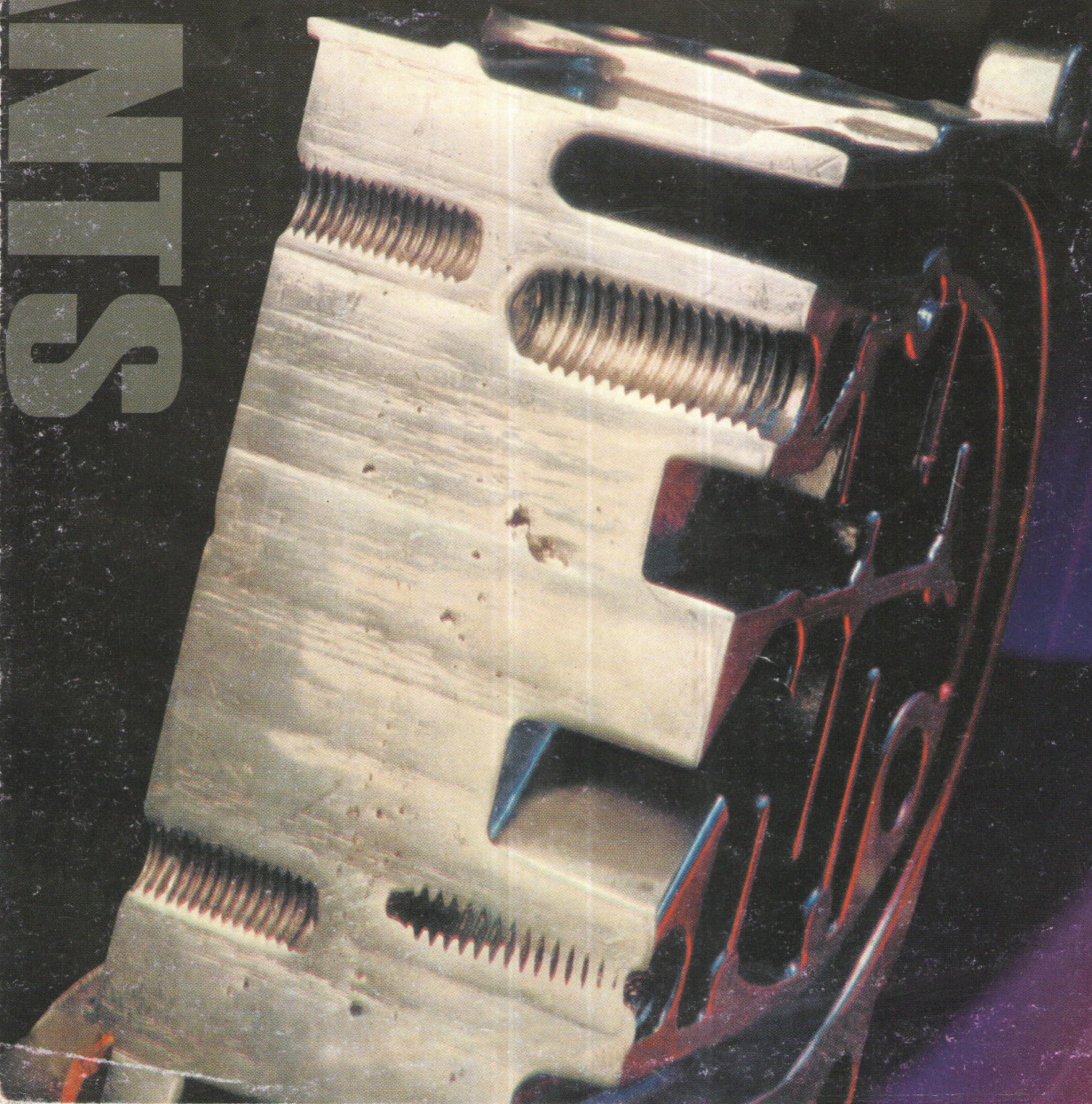


SEALANTS



N. S. Industries

for sealing of micro porosity in metals



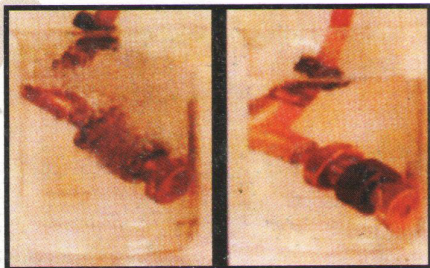
The Ultraseal Range of Porosity Sealants

Ultraseal India makes a range of patented impregnation sealants. The latest generation of sealants used are the Thermocuring Methacrylate range. PC 504/66 I and the new range of Ultraseal sealants under development have been formulated for components which operate at elevated temperatures. They combine high sealing performance with excellent stability at elevated temperatures. Ultraseal sealants polymerise when exposed to a temperature of 90 deg. C. (194 deg. F.) for 10 minutes.

Performance Sealing

As a guideline Ultraseal series sealants will fill porosity of up to 0.30 mm (0.012 in) dependent on the thickness of the relevant wall section.

The effectiveness of the Ultraseal series sealants has been proved under laboratory conditions in a series of tests using a powder iron Ultraseal test ring. In each case the ring was approximately 20 percent porous, which included fine and gross porosity. After treatment with the Ultraseal series of sealants the test ring were airtight when pressurised to 6 bar. Independent tests conducted on various castings used in a wide range of applications have confirmed the superior sealing performance of the Ultraseal Sealants.



Sintered metal rings before and after Impregnation with Ultraseal Sealant, when pressurised at 6 bar.

Sealant Performance at Elevated Temperatures

The Ultraseal Series of sealants have been specially developed to achieve and maintain excellent sealing results at elevated temperatures. After impregnating the Ultraseal Test ring with the Ultraseal series sealants, the rings were subjected to 300 deg. C. for 24 hours. When pressure tested, these rings exhibited superior sealing results in comparison to that obtained from rings impregnated with previous methacrylates. Ultraseal sealants have been independently evaluated and accepted as the most suitable sealant for the impregnation of aluminium cylinder heads by several international automotive manufacturers.

Drainage

During laboratory checks in the case with which sealant drained from an aluminium test piece, the

performance of Ultraseal sealants was set as a standard with a drainage factor of 1. In the same test Ultraseal sealants recorded only 0.83. because of its improved drainage in practice. Ultraseal sealants will exhibit very low material consumption when sealing porous components.

Washability

All Ultraseal series sealants wash away easily with clean cold water. This excellent washing performance facilitates a high standard of cleanliness on components, including machined surfaces and tapped holes.



Ultraseal Sealant washes away easily from the surface of an aluminium test piece.

Chemical resistance

Cured Ultraseal sealants are thermoset, cross linked materials and therefore have excellent chemical resistance to attack from water, motor oil, antifreeze, transmission fluid, hydraulic oil, petrol and many other chemicals. A full list is available on request.

More information

Detailed technical data sheets will be available on request.

The Ultraseal Series Sealants

Thermocuring methacrylates Performance:

- Seals micro and gross porosity in all materials.
- Excellent resistance within castings to high pressure, stress, flexings and high temperature.
- High resistance to most chemical environments.
- Low viscosity therefore more effective sealing.

Process:

- Simple two-chemical system sealant and catalyst, supplied in single pack or two pack form.
- Surplus sealant washes away easily with water.
- No known environmental side effects. Sealant is biodegradable & can be disposed off in municipal sewers.
- High flashpoint.
- Low shrinkage on polymerization assuring a perfect seal.
- Short process and cure time.

After curing, castings may be tested and assembled.

- Simple process equipment & sealant control procedures.

- No aeration needed : Sealant remains stable at ambient temperatures of 25 deg.C.(77 deg.F.) indefinitely.
- Suitable for use by wet vacuum, dry/ wet vacuum and pressure impregnation techniques.
- Equipment designed for sodium silicate, polyester or anaerobic impregnants can be simply converted to use Ultraseal sealants.

Conclusion

We believe that the Ultraseal sealing system best meets current production requirements for a fast, simple and cost effective process with a high success rate that can be used for batch production or flow-line systems.

General Impregnation Issues

(1) Cost Effectiveness

Due to the high performance and simple operation of the Ultraseal process it is more cost effective to impregnate porous castings rather than scrap them, particularly if the castings are in an expensive machined condition. Engineers in the automotive industry calculate that if 5 per cent of high volume components regularly fail their initial pressure tests, then the economics of 100 per cent impregnation become attractive. This can enable pressure testing to be limited to either just samples or on final assembly.

(2) Quality assurance

Due to the cost advantages following the introduction of advanced automatic impregnation technology developed by Ultraseal, major volume users of castings are now able to consider 100 per cent impregnation of their components to meet stringent production demands such as those of 'Just in Time' and 'Zero Defect' programmes.

Living with porosity

Knowing the facts

Although over 30 years have now passed since impregnation began to play an important everyday role in industry, generally there is still little known as to arguments for and against the various impregnation systems. By "knowing the facts" a better judgement can be made enabling the right choice for the right reasons. The information compiled in this brochure has been carefully assembled so as to be factual and informative.

We acknowledge that whilst other impregnants such as epoxies, pheolics and polyester resins have made their mark in the history of impregnation, their use is now rare, therefore we have concentrated on the two main systems in use today -namely Sodium Silicate and Acrylic Sealants (Ultrasal PC 504/66 I).

To understand the process of impregnation, it is equally important to understand the problem-'porosity'.....

What is porosity

For a long time engineers have been aware of the problems caused by cavities in metal castings. The high magnification photograph on the front cover shows a typical example of such cavities. The problems caused from porosity defects are many.

The main concern is the porosity across the wall of the casting allowing liquid or air to pass through it.

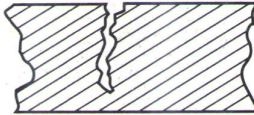
As is known, porosity originates when the metal is cast, particularly in the manufacture of intricate alloy castings. In addition to gassing and the formation of air bubbles within the metal structure, it is in the cooling down of the metal when shrinkage cracks & cavities are formed. The majority of castings produced contain such defects and are often undetected by the naked eye.

Porosity in castings can be divided into three categories:-



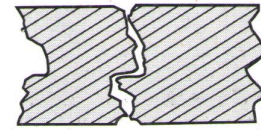
Enclosed Porosity

a problem only if opened up by machinery operations.



Blind porosity

can cause spotting out of plating and blow out of paint finishes.



Through Porosity

which will allow the passage of liquid or air through the wall. It is the last mentioned that concerns us most. As can be seen here, the size of porosity need bear no resemblance to that seen on the surface. A large cavity on the surface can shrink to something much smaller (Fig. A) and vice versa, (Fig. B) but the resultant leakage could be the same.

FIG.A

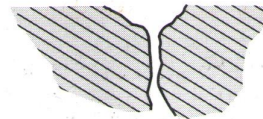
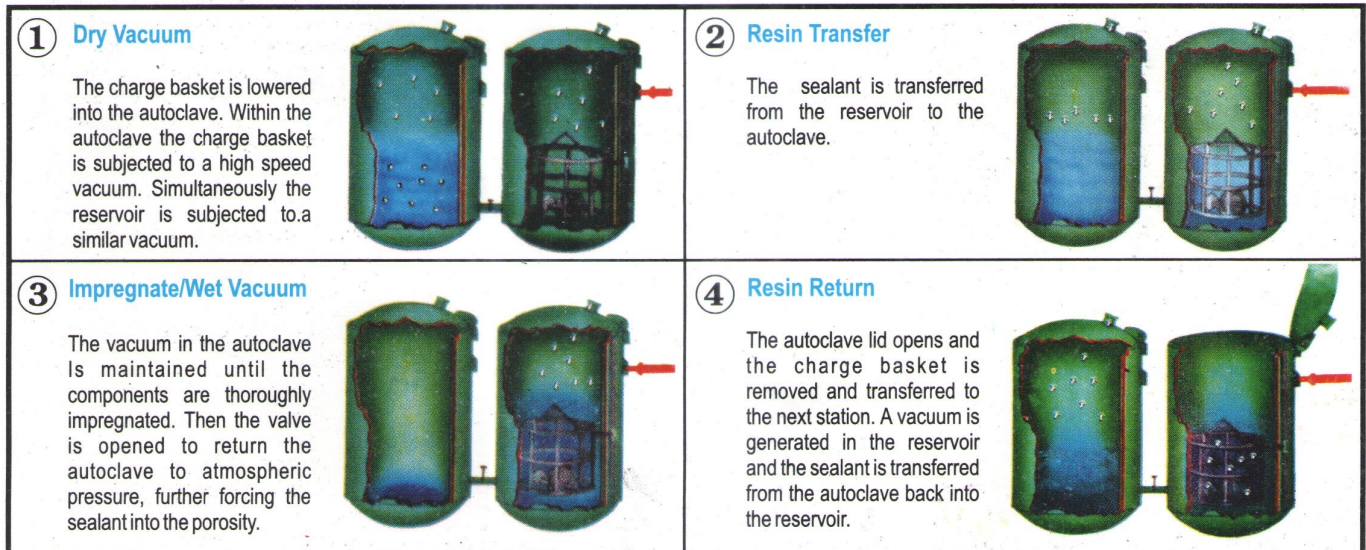


FIG.B



The process

The Ultrasal Resin Transfer System (R.T.S) employs a separate sealant reservoir and autoclave in dry/wet vacuum impregnation cycle.



The subsequent treatment cycles follow :

Drain

With the basket hoisted over the drain station, the low viscosity sealant drains quickly and is returned to the autoclave. An automatic rotational drain station is available as an option.

Wash

The components are washed by agitation, room temp. water, to remove residual sealant from the component surfaces.

Cure

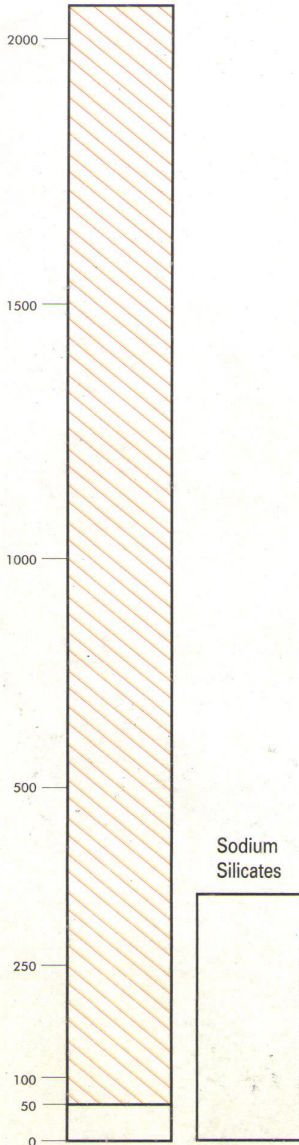
Finally, the process basket is lowered into water maintained at 90 deg. C. for 10 minutes allowing the sealant to polymerize. The components are now ready to use.

The whole process takes 30 minutes & the components can be used or pressure tested immediately. On a continuous production cycle with batch processing, one operator can process upto 4 baskets an hour.

Leak Rate

3000

Polyester/Anaerobic Sealants



The illustration show the range of typical leak rates (ml/min at 3 bar) that can be sealed with the various impregnants.

Key Technical Properties

Product Composition	PC 504 / 66 I Sealant
	Polyfunctional methacrylate monomer
Uncured Properties	
Colour	--- Clear, Pale Straw Coloured---
Viscosity at 25 deg.G	
Seta-Zah No.1 Cup. sec.	31+1
Flashpoint (PMCC) deg.C.	>98
Specific gravity at 25 deg.C.	1.003 - 1.009
Odour	-----Mild-----
Flourescent	-----Yes-----
Surface tension at 25 deg. C. dyne/cm	34
Gel time at 90 deg.C. (0.2% AZDN Catalyst)	-----Approximately 3 minutes-----
Pot life	Indefinite under recommended operating conditions
Cured properties	
Temperature range	-50 deg. C.+ 250 deg. C.
Pressure resistance	Greater than 815 bar (12,000 psi) Pressure strength of the impregnant is equal to structural strength of the parent metal
Chemical resistance	Includes Freon gases, acids, hydraulic fluid, oil, water, steam, alkalis, antifreeze, and most petrochemical products. Further, information, provided on request.
Electrical resistance Surface resistivity @25 deg. C. and 75% RH to BS771	----- Greater than 10 to the power of 14 Ohms -----
Electrical strength BS 771	---- Approximately 150 KV centimetres ----
Dielectric constant	Approximately 3 @ 50hz, 2.5 at 9 Hz
Co-efficient of liner expansion ASTM D696-79	0.000134 per deg. C.
Shrinkage on polymerisation % volume	1.1
Heat Stability/ temperature resistance % wt loss 1 hour at 200 deg. C.	1.4
Sealing performance	Excellent



N. S. Industries

Manufacturers of : Fire Fighting Equipments and Engineering Works

Gala no. 24, Buddhisagar Premises CISL, Gokhiware Village, Chinchpada, Vasai (E), Thane - 401 208.