



Ceramic Systems

Innovative Cerpofix™ Ceramic/Epoxy Resin Technology

Filler and Topcoat Systems

September 2015

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Introduction

With the invention and availability of polymeric engineering products in the 60's and 70's, the refurbishment of fluid-flow equipment such as valves, pumps and heat exchangers has been very successful and cost-effective. This technology has been so successful that it is now widely used for the refurbishment of old equipment as well as new. There are two main traditions:

1. Glassflake polyester/vinylester systems

Main advantages:

- Abrasion/chemical/temperature resistance
- Excellent resistance to under-cutting/cavitations
- Machinable
- Providing a very smooth topcoat to reduce drag, improve performance/output and reduce power consumption; efficiency of around 4% can be achieved

2. Ceramic epoxy systems

Main advantages:

- Exceptional abrasion resistance
- Excellent resistance to under-cutting/cavitations
- Machinable
- Very high gloss and super smooth finish (no need for special topcoats), improves the performance/output by as much as 4-9% hence reducing power consumption/energy use and offering major cost savings. Unlike uncoated pumps, where efficiency falls year by year, performance of **Chemco** coated pumps remains constant for many years

It can be concluded from the above that both systems are capable of delivering exceptional value as they prolong the life of equipment cost-effectively. The main difference between the two systems is the **solvent-free** nature of the epoxy systems which can be of great benefit. The main advantage of the glassflake vinylester system is the exceptional chemical resistance at low pH, i.e. acidic environment, especially if that is at high temperatures. Utilising both technologies only available from **Chemco International**, rather than relying on only one technology, can cover all applications across the board.

Specification Guide for Ceramic System

The use of primer is optional and it depends on the surface preparation standard. Products can be applied direct to metal if minimum surface preparation standard of Sa2.5 with minimum surface profile of 75 μ is achieved.

	Application	Coating	Product		Specification
System 1	Ambient temperature & mild chemicals e.g. sea water	Primer	Epo-chem™ RS 500P	Solvent-free wet/surface tolerant epoxy primer	- 100 μ of RS 500P - Fill up the cavities/cracks/pitted areas by RH 500 - 200-400 μ of RP 500
		Filler/Putty	Ceram-chem™ RH 500	High density machinable epoxy putty	
		Topcoat/Sealer	Ceram-chem™ RP 500	Epoxy composite incorporating Cerpofix™ Hi-performance composite	
System 2	Medium temperature & aggressive chemicals	Primer	Epo-chem™ RE 500P	Solvent-free surface tolerant epoxy Novolac primer	- 100 μ of RE 500P - Fill up the cavities/cracks/pitted areas by RT 500 - 200-400 μ of RU 500
		Filler/Putty	Ceram-chem™ RT 500	High density / High temperature machinable epoxy putty	
		Topcoat/Sealer	Ceram-chem™ RU 500	Epoxy Novolac incorporating Cerpofix™ Hi-performance composite	
System 3	High temperature & aggressive chemicals	Filler/Putty	Hot-cote™ RE 900	High density / High temperature machinable epoxy compound	- Fill up the cavities/cracks/pitted areas by RE 900 - 200-400 μ of RF 900
		Topcoat/Sealer	Hot-cote™ RF 900	High temperature solvent-free ceramic epoxy	
System 4	Abrasion resistance lining	Primer	Ceram-chem™ RE 500P	Solvent-free surface tolerant epoxy Novolac primer	- 100 μ of RE 500P - 2mm of InD-cote™ apply by trowel - 200-400 μ of RU 500
		Filler/Putty	InD-cote™	Abrasion resistant lining	
		Topcoat/Sealer	Ceram-chem™ RU 500	Epoxy Novolac incorporating Cerpofix™ Hi-performance composite	

Ceram-chem™ RH 500

A high density, **solvent-free epoxy filler/putty/renewal compound** designed to fill/repair cavities, cracks and heavy pitting. Specially formulated for repair of all fluid-flow equipment as a filler, build-up coat. The material cures rapidly to form an extremely tough machinable finish with excellent resistance to abrasion and cavitation. It is designed for applications where temperatures may be up to **80°C**. All irregularities/metal loss areas are filled using the product. It can then be machined to the required thickness/tolerance prior to application of topcoats such as **Ceram-chem™ RP 500** or **RU 500**. It is very easily applied by trowel, spatula or brush to any thickness or depth without cracking.



10mm mild steel plate, gap prepared by hand grinder and Ceram-chem™ RH 500 putty applied with a spatula.



Ceram-chem™ RP 500

This is a two pack, **solvent-free**, ceramic epoxy **topcoat** which provides an extremely hard wearing, very smooth, low friction surface for all fluid-flow environments. It has an excellent chemical resistance and is used for **general chemical environments**, such as **petroleum** or **sea water** and designed to handle temperatures up to **70°C**. It is easily applied by brush, roller or airless spray (in specific circumstances). **FDA approval** for drinking water and food contact.

Ceram-chem™ RP 500 is used as a single or multiple coat system with no over-coating time limitation.



Fire pump repair:

Product: **Ceram-chem™ RP 500**



Ceram-chem™ RT 500

A high density, **solvent-free**, high temperature Novolac epoxy putty designed to fill cavities, cracks and heavy pitting. Cerpofix™ renewal compound is specifically formulated to rebuild all types of fluid-flow equipment as well as for general purpose rebuild/filling repairs. The material cures rapidly to form an extremely tough machineable finish.

Recommended to be used in conjunction with **Epo-chem™ RE 500P** (primer) and **Ceram-chem™ RU 500** (topcoat) for a complete repair system.



Applying Ceram-chem™ RT 500 putty by spatula/plastic applicator/scrapper

Ceram-chem™ RU 500

This is a two pack **solvent-free** ceramic epoxy Novolac **topcoat** which has similar qualities to **Ceram-chem™ RP 500**, i.e. it provides a very smooth, low friction surface. It is ideal in **extremely corrosive** environments and offers excellent resistance to the combination of **aggressive chemicals and high temperatures up to 130°C**. It may be applied by brush, roller or airless spray (in specific circumstances).



Equipment: High pressure
multi-stage impeller

Product: **Ceram-chem™ RU 500**



Hot-cote™ RE 900 (renewal compound)

This is a two pack, **solvent-free**, high temperature epoxy **putty**, designed to fill cavities, cracks and heavy pitting. It is specifically formulated for repair and renewal of all types of fluid-flow equipments operating at temperatures up to **250°C**. It offers an extremely tough machinable finish with excellent resistance to abrasion and cavitation. All irregularities/metal loss areas are filled in using this product. It is then machined to the required thickness/tolerance prior to the application of the topcoat, **Hot-Cote™ RF 900**. It is very easily applied by trowel, spatula or brush to any thickness or depth without cracking.



Hot, pitted exhaust pipe before application



Hot-cote™ RE 900 being applied by brush on a hot, pitted exhaust pipe. Surface prepared by sander/grinder

Hot-cote™ RF 900

This is a high temperature, two pack, **solvent-free** ceramic epoxy **topcoat** which can be used in situations where there is a **combination** of very **aggressive chemicals** and **very high temperatures** up to **220°C**. It is an extremely hard wearing, very smooth, low friction surface for repair and renewal of all fluid-flow environments operating at high temperatures. It can be applied by brush, roller or airless spray (in specific circumstances).



Nuclear Power Station fan repair

Hot, corrosive air @ 180°C

Hot-cote™ RF 900 topcoat

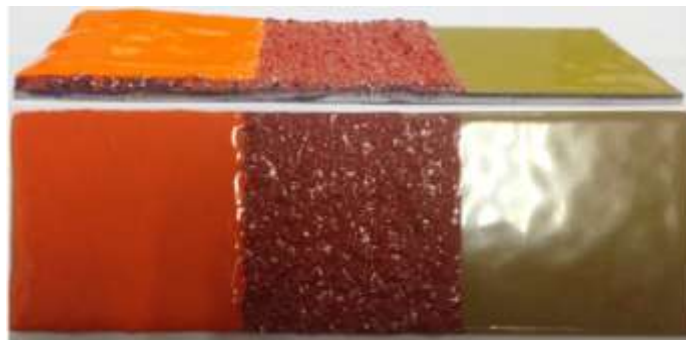


InD-cote™ (Abrasion Resistance Lining)

A high density, **solvent-free**, high temperature Novolac **epoxy lining** designed for very aggressive abrasive environments. A seamless, repair and protective coating compound for long-term protection. Especially formulated for fluid-flow equipment, hoppers, nozzles, chutes, vessels, pipe bends and deflector plates, etc. Recommended to be used in conjunction with **Epo-chem™ RE 500P** (Primer) and **Ceram-chem™ RU 500** (topcoat/sealer) for a complete repair system.



Applying InD-cote™ by trowel



RU 500 as sealer

2mm of InD-cote™
applied by trowel

RE 500P primer

Examples of Ceramic Systems in use (Worldwide)

Water Pump Repair 1 (Netherlands)

Coating Application: Ceram-chem™ RH 500

Ceram-chem™ RP 500



Water Pump Repair 2 (Netherlands) – After three years in service

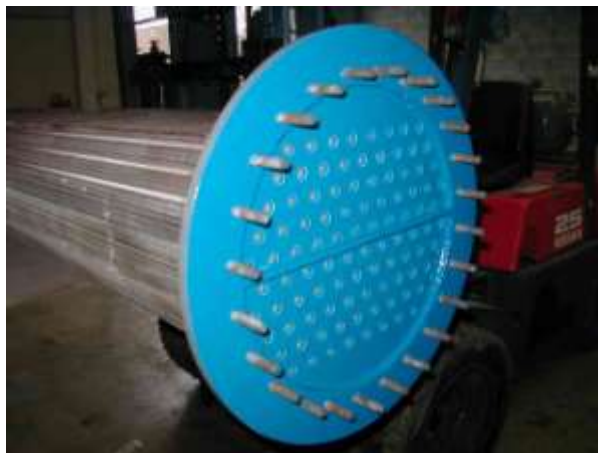
Coating Application: Ceram-chem™ RH 500

Ceram-chem™ RP 500



Heat Exchanger (Belgium)

Coating Application: Ceram-chem™ RP 500



Atlas Copco Cooler Housing (Netherlands)

Coating Application: Ceram-chem™ RU 500



Hydro Electric Power Station Spiral Pump Repair (UK)

Coating Application: One coat of surface tolerant **Epo-chem™ RA 564**
Badly damaged areas and pitted surfaces filled with **Ceram-chem™ RH 500**
One coat of **Ceram-chem™ RP 500**



Before Application



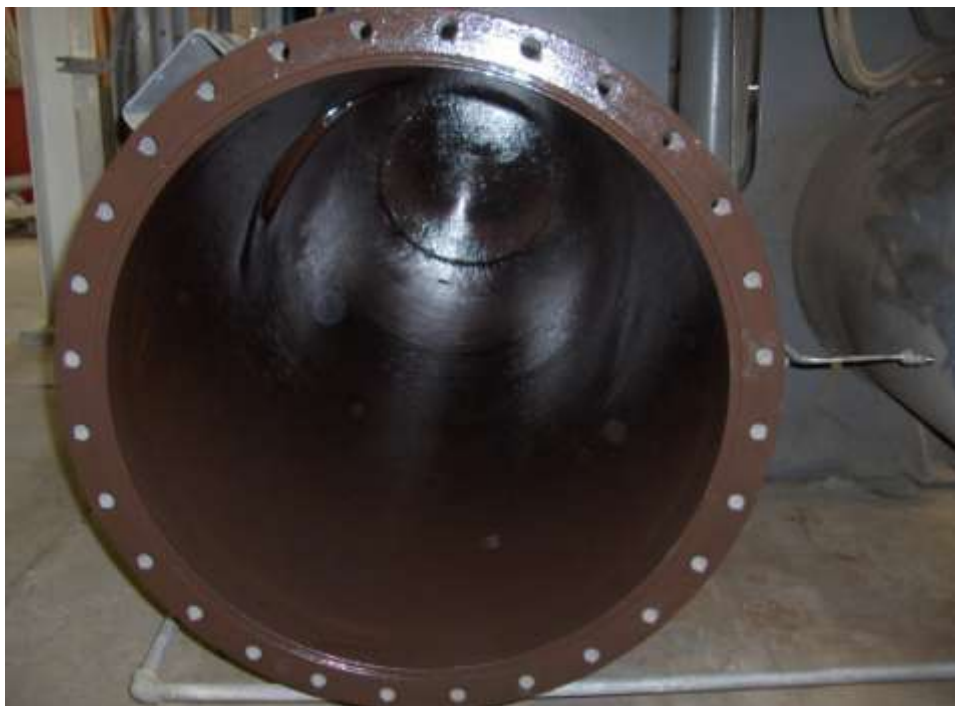
After Application

Three-stage turbo compressor (Belgium) – Operating @ 180°C

Coating Application: Three coats of Hot-cote™ RF 900 applied by roller



Before Application



After Application

Split Case Pump Refurbishment (Belgium)

Coating Application: External coating: **Epo-chem™ RL 500PF**
Internal coating: **Ceram-chem™ RP 500**



Large Concrete Pump Volute (Belgium)

Coating Application: One coat of **Ceram-chem™ RP 500 - green**
One coat of **Ceram-chem™ RP 500 - blue**



Methane Gas Impeller (Australia)

Coating Application: One coat solvent-free, wet & rust tolerant epoxy
Epo-chem™ RS 500P (primer)
One topcoat of Ceram-chem™ RP 500



A-frame and Bow Thruster Tunnel Repair (UK) Corrosion/cavitation damage repair in dry dock

Coating Application: One coat solvent-free, wet & rust tolerant epoxy
Epo-chem™ RS 500P (primer)
One build-up coat of **Ceram-chem™ RH 500**
One topcoat of **Ceram-chem™ RP 500**

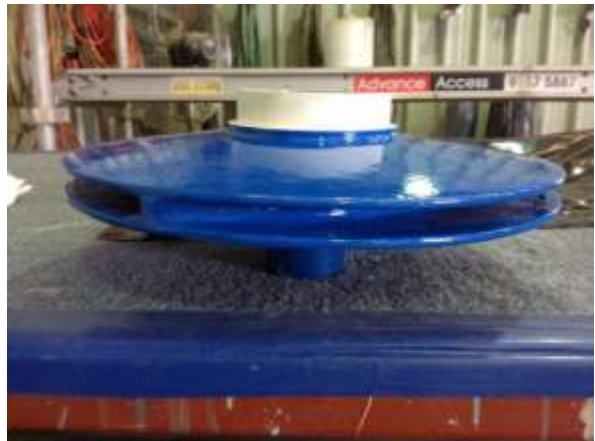
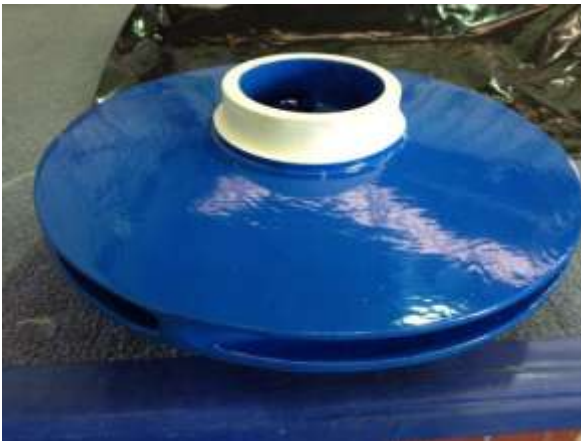


Impeller Refurbishment (Australia)

Coating Application: One coat of Chem-tect™ RB 300
One coat of Epo-chem™ RS 500P
One coat of Ceram-chem™ RP 500



Before Application



After Application

Cooling Water Pump (Belgium)

Coating Application: Three coats of Ceram-chem™ RP 500



After 10 years in service



After Refurbishment

Appendix 1

Certificates and Approvals

1.1 FDA Approval – Food Contact – Ceram-chem™ RP 500



Food Contact Plastics Certificate of Conformity with the Test Requirements of USA FDA Code of Federal Regulations (CFR21) Section 175.300 (Resinous and Polymeric Coatings).

Certificate no: 2013/5092

Product Name:	'RP 500'	Date of Issue:	17 October 2013
Manufacturer/ Supplier:	Chemco International	Pira Reference No:	13A12J5514
Address:	East Shawhead Industrial Estate Coatbridge Scotland ML5 4XD		

Samples of the above product have been found to comply with the following requirements, as specified in sections (1) of the USA FDA Code of Federal Regulations CFR21 Section 175.300 (Polyethylene Phthalate Polymers).

- The chloroform soluble portion of a distilled water extract of the food contact surface of the sample shall not exceed 0.5 mg per square inch when tested using extraction conditions of 24 hours at 120°F.
- The chloroform soluble portion of an n-heptane extract of the food contact surface of the sample shall not exceed 0.5 mg per square inch when tested using extraction conditions of 0.5 hours at 70°F.

Accordingly, the above sample is in compliance with the test requirements specified in the USA FDA Code of Federal Regulations CFR21 Section 175.300 (1) and is suitable for use in packaging, transporting or holding all non alcoholic foods, at temperatures not to exceed room temperature.

A handwritten signature in cursive script, appearing to read 'Allison Chambers'.

Certified by: Allison Chambers
Senior Analytical Chemist
Analytical Services

1.2 FDA Approval – Fresh Drinking Water – Ceram-chem™ RP 500



Food Contact Plastics Certificate of Conformity with the Test Requirements of USA FDA Code of Federal Regulations (CFR21) Section 175.300 (Resinous and Polymeric Coatings)

Certificate no: 2013/5093

Product Name: 'RA 500M / RP 500'
Date of Issue: 17 October 2013
Manufacturer/Supplier: Chemco International
Address: East Shawhead Industrial Estate
Coatbridge
Scotland
ML5 4XD
Pira Reference No: 13A12J5514

Samples of the above product have been found to comply with the following requirements, as specified in sections (1) of the USA FDA Code of Federal Regulations CFR21 Section 175.300 (Polyethylene Phthalate Polymers).

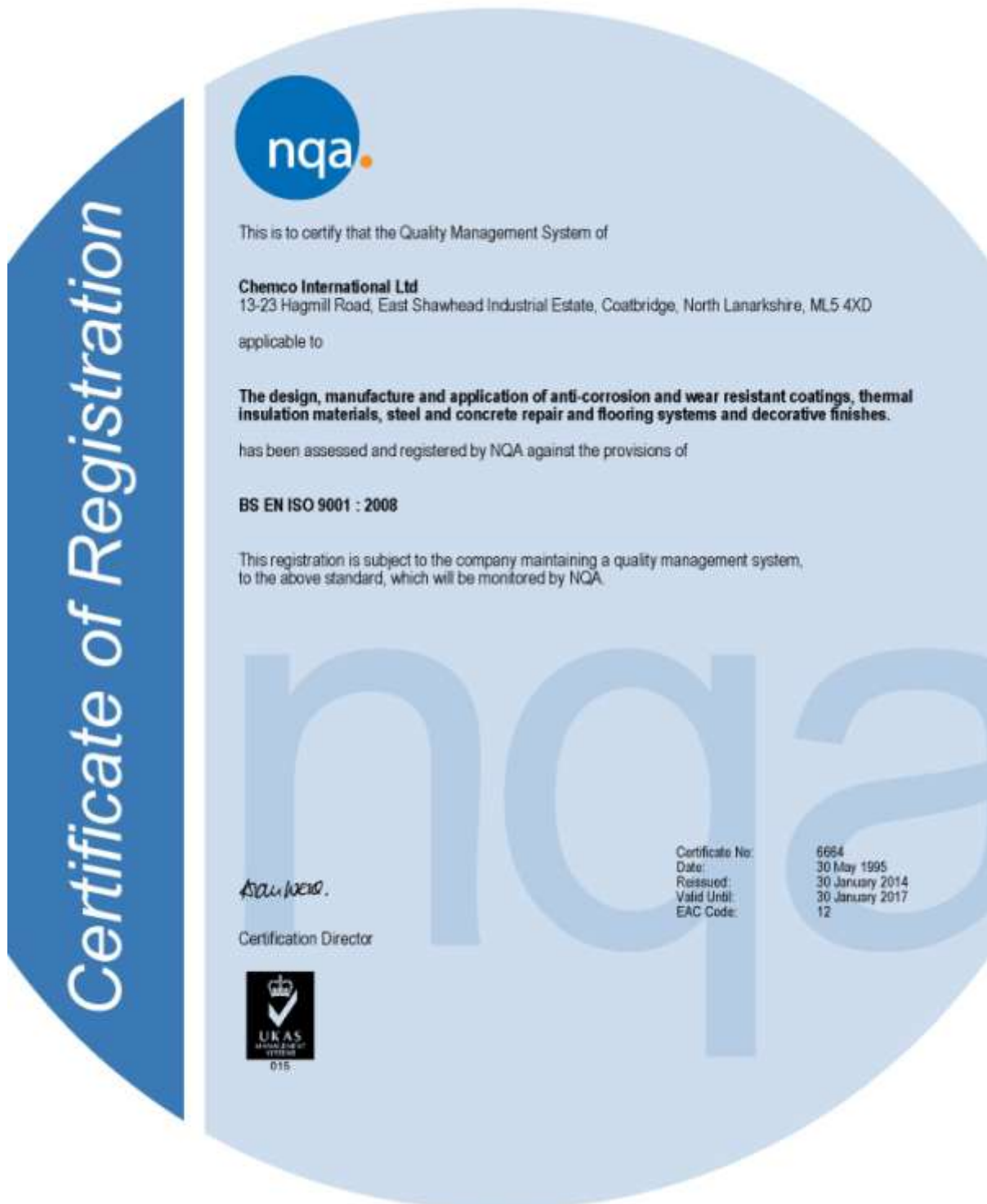
- The chloroform soluble portion of a distilled water extract of the food contact surface of the sample shall not exceed 0.5 mg per square inch when tested using extraction conditions of 24 hours at 120°F.
- The chloroform soluble portion of an n-heptane extract of the food contact surface of the sample shall not exceed 0.5 mg per square inch when tested using extraction conditions of 0.5 hours at 70°F.

Accordingly, the above sample is in compliance with the test requirements specified in the USA FDA Code of Federal Regulations CFR21 Section 175.300 (1) and is suitable for use with fresh drinking water, at temperatures not to exceed room temperature.

A handwritten signature in cursive script, appearing to read 'Allison Chambers'.

Certified by: Allison Chambers
Senior Analytical Chemist
Analytical Services

1.3 Chemco ISO 9001:2008 Quality Management Certification



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