

dryflex[®] ws

HYDROPHILIC TPE

Dryflex® WS

Hydrophilic Thermoplastic Elastomers

Introduction

With our Dryflex® WS range we have turned the usual water-resistant properties of thermoplastic elastomers on their head to create materials that swell up to eight times their volume when immersed in water. These materials have been developed to expand upon contact with aqueous solutions (pH7 to 12) to form a positive seal and prevent the ingress or exit of water.

Material Science

A range of formulations have been developed to offer swell rates from 300 to 800% when immersed in water. When there is no longer water present the compound shrinks back to its original size, a process of expansion and contraction that can be repeated an unlimited number of times.

The compounds have solid structural integrity; unlike many of the equivalent clay based products which can erode and shatter over time. Compounded in any colour, the water swellable TPE is 100% recyclable and can be processed using conventional fabricating methods, including extrusion and injection moulding. Antimicrobial versions are available, as well as compounds suitable for saline and alkaline environments.

Applications

Waterstops, buidling & construction, water treatment plants, tunnels, drains, sewers, tanks, automotive sealant parts, glazing, headlights and cable protection are just a few of the potential applications for Dryflex® WS materials.



How does it work?

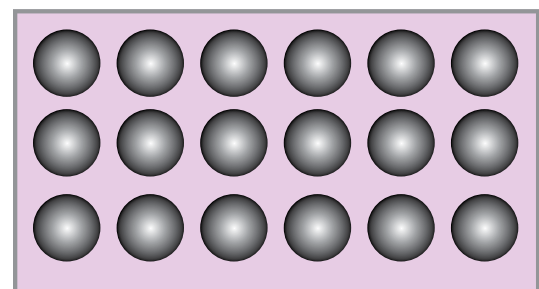


Fig 1 : The active hydrophilic ingredient is compounded into the TPE at the time of manufacture

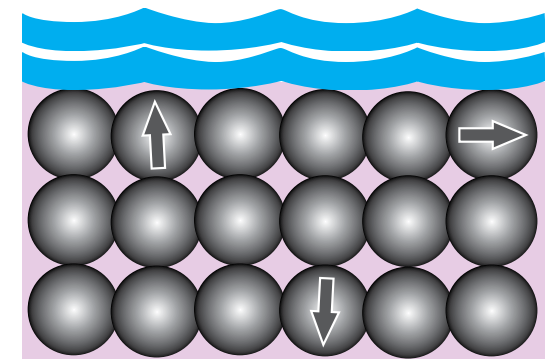


Fig 2 : Upon contact with water Dryflex® WS will expand uniformly, at a controlled rate and percentage.

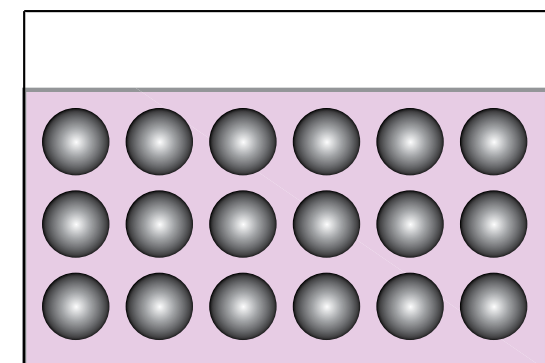


Fig 3 : When there is no longer water present Dryflex® WS shrinks back to its original size.



General Properties

Service Temperature:	-50 to +75°C (unstressed material)
Presentation:	Free flowing pellets that can be processed without predrying when stored under normal conditions.
Weather Resistance:	Excellent
Chemical Resistance:	Moderate (excluding organic solvents, aromatic and vegetable oil.)
Recycling:	100% Recyclable
Mould Shrinkage:	Appr. 1.5% depending on e.g. shape of the detail and placement of gate. (linear)

A selection of Dryflex® WS grades

Material	Hardness Shore A	Specific Gravity g/cm ³	Tensile Strength MPa	Elongation at Break %	Tear Strength N/mm	MFR 2.16kg/190°C g/10 min	Water Swell Rate 3 weeks at 23°C %
Test Method	ISO 868	ISO 2781	ISO 37	ISO 37	ISO 34 Method C	ASTM D1238	
WS 25E165 ¹	25	1.19	2.2	770	13	3 ²	Approx 165 ³
WS 30M500 ⁴	30	1.25	1.0	500	8	90	Approx 500 ⁵
WS 35M200 ⁴	35	1.23	1.2	510	8	50	Approx 200 ⁶
WS 40E350	40	1.24	2.5	550	17	2	Approx 350
WS 40E450	40	1.25	2.5	550	17	2	Approx 450
WS 40E850	40	1.25	2.0	350	14	3	Approx 850
WS 73E150	73	1.24	3.3	260	22	6	Approx 150

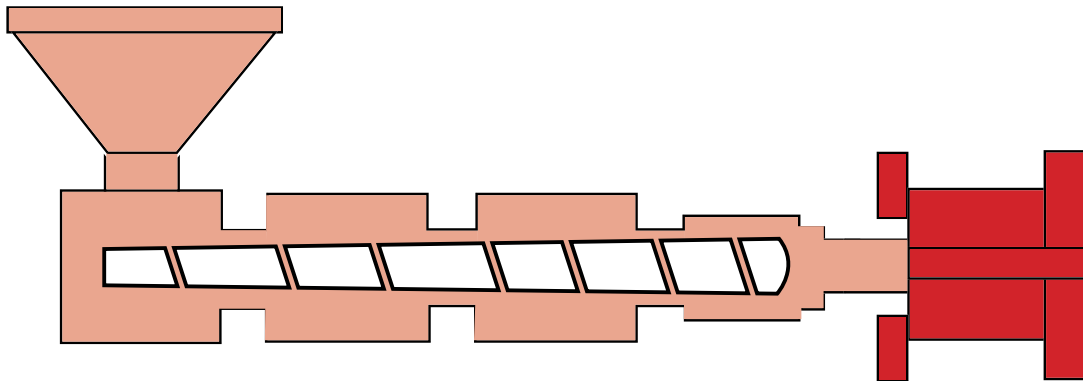
¹ Suitable for saline environments ² 5kg/190°C ³ 165% swell in saline water, 350% in standard water ⁴ Suitable for Injection Moulding ⁵ 7 Days at 23°C ⁶ 14 Days at 23°C

Processing

Dryflex® WS materials are primarily designed for extrusion processing techniques, but may also be thermoformed by injection moulding. Due to the nature of the swelling process, many factors can affect the overall level of swell and the rate at which swelling occurs;

- During processing, orientation effects and built-in stresses can have a major impact on the materials performance.
- Extrusion temperatures at the die should not be too low and extrudate not force cooled in order to allow for a relaxed and random formation of the polymer structure.
- Profile geometry may also affect the degree of swell.
- During injection moulding, the differences are more dramatic when dealing with higher levels of orientation and thinner products, these cool quicker resulting in vastly reduced and slower swell rates.
- Product design and gate placement are contributing factors to the swell characteristics.
- We suggest that in order to maximize swelling, warmer tools are used, and if possible, products are demoulded as warm as possible.
- Once a product has been formed, there are further factors which can have a bearing on the performance of the material, these include: preconditioning, temperature, volume and pH of the water which is in contact with the article.

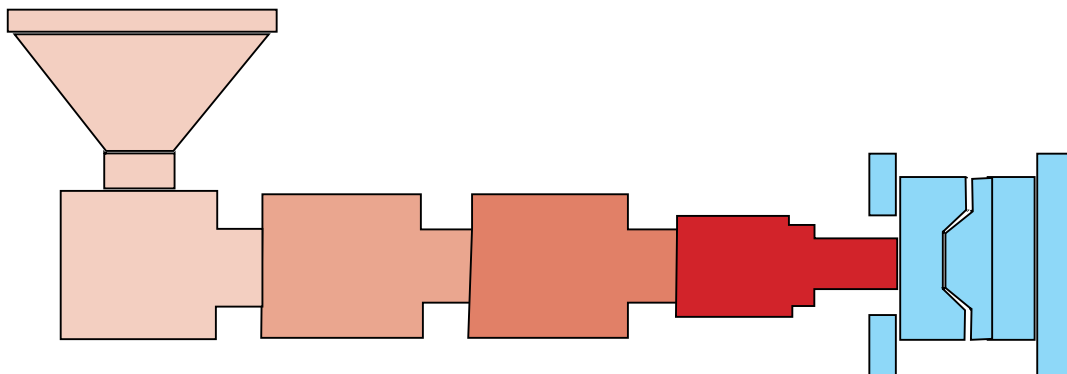
Extrusion Guidelines



WS 25E165	80 - 90°C	80 - 90°C	90 - 100°C	90 - 100°C	130 - 140°C
WS 40E350	110 - 115°C	110 - 115°C	110 - 115°C	110 - 115°C	150 - 160°C
WS 40E450	110 - 115°C	110 - 115°C	110 - 115°C	110 - 115°C	150 - 160°C
WS 40E850	110 - 115°C	110 - 115°C	110 - 115°C	110 - 115°C	150 - 160°C

L/D Ratio: 20:1 - 25:1
 Compression Ratio: 2.5 - 3.0
 Breaker Plate / Screen: Both should be used
 Draw Down: 5 - 10%
 Cooling: Air cool only (Must not come into contact with water)

Injection Moulding Guidelines



WS 30M500	100 - 110°C	110 - 120°C	120 - 130°C	130 - 140°C	15 - 40°C
WS 35M200	100 - 110°C	110 - 120°C	120 - 130°C	130 - 140°C	15 - 40°C

Injection Speed: Medium - Fast
 Injection Pressure: Medium
 Back Pressure: Low - Medium
 Holding Pressure: Sufficient to pack the mould
 Cooling: Parts can be demoulded once temperature drops below 70°C

The above information is, to the best of our knowledge, true and accurate, but any recommendations or suggestions, which may be made, are without guarantee, since the conditions of use are beyond our control.

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