ULTRASEAL™

sustainable

impregnation recycling technology

Introduction

Ultraseal International is a leading provider of Impregnation Recycling Technology to the Japanese Manufacturing Industry.

Our roots in the Japanese automotive market run deep. We have strong, well established relationships with all of our customers that are based upon trust, integrity, quality, efficiency and stability.

We recognise the importance of the Japanese automotive industry and its significant influence on world manufacture and international trade; therefore our focus on providing world class products and service in this demanding marketplace is second to none.

The pioneering work of Ultraseal International has taken impregnation from the perception of a dirty, polluting rectification operation, often consigned to the back of the factory, to a cost saving, environmentally friendly and quality enhancing process, which is able to be fully integrated into mainstream production.

Ultraseal has been involved in Sealant Impregnation Technology for almost half a century, maintaining a focus on ecological sustainability for over 20 years. Our latest performance enhancing, environmentally friendly products have been shown to develop and add value to our customers' production of superior castings.

We care about the effects of our technology on the environment, as well as the economic development of our growing markets. Consequently, we continue to develop our potential through cost effective, eco-friendly systems and processes that help us, to help you, provide a better future.

Gary Lloyd
Managing Director

Recycling Sealants

For many years, Ultraseal has been dedicated to the improvement of the impregnation process through innovative developments in equipment, process and chemistry, which all constitute significant cost benefits to its customers.

Nowhere is this better illustrated than by the introduction of recycling sealant some 20 years ago and now in its third generation. This innovation has resulted in huge savings for Ultraseal customers around the globe; who now collectively recycle **over 1.25 million litres of sealant each year** - sealant that otherwise would have been lost in the waste water, which is uneconomical and has an environmental impact as well as considerable associated costs to the user through inventory, shipping, water consumption and effluent. The user benefits are:

Quality
Enhanced performance brings quality benefits.

Cost
Overall cost of chemicals reduced due to recycling technology.

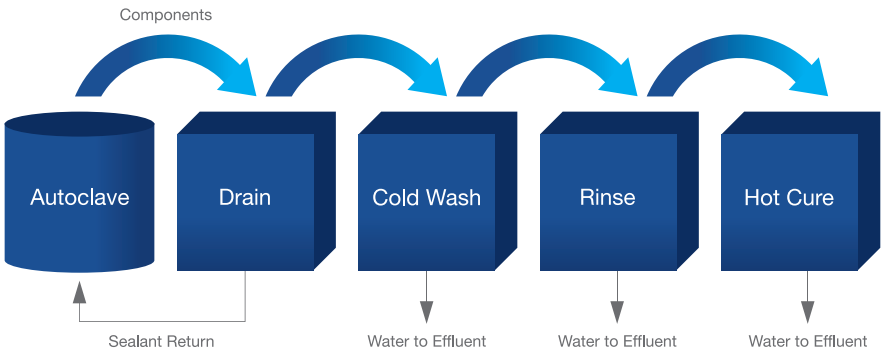
Inventory
Sealant stocks reduced with recycling rates as high as 90%.

Shipping
High recycling rates reduce consumption of sealant, thereby reducing associated transport costs (and CO_2 emissions).

Water Consumption
Recycling eliminates overflow or discharge from the cold wash, dramatically reducing water consumption.

Effluent
Conventional sealants emulsify on contact with water, as a result the cold wash and rinse tank need to be periodically replenished and the water requires expensive treatment to make it environmentally acceptable. Recycling sealants eliminate cold wash effluent and associated treatment costs.

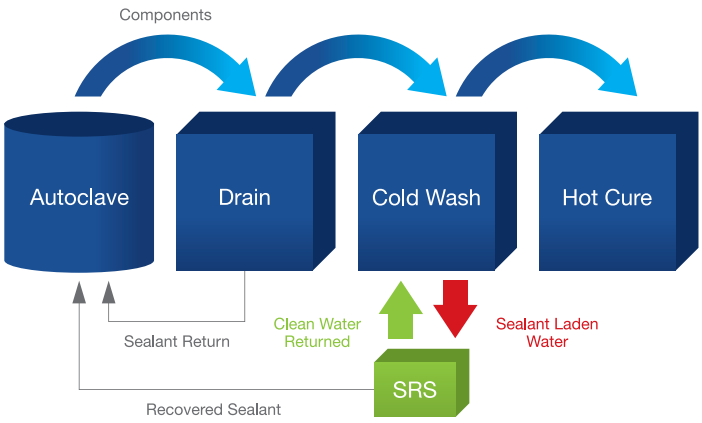
A Conventional Non-Recycling Impregnation System

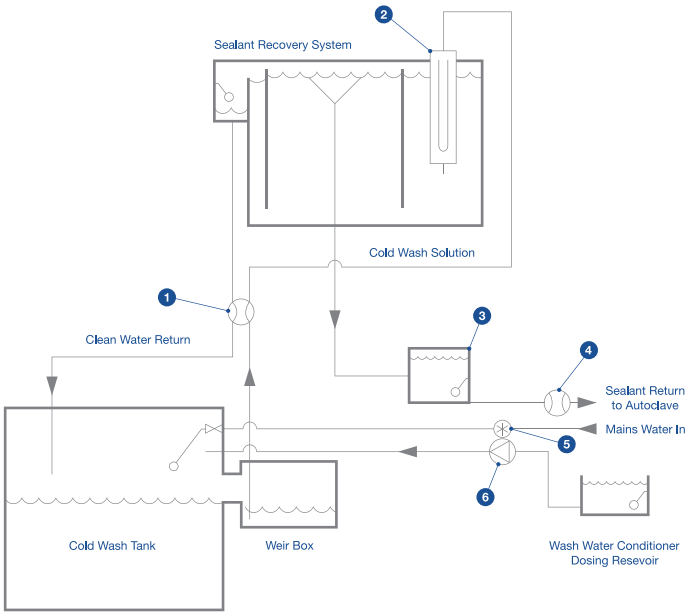


While conventional sealing technologies have made some advances in terms of quality and consistency, over 95% of the total volume of sealant consumed is wasted and goes as effluent in the wash tank during the cold wash process. Only a fraction of the sealant is actually required to seal the porosity. This brings a greater financial burden to companies who are facing ever increasing environmental legislation and costs associated with waste water.

The growing need for manufacturers to reduce costs and address environmental issues, led Ultraseal to develop the world's first recycling sealant, MX2, in 1987. Ultraseal's recycling sealants are revolutionary, and offer additional qualities to conventional sealant with the added commercial and ecological benefits of being recyclable. Now, excess sealant, instead of simply being consumed in the cold wash tank and lost as effluent, can be recovered and reused in the autoclave, improving the sustainability of the impregnation processes.

Sealant Recycling System





1 Diaphram Pump
2 Filter
3 Sealant Discharge Pot
4 Diaphram Pump
5 Water Meter
6 Chemical Dosing Pump

Ultraseal MX2 - The Original Recycling Sealant

Ultraseal MX2 has gained significant global approval with major automotive manufacturers and their suppliers, and remains a high performance recycling sealant offering significant environmental benefits when compared to conventional non-recycling sealants.

MX2 is the preferred choice of sealant for a wide range of companies in differing sectors; who are seeking to maintain sealing quality and process consistency, while simultaneously reducing sealant consumption, effluent disposal costs and water usage.

Ultraseal recycling sealants are specially formulated to give them hydrophobic properties. They have a specific gravity less than 1.0 which means they will naturally tend to separate from water. The separation process involves the Sealant Recycling System (SRS). This is a custom-built separator that takes sealant-laden water from the wash tank and passes it through filters, before separating the sealant from the water. The wash water solution is dosed with Ultraseal Wash Water Conditioner (WWC), which ensures separation of the sealant from the cold wash water.

The recovered sealant is then returned back to the autoclave and the remaining wash solution is pumped directly back to the wash tank, giving a totally closed loop system. Unlike conventional systems, there is no requirement to change the cold wash water.

Therefore manufacturers who use this system experience substantial cost savings through lower sealant consumption, conservation of water, reduced down time and in addition, less effluent and the associated environmental benefits.

Ultraseal Rexeal 100 - A New Generation

Ultraseal never relax from their vision of continuous improvement and through extensive research by the Ultraseal research and development department, they have drawn upon a proven track record of more than two decades in the use of recycling sealants to develop this evolutionary product.

By examining the performance of Ultraseal MX2 in the field, and taking into account extensive feedback from the market, Rexeal 100 has been purposely formulated to meet the ever changing requirements of companies. It brings additional tangible benefits to manufacturers that require the highest possible levels of sealing quality and environmental conformance.

Quality as Standard

Ultraseal puts all products through internationally accepted test conditions. Our rigorous laboratory testing ensures that our sealants deliver substantially superior qualities and also carry the US Military Specification MIL-I-17563C approval, therefore our customers can have the confidence that our quality statements are approved by independent accreditation (outlined in following tables) and we can provide substantiated evidence that our products will work effectively in tough service environments.

Product is available in 20 litres, 185 litres and 900 litres pack sizes

US Military Specification MIL-I-17563C Class 1 & 3 Approval

Environment	Time	Temperature	Result
Water	14 days	100°c (boiling)	No leak
Oil	14 days	99°c (+/- 2.8°c)	No leak
Hydrocarbon Fluid	14 days	23°c (+/- 2°c)	No leak
Carbon Removal Fluid	30 minutes	23°c (+/- 2°c)	No leak
Lubricating Oil	48 hours	121°c (+/- 2°c)	No leak
Turbine Fuel	48 hours	23°c (+/- 2°c)	No leak
Ethylene Glycol	14 days	149°c (+/- 2.8°c)	No leak
Hydraulic Fluid	14 days	99°c (+/- 2.8°c)	No leak
Fuel	48 hours	23°c (+/- 2°c)	No leak
Diester Grease	48 hours	23°c (+/- 2°c)	No leak
Sulphuric Acid (18%)	2 hours	23°c (+/- 2°c)	No leak
Stoddard Solvent	48 hours	23°c (+/- 2°c)	No leak
Ethyl Alcohol	14 days	23°c (+/- 2°c)	No leak

Impregnated US MIL Test Rings. Test pressure 3.5 bar (3.57kg/cm^2)

Ultraseal International Additional Tests

Environment	Time	Temperature	Result
Engine Oil	14 days	150°c	No leak
Brake Fluid	14 days	150°c	No leak
Ethylene Glycol	14 days	150°c	No leak
Hydraulic Fluid	14 days	150°c	No leak
Unleaded Petrol	14 days	25°c	No leak
Water	14 days	100°c	No leak
PAG Oil	14 days	150°c	No leak
R134a Refrigerant	6 months	Ambient -10°c to 35°c	No leak
R134a Refrigerant	6 months	150°c*	No leak

*test completed by an external global manufacturer of air compressors

The US Military approval process subjects test rings manufactured from Aluminium, Copper Alloy and Iron to a number of stringent sealing capability tests. These show the chemical resistance and thermal stability of the sealant over a wide range of standard conditions.

R134a Refrigerant

An impregnated test ring was installed in a refrigerant line for 6 months (R134a). Temperature exposure was ambient. At the end of the 6 month period the ring was tested and remained leak free.

Independent tests carried out by a global manufacturer of air conditioning compressors over an extended period confirmed the suitability of Rexeal 100 when put in elevated temperatures representative of the working environment of the unit. It showed that Rexeal 100 remained effective at 150°c.

Technical Data - Rexeal100 Sealant

Liquid Phase:

Appearance	Clear pale straw liquid	**Odour**	Mild methacrylate
Viscosity (20°c Seta Zahn No 1)	28 - 30 seconds	**Specific Gravity** at 20°c	0.910 -0.935
Flash Point (Twin Pack (uncatalysed))	>100°c	**Surface Tension**	31 dynes/CM
Drag Out (g/m^3)	34	**Gel Time** (0.8% DB42)	90 sec - 180 sec
Contamination Tolerance	Very Good	**Washability**	Very Good
Pot Life (under normal operating conditions)	Indefinite	**Shelf Life** (under normal storage conditions)	12 months (uncatalysed) 6 months (catalysed)
Temperature Range	-50°c / +220°c		

Laboratory Testing of the Effectiveness of Rexeal 100 on Sintered Test Rings

Thermal Test Data

Rexeal 100 has been fully tested to strict international standards, including the standard Heat/Freeze cycle, a test that challenges the sealant over extremes of temperature.

Temperature Testing (Short Term)

Impregnated sintered test rings (20% porosity) were exposed to a temperature of 220°c over the standard test time of 24 hours. The rings were tested for leaks at 3.5 bar (3.57kg/cm^2) and remained pressure tight.

Impregnated sintered test rings (20% porosity) were immersed in engine oil and exposed to a temperature of 220°c for 14 days. The rings were tested for leaks at 3.5 bar (3.57kg/cm^2) and remained pressure tight.

Heat Resistance (Long Term)

Impregnated sintered test rings (20% porosity) were subjected to a temperature of 220°c for 30 days. The rings were tested for leaks at 3.5 bar (3.57kg) and remained pressure tight.

Thermal Cycling

Impregnated sintered test rings (20% porosity) were subjected to temperature cycling at one hour intervals from -76°c to ambient to +160°c to ambient. After 30 days the rings were tested for leaks at 20 bar (20.4kg/cm^2) and remained pressure tight.

Impregnated sintered test rings (20% porosity) were exposed to the following thermal cycling conditions remained pressure tight (no leaks) at 3.5 bar (3.57kg/cm^2)

a One thermal cycle = 1 hour -30°c, 1 hour ambient, 1 hour 160°c, 1 hour ambient. Total number of cycles = 250

b One thermal cycle = 1 hour -76°c (in methanol), 5 minutes immersed in boiling water, 3 hours 160°c, 1 hour -76°c (in methanol), 5 minutes 60°c. Total number of cycles = 30

c One thermal cycle = 1 hour -76°c (in toluene), 5 minutes immersed in boiling water, 3 hours 160°c, 1 hour -76°c (in toluene), 5 minutes 60°c. Total number of cycles = 30

The effect of temperature on alternative sealants

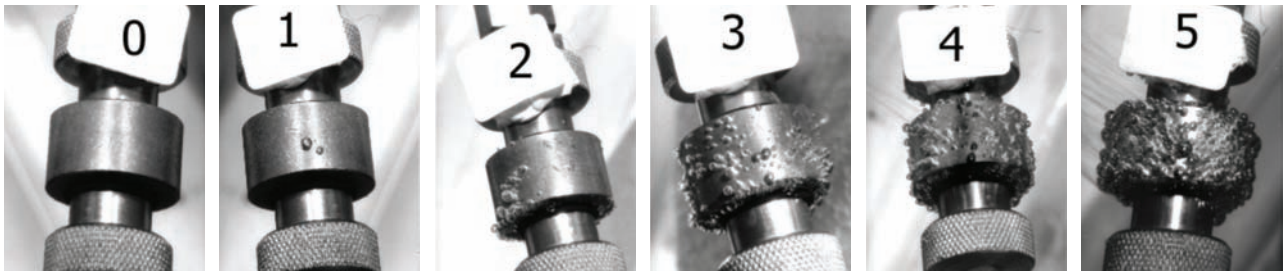
We consistently monitor our sealants performance against others on the market. This guarantees that the statements we make about the quality of our products and their performance is proven true. The following test results show how impregnated US MIL-I-17563C test rings performed when subjected to thermal tests, with any leakage being recorded and graded as shown in the chart below.

Where 0 = pressure tight (leak free) and 5 = bad leakage

Product	Alternative competitors non-recycling sealant					Rexeal 100		
Temperature	40°c	100°c	180°c	200°c	220°c	180°c	200°c	220°c
Initial Seal	0	0	0	0	0	0	0	0
0.5 Hours	0	1	2	2	3	0	0	0
1 Hour	0	2	3	3	3	0	0	0
4 Hours	1	3	3	3	4	0	0	0
8 Hours	2	3	4	4	4	0	0	0
24 Hours	3	4	5	5	5	0	0	0

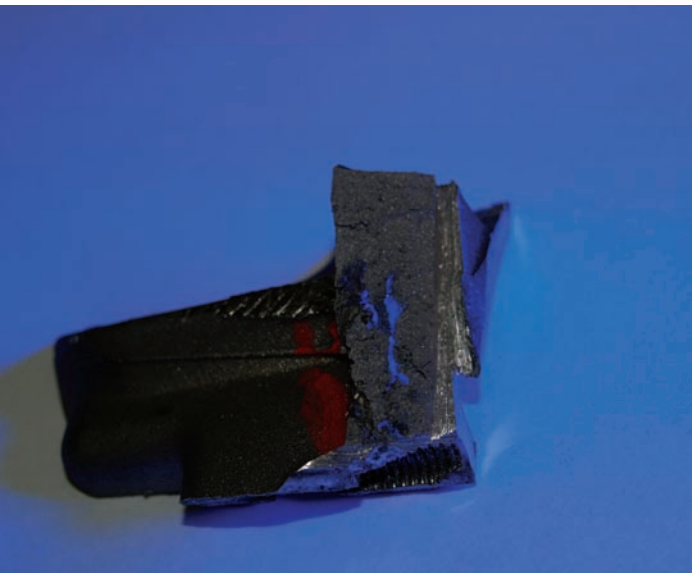
The results in this table were generated from tests with a standard batch of competitors sealant and Rexeal 100

Test Ring Leak Parameters



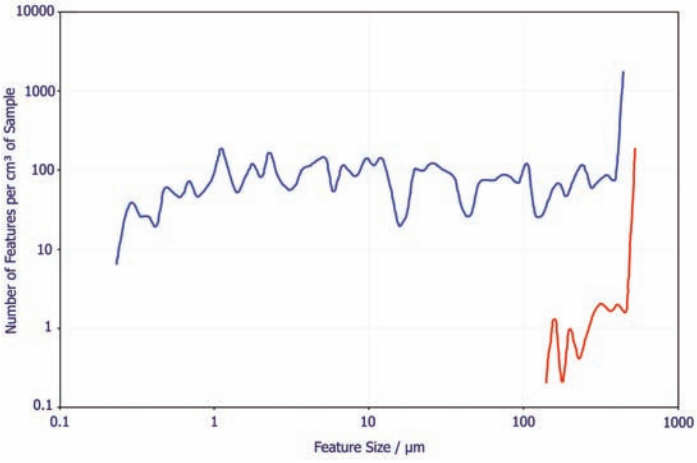
Thermal Stability Test Results

Even when exposed to relatively low temperatures (40°c), the competitors sealant performance is found to suffer after only short periods of time. By comparison, Rexeal 100 retains a perfect ring seal even after 24 hours at 220°c.



Ultraseal would always recommend that the most reliable method for evaluating the performance of an impregnation sealant is through the testing of impregnated test rings, as established by the international standards and recognised test procedures. By doing so, results that reflect ‘in use’ product performance are generated, and in this instance they indicate very clearly the superior thermal resistance of Rexeal 100 over alternatives.

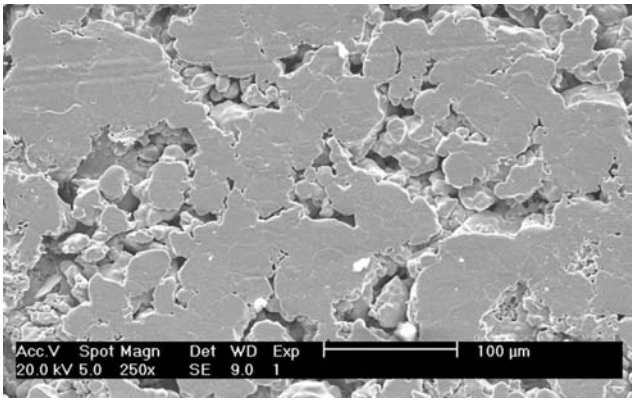
Porosity Diagram



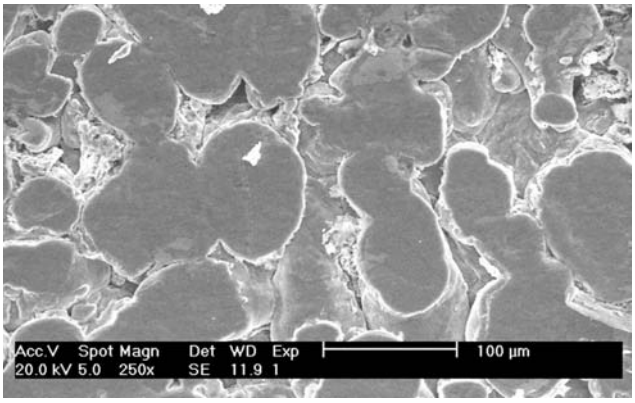
The blue line on the diagram indicates the size and density of the voids (porosity) in a test ring before impregnation.

The red line indicates the size and number of voids (porosity) in the test ring after impregnation with Rexeal 100. This demonstrates that all micro-porosity is sealed and the gross porosity of the sample was improved by 99%.

Micro Sections showing magnified porosity in test rings



Iron ring



Aluminium ring

The process benefits of Rexeal 100

Rexeal 100 is an enhanced recycling sealant, which breaks new ground in the performance of impregnation sealants and exceeds customer expectations. Rexeal 100 offers tangible benefits when compared to its forerunner MX2. These benefits include:

Improved Process Stability
Resulting in more easily maintained systems

More Reactive Sealant (faster gel time)
Gel time typically at least 30 seconds faster than MX2 allowing the possibility of reducing cycle times. Gel time is stabilised.

Enhanced Washing Characteristics
Rexeal 100 has greater hydrophobic properties and is more readily washed off, leading to cleaner components.

Improved Thermal Resistance
Rexeal is qualified up to a temperature of 220°c.

Flexible
To withstand exposure to harsh environments such as vibration and temperature fluctuation.

Improved Sealant
By examination of MX2 and the experience gained over 20 years; we were able to progress and improve upon the performance of recycling sealants.

Environmental Benefits
The formulation of Rexeal 100 conforms to the recently changed classification labelling regulations and will not carry the ‘Dead Tree - Dead Fish’ markings.

Rexeal 100 has been selected by many major manufacturers throughout the world, who are all profiting from the range of advanced characteristics.

Making life easier – Converting to Rexeal 100

Rexeal 100 is the latest generation of recycling sealants and is fully compatible with Ultraseal MX2. Customers wishing to convert their existing MX2 recycling systems can simply add Rexeal 100 to their autoclave to begin benefiting from the additional advantages that Rexeal 100 brings.

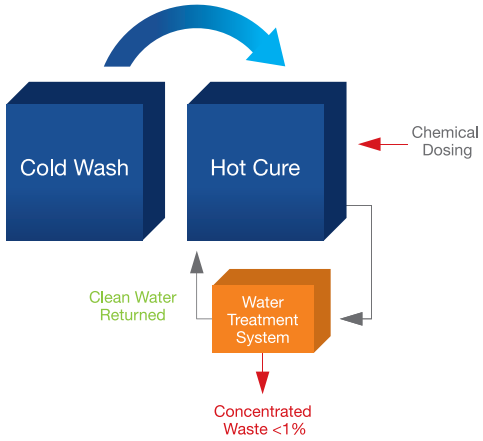
Convert your existing system to recycling

Ultraseal can provide a service to survey your existing impregnation equipment, to assess the suitability for conversion to recycling. We have completed many such conversions around the world that have enabled our customers to reap the cost and environmental benefits of recycling without the need to totally replace the existing machine.

Hot Cure Recycling Technology

To compliment Ultraseal's recycling systems and sealants we now offer hot cure recycling technology.

Recycling sealant means no effluent from the cold wash tank and often the elimination of the rinse tank. The only remaining area of effluent therefore, comes from the hot cure tank.



Ultraseal has addressed this problem by the introduction of a Water Recycling System. A volume of water is continuously pumped from the hot cure tank to an energy efficient distillation unit where the water is purified. This clean water is then returned to the cure tank for re-use. A specialised chemical is automatically dosed into the system to ensure that the distillation process is kept clean. The highly concentrated waste (usually less than 1% by volume) is collected separately for subsequent disposal.

By recycling the hot cure water, cost savings are made in four major areas:

- Water saving by not having to replace the tank volume on a regular basis
- Energy savings by not having to reheat the replacement water
- Effluent savings by reducing the effluent stream by up to 99%
- Manufacturing savings by not having to stop the machine and lose production whilst changing the water

Hot cure recycling also reduces polymerisation within the hot cure tank; as such the hot tank doesn't need to be cleaned on a regular basis, reducing the need for it to be emptied, refilled and then reheated, bringing savings in both time and cost.

What can Ultraseal do for you?

We set the benchmark with our outstanding technology that other suppliers strive to imitate.

- **Experience – We are a leader not a follower**

- Innovative - over 30 years supplying many 'world first' solutions to industry
- Over 20 years experience in providing recycling technology with more than 300 installations worldwide
- Preferred supplier to many key global manufacturers

- **Security**

- Part of Norman Hay PLC giving financial security
- One of the Norman Hay Group of companies specialising in chemical technology
- Production and manufacturing facilities in house

- **Confidence**

- Only established supplier of impregnation recycling technology
- Norman Hay PLC - Group focus on expanding global chemical solutions
- Worldwide operation with a network of subsidiaries and partners
- Our focus is impregnation – it is our only business
- Turnkey solutions from a single source
- Provider of bespoke solutions to suit your processes
- Consultancy service available to share the experience
- Complete comprehensive training

- **Quality**

Ultraseal remains the only globally accepted manufacturer and supplier of recycling technology and associated products. Our corporate governance through product differentiation is illustrated by the vast number of international users and the variety of applications for which their products and services are employed.

- **ISO 9001:2000**

Ultraseal are not only concerned with maintaining the highest standards within our company and products; but also within yours. As such, we constantly regulate our quality standards to match the requirements of global legislation policies.

- **Focus on the environment – ISO:14001**

Ultraseal's sustainable products have contributed in many of our customers obtaining ISO: 14001, the environmental standard. In some circumstances this has qualified them for awards in quality and environmental recognition.

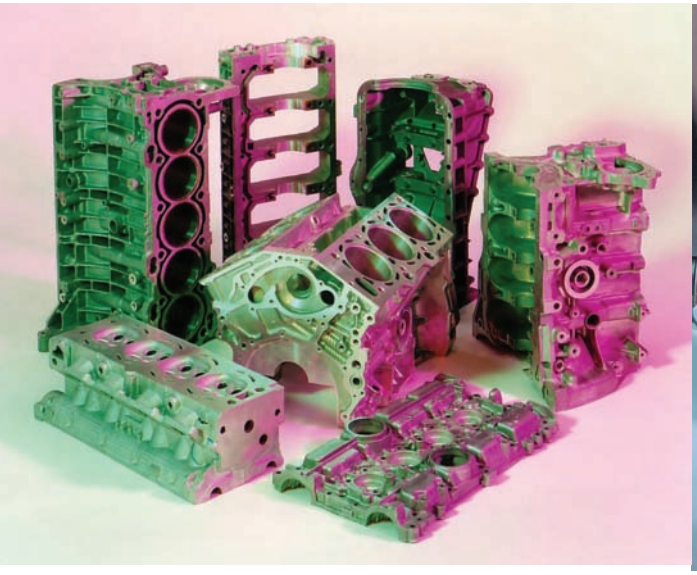
Governments worldwide are putting pressure on businesses to improve the environmental and economic impact of manufacturing processes. In some instances grants are available to help companies adjust their current systems.

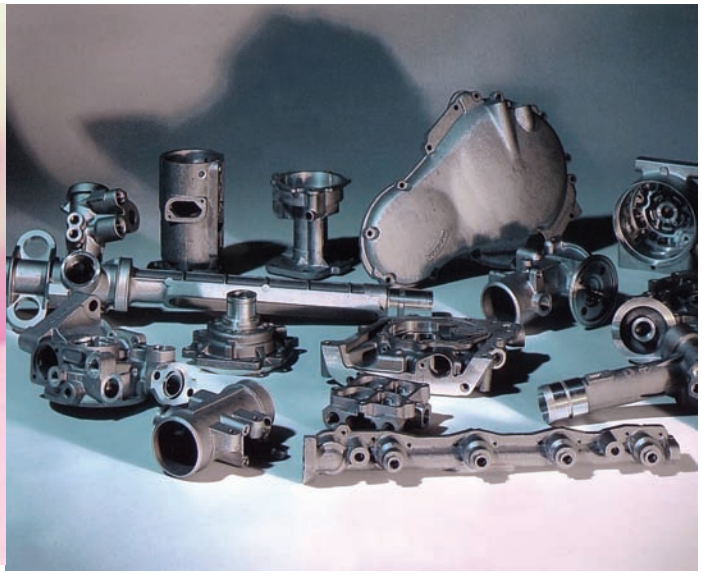
Rexeal 100 has achieved qualified product status to various international test standards

European Waste Electrical Electronic Equipment and Restriction of the use of Hazardous Substances Directives

The formulation of Rexeal 100 complies with the EU Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), in that the formulations do not include harmful substances:

And finally - we care





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