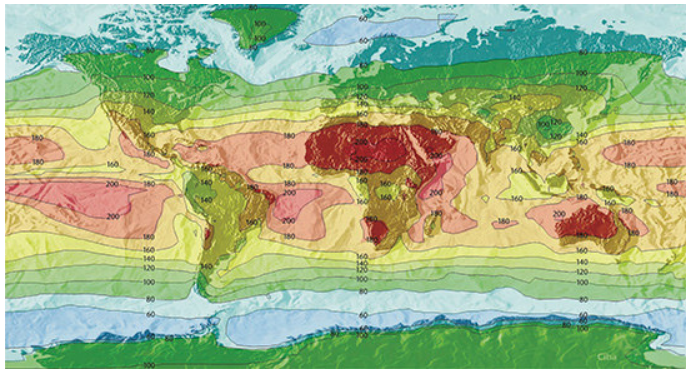

Figure 1: UV Radiation in Kilolangleys

Traditionally a UV8 level of stabilisation has been considered the minimum required for good long term protection in Australia. This is the level specified in the Australian Tanks Standard, AS/NZS4766:2006. Rotathene® SUPA UV incorporates advanced additive technology to provide UV protection well in excess of the standards specified.

SUPA Tough in the Sun with Proven Performance
UV protection levels in Rotomoulding grades of PE are assessed under highly controlled conditions of high intensity UV radiation with similar wavelengths to those from the sun. The test temperature is also controlled since, as mentioned earlier, temperature can affect additive consumption and polymer degradation. A number of sets of identical Natural (Un-pigmented) PE samples are prepared and all but one set is placed in a weatherometer test chamber and irradiated with UV over 1000's of hours. Samples are removed from the UV weatherometer every few 1000 hours and stretched in a tensile tester to determine how much they can still stretch. This provides the % Elongation of the test sample. This value is compared to the value obtained for the set that was not placed in the weatherometer and recorded on a graph as the % Retained Elongation **(Figure 2)**.

Because PE becomes brittle as it degrades, its ability to stretch declines and thus the % Retained Elongation decreases as degradation increases.

In the Rotomoulding industry, a test sample is deemed to have failed when the Elongation drops to 50% of the value for the original PE sample that was not exposed to UV. The time taken in 1000's of hours to reach this point is taken as the level of UV protection. For example a PE grade that takes 8000 hours of intense UV radiation to drop to 50% of the value for its original unexposed samples, is said to have a UV8 level of protection. Rotathene® SUPA UV takes longer in the UV weatherometer before it drops to 50% of the elongation value for the unexposed polymer **(Figure 2)**.

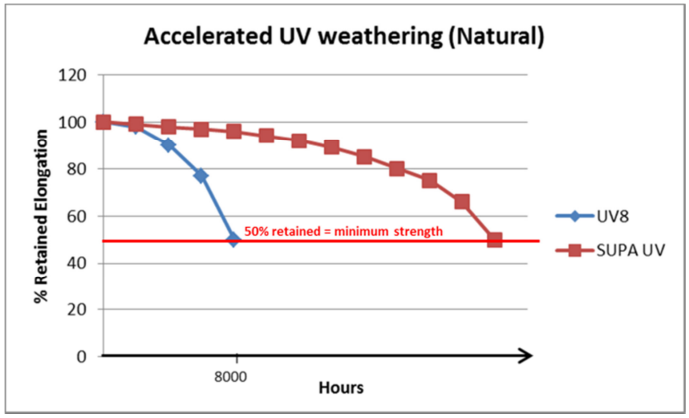

Figure 2: UV performance of UV8 and SUPA UV

Testing is carried out on Natural (un-pigmented) PE but additional UV protection is obtained from pigments present in the moulded part. This is due to the ability of the pigments to absorb or scatter UV to a greater or lesser extent, depending on the pigment type, colour and level. Testing of every combination of pigment and level found in the range of colours available to the tank market, is not practical so UV ratings are based on Natural which provides an indication of the minimum level of UV protection. However, some work undertaken by a supplier of pigment concentrates (called masterbatches) to the industry did accelerated UV testing on 4 commonly used tank colours and showed that while the Natural Rotathene® SUPA UV PE provided a significantly higher than UV8 level of protection, the pigments which had been melt compounded into the PE base polymer extended the level of protection even more. Even after 36000 hours accelerated UV testing, the pigmented samples still retained well over 50% of their original elongation properties **(Figure 3).**

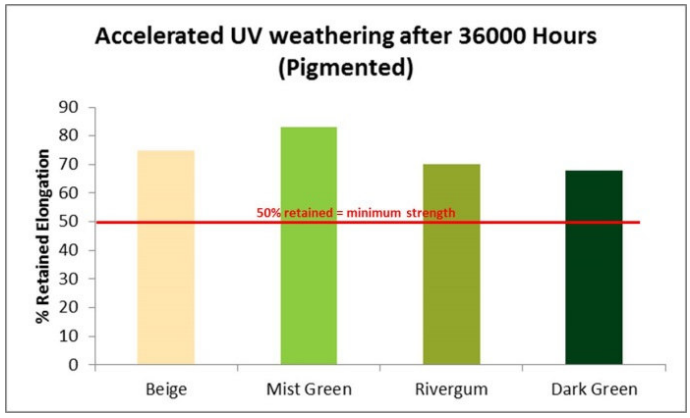

Figure 3: Improvement in UV protection due to pigments

Relating accelerated testing in a controlled environment to what may be experienced in the field is a challenge since conditions in the field vary so much. Just like other polymers, metals and paints, factors such as temperature, precipitation, hours of sunlight, dust, chemicals or salt spray in the air all affect how a Rotomoulded part may behave over time. However, as mentioned above, for many years a UV stabilisation level of UV8 has performed well in the Australian environment so the Rotathene® SUPA UV provided by Matrix Polymers, affords the tank owner an additional level of UV protection in their tanks.

Rotathene® SUPA UV – Exceeding Australian Standards

All pigments used in Rotathene® Tank Colours are Heavy Metal Free, comply with the requirements of ***AS/NZS2070 Plastics Materials for Food Contact use*** and have passed testing to the stringent requirements of ***AS/NZS4020 Testing of products in contact with Drinking Water.*** This provides peace of mind to the user that water stored in tanks made from Rotathene® SUPA UV is not affected by these materials and that no heavy metals will be introduced into the environment when tanks are eventually disposed of.

Pigments are chemicals which can be quite simple or highly complex in composition and structure. The particular chemical composition and structure

provides the pigment not only with its unique colour but also with its weathering and thermal stability properties. Pigments used in Rotomoulding SUPA UV have to have excellent thermal stability since they are exposed to high temperatures for relatively long periods of time during the moulding process. In addition, to ensure they retain their colour as long as possible in the field, only pigments with high weathering properties are selected.

Designing for Life

The main purpose of a tank is however to hold water or chemicals. In order to do this, a tank needs to be designed to withstand loads applied to the tank, in particular the pressure of the contents. Polyethylene stretches slightly when a load is applied to it such as when the tank is filled and being able to predict how a tank will behave when it is filled and used over many years, is very important. In order to do this one needs to understand how the PE stretches or 'creeps' under stress. Extensive creep testing is conducted both locally and overseas on Rotathene® SUPA UV tank grade materials. This testing is performed under different stress levels and at different temperatures to obtain information that is vital to professional design engineers who design these tanks.

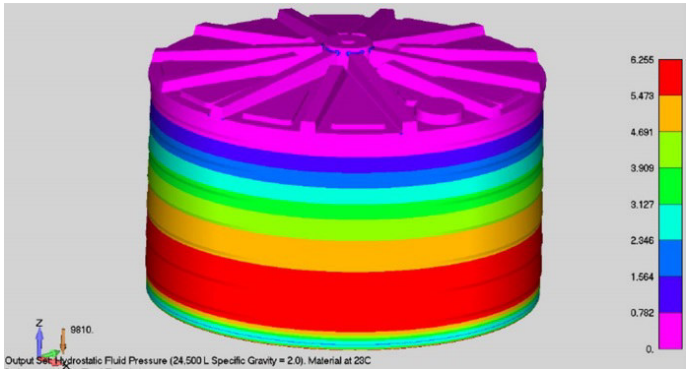

Figure 4: Stress Intensities due to fluid pressure

The design of the tank is checked using Finite Element Analysis. This is a special computer design program used by design engineers which predicts how the contents of the tank will affect stress intensities in the tanks and what deflections or level of creep may be expected due to this stress over a reasonable service life. **Figure 4** shows the stress intensities generated in a tank by the contents.

The red areas have the highest stress intensity and pink the lowest. As one can see from this, the highest stress will be found near the base of the tank wall where the pressure is greatest, as one may well expect.

By using FEA, the appropriate wall thicknesses can be determined and the effect of design features can be examined to optimise the expected performance of the tank. This analysis is done using the assumption that the tank will be properly installed on a flat and level platform and that the tank is plumbed correctly. A sloping platform or presence of stones or anything else causing an uneven surface under the tank will introduce stresses which would not have been accounted for in the design and could have adverse consequences to the life expectancy of the tank. The same may be true of heavy or rigid fittings which are attached to the tank without due consideration for appropriate support and movement. It is therefore important to follow the installation instructions fully.

Rotathene® SUPA UV – Making tanks built to last in Extreme Environments

Through careful selection of a high quality Polyethylene base polymer specially designed for tanks and having the increased SUPA UV level of protection, the National Poly Industries Group in conjunction with its material supplier, Matrix Polymers, can ensure that it has the best materials with which to make their tanks. Using professional design engineers and Finite Element Analysis in the design of these tanks as well as moulding and testing the tanks to the requirements of the Australian Tank Standard AS4766, optimises the properties of the materials used in the manufacture of these tanks and affords the end user the knowledge that they have a superior product designed for the harsh Australian conditions.

For further information please contact your local NPI representative.
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