

Unique Polymers Applications



UniquePolymerSystems.com

The Engineer's Choice

... for Solutions

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INTRODUCTION

Unique Polymer Systems (UPS) is an energetic and ambitious organization with unique products and services geared towards problem solving in the industrial world.

UPS has carefully positioned itself to provide much needed relief to industry through its unique repair and maintenance products, kits, and systems.

UPS products make use of advanced polymer science and technology that save industry tremendous amounts of money, time and frustration through permanent repairs that make replacement unnecessary. **UPS** means polymer science and technology.....at its BEST!

Machinery, equipment, buildings and structures represent billions in finances of investment to industry, and they are all at the mercy of the elements.

Moisture, stress, weatherization, use and abuse constantly devalue these investments around the clock, day in and day out. replacement is never a permanent solution - sometimes not even possible - and it's always costly.

UPS's metal repair kits, pump rebuilding systems, and high performance coatings save industry time and money by making replacement unnecessary, outside contracting obsolete, and downtime almost negligible

UPS's innovative products are marketed worldwide through a network of independent, exclusive, and highly trained industrial distributors who, in turn, establish their own local networks of similarly trained and exclusive industrial consultants.

They offer around-the-clock local technical support, advice, training in field, shop or plant, and solutions to challenging repair and maintenance problems.

In a world based on tackling real problems and interfacing with real people every day, one cannot go far without providing real solutions.

We cannot emphasize training enough!

Our industrial distributors and industrial consultants undergo vigorous training on an ongoing basis.

Creation and dissemination of new information on products and applications on a timely basis is the most important part of these training seminars.

Challenges and problems of the industrial world are never to be underestimated - but then neither are **UPS's** innovative, exciting research programs, and unique products.

We supply: Power Plants and Utilities (Nuclear, Hydro, Coal, Gas, Oil and Others); Pulp and Paper; Marine (Military and Merchant); Shipbuilding and Repair Facilities; Petrochemical; Chemical; Food Processing; Mining and Quarrying; Institutions (School Systems, City Halls, Government, Hospitals); Commercial (Office Buildings, Shopping Malls, Hotels); Manufacturing; Agriculture; Textiles.

The Product Range UPS Engineering Polymers:

Metal Repair System Products:

UPS105 Super Metal Rebuilding System
UPS110 Fluid Super Metal Rebuilding System
UPS19060 Plasteel / Plasbronze Rapid Metal Stick Grade
UPS19060UW Plasteel / Plasbronze Rapid Under Water Metal Stick Grade
UPS115 Extended Life Super Rebuilding System
UPS19065 Rapid Metal Rebuilding System

Ceramic Coating and Repair System Products:

UPS200 Engineering Grade Erosion / Corrosion Repair System
UPS205 Fluid Grade Erosion / Corrosion Repair System
UPS240 Heavy Duty High Abrasion Resistant Protection System
UPS210 Smooth Low Friction Protection System
UPS220 High Temperature Corrosion Protection System
UPS230 Thixotropic Cavitation Resistant System
UPS235 Brush Grade Flexible Ceramic System
UPS206 Acid Resistant Ceramic Coating

Elastomeric / Rubber Repair Systems:

UPS305 Engineering PASTE Grade Flexible Repair Protection System '60' Durometer
UPS300 Abrasion Resistant FLUID Grade Flexible Repair Protection System '60' Durometer
UPS310 Elastomeric Rapid Repair System Paste Grade '60' Durometer
UPS075 Rapid Elastomeric Repair System '75' Durometer
UPS325 Abrasion Resistant BRUSH Grade Flexible Repair Protection System '80' Durometer
UPS320 Tough Abrasion Resistant Flexible Repair System '80' Durometer
UPS315 Fluid Grade Flexible Casting & Moulding Repair System '80' Durometer



The Product Range UPS Engineering Polymers:

GRP Repair Systems:

TRK19000 Lifeboat Resin
TRK19000 Standard Resin & Hardener

Adhesives:

TRK19002 General Purpose Industrial Adhesive

Pipe Repair

UPSTRK19601 / 3 / 4 / 5 Rapid Grade Pipe Repair Bandages

TRKTA445 Re-usable emergency pipe repair

Pre Packed Engineering Kits:

TRK11000 Engineers A Kit
TRK13000 Top UP For A Kit
TRK17000 Life Boat Repair Kit
UPS2006 Large Pipe Repair Kit

Accessories

Why UPS Polymer Products?

There are many manufactures of polymers – some good some not so good –

At Unique Polymers we pride ourselves by only supplying the BEST of the BEST.

We go through VERY rigorous selection procedure that involves making site visits to manufacture – looking at the R&D sections – looking at the manufacturing process – meeting the people.

We do not JUST accept written documents at face value – we always check so that ensures that you are buying an authorised product.

Price is of course very important when making purchasing choices BUT we feel that there are many other considerations when making your important decision.

After all the MOST costly party of using polymer coating and repair products is the PREPARATION time spent. There is nothing worse than investing highly in good surface preparation only to then apply the cheapest product that may fail or wear out early.

So we would respectfully suggest that some thought and consideration is also given to the following:

- Price**
- Delivery**
- Quality**
- Service**
- Warranty**
- Professional Assistance
- Product Choice (we have found that some manufactures just focus on one or two versions of a product and you have to MAKE DO. With UPS we offer most of the solutions available)
- Manufacture Choice (we offer the BEST manufactured product from many manufactures. This allows us to give the BEST solution form a variety of sources)
UPS can offer the following BENEFITS that will help your choice be the best it can be.

- Manufactured in UK
- ISO9001 Manufacturing
- ISO4001 Manufacturing
- FULL Product Traceability
- Product Availability Ex Stock – Max 14 days
- UPS Dedicated to providing and finding Engineering Solutions
- Full Technical Support
- R&D section always looking and able to help with application problems
- Full Product Training Available
- Sales Training
- Application Training
- Exclusive POLYMER Technology using state of the art Product Knowledge
- Most Comprehensive Product Range available on the market today
- World Wide Coverage
- Over 80 years experience in the Industrial and Marine sectors
- ASTM Testing procedure
- In-House Testing facility Batch Process
- All products Solvent Free
- Most Maintenance problems are provided with a SOLUTION
- Widest variety of product choice



Whatever the business or building, there is a NEED for the UPS range of polymer products to be used in some capacity, whether it be in PROTECTION, REPAIR or simply providing acceptable finish.

REPAIR:

UPS Polymer Products can offer SOLUTIONS to a huge variety of problems.

These products can offer a wide range of advantages over conventional or alternative solutions.

COST EFFECTIVE: Repairs completed at a fraction of the cost of replacing the damaged component.

For Example : UPS105 Metal Tech Repair used to repair a shaft that will cost \$1000's to REPLACE.

IMPROVED PERFORMANCE: High performance compared to solutions.

For Example UPS210 can add low friction characteristics to even very smooth metal surfaces.

OVERCOME RESTRICTIONS: Customers environment or application may prohibit the use of conventional solutions, or may demand materials that have been approved to certain specifications.

For Example: UPS19601 Pipe Repair Bandage can get the plant BACK TO PRODUCING IN A MATTER OF MINUTES

UPS315 can be used to make a NEW PART by moulding.

PROTECTION: Surfaces can suffer from a bewildering number of sources both MECHANICAL and CHEMICAL.

For Example: Weather – Chemicals – Abrasion – Erosion – Cavitation -

There are UPS products that can offer DURABLE HIGH PERFORMANCE protection to a wide range of substrates, which will suffer attack from these and many other sources.

The PROTECTED surface will last LONGER, increasing the MAINTENANCE FREE PERIOD and MTBF (Mean Time Between Failure) for the customer, which reduces any future loss of production due to down time.

In addition to protection, Unique Polymer Products can often provide further benefits over the alternatives.

COST EFFECTIVE: The protection can be offered at a fraction of the cost of conventional systems.

For Example: Use of the UPS105 Metal Repair systems to repair a wide range of plant and equipment without the need and high cost of replacement parts.

IMPROVED PERFORMANCE: High performance compared to conventional solutions.

For Example use of the cavitation resistant polymer as coating in stead of high cost of exotic hard materials.

OVERCOME RESTRICTIONS: Customers environment or application may prohibit the use of conventional solutions, or may demand materials that have been approved to certain specifications.

For Example UPS210 Ceramic is approved for use with intimate contact with food products where the application or use of other material could be prohibited.

The 8 Steps For Successful and Full Life Applications

1. Fitness for purpose
2. Joint design
3. Surface Preparation
4. Product mixing
5. Applying
6. Curing
7. Service conditions
8. Inspection and touch up

Chapter #1 The Chemistry

The repair and protection of metal and rubber components is an ongoing maintenance priority, consuming a great deal of time and money.

While current techniques such as welding, flame spraying and cladding offer some solutions, they do not provide a satisfactory answer to the question: How can repairs be made in-house without special application equipment?

Unique Polymer Systems with its component systems Metal, Ceramic, Adhesive and Rubber Repair Systems, offers an economic alternative to established engineering repair/protection programmes.

UPS Metal-Tech and Cerami-Tech Engineering Products are a range of cold curing metal repair and rebuilding materials based on the latest polymer resin technology with years of practical experience. UPS's range of Flexi-Tech products are cold vulcanising, elastomeric repair materials for use on rubber and other flexible components. UPS Engineering Products are compatible with all ferrous and nonferrous metals as well as most plastics, and have proved themselves as permanent repairs. UPS products have excellent chemical resistance and are suitable for permanent immersion in many environments including sea water, hydrocarbons, oils and a vast range of chemical solutions.

When properly selected and combined at the specified mixing ratio, UPS Metal-Tech, Cerami-Tech and Flexi-Tech repair systems will harden to form long lasting, corrosion resistant, wear resistant composites and flexible composites.

UPS Engineering repair systems are easy to apply requiring no specialized equipment. UPS Engineering Repair and Resurfacing Systems are a two component products, a Base component and an Activator component which when mixed together begin a molecular chain reaction to produce a strong permanent repair saving the engineer downtime compared with traditional repair methods.

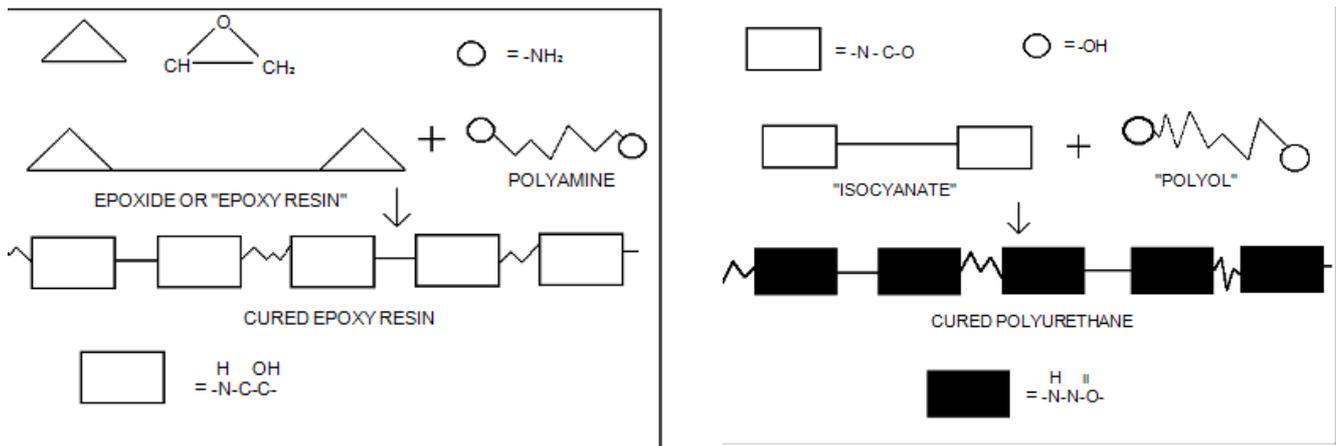


Note: FG = Fluid Grade – EG = Engineering Grade (paste) – XL = Extended App Time – RG = Rapid Grade

THE CHEMISTRY

Unique Polymers Engineering Repair Systems are based on complex polymers which are extremely long, chain like molecules resulting from the chemical reaction between a large number of much smaller molecules. Provided that these small molecules contain at least two reactive "groups" or "site" per molecule, the chemical reaction can proceed in a progressive, chain building fashion to yield long molecules made up of regular, repeating units. In the uncombined state, the reactive components are generally liquids on account of their relatively small size or low "molecular weight". As the chemical reaction or "cure" progresses, the size of the polymer chain units ultimately the material becomes a solid.

The repair materials can be classified generically into two basic chemical types, namely "epoxies" and "polyurethanes". A schematic representation of the structure of these materials and their reaction mechanism is shown below.



By combining these complex molecules with selected fillers it is possible to produce materials with properties equal to a wide range of engineering components.

The reaction between the polymers (polymerisation) within Unique Polymers Engineering Repair Systems undergo several physical changes during the curing (hardening) process.

Initially the two components mix easily together to provide a simple to use the product. As soon as mixing begins, the chemical reaction which causes solidification begins and as the reaction proceeds, the molecular structure of the repair material changes and after a time the consistency of the mixed compound becomes a firm semisolid mass. At this point, the product is unable to be spread, trowelled, or poured as it has gelled, (reached the end of its usable life)

As the product nears the point of solidification, an increase in temperature will be noticed. This heat is termed exothermic heat and is a result of the chemical reactions between the base and activator resins.

The amount of heat produced will vary with the type of product and the quantity of product mixed. Large quantities produce more heat than small masses. Rapid curing systems like UPS Metal-Tech RG will produce this heat more quickly than standard curing systems like UPS Metal-Tech EG and FG. Heat will continue to be produced until a peak exotherm is reached. The rate at which a repair material reaches its gel point is influential on the final physical and chemical properties of the repair. Curing of the UPS Metal and Ceramic Repair Systems can be influenced by both Temperature and Quantity of product mixed.

EFFECT OF TEMPERATURES

Curing can be speeded up with the addition of heat, and removal of heat (cooling) will slow down the speed of reaction.

When applied to a warm surface, or if the components are warm when mixed, the working time is decreased as the rate of cure is faster. The faster the reaction, the faster the product hardens.

Conversely cooling the components prior to mixing will slow down the reaction and solidification will take longer. Likewise when the ambient temperature is low or surfaces are cool, the reaction will be slower.

Below certain temperatures (for practical purposes 5°C/40°F) the chemical reaction ceases and the material does not cure.

Temperatures of either the repair compound or the substrate must be maintained above the minimum temperature at which the chemical reaction ceases to happen.

Electrical heat guns, gas heaters etc. are preferred to an open flame to raise the temperature where accelerated cure of the applied system is required.

Heating the repair with a blow torch can be done, taking care that the flame does not directly contact the UPS material. This can be achieved by placing a protective metal sheet 20 cm (1 inch) from the repair and playing the flame over the sheet without it becoming red hot.

QUANTITY MIXED

As the chemical reaction begins, the product will start to become warm due to the exothermic reaction, in small quantities this heat is easily dissipated, but in larger quantities the heat is retained and quickly builds up accelerating the reaction.

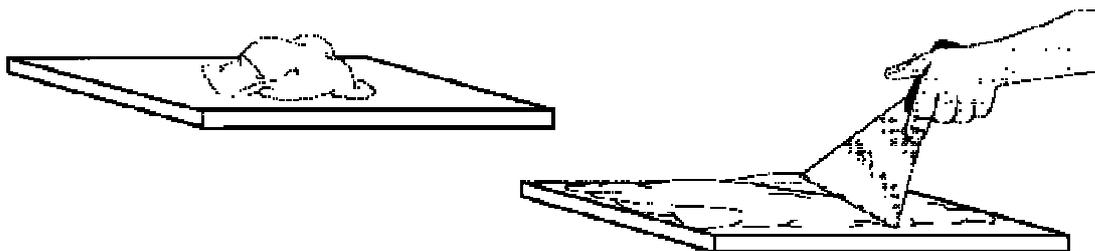
The heat produced will have a positive effect on the curing rate, and gel points will occur sooner.

Should a repair require a large volume of product, it is better to build up the repair with multiple mixes than attempt to mix all the product at once and waste the material due to the shorter resultant usable life.

The reaction rate UPS Metal-Tech RG is so fast that it prohibits the use of large quantities and mixing of a complete 500g unit is not recommended.

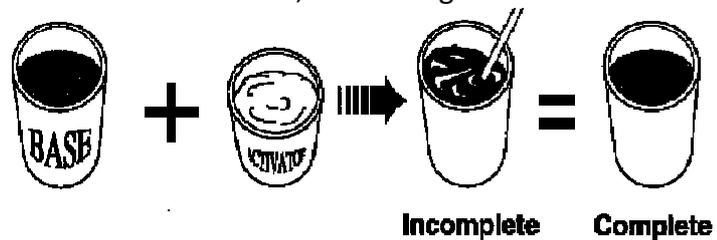
Special care should be taken when large quantities of liquid repair compounds (UPS Metal-Tech FG and UPS Cerami-Tech FG) are being poured into castings or moulds. External cooling of the mould may be necessary to reduce the amount of heat generated, thus preventing any distortion.

Spreading the mixed product out thinly on a plastic board will assist in dissipating the heat from the mixed product and slow down the reaction. This technique is valuable when large quantities are mixed or when ambient temperatures are over 20°C



MIXING

UPS Repair Products are supplied in correctly matched quantities of Base and Activator. It is essential that the correct amount of curing agent (Activator) be added to the Base and that it is thoroughly mixed to ensure complete cure and full development of properties. The Base and Activator are produced in different colours so that the mixture can be visually inspected for homogeneity. Streaks, swirls or other colour variation in the mixed material are indications of unmixed material, and mixing must be continued until all such defects are removed.



Where less than complete units are used, the proper mixing ratios must be strictly followed, for UPS Metal and Ceramic Repair Systems.

Accurate measuring out of the two components prior to mixing is essential for ultimate performance and either measuring by weight or using measuring spoons, cups or similar can be used. As soon as the activator is added to the base the curing process begins and the product must be used immediately after complete mixing.

Paste materials should be mixed on a clean flat surface such as a sheet of metal, glass or plastic. Transfer the appropriate quantities of Base and Activator onto the sheet and then mix together completely as described previously. Work the material by folding and kneading with the mixing tool to ensure good mixing, taking care not to trap air into the mix. To remove any entrapped air spread the mixed material into a thin film on the mixing board.

By repeating the process, air will be excluded from the mixed product.

Fluid grade **(FG)** materials can be mixed together in the base container, or alternatively the appropriate quantities of Base and Activator should be transferred to a clean mixing container and mixed thoroughly. If mechanical equipment is used for mixing use a slow speed mixer. High speed mixing will generate heat which will cause the product to cure prematurely, also the product can become full of air which is then difficult to remove. Mixing should continue until a uniform colour is reached being sure to scrape the material out of the bottom and from the sides of the containers.

APPLICATION

Application should only be carried out when the following conditions exist.

- The surface is properly prepared.**
- The surface is dry, the substrate temperature is above the dewpoint and the relative humidity is less than 90%.**
- The surface temperature is above 5°C (40°F).**

UPS paste grade materials should be applied using a flexible spatula or palette knife of a suitable width for the area to be repaired. The mixed material should be pressed firmly on to the prepared surface to ensure complete wetting of the surface.

Where there is a requirement for the material to be built up, a thin layer should first be applied to the whole of the repair area, then further layers applied using firm pressure to avoid air entrapment.

UPS fluid grade materials should be applied using a stiff bristled brush or squeegee.

Where a smooth finish is required but the repair can not be machined then the surface can be smoothed by pressing a piece of plastic wrap, sheet or forming plate against the surface prior to the product setting.

FINAL CURE

Once set, the repair material will require additional time to reach a full cure prior to being put into service. The time needed will be determined by the temperature during the curing process. As previously discussed, heat can be used to accelerate the cure when necessary.

If heat is used to accelerate curing the component should be allowed to cool to room temperature before any machining is undertaken.

POST CURE

The mechanical and chemical properties of Unique Polymers Metal and Ceramic Repair Systems can be enhanced by post curing the repair. Once a repair has reached full cure at ambient temperature, the part can be heated to 100°C for 24 hours then allowed to cool. During post curing, further cross linking occurs within the resin matrix which results in the physical as well as chemical properties being improved. In general a 20-30% improvement is normal for most physical properties. The following improvements are typical for most systems.

- Impact Resistance**
- Adhesive Strength**
- Compressive Strength**
- Heat Resistance**
- Flexural Strength**
- Hardness**

Actual figures obtained may vary due to application technique, surface preparation, degree of mixing and mass of the repair.

HIGH TEMPERATURE APPLICATIONS

If the surface temperature is high while the repair is being made, the product may cure too quickly to allow proper bonding to the surface and making application difficult. Where surfaces cannot be cooled to more acceptable temperatures UPS Metal-Tech XG should be used as the repair material.

APPLICATION OF ADDITIONAL PRODUCT

Once the product has cured additional material should not be applied without roughing the surface. Failure to roughen the surface will result in poor adhesion between the two applications. CLEAN UP

Clean all equipment immediately after use with UPS Universal Cleaner.



Chapter #2 SURFACE PREPARATION

The successful application of any product in the Unique Polymers Engineering Repair Systems Range is dependent on correct surface preparation. Dust, dirt, grease, oil, rust and dampness will prevent the product from sticking to the surface. Lack of adhesion to the substrate could cause the entire repaired area to fall out under stress or at the very least, cause it to partially chip or crack. The only way to ensure good adhesion is through proper surface preparation. Surface conditions will vary from application to application and the following will provide guidance in determining the method of preparation needed. This section describes the general surface preparation procedures as well as the methods for various types of surface conditions.

GENERAL SURFACE PREPARATION

Prior to applying any of the products the surface must be firm, dry, clean and thoroughly abraded. Any leaks or liquid seepage must be stopped and the area must then be wiped dry.

All dirt, rust, paint and other surface contaminants should be removed by abrasive blasting or other mechanical techniques.

The area to be repaired should be degreased using Unique Polymers Universal Cleaner.

The area to be repaired should now be abraded by abrasive blasting, needle gun, grinding or other mechanical means with abrasive blasting being the recommended preparation for fluid flow situations.

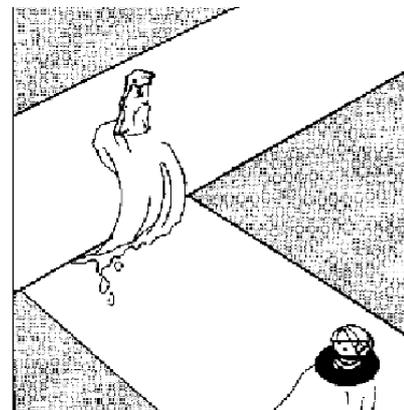
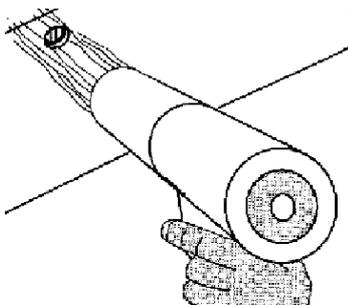
The individual tech sheet supplied with each product should be referred to ensure correct preparation.

WET SURFACES

Surfaces may be wet for many reasons, including weather, condensation, seepage or leaks. Regardless of the reason, the area to be repaired must be dry before applying any of the Unique Polymers Engineering Repair Systems.

All leaks must be stopped. Sometimes this may be accomplished by simply turning off the liquid flow. If the system can not be shutdown other measures must be taken. These include fitting a wooden peg or other form of plug into the hole, or if the source is fairly large inserting a sheet metal screw fitted with a soft rubber washer into the hole. If the leak is caused by corrosion, the surface may be extremely thin, and in such instances the hole should be opened back to a solid area before being plugged.

Surface condensation or dampness should now be removed by wiping with an absorbent material. The remaining moisture can be dried off using a hot air gun or similar device. Open flames are not recommended for this purpose.



CLEANING SURFACE

The surface onto which the UPS Engineering Repair Systems are to be applied must be clean and sound. Heavy deposits of dirt and grease should be first removed.

Oil and grease should be thoroughly removed by cleaning with UPS Universal Cleaner or other suitable solvent.

Metal surfaces should then be prepared by abrasive blasting. Abrasive blasting cleans and roughens the surface. On irregularly shaped surfaces, abrasive blasting is the only satisfactory cleaning method. The blasting medium should be an angular grit. Where abrasive blasting can not be used the surface may be abraded with a coarse grinding wheel, 80 grit abrasive paper or a needle gun, making sure that a coarse profile is obtained and the surface is not polished. Cross scoring the surface with a rasp or scribe will be beneficial to adhesion.

Rubber surfaces should be coarsely abraded using a rough metal comb or similar, a special abrading tool is available from UPS if required.

Finally the surface should be degreased again with UPS Universal Cleaner.

On metal surfaces the repair should be made as soon as possible after the preparation process has been completed to avoid flash rusting or oxidation of the surface and other possible recontamination of the cleaned surface.

Handling of the cleaned area should be avoided to prevent re-contamination. If handling is unavoidable the surface should again be wiped with UPS Universal Cleaner prior to the application of the product.

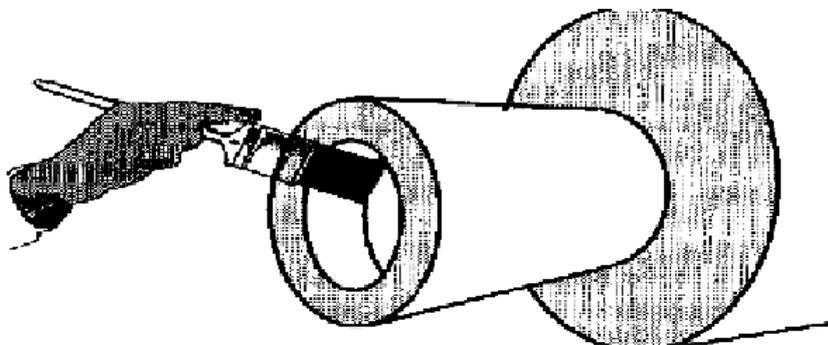
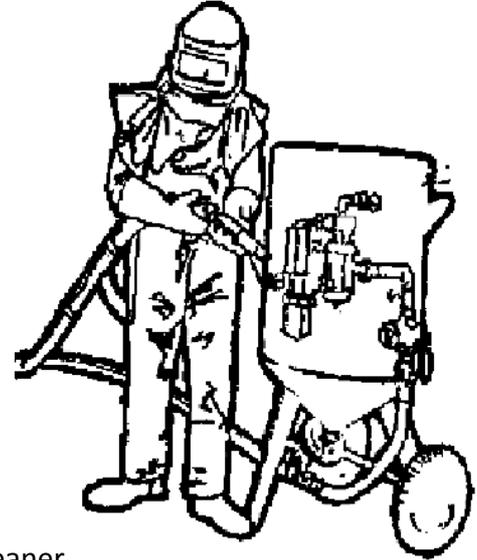
DEGREASING

No UPS product will adhere very well to an oily surface. It is essential that all surfaces to which these products are to be applied are oil and grease free. Unless otherwise specified UPS Universal Cleaner should be used for degreasing.

UPS Universal Cleaner should be applied to the surface by brush then the surface wiped with a clean cloth. The cloth

should be turned frequently and replaced often to avoid re-contamination of the surface. Before applying UPS Universal

Cleaner to plastic or painted surfaces checks should be carried out to ensure the solvent does not attack the surface

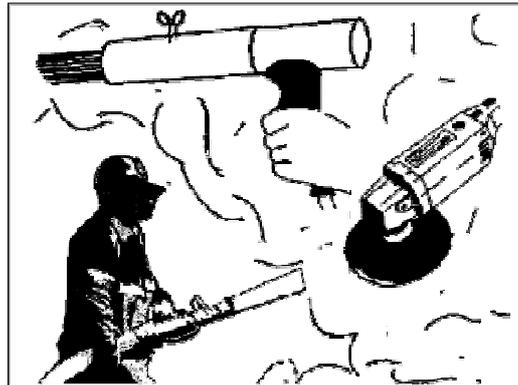


SURFACE ROUGHENING

Roughening the surface increases the surface area resulting in better adhesion of the product to the surface.

If the surface was cleaned by abrasive blasting, grinding or needle gun the surface should be sufficiently rough.

When the surface needs to be roughened one of the above methods can be used, otherwise coarse abrasive paper or a rasp file could be used.

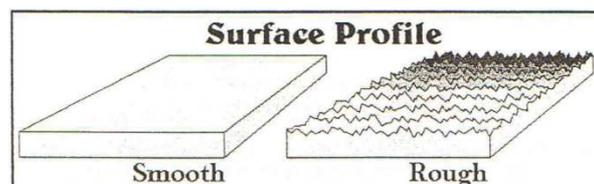


How CLEAN?

A SMOOTH surface is NOT the REQUIREMENT. Select abrasives that can achieve the necessary standard of minimum depth of PROFILE at 3 mils (75 microns). The standards used by the industry are ISO 8501-1 Sa 2 1/2 = VERY thorough BLAST Cleaning. (US Standard NEAR WHIT FINISH SSPC SP10 - Swedish Standard Sa 2 1/2 SIS 05 5900)

How ROUGH?

Most successful applications require a SUBSTRATE PROFILE to gain a successful 'KEY' to the surface. Repairs and Coatings to METAL surfaces require a substrate profile 25-100 microns (0.025-0.100mm or 1-4mil) REMEMBER that the ROUGHNESS of the surface will also affect the amount of product USED as the surface area increase.



How DRY?

MOISTURE content is below 6%.

Chapter #3 SHAFT REPAIRS

Unique Polymer materials can be used for three main types of repairs on shafts; the worn shaft itself, damaged and worn keyways, or damaged splines.

Most shafts can be repaired however, in the past many of these repairs have been classed as temporary rather than permanent repairs, but most have proved to be permanent repairs.

3.1) SHAFT BODIES

Shafts are worn by vibration, rubbing, abrasive materials and fretting corrosion among others. UPS Metal Repair Products are easily used to rectify these defects.

The products normally used for this purpose are UPS Metal-Tech EG105 or RG19605.

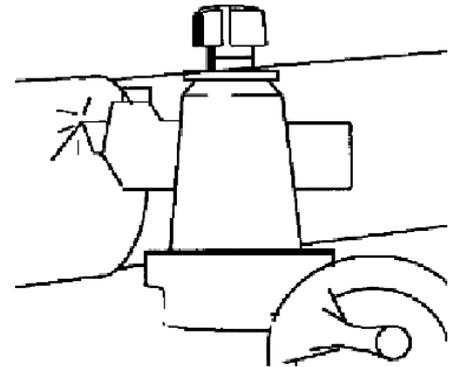
When rebuilding sections of worn shafts which run under packing, consideration should be given to the fact that the packing will cause friction, which in turn will generate heat that could affect the physical properties of the repair, and in such cases UPS Cerami-Tech 200 can be used to provide an effective repair.

It is inadvisable to use UPS materials to repair shafts which are so worn that after preparation more than 40% of the original diameter of the shaft has been removed.

3.1.1) SURFACE PREPARATION

Any oil on the surface of the shaft should be wiped away using clean cloths and Thortex Universal Cleaner. If the shaft has operated in an oily environment, impregnated oil should be sweated out by warming with a blowtorch. The surface should again be degreased and the process repeated until a lint-free cloth soaked in Thortex Universal Cleaner shows no further oil contamination.

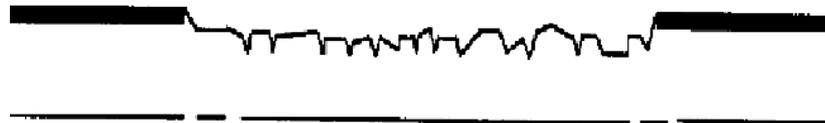
The worn areas on the shaft should now be undercut using a lathe.



The undercut should be at least 2mm (0.08 ins). If the shaft is already worn to the recommended depth then the area should only be machined to a course thread profile. A shoulder should be left at both ends of the cut to provide reinforcement

for the repair and to serve as a guide when rebuilding the shaft, however if the shoulder is 6 mm (¼ ins) or less it should be removed.

Worn Shaft
Before
Machining



Shaft After
Machining
Showing Collar



Undercutting Depths

Shaft Diameter

13 - 25 mm ($\frac{1}{2}$ -1 ins)

over 25 mm (>1 ins)

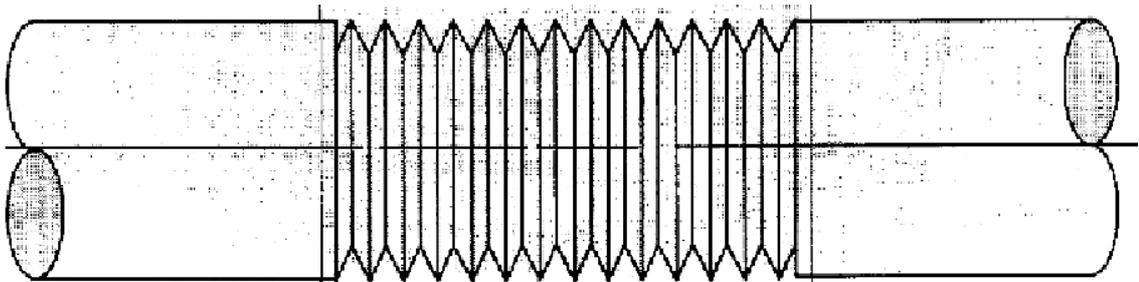
Finish the undercutting by machining a coarse thread profile over the repair area. The rough surface cut increases the surface area and produces a surface for maximum adhesion of the products.

The following guidelines should be followed for producing the coarse thread profile.

Shaft Diameter	5cm (2") or LESS	over 5cm (2")
Threads	16 per cm (40 per ins)	8 per cm (20 per ins)
Pitch	0.64mm	1.27mm
Depth	0.30mm (0.0012")	0.64mm (0.0025")
Angle	90%	90%

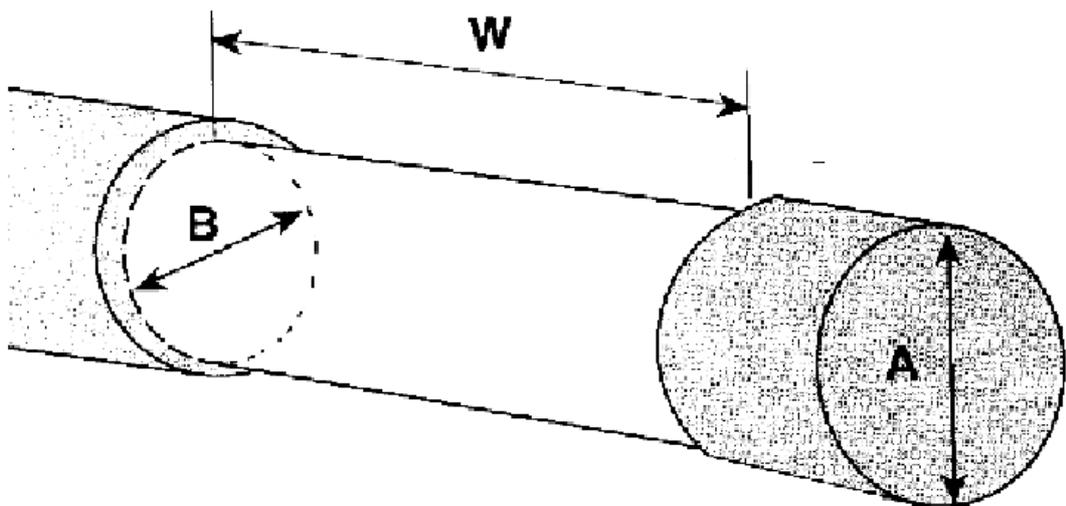
After machining surfaces should again be degreased using Unique Polymers Universal Cleaner masking tape can now be wrapped around the shaft at the end of the repair area using 7-10 revolutions of tape. This allows for easier application of the UPS Metal-Tech EG105

A thin layer of the chosen product should now be applied to the coarse threaded area with a putty knife, or spatula. Pressure should be used on the tool to force entrapped air out of the threads.



APPLICATION OF PRODUCT

Sufficient product should be mixed to ensure that the area to be rebuilt is completely filled. Using the calculation $(A^2 - B^2) \times W$ equals volume of product to be mixed, will ensure sufficient product is mixed.



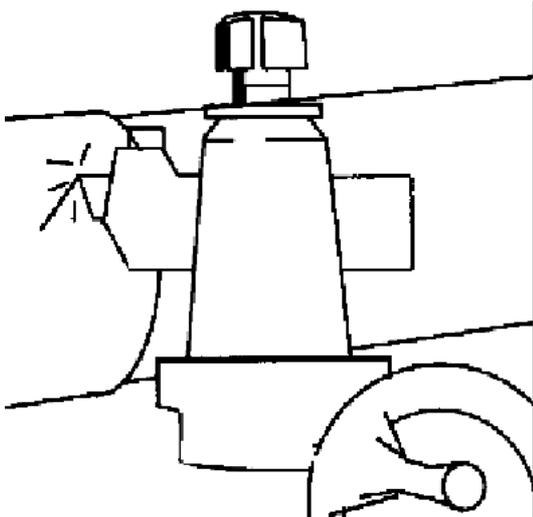
The volume capacity of each Unique Polymer Repair Product can be found on appropriate product data sheet.

The mixed product should now be applied to the prepared area, building the material up to the level of the masking tape, and should be pressed firmly and carefully onto the surface to avoid air entrapment, and ensuring the product is firmly pressed into the shoulder of the cut out area.

The product can be applied while the shaft is on the lathe using a palett knife or straight edge pressed against the maskingtape to finish the repair proud of the shaft diameter to allow for machining to the exact dimensions. As soon as the repair material has gelled the masking tape should be removed.

NOTE : To help eliminate pinholes a piece of round stock or shaft should be used as a straight edge, easing the stock out slowly as the shaft rotates.

Once the product has cured sufficiently for machining (refer to the product tech sheet or Table 4 at the end of this manual) the repaired shaft can be machined in a lathe. Machining recommendations are given in Table 1.



Polishing of the surface with 400 to 600 emery paper wet can be carried out to improve the finish of the repair.

If air holes are exposed during machining these can be filled in with Unique Polymers Metal-Tech FG 110 or RG19605

KEYWAYS

A key and key way provides a positive means of transmitting torque between a shaft and a hub. Through use keyways become worn and will no longer effectively perform this function, but these problems are easily overcome using Unique Polymers Repair Materials.

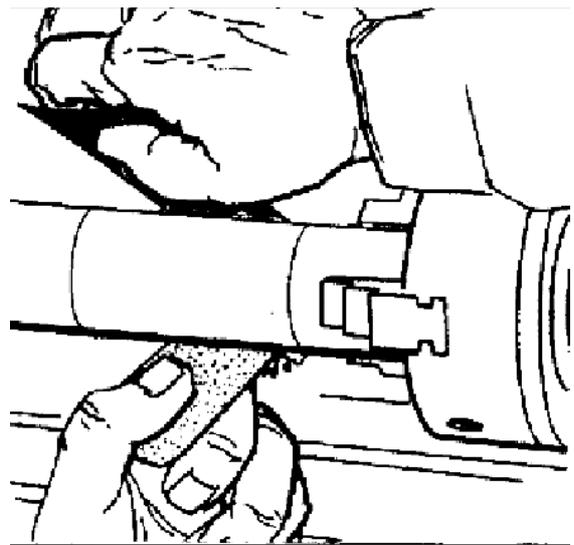
SURFACE PREPARATION

Surfaces should be thoroughly degreased using UPS Universal Cleaner.

Surfaces of the keyway should then be thoroughly roughened and scored with a file or rotary grinding tool. All grinding swarf (metal filings) and loose material should be removed and surfaces then degreased again using UPS Universal Cleaner.

UPS Release Agent should be applied to all surfaces of a new key and to the internal area of the hub including the hub keyway. DO NOT apply UPS Release Agent to the keyway or the shaft.

The purpose of the UPS Release Agent is to prevent the UPS Metal-Tech EG105 from sticking to the key hub and the hub keyway. The UPS Release Agent should be allowed to dry for approximately 25 minutes before applying the UPS repair material.

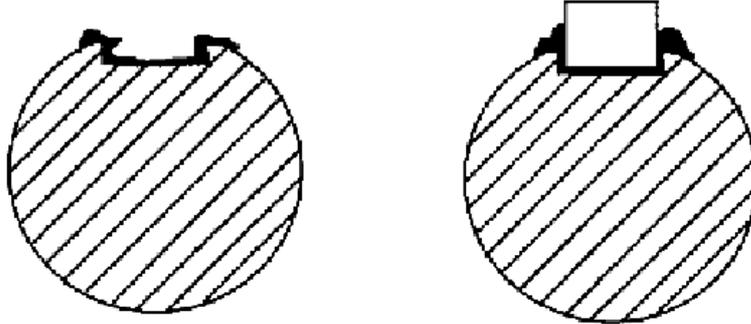


APPLICATION OF PRODUCT

Mix sufficient product to complete the application as described earlier.

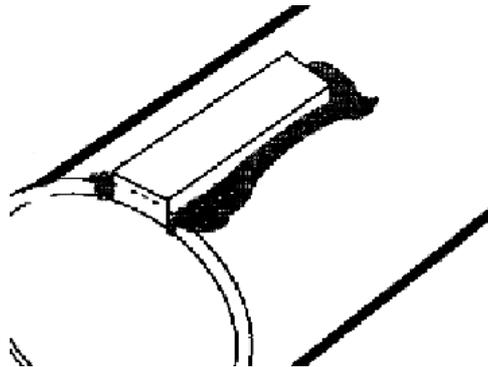
The mixed product should now be applied to the prepared keyway. A thin coat should be applied to the bottom of the keyway and a heavy coat on the sides. The mixed product should be pressed into the corners and against the side walls to force out the air.

If too much product is applied on the bottom of the keyway it will raise the key too high and prevent it from sliding into the hub.



POSITIONING THE KEY

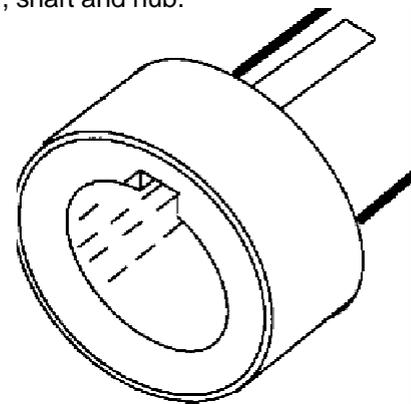
Press the new key into the keyway. This should cause the excess UPS Metal-Tech EG105 to squeeze out of the keyway. Using the putty knife remove the excess product and shape the surface to the shaft profile.



Immediately reposition the hub on the shaft. This will properly align the key, shaft and hub.

Once the product is cured as indicated in the product tech sheet the coupling can be put back in operation. There is no need to dismantle the coupling since everything was coated with UPS Release Agent to prevent components sticking together.

NOTE : Badly worn keyways may have caused excessive wear to both the shaft and the hub, and in such cases UPS Metal-Tech EG105 should be applied inside the hub and around the shaft to ensure a good repair is made.



SPLINES

A spline is a series of parallel keys formed integrally with the shaft and mating with corresponding grooves in a hub or socket.

Splines are used to transmit power. Like keyways the grooves into which the spline fits can become worn, creating unwanted play in the drive system.

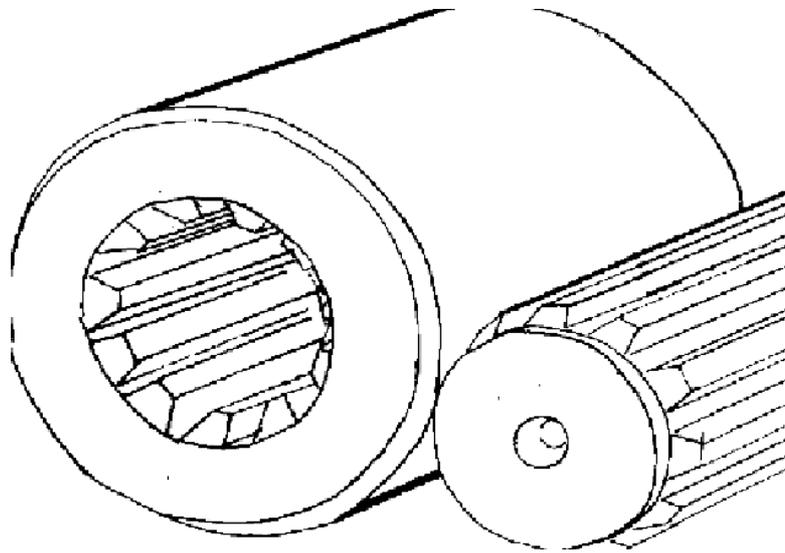
SURFACE PREPARATION

Separate the splined shaft from the hub then clean and degrease the surface ensuring complete removal of oil and grease.

File down the ends of the splines to give a 45° chamfer. This will prevent complete removal of the Unique Polymers Metal - Tech EG105 when the shaft is replaced into the splined hub.

The surfaces inside the hub should now be thoroughly roughened using a coarse file or similar tool, surfaces should then be wiped with UPS Universal Cleaner to remove any final traces of oil or grease.

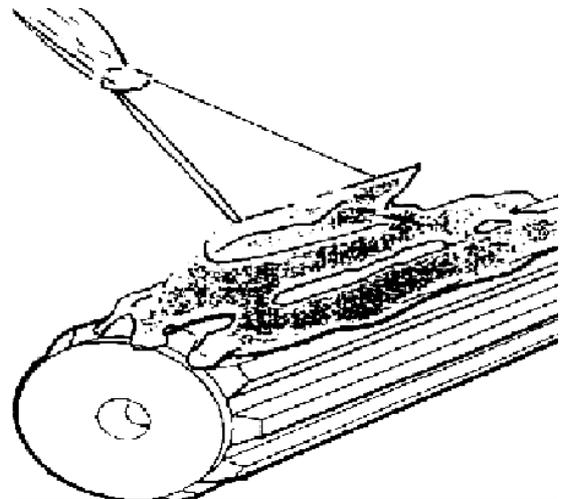
Smooth down any high spots or rough areas on the spline shaft by filing or sanding then treat the shaft with UPS Release Agent.



PRODUCT APPLICATION

Sufficient product (usually Unique Polymers Metal-Tech EG105 to complete the application should be mixed as previously described.

The mixed product should now be applied generously to the splined shaft by spatula, the product should not be applied into the hub, unless the hub is badly worn.



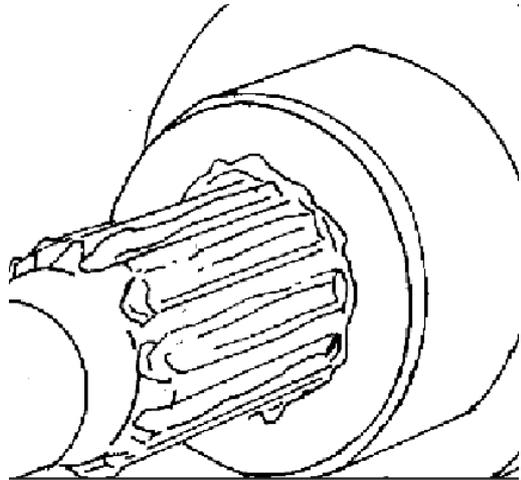
REPOSITIONING THE SPLINE

The coated spline shaft can now be pushed into the prepared hub.

The excess product will be scraped off by the hub as the shaft is installed.

Extra pressure can be applied to the shaft on insertion to extrude the excess product from the hub.

Excess product should be wiped from the shaft which can then be finally cleaned with UPS Universal Cleaner.



The worn area should now be completely filled which will eliminate play once the product is cured.

Once the repair is cured the coupling can be put back into service (see product tech sheet or the data section of this manual).

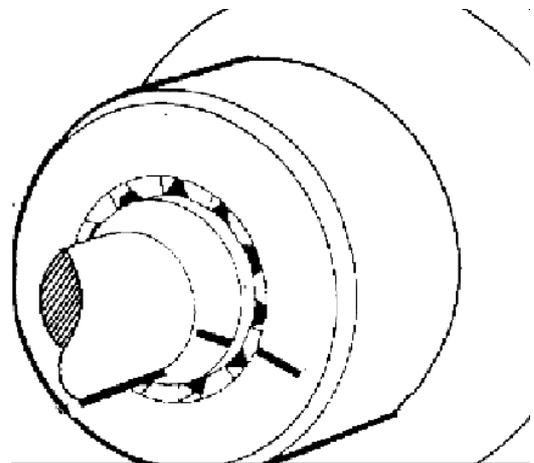


DISMANTLING

Should it be necessary sometime in the future to disassemble the spline and the hub they can be separated.

Before taking the components apart it is advisable to mark the position of the spline and hub before separating.

The reason for this is that the repair is a custom fit and the spline can only go back into the hub in one position.



Chapter #4 CRACK REPAIRS

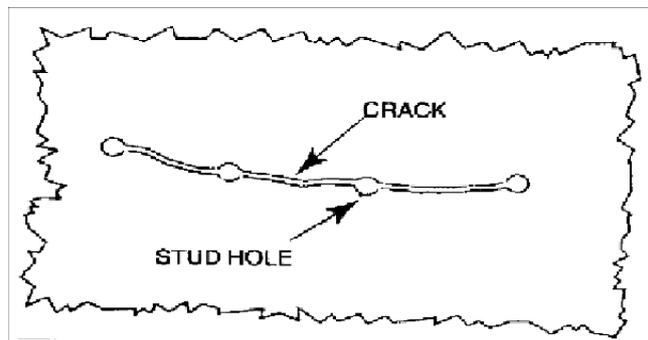
Unique Polymers Metal-Tech and Cerami-Tech Products can be used to repair cracks in metal castings and components. Typical repairs include pump casings (Cerami-Tech Products), valve bodies, storage tanks and gear boxes. In some cases the equipment to be repaired may have contained flammable or explosive materials. Some of the preparation techniques suggested for use in this section will involve electric tools which generate sparks, open flames and other ignition sources. If these conditions exist, proper safeguards should be employed and steps taken to avoid fire or explosion.

The products normally used to make these repairs are UPS Metal-Tech EG105 , RG19065 , and Cerami-Tech EG200 . UPS Metal-Tech RG19065 would be used to make emergency repairs and should be overcoated with UPS Metal-Tech EG105 or Cerami-Tech EG200 to make a more permanent repair.

4.1) SURFACE PREPARATION

Thoroughly clean the surface to remove grime, grease and accumulated dirt, surfaces should then be prepared in accordance with the surface preparation section of this manual and by reference to the product tech sheet, extending the prepared area 5-7 cm (2-3 ins) each side of the crack.

The end of the crack or cracks should be located and if necessary use a crack detecting dye. Drill a hole at each end of the crack to stop the crack from spreading. If the crack continues to spread after drilling Do Not attempt to repair it. Drill holes approximately 4-5 cm (1½ - 2 ins) apart along the length of the crack.

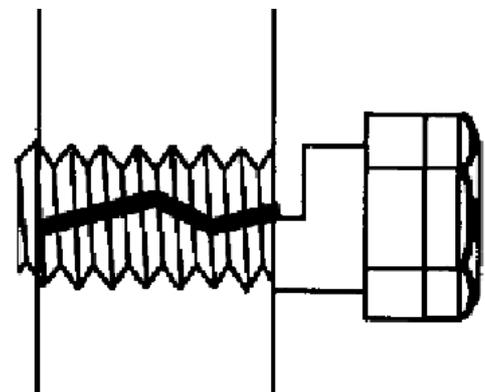


The diameter of the hole should be 5 mm (¼ ins) wider than the width of the crack. Hairline cracks would be drilled 5mm (¼ins). If the crack was 5 mm (¼ ins) wide then the hole should be 11 mm (½ ins).

Holes should now be tapped with a coarse thread.

Bolts which have been partly sawn through should now be screwed into each hole, using the cut as a guide for installation depth.

The bolts can now be cut off, flush with the coating surface.



Using a drill or grinding wheel, V the crack out between the installed bolts.

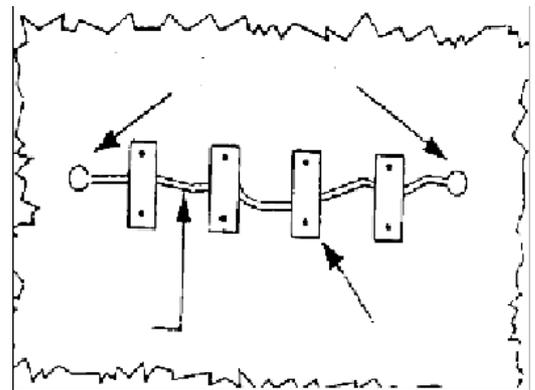
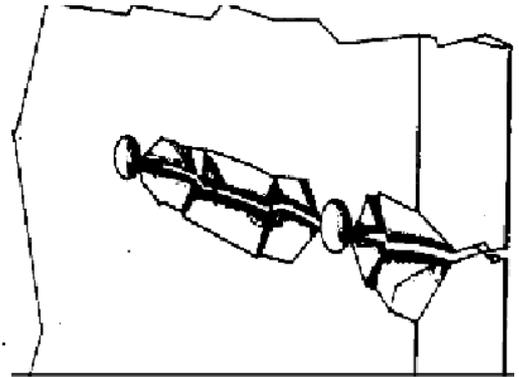
The depth of the cut should be slightly less than half the wall thickness.

Where cracks are subject to tensile stress, in addition to stabilising and opening the crack as above, the crack can be stitched by fixing metal strips across the crack.

These strips should be fixed by bolts or studs, and the strips should be coated with UPS Metal-Tech EG105 prior to being tightened into position.

The repair can then be completed as detailed below.

Degrease the repair site again with UPS Universal Cleaner.



APPLICATION OF THE PRODUCT

Mix sufficient UPS Metal-Tech EG105 to complete the repair.

Using a spatula force the mixed product into the crack. Avoid pushing the product through the crack to the inside of the wall. Fill the V and overlap the product by 2.5 cm (1 ins) on either side of the V.

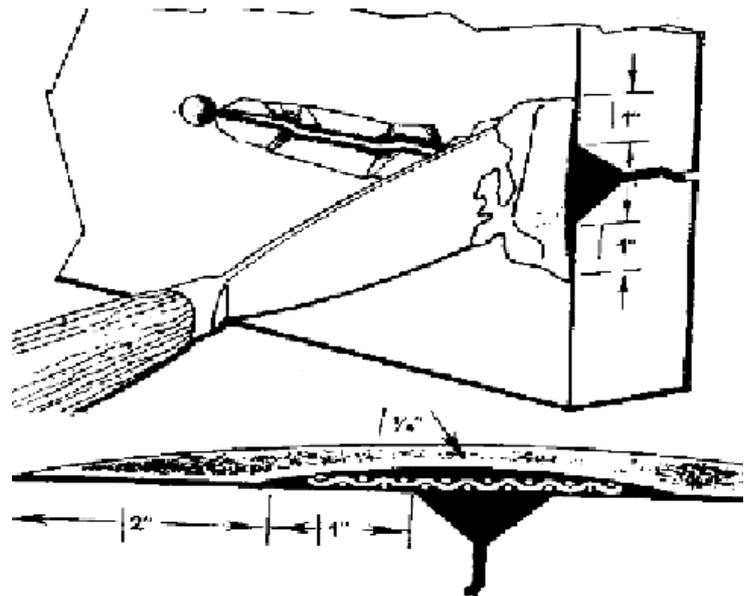
Cut a piece of reinforcing cloth 2.5 cm (1 ins) wider than the V.

Lay the cloth over the applied product and embed the cloth into the mixed material.

Once the UPS Metal-Tech EG105 has set, a further quantity of product should be mixed and apply another layer at least 6mm (¼ ins) thick and overlap the edge of the reinforcing tape onto the prepared surface.

The edges of the repair should then be feathered out using a spatula.

After curing for the appropriate time the equipment can be put back into operation.

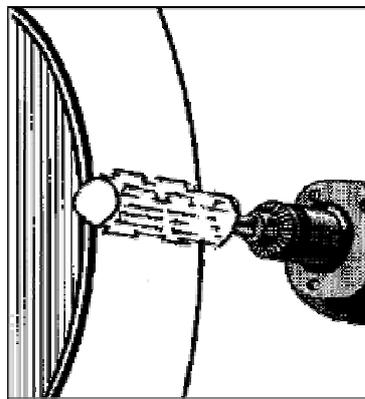


Chapter #5 BEARING HOUSINGS

Bearing housings are subject to abrasive wear as a result of a number of external factors. Wear increases the size of the housing allowing the bearing to move resulting in vibrations, shafts running out of true and other problems. Oversize bearing housings can be brought back to the correct dimensions by rebuilding the worn surfaces with a UPS Metal Repair System.

SURFACE PREPARATION

Where the gap between the bearing and the housing is less than 1 mm (0.04 ins), the housing should be enlarged by machining or grinding off approximately 1mm (0.04 ins) from inside of the bearing housing. The surface should then be roughened to provide a greater surface area and increase the adhesion of the UPS Metal-Tech EG105.



If machining or grinding the housing is carried out with the housing in place be careful not to get metal filings into the machinery. A rag stuffed into the housing is usually an effective method to prevent this.

If the worn area is already greater than 1mm (0.04 ins), roughen and score the bearing housing surface with a file or rotary cutting/grinding tool. Avoid getting filings in the machinery as above. All surfaces should now be thoroughly degreased with UPS Universal Cleaner.

The bearing should be used as a former. Apply a thin layer of release agent to the outer circumference of bearing and overlap on to the outside edge of the bearing. This is to prevent the UPS Metal Repair Product from sticking to the bearing and to allow it to be removed from the housing when desired.

APPLICATION OF PRODUCT

Mix sufficient product to fill the space between the bearing and the housing.

For insitu repairs, apply the product directly to the outer circumference of the bearing but only on the back half of the outerrace. Remember the void between the bearing and housing must be completely filled. There should be no gaps. It is also essential that the UPS Metal-Tech EG does not extrude onto or become applied, even by accident, to the backside of the bearing housing.

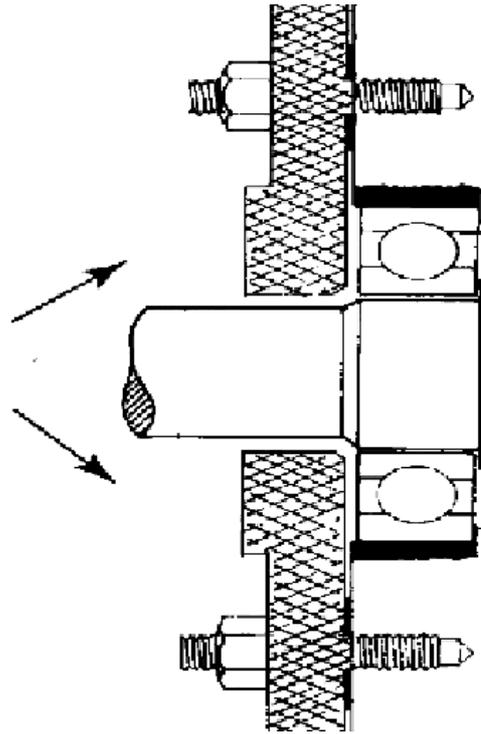
Push the bearing into the housing, forcing out excess mixed product.

Wipe off the excess product from the side of the bearing. All the product should be on the circumference of the bearing, none should lap over on the side.

ALIGNING BEARING IN HOUSING

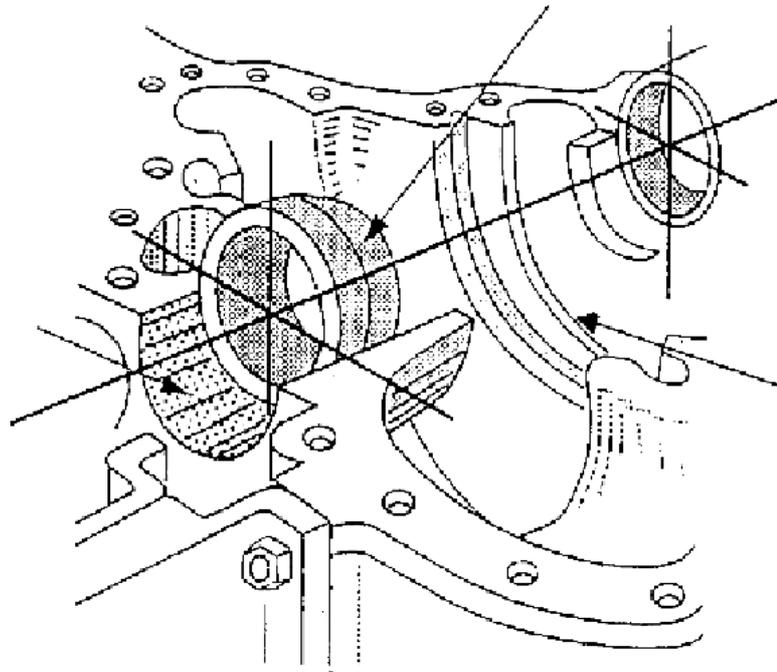
Immediately after placing the bearing in the housing, and removing the excess product, the bearing must be accurately aligned with the shaft.

The easiest method of alignment is to reinstall the bearing on the shaft and allow the product to cure in that position. If it is not possible to use this method because of the type of equipment, a jig must be designed to ensure correct alignment.



RETURN TO SERVICE

The product should be allowed to cure for the appropriate time as indicated in the product tech sheet and in this manual before returning the bearing to service

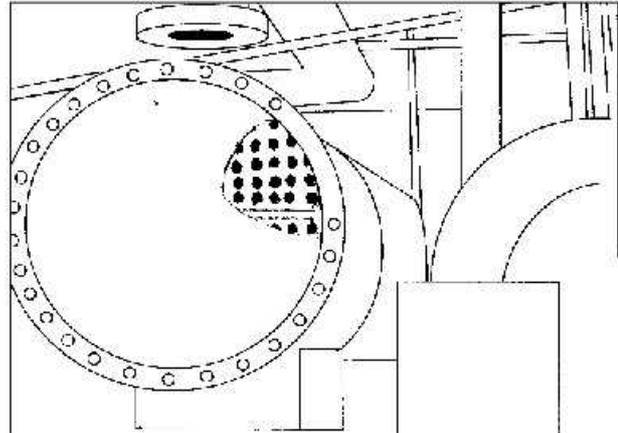


Chapter #6 HEAT EXCHANGERS

Heat exchangers, chillers and condensers are constructed of bundles of copper tubes held together by tube plates, all of which are contained in a solid metallic cylinder. The purpose of the unit is to transfer heat from one liquid to another.

The tube plates are subject to heavy corrosive attack, due to the tubes being copper and the tube plates are of a different metal, and being dissimilar metals in contact this causes galvanic corrosion.

The whole corrosion process is accelerated by the heat and wet conditions inside the equipment.



If left unattended, the corrosion would completely destroy the tube plate. There are two ways to maintain the tube plates. **A UPS110 Metal Repair Product or UPS205 Fluid Ceramic** can be applied to a new tube plate before the unit is put into service and it is regularly maintained, thus preventing the tube plate from becoming corroded.

Where the tube plate is put into service without protection and once it has become corroded, the surface can be rebuilt with a **UPS Repair System UPS Metal Repair 105 or UPS200 Paste Ceramic** and its working life extended.

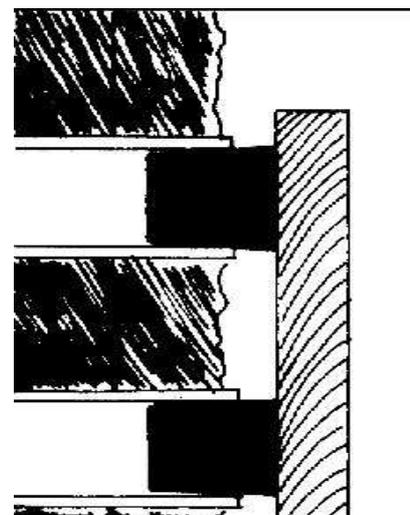
These units are found in large buildings with air conditioning systems, in chemical plants and refineries among others. As a rule, they are shut down annually for maintenance, when the UPS repair can be successfully undertaken.

SURFACE PREPARATION OF NEW UNITS

Prepare both ends and all components of the unit before applying product.

Remove the end plates and baffle.

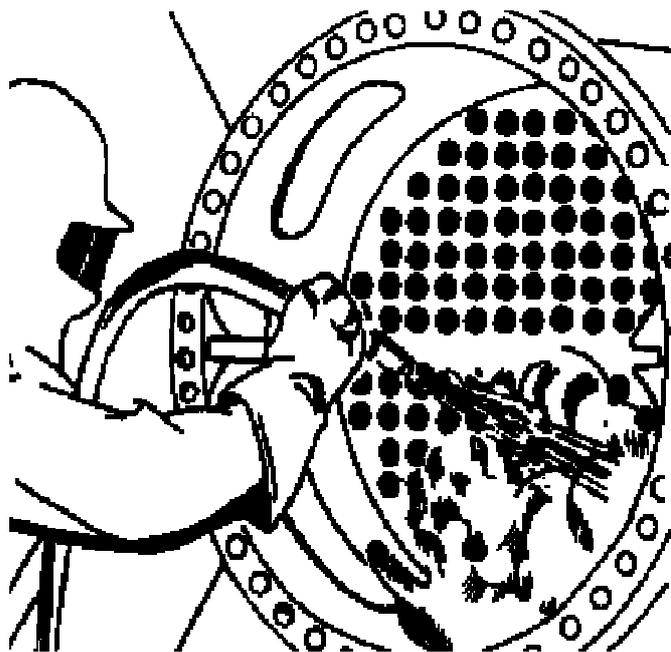
Insert a suitable stopper into the end of each tube so that the stopper stands proud of the tube equal to the thickness of the system being applied. The stopper should fit snugly into the tube a wooden bar should be used to push the stoppers in to the current uniform level.



Once the stoppers have been installed, the surface should be abrasive blasted.

After thorough blasting, blow all the debris off the surface with clean oil free air.

Surfaces should finally be thoroughly degreased using **UPS Universal Cleaner**.



SURFACE PREPARATION OF WORN UNITS

Prepare both ends and all components of the unit before applying product.

Remove the end plates and baffle from the unit.

Blow out the standing water in the tubes with air until the tubes are dry.

Degraded metal should be removed from around the tubes using a proper size tube saw, to cut a groove around the end of each tube. The degraded metal can now be chiselled from between each tube. Care must be taken not to damage the tube ends.

Insert a rubber stopper into the end of each tube as before using the most protruding tube as the guide level to which all the stoppers should be pressed in.

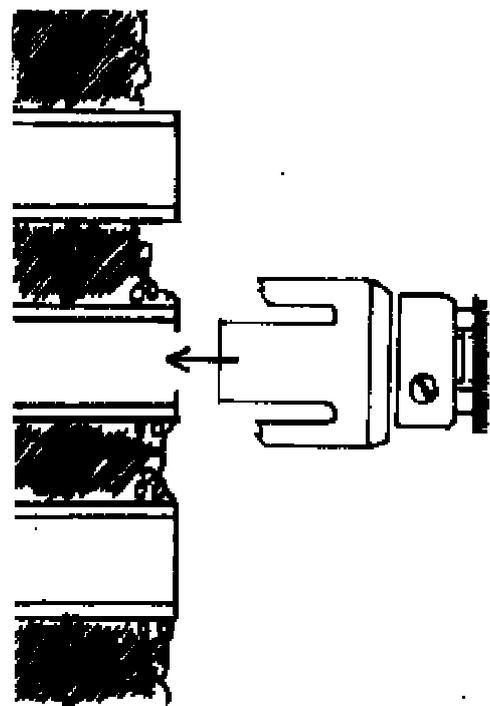
Once the stoppers have been installed, the surface is abrasive blasted as before.

The blasted surface should then be sweated to remove any ingrained salts then reblasted if salts are present.

After thorough blasting, blow all the debris off the surface with clean air.

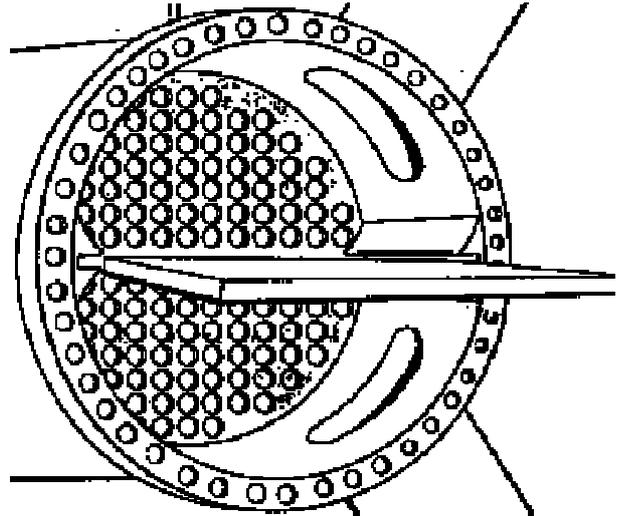
Thoroughly degrease the area **using UPS Universal Cleaner** or by pressure spray. Repeat degreasing procedure.

NOTE: If delays occur between blast cleaning and application of the repair material, and the surface flash rusts, surfaces should be flash blasted to remove the rust.



SURFACE PREPARATION OTHER COMPONENTS

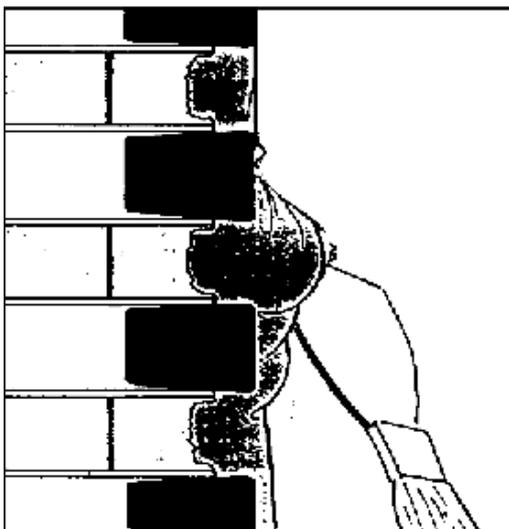
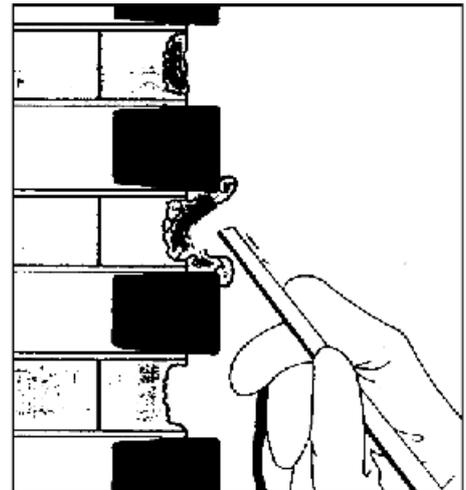
The baffle plate, recessed area and end covers should be prepared as detailed in the SURFACE PREPARATION section. The baffle plate is found in the recessed area of the unit and usually can be slid in and out. Remove the baffle plate before preparing the surface of the plate or the recessed area. Do not put the baffle plate back in until the coating job is completed. There is an inlet and outlet opening in the recessed area. When preparing the surface, reach as far down into the line as possible. Some units have fixed baffle plates and no recessed area.



APPLICATION OF PRODUCT ----- TUBE PLATES

Mix the appropriate quantity of **UPS105 Metal-Tech EG or UPS200 Cerami-Tech EG** to fill any eroded/pitted areas in old tube plates. As soon as the product is set it can be overcoated with the finish material. Mix the amount of **UPS110 Metal-Tech FG or UPS205 Cerami- Tech FG** which can safely be used within the working time for the product. The working time can be found in the product tech sheet .

Two coats of mixed product should be applied to the tube plate. Apply the first coat evenly over the prepared/rebuilt surface whilst the **UPS200EG** is still soft. It is important to press or force the product around each stopper to force out any entrapped air. This can be done by using a stiff piece of plastic, wood or metal, cut to fit between the stoppers. Draw the tool down each row, pressing down and around each stopper. Do this in both the north-south and east-west direction. As soon as the first coat is set apply the second coat and fill to the top of the stoppers. Smooth level with the top of the stoppers.



After 24 hours the stoppers can be removed using a ball peen hammer, gently tap each stopper to break the bond between the cured product and the stopper, and the stoppers can then be blown out from the tubes, if this is not possible they may be forced out by a rod from the opposite end of the tube.

Remove all the stoppers.

Do not throw the stoppers away as they may be reused in future repairs.

The end of each tube hole can be chamfered to get rid of excess material and to smooth out the hole using a small grinding tool with a conical grinding bit.

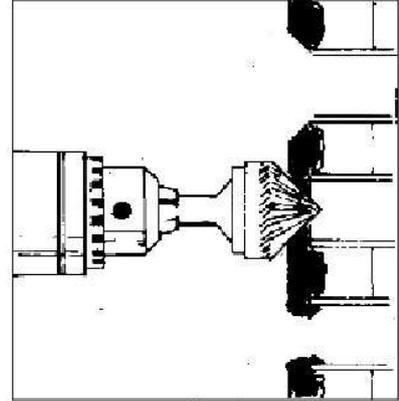
RECESSED AREA (If applicable)

Mix sufficient product to coat the recessed area, baffle plate holder and inlet and outlet pipe.

Apply the product using a spatula or putty knife, to give a uniform even coating, a stiff brush may be used to give a good smooth finish.

Coat the recessed area and the inside of the inlet and outlet pipe, but no further than the prepared area.

Coat the baffle plate holder, but do not coat the groove into which the plate slides nor the outside end of the holder which makes up to the end cover.



BAFFLE PLATE

Sufficient product to coat the baffle plate should now be mixed and apply two coats as before.

Do not coat the edges that slide into the baffle plate holder nor the ends which come into contact with the tube plate and the end cover.

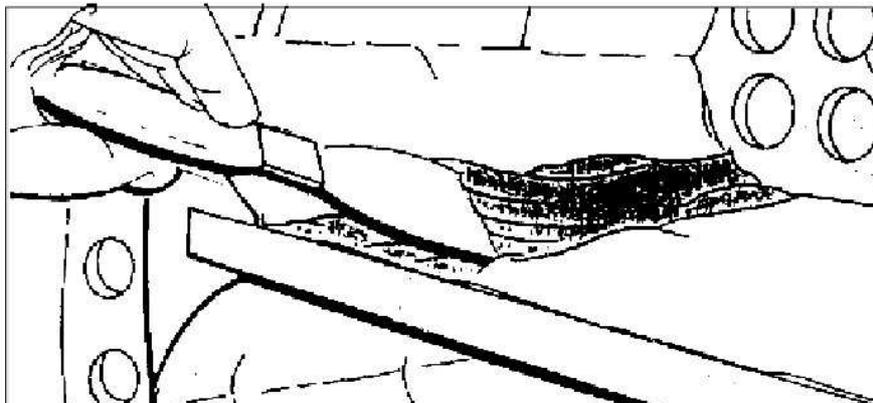
END COVERS

Mix sufficient product to coat the end covers and apply two coats as before.

REASSEMBLY OF EQUIPMENT

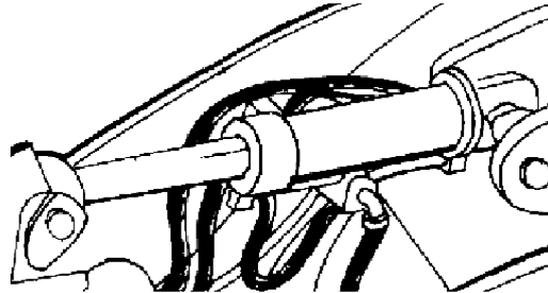
Once the product has hardened in accordance with the cure times on the tech sheet the equipment can be reassembled.

Slide the baffle plate back into the recessed area. Apply **UPS105 Metal-Tech EG or UPS200 Cerami-Tech EG** along the joint between the baffle plate and the groove to seal it.



Chapter #7 Hydraulic / Pneumatic Rams and Rods

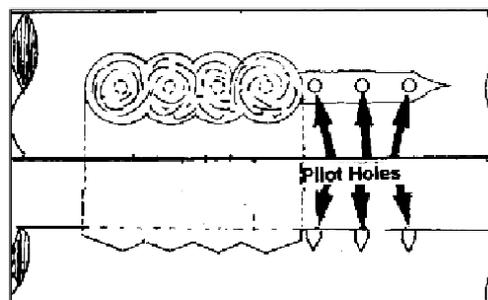
Reciprocating rods or rams such as those found in pumps or hydraulic/pneumatic equipment become scratched or scored.
The damage is normally found along the length of the ram rather than around the circumference. These scratches or scores allow fluid or air to escape from the cylinder, reducing lift capacity or efficiency.



Score or scratch marks can be repaired using UPS Metal-Tech EG105 or UPS Metal-Tech RG19605.

SURFACE PREPARATION

Thoroughly degrease the ram or rod using UPS Universal Cleaner. Degreasing should also be carried out on pneumatic systems as well as systems using waterbased or non flammable hydraulic fluids. Absorbed oil from surfaces which have been immersed should be removed by heating to sweat out the oil. First wipe off the excess oil with UPS Universal Cleaner. Then heat the surface to force the oil out of the pores of the metal. The heating can be done in an oven or with an open flame or an electric heat gun. Allow the surface to cool and wipe it down again with UPS Universal Cleaner. Repeat the sweating process until all of the oil has been removed. **DO NOT USE AN OPEN FLAME ON A SURFACE WHICH MAY BE DAMAGED BY HEAT OR IS COMBUSTIBLE NOR IN AN AREA WHERE THERE IS A FLAMMABILITY OR EXPLOSIVE POTENTIAL.** Using a small drill, a series of holes should be drilled along the length of the score. These pilot holes will prevent the large drill used to open out the score from travelling and assure correct overlapping of holes.



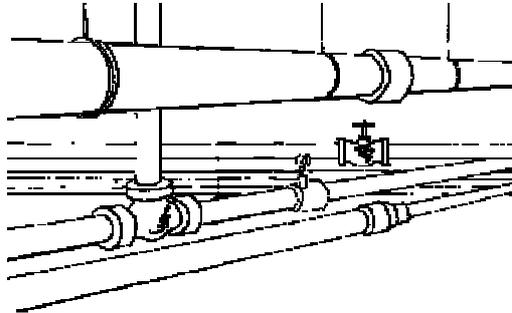
Using a drill bit 50% greater than the width of the score, the score should be opened out by drilling holes using the following table as a guide.

Shaft Diameter	
mm	Inch
13 to 19	½ to ¾
over 19	over ¾

Once the holes have been drilled, remove all swarf then degrease the area with UPS Universal Cleaner.

Chapter #8 PIPES AND DUCTING

Pipes, conduit, and ducting carry a vast range of fluids, gases, and suspended solids. A Factory or Plant may have countless miles of pipe, conduit, and ducting, creating an enormous number of potential problem areas.



Pipes, conduit, and ducting suffer from various forms of attack, chemical attack by fluids or gases, erosion due to abrasive solids all of which reduces the wall thickness and eventually creating a hole. These problems can be overcome by application of the correct Unique Polymers Metal Repair system.

EXTERIOR REPAIRS

Holes, cracks and splits in piping etc. may be tackled from the external of the pipe without complete disassembly of the system. Any pressure within the system must be relieved before starting the repair and if possible fluid flow shut down.

SURFACE PREPARATION

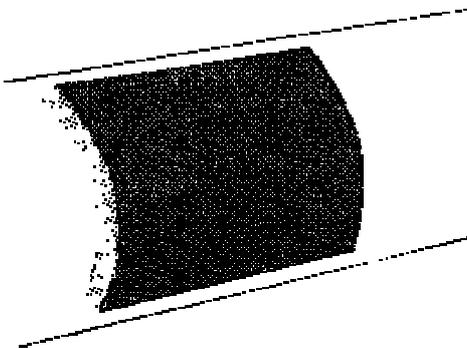
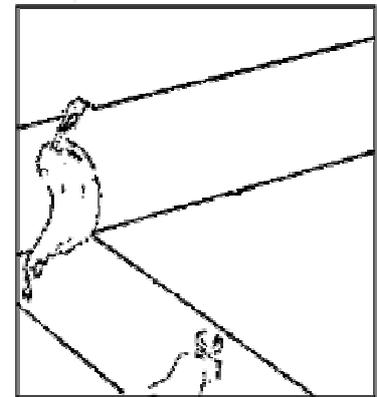
The damaged section of pipe/ducting should be isolated from the system if possible then drained of any fluid. Caution must be If all fluid cannot be drained and leakage continues, the site must be plugged with a wood dowel, sheet metal screw or as detailed in surface preparation section of this manual.

In some areas, the thickness of pipe may be too thin to support a mechanical plug, in such instances leaks can be stopped by fixing a thin rubber patch directly over the problem area with wire ties or clamps. Remove all paint, rust, millscale and hardened deposits by abrasive blasting, needlegun, grinding or rotary file.

The prepared area should extend 2-3 inches (50-75 mm) around the area to be repaired.

Thoroughly degrease the prepared surfaces with Unique Polymers Universal Cleaner.

Certain repairs may require the use of a metal backing plate to strengthen the repair these include large pipes and high pressure repairs. To do this follow the procedures of the next three steps.

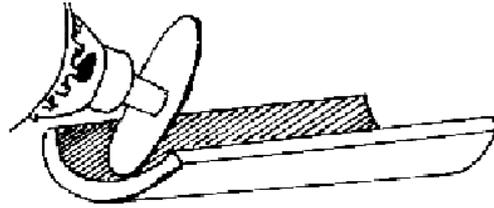


Select a piece of aluminium or steel plate of equal thickness to the damaged pipe and shape it to the outside dimensions of the damaged area.

Alternatively, a piece of pipe with a slightly larger internal diameter (ID) than the damaged pipe outside diameter (OD) can be cut to cover the area to be repaired.

The plate should extend 5cm (2 in) beyond each side of the damaged area. Radially it should extend 5 cm (2 in) beyond each side or one third the pipe circumference, whichever is smaller.

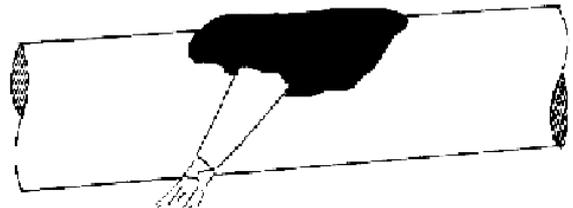
Thoroughly abrade the inside and outside surfaces of the plate to achieve a course profile and follow with a thorough cleaning with Unique Polymers Universal Cleaner.



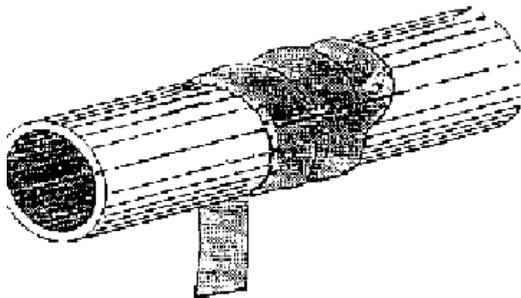
APPLICATION OF PRODUCT

LOW PRESSURE - SMALL DIAMETER (0,70 MPA (100 psi) max - less than 7,5 cm (3 in) diameter)

Prepared surfaces must be clean, dry and prepared as specified above.
 Mix sufficient Thortex Metal-Tech EG to complete the repair.



Apply Unique Polymers Metal-Tech EG105 to the prepared surface. Work the material into the abraded surface forcing the product into the crack or hole if not plugged. UPS reinforcing cloth long enough to wrap twice around the pipe should now be impregnated with Unique Polymers Metal-Tech EG105. The treated cloth should then be firmly wrapped around the damaged area, overlapping each wrap at least 50% of the cloth width.



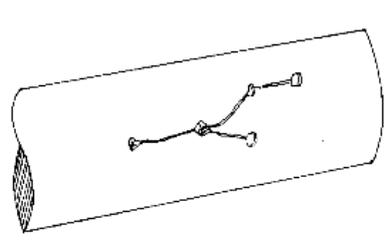
Excess product which is forced out of the tape can be smoothed down with the application tool or mixing blade provided with each kit of the UPS Metal Repair System. Additional mixed product can be applied over the mesh so that it is totally covered and then contoured to a desired finish. Do not apply product beyond the prepared areas of the pipe.

LOW PRESSURE - LARGE DIAMETER (0,70 MPA /100psi) max -greater than 7,5 cm (3 in) diameter)

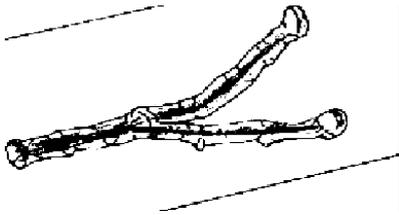
Large diameter pipe, particularly cast pipes which have cracked, require a different technique due to stress exerted on the crack



Prepare the damaged section of pipe and a backing plate as detailed in the surface preparation section of this chapter.

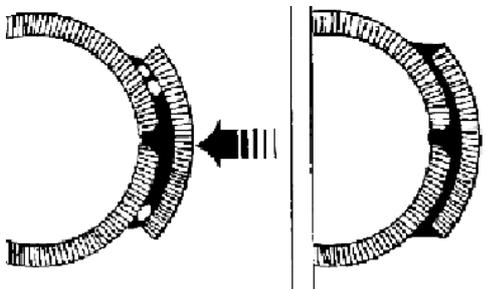


The damaged area should be inspected to determine if any cracks or fractures are propagating due to stress in the pipe. If so, the crack should be stress relieved by drilling the ends and V-ing out the crack, as discussed in CHAPTER 4 of this manual.



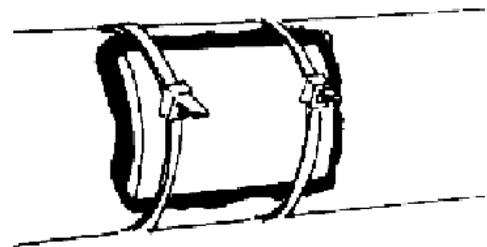
Mix sufficient Metal-Tech EG 105 and apply it to the prepared area. Force the product into the hole or crack. Also apply the product to the internal surface of the repair backing plate.

Press the plate firmly over the repair area, forcing out any air pockets and then wipe off the excess Unique Polymers Metal-Tech EG105, flush with edge of the plate. Do not permit the mixed product onto unprepared surfaces. Wipe these areas clean with Unique Polymers Universal Cleaner.



The plate should now be held in place until the Unique Polymers Metal-Tech EG105 has set, this can be done using wire, plastic strapping or cable ties.

Once the initial repair has set the clamps can be removed and further mixed product can be applied over the patch to totally encapsulate the plate.

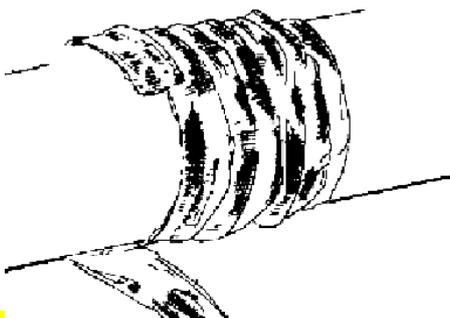
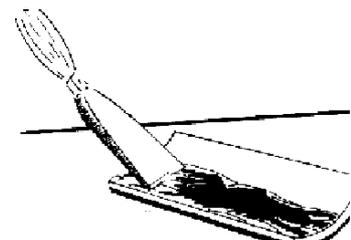


HIGH PRESSURE - SMALL & LARGE DIAMETER (Above 0,70 MPA/100 psi)

For the repair of small and large diameter high pressure lines additional reinforcement to the patch plate is required. Prepare both small and large diameter pipe as well as a patch plate as detailed in the previous Section 1

Apply UPS Metal-Tech EG 105 to the prepared area of the pipe and to the inside of the patch plate and fix as described in Sections A1-5 for small pipes above.

Once the patch has set the ties/clamps can be removed and UPS Reinforcing Tape impregnated with UPS Metal-Tech EG105 can be wrapped around the pipe totally enclosing the patch.



Once this application is set further mixed product can be applied to seal in the reinforcing tape.

On large diameter pipes the clamps/ties should remain in position to give additional support to the repair.

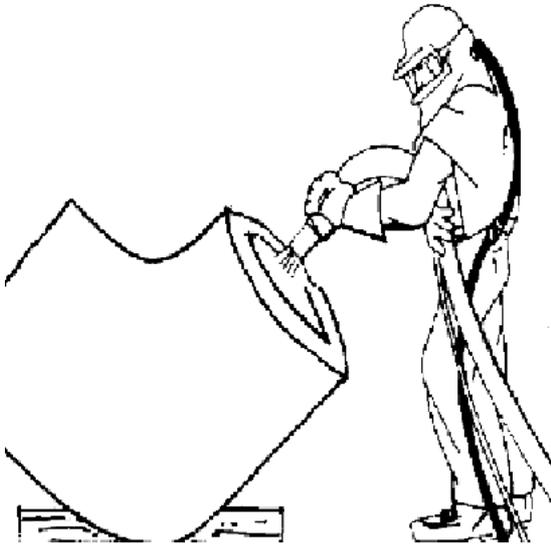
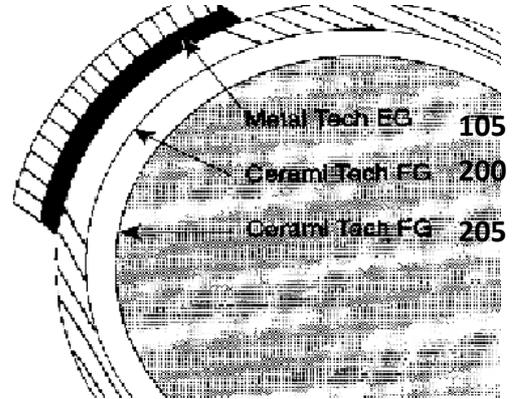
D) EMERGENCY REPAIRS

Where time is of the essence the initial stage of the repairs described in Sections A, B, and C can be carried out using UPS Metal-Tech RG19065, with the final application of product/reinforcing tape being carried out using Thortex Metal-Tech EG105. This allows equipment to be returned to service whilst the UPS Metal-Tech EG105 continues to cure.

INTERNAL REPAIRS

Movement of abrasive powders and slurries through pipes can cause erosion of the internal of the pipe. This is pronounced at the elbows and reduction fittings. This erosion often only becomes evident when a hole appears in the pipe as the pipe wall is eaten away from the inside.

Repair of the pipe elbow and fitting can be done to the interior surface using UPS Cerami-Tech EG200, HG240 or FG205, elbows can also be lined with UPS Cerami-Flex EG230. In addition exterior patching with sectioned pipe or elbows on the external surface can add strength to the damaged area.



SURFACE PREPARATION

Remove the section to be repaired from service and flush liberally with water to remove surface debris. Allow to dry. Surfaces which are continuously exposed to oil, salt, acid slurries etc will require sweating as described in the surface preparation section of this manual.

Note: Certain lengths of pipe may need to be sectioned in order to provide sufficient access to allow them to be blasted effectively. Ideally the pipe should be cut into 1 meter lengths.

This length will also allow easy application of the Unique Polymers Repair Systems.

Surfaces should be abrasive blasted using a suitable abrasive to achieve a 75-125 micron (.003-.005in) profile. It will be necessary to abrade the outside as well as the inside of the pipe when a patch plate is being used to strengthen the repair.

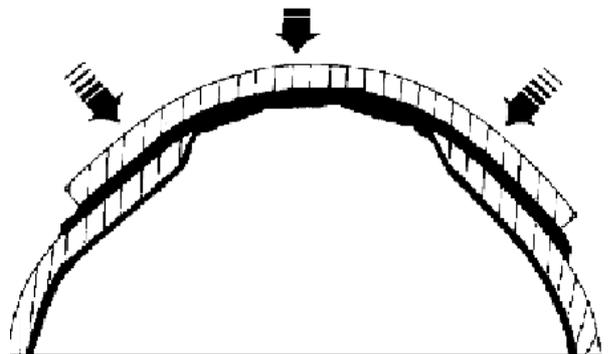
Surfaces should now be degreased with UPS Universal Cleaner and allowed to completely dry.

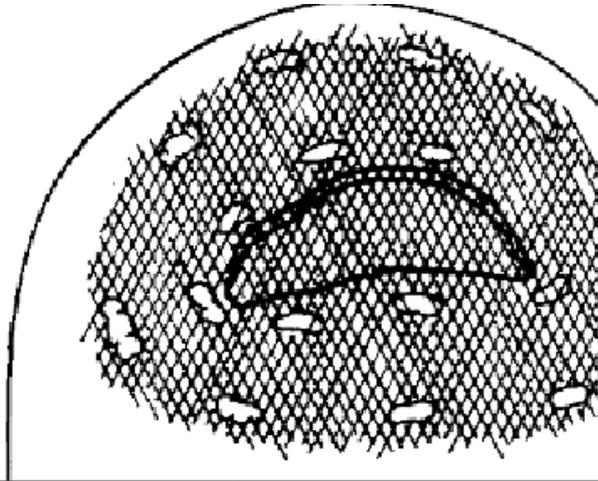
8.2.2) APPLICATION OF PRODUCT

Badly worn or holed sections must be reinforced externally prior to internal lining. Using UPS Metal-Tech EG105 coat the inside area of the prepared patch and the exterior of the prepared pipe section. Press the patch firmly into position and hold in place using clamps.

If a reinforcing plate is not feasible, heavy metal mesh can be substituted and tack welded to the external of the damaged section, and this can be coated with the UPS Cerami-Tech EG200 to rebuild the holed area.

UPS Cerami-Tech EG200 should be applied at a thickness of 4-6 mm. (3/8"-5/8").





Allow the plate or mesh reinforced area to reach an initial cure before proceeding to the next step. The interior of the pipe section is now rebuilt using Unique Polymers Cerami-Tech EG200.

Apply the first coat of UPS Cerami-Tech EG 200 only to the damaged areas.

Press the product into the abraded profile. Do not apply too much at once, use manageable quantities to ensure a neat job. Continue applying the product until the damaged areas are rebuilt to the approximate original profile.

Once the repair material has set UPS Cerami-Tech FG205 or CR210 can be applied to the balance of the pipe or elbow including overcoating the built up damaged area.

Note: Sectioned pipe should not be coated to the very ends as they must be welded together at final assembly.

8.2.3) REASSEMBLY

The sectioned pipe can now be welded together. The uncoated inner area of each joint can be lined with UPS Cerami-Tech EG200 and FG205, by reaching in from the open end.

Smooth the repair flush to the cured repair and then weld on the next section. Continue this procedure until the pipe work is assembled.

Flange joints can be refitted with a new gasket and reassembled. To maintain streamline flow, the inside diameters should be aligned. If the inside diameter of the sections do not match up, apply additional UPS Cerami-Tech EG200 to the inner seam and smooth down.

Allow the repair to cure until full physical properties have developed before putting the system back into service.

❑ Product Release For – Pipe Repair Applications

Many industrial and marine companies today are suffering from the long term effects of internal pipe erosion and corrosion due to the amount of time in service and age of plant and equipment.

To replace these pipes is proving to be not only expensive but can seriously affect the companies ability to continue to manufacture and make profits.

To prevent the replacement of pipe work – Unique Polymer Systems can supply a long term solution that enables full repair whilst allowing full production / plant operation to continue.

By utilising UPS **Resin and Hardener** in conjunction with UPS **Glass Tape** – immediate and cost effective repairs can be carried out.

Surface preparation is at a minimum due to the surface tolerant characteristics of the Resin product.

The end result can offer long term protection at a working temperature of 170°C and at pressures ranging from 35kg/cm² (500 psi) through 112kg/cm² (1600psi).

For further information please contact your local distributor or Unique Polymers Systems direct.

sales@uniquepolymersystems.com

www.pipewrap.co.uk

❑ Step One Clean Pipe Best Possible



❑ Step Two Mix and Apply Resin and Hardener



❑ Step Three Wrap Glass Tape (x 3 Times)



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Product Release For – Pipe Repair Applications

Many industrial and marine companies today are suffering from Un-Planned small pipe leaks that need an instant repair solution. The LEAKS can seriously affect the companies ability to continue to manufacture and make profits.

To prevent the replacement of pipe work – Unique Polymer Systems can supply a long term solution that enables full repair whilst allowing full production / plant operation to continue.

By utilising UPS Pipe Repair Tape – immediate and cost effective repairs can be carried out.

Surface preparation is at a minimum due to the surface tolerant characteristics of the Resin product.

The end result can offer long term protection at a working temperature of 270°C and at pressures ranging from 10 bar (150 psi) through 50 bar (725psi) if used in conjunction with UPS PlasSteel Metal Repair Stick.

The finished repair can seal effectively after only 5 minutes with full cure after 30 minutes!

For further information please contact your local distributor or Unique Polymers Systems direct.

Effective on Pipe Circumference nb15mm – nb400mm.

sales@uniquepolymersystems.com

Step One Clean Pipe Best Possible



Step Two Mix Pipe Wrap In Water



Step Three Wrap Bandage Around Pipe



Use PlasSteel Metal Stick To Plug Leaking Holes



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Chapter #9 FLANGES AND MATING SURFACES

Flanges and Mating surfaces on pipes, pumps and valves can become distorted and scored through repeated dismantling for maintenance and cleaning, this results in leaks and loss of efficiency.

UPS Repair Systems can be successfully used to rectify these defects.

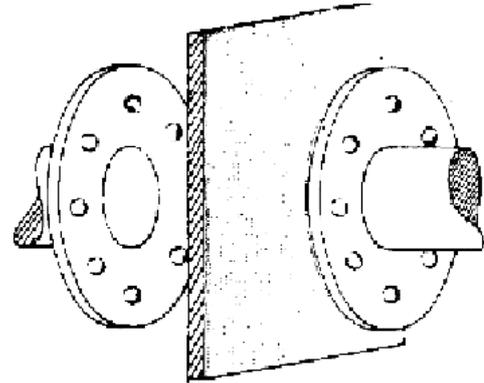
DAMAGE TO BOTH MATING SURFACES SURFACE PREPARATION

Both surfaces should be thoroughly degreased using UPS Universal Cleaner.

Surfaces should now be abraded using one of the techniques described in applications.

The bolt holes in the flanges should now be plugged using wooden pegs, putty or plasticine.

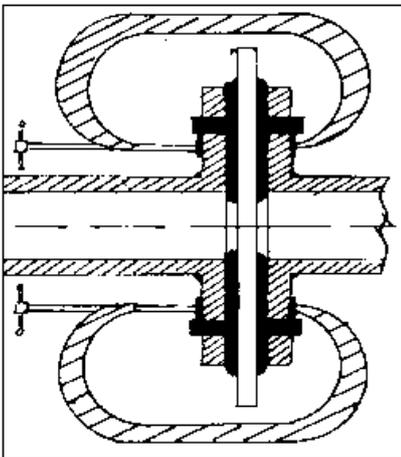
A flat metal plate larger than the external diameter of the flanges should now be coated on both sides with UPS Release Agent.



PRODUCT APPLICATION

Mix sufficient UPS Metal-Tech EG105 (or UPS Metal Tech XG 115 if applications are being carried out in hot conditions) to complete the application.

The mixed product should now be applied by spatula or pallet knife to the two mating faces, to wet out the entire surface, tapering the application from the centre to the edge of each face.



The treated metal plate should now be held between the two faces and the two faces squeezed together so that the UPS Metal-Tech EG105 is evenly spread over the surface.

The two faces should then be clamped together, using G Clamps, with further mixed product being squeezed out.

The excess material should be scraped away and the clamps left in position until the product has cured in accordance with the product tech sheet .

Once cured the clamps can be removed and the metal plate taken away.

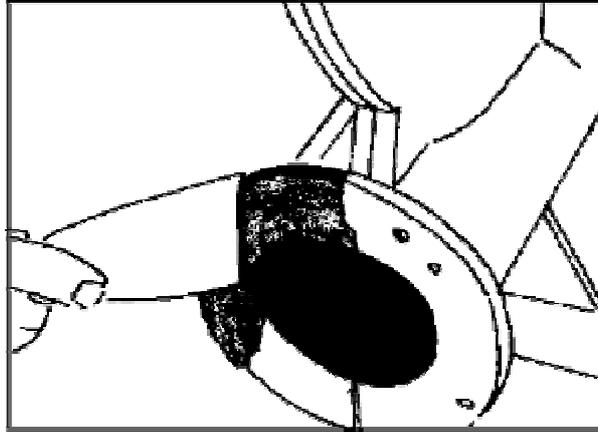
The internal and external edges of the flanges can be dressed with a file or rasp to remove ragged edges of cured material.

The plugs can then be removed from the bolt holes and the flanges reassembled.

PRODUCT APPLICATION

Unique Polymer Systems Metal-Tech EG 015 should be mixed in accordance with the product tech sheet.

The mixed product should be applied to the prepared face as in the previous section



The two faces should be pressed together and the coupling bolts tightened into position squeezing out the excess UPS Metal-Tech EG105.

The excess product should be removed and surfaces wiped clean.

The two flanges should be allowed to cure as described in the technical data sheet.

Once cured the flange can be opened up and dressed as before then reassembled and put back into service.

Chapter #10 PUMP IMPELLERS, FANS AND PROPELLERS

During service impellers, fans and propellers suffer from erosion, pitting and cavitation all of which reduce the effectiveness of the component. Unique Polymers Metal Repair Systems can be successfully used to repair and remedy these defects.

SURFACE PREPARATION

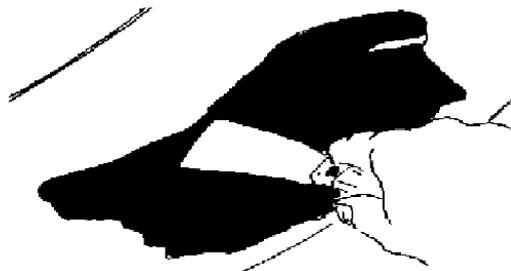
All surfaces should be abrasive blast cleaned, on pitted surfaces it is essential that all pitted areas are thoroughly cleaned. Components which have been operating in sea water or chemical environments should be sweated to ensure complete removal of impregnated salts then re-blasted. Surfaces should be coated within 2 hours of blasting to prevent flash rusting. Surfaces should now be thoroughly degreased using UPS Universal Cleaner.

PRODUCT APPLICATION

Pitted and eroded surfaces should be rebuilt with either UPS Metal-Tech EG105 , UPS Cerami-Tech EG200 or UPS Cerami-Flex 235

The repair product should be mixed in accordance with the product tech sheet.

The mixed product should now be applied to the prepared surface by spatula or pallet knife.



The product should be pressed firmly into the surface to prevent entrapment of air, paying particular attention to pitted areas. The surface should be finished to the approximate contours of the component and the exact shape can be achieved by using a thick sheet of plastic pressed firmly onto the surface following the profile.

Any excess product squeezed out should be carefully removed and the repair allowed to cure .

If required to prevent future erosion and corrosion the whole surface can be coated with UPS Cerami-Tech FG 205 or CR210 where UPS Metal-Tech 105 or UPS Cerami-Tech have been used for rebuilding, UPS Cerami-Flex FG 235 is used as the finish over UPS Cerami-Flex EG 230 rebuilt surfaces.

The UPS Resurfacing System should be mixed in accordance with the instructions supplied on the product tech sheet.

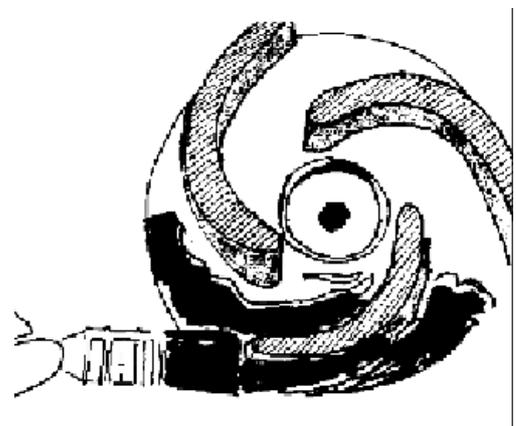
As soon as the product in the rebuilt areas has set the UPS Resurfacing System should be applied by stiff bristled brush or squeegee.

NOTE: If delays have occurred between initial surface preparation and application of the coating system which have

allowed surfaces to flash rust, surfaces should be brush blasted

prior to coating application, to remove any flash rusting.

Once the applied system has cured the component may be returned to service.



Chapter #11 SHIPS RUDDER REPAIRS

In service, ships rudders become pitted and eroded and these areas are easily rectified in the same way as impellers and propellers.

One other area frequently causing problems are worn pintle housings and these can be rebuilt using Unique Polymers Metal-Tech EG105

OVERSIZE PINTLE HOUSINGS

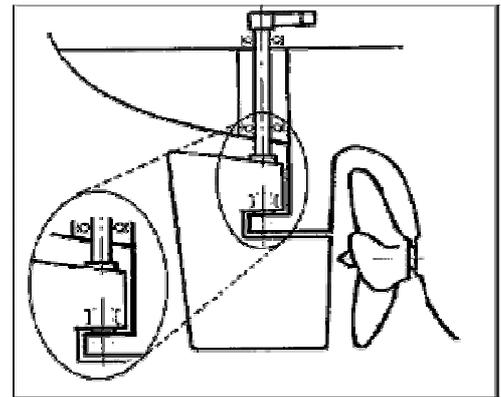
SURFACE PREPARATION

The interior of the pintle housing should be abrasive blasted to give a coarse surface profile.

Surfaces should now be sweated, to ensure any entrained salts are removed.

Surfaces should now be re-blasted.

Step 2 and 3 should be repeated until all salts are completely removed.



The prepared surface should now be degreased using Unique Polymers Universal Cleaner.

The pintle (normally a new component if the existing pintle is scored or damaged), should now be treated with UPS Release Agent.

PRODUCT APPLICATION

UPS Metal-Tech EG should be mixed in accordance with instructions on the product tech sheet.

The mixed product should then be spread onto the internal surfaces of the prepared housing and onto the external of the pintle using a spatula or palette knife.

The pintle should now be jacked into position and correctly located.

The excess UPS Metal-Tech EG105 which is squeezed out when the pintle is being inserted should be removed before the product cures.

Once the UPS Metal-Tech EG105 has cured as required by the product tech sheet the repair can be put into service.

FITTING NEW PINTLE LINER

SURFACE PREPARATION

The worn rudder housing should be prepared in accordance with steps 1-4 of the surface preparation in 1.1 above.

The external surface of the new pintle liner should be completely clean then treated with UPS Release Agent.

PRODUCT APPLICATION

UPS Metal-Tech EG105 should be mixed in accordance with instructions on the product tech sheet.

The mixed product should then be spread onto the internal surfaces of the prepared housing and onto the external of the pintle liner.

The pintle liner should now be jacked into position and correctly located.

The excess UPS Metal-Tech EG105 which is squeezed out when the pintle liner is being inserted should be removed before the product cures.

Once the UPS Metal-Tech EG105 has cured for the specified time - the repair can be put into service

Chapter #12 ENGINE REPAIRS

Unique Polymer Systems Metal Repair Systems can be successfully used to rectify many types of damage that may occur to engines in their working life.

Cracks in engine blocks can be repaired by following the procedures set out in CHAPTER 4 of this manual for crack repairs.

HOLED SUMPS (OIL PANS)

SURFACE PREPARATION

The damaged sump should ideally be removed from the engine and flushed with UPS Universal Cleaner to completely remove any oil.

The external surface around the holed area should then be thoroughly abraded in accordance with instructions in this manual.

Surfaces should now be sweated to drive out any ingrained oil and then thoroughly degreased again with UPS Universal Cleaner.

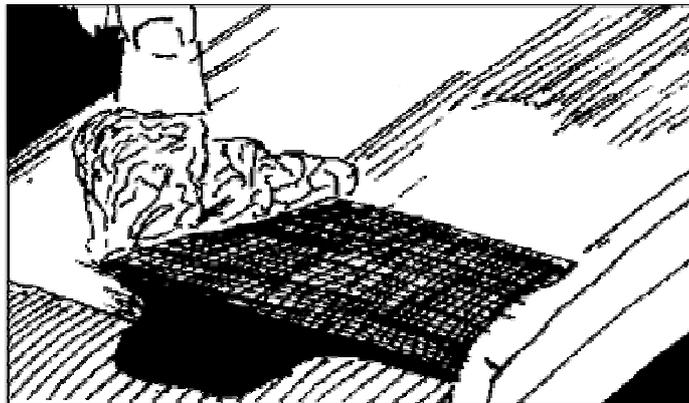
If the hole being repaired is large a metal plate formed to the shape of the sump to fit over the hole should be prepared on the internal surface in accordance with SECTIONS 2 and 3 above. Alternatively heavy metal mesh can be tack welded to the external of the sump over the hole.

PRODUCT APPLICATION

Mix sufficient UPS Metal-Tech EG105 to complete the application in accordance with instructions on the product tech sheet.

Spread mixed product onto the prepared area of the sump.

For small holes, impregnate UPS Reinforcing Tape with mixed UPS Metal-Tech EG105 and apply as a patch over the hole, and allow to set. Further UPS Metal-Tech EG 105 can then be applied to totally encapsulate the reinforcing sheet



For larger holes where a metal patch is being used mixed material should be applied to the prepared surface of the plate and the plate then pressed over the hole in the sump. The excess product squeezed out should be scraped away before the material sets. The plate should then be held in place by clamps until the product has cured.

Where metal mesh has been used over the hole, the mesh should be coated with the UPS Metal-Tech EG105

Once the repaired area has cured in accordance with instructions the component can be refitted to the engine and put back into service.

WORN AND PITTED WET LINERS

SURFACE PREPARATION

Surfaces should be abrasive blast cleaned ensuring that deep pits are thoroughly clean and all corrosion products removed.

Surfaces should now be degreased with UPS Universal Cleaner.

12.2.2) PRODUCT APPLICATION

Pitted areas should be first made good with Thortex Cerami-Tech EG. The product should be mixed as stipulated in the product tech sheet.

The mixed Thortex Cerami-Tech EG should then be applied to the pitted/eroded areas using a spatula, forcing the material into the pits and forcing out all entrapped air. Warming the surface of the liners before product application will aid this process.

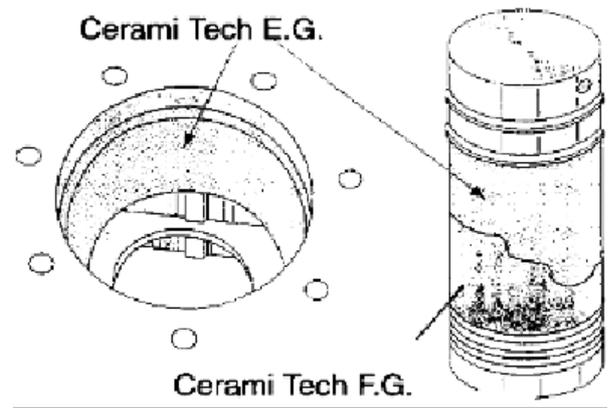
The applied material should be finished off to the original dimensions of the liner and allowed to set.

UPS Cerami-Tech FG205 mixed in accordance with supplied instructions should now be applied over the entire surface of the liner. Where delays have resulted in either flash rusting of exposed metal or the UPS Cerami-Tech EG200 becoming hard then surfaces should be re-blasted before the UPS Cerami-Tech FG205 is applied.

Once the applied products have cured in accordance with the data supplied the repaired liner can be refitted to the engine.

EROSION OR CORROSION OF LINER SEATS

The surface of the seat should be prepared using a conical grinding wheel or needle gun to produce a coarse profile and remove all corrosion products.



Sweating and regrinding may be necessary to remove it.

The surface should then be degreased using Unique Polymers Universal Cleaner.

The liner landings should be treated with Unique Polymers Release Agent.

PRODUCT APPLICATION

Sufficient UPS Metal Tech EG105 should now be mixed as detailed in the product tech sheet.

UPS Metal-Tech EG105 should be applied to the seat area and allowed to become tack-free.

The liner can then be carefully positioned, care being taken not to displace the product from the seat area.

When the UPS Metal-Tech EG105 has cured sufficiently the liner can be removed to gain access to the excess product squeezed out so that it can be ground away.

Once the UPS Metal-Tech EG105 has reached its full mechanical strength the liner can be refitted and the unit put into service.

WORN LINER SEAL HOUSINGS SURFACE PREPERATION

Surfaces should be thoroughly degreased using UPS Universal Cleaner.

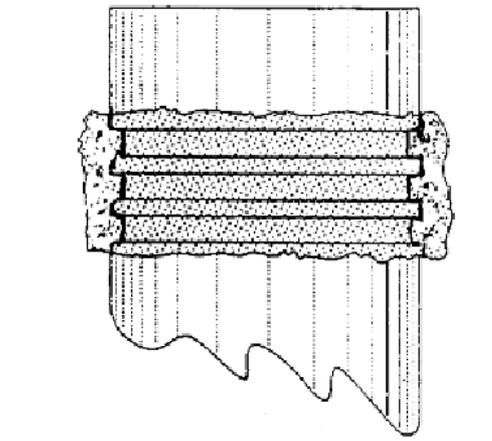
The worn housing should now be abraded by grinding or needle gunning.

Surfaces should then be degreased again.

PRODUCT APPLICATION

UPS Metal-Tech EG105 should be mixed as previously described.

The mixed product should now be applied into the worn housing so that it stands proud of the liner surface.



Chapter #13 - VALVES

Repairs to cracks in valve casings can be carried out as described in CHAPTER 4 of this manual. Holes in casings can be repaired in accordance with methods outlined for holed sumps in CHAPTER 12.

ERODED GATE VALVES SURFACE PREPARATION

All corrosion products and degraded metal should be removed by grinding and needle gun, taking care not to damage the brass sealing ring.

Surfaces should now be sweated to remove any ingrained corrosion products and salts.

Further grinding should then be carried out to ensure a coarse surface profile.

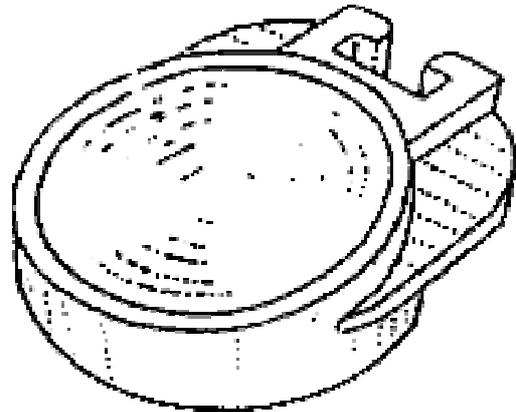
The prepared area should now be degreased with Unique Polymers Universal Cleaner.

PRODUCT APPLICATION

Unique Polymers Cerami-Tech EG 200 should be mixed as required in the product tech sheet.

The mixed product can now be applied to the prepared surface using a spatula or pallet knife. A thin coat should be first spread thinly over the surface to avoid air entrapment, especially in areas of deep pitting. The areas can now be filled with UPS Cerami-Tech EG200 ensuring no air entrapment and smoothed off just proud of the sealing rings.

Once the product is cured sufficiently for machining the repaired area can be dressed back to the correct dimensions using an electric sander.



WORN VALVE SEATS (Non Internal Combustion Type) 1 SURFACE PREPARATION

Surfaces should be thoroughly degreased with Unique Polymers Universal Cleaner.

The valve seat should be thoroughly prepared by abrading or grinding.

Surfaces should once again be degreased.

The valve itself should be coated with Unique Polymers Release Agent.

PRODUCT APPLICATION

UPS Cerami-Tech EG200 should be mixed as detailed in the product tech sheet.

The mixed product should now be spread onto the prepared surface using a spatula or pallet knife.

The valve should now be fully closed using sufficient pressure to squeeze out excess product.

The excess product should be carefully removed taking care not to disturb the valve.

Once the product has cured the valve can be opened or removed and the cured UPS Cerami-Tech EG200 dressed to remove any residual excess material.

The valve can now be reassembled and returned to service.

Chapter #14 RUBBER REPAIRS

SURFACE PREPARATION

Unique Polymers Flexi-Tech Rubber Repair materials can be used for a wide range of repairs to rubber components including hoses, gaskets, rollers, and other flexible materials. Unique Polymers Flexible Repair materials are available in two hardness grades designed to match hardness of the parent rubber.

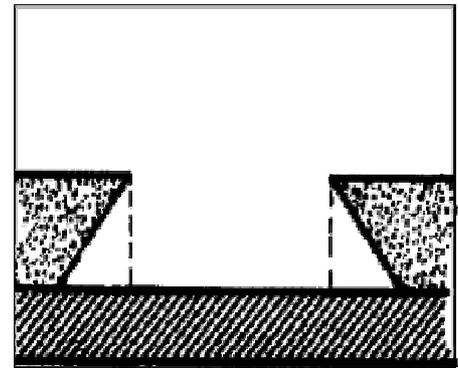
INITIAL PREPARATION

It is important that any loose contamination on the rubber surface be removed. This can be accomplished by high pressure hosing, scrubbing with detergent solutions or UPS Universal Cleaner. Where the component is fabric reinforced the reinforcement must be dried if this has become saturated with water or other chemicals. The prepared area must be greater than the area to be repaired. Any loose or fraying rubber or fabric which may hinder good adhesion must be cut away.

UNDERCUTTING

To give good adhesion and to eliminate the possibility of the UPS Flexi-Tech Materials being lifted out it is advisable to undercut the parent rubber to allow for a reasonable thickness and to provide good adhesion at the extremities of the repair.

Ideally the cut should be made to produce a joint with parent rubber of at least 90° and ideally an actual undercut so that the rubber repair is dovetailed into the parent rubber, eliminating any possibility of the edges of the repair being picked up.



ABRADING THE SURFACE

This is the most critical stage in the surface preparation of rubber surfaces. To obtain optimum results, the rubber must be abraded to remove any deteriorated rubber and to produce a rough surface to which the repair can bond. The choice of tools is extremely important and there are several tools that can be used for this purpose. The most versatile and readily available is a rotary wire brush.

The wire brush itself must be in good condition so that when used on the rubber, the actual surface is broken and not just polished as can happen with worn wire brushes. Coarse grinders can also be used to prepare rubber surfaces, but care has to be exercised to ensure that the rubber surface is actually roughened and not polished.

DEGREASING

Once the surface has been roughened, the surface should then be wiped with UPS Universal Cleaner to ensure any oil or wax that may have been brought to the surface is removed. Surfaces then must be allowed to fully dry prior to the application of UPS Flexi-Tech Primer. Where fabric reinforcement has been exposed, extra time should be allowed for this drying process, since the fabric may have absorbed a considerable amount of the UPS Universal Cleaner.

CONDITIONING

It is essential that the thinnest possible layer of UPS Flexi-Tech Primer is applied to the surface, only sufficient UPS Flexi-Tech Primer should be applied to ensure complete wetting of the surface. To this end the brush should be used as a stipple to work the Unique Polymers Flexi-Tech Primer into the surface, taking particular care to avoid ponding in any surface depressions.

REPAIR OF LOW PRESSURE HOSES

Repairs cannot be carried out whilst the hose is under pressure and / or weeping, therefore pressure must be removed and the hose drained before proceeding.

SURFACE PREPARATION

Any oil, or contamination must be removed from an area at least 3" on all sides of the damage. The area should then be abraded as described in section 1 followed by being degreased using UPS Universal Cleaner. The prepared area should then be primed with UPS Flexi-Tech Primer and allowed to cure as detailed in the data sheet before overcoating.

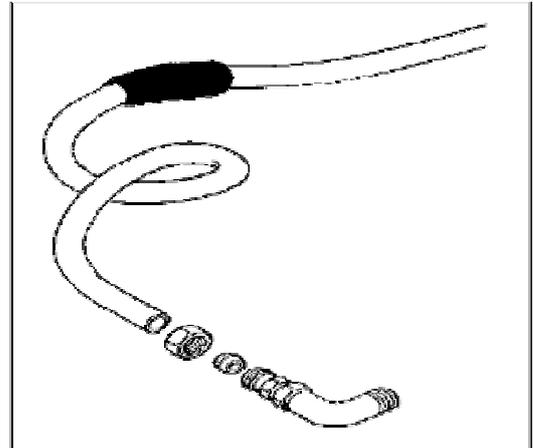
APPLICATION OF Unique Polymers FLEXI-TECH

The paste grade (305 / 310 / 075 / 320) of UPS Flexi-Tech with the hardness nearest to the parent rubber should be chosen and sufficient product to complete the repair should be mixed in accordance with the product tech sheet.

Using the applicator supplied, apply the mixed product to the prepared areas around the damage. UPS Reinforcement Tape should then be wrapped around the damaged area and further mixed product applied and worked into the UPS Reinforcement Tape.

Extra layers of Thortex Reinforcement Tape and UPS Flexi-Tech should be applied to strengthen the repair so that the thickness of repair is at least 50% greater than the original wall thickness. A final layer of mixed product should be spread smoothly over the surface.

A sheet of polyethylene can be pressed over the surface and this sheet can be worked with the fingers to produce a neat, smooth repair contoured to the hose. When the repair has cured, the piece of polyethylene sheeting can be peeled away to leave a smooth surface.



The repair should be left to cure before returning to service as detailed in the product tech sheet.

REPAIR OF PUMP DIAPHRAGMS SURFACE PREPARATION

The damaged diaphragm should be removed from the pump and scrubbed with a detergent solution followed by rinsing in clean water. Any loose rubber should be cut away with a sharp knife, so that the wire reinforcement is exposed but not severed. The edges of the worn area should be undercut and the diaphragm edges should be mechanically wire brushed to produce a rough surface as detailed in section 14.1 above.

The entire damaged area and outer edge of the diaphragm should then be wiped over with a rag treated with UPS Universal Cleaner.

APPLICATION OF Unique Polymers FLEXI-TECH PRIMER

A thin coat of UPS Flexi-Tech Primer should be applied to all exposed areas of the wire mesh reinforcement and the diaphragm edge and allowed to dry in accordance with the product tech sheet. Sufficient UPS Flexi-Tech 60 or 80 EG (305 / 320) (depending on the hardness of the rubber) should be mixed in accordance with the product tech sheet.

The mixed product should be forced into any split areas. A thin coat of the UPS Flexi-Tech should then be applied onto damaged areas with a stiff bristled brush. UPS Reinforcement Tape should then be stippled into the wet material. Further product should then be applied to completely cover the UPS Reinforcement Tape.

A further coat of UPS Flexi-Tech should then be applied over this and around the diaphragm edges and the entire repair allowed to cure in accordance with the product tech sheet before being put back into service.

REPAIRING RUBBER COVERED ROLLERS

Basically, the techniques for repairing rubber rollers can be separated into patch repairs using a paste grade of UPS Flexi-Tech or the casting of new sections using a fluid grade.

PATCH REPAIRS

The edges of the damaged area should be undercut with a sharp knife. The area should then be thoroughly abraded with a rotary wire brush, and then degreased with UPS Universal Cleaner .

PRODUCT APPLICATION

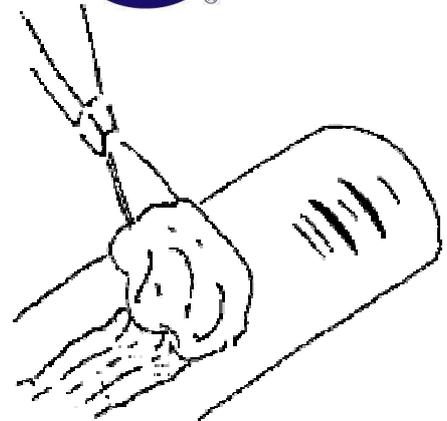
All abraded areas should now be coated with UPS Flexi-Tech Primer. Sufficient UPS Flexi-Tech product appropriate to the hardness of the roller to complete the repair, should be mixed in accordance with the product tech sheet.

Unique Polymers Applications



The mixed UPS Flexi-Tech should be pressed firmly into the area to be rebuilt with a spatula, great care being taken to avoid air entrapment, which could weaken the repair. The repair can be shaped by stretching a heavy duty polythene sheet over the surface. Once cured the sheet can be removed and a perfectly smooth finish will remain.

On grooved rollers, a straight edge can be used to finish the repair, flush with the surrounding surface can be left proud then machined to the correct profile. Where machining is involved, a sharp tool should be used and the cutter should be adjusted so that the rubber swarf is removed as a continuous thread to give the best possible finish. A feed rate of 5-10 thou./ rev with a surface cutting speed of 200-400ft./min should be used. Small repairs can be hand finished with abrasive paper.



RESURFACING BY REMOULDING

The entire rubber surface should be cleaned, mechanically abraded as described in section 14.1 and then degreased. For badly worn rollers the old cover should be completely stripped and the metal roll thoroughly abraded preferably by grit blasting and degreasing using UPS Universal Cleaner.

APPLICATION OF Unique Polymers FLEXI-TECH 60 OR 80 FG (300 / 315)

Prepared surfaces should now be coated with Unique Polymers Flexi-Tech Primer and left to cure before overcoating in accordance with the product tech sheet.

Sufficient product to complete the repair should now be mixed in accordance with the product tech sheet.

A cylindrical mould such as a PVC pipe of suitable bore, cut in half, is ideal for producing the circular mould. The pipe should be closed using clamps or tapes and positioned around the roller frame so that the frame is centered in the mould. The UPS Flexi-Tech can now be poured into the mould taking care to avoid air entrapment, entrapped air can be minimised by vibrating the mould. After cure, the longitudinal cut is eased open and the roller removed.

This method provides a rebuilt roller of high quality and if machining is necessary, the procedure outlined previously should be followed.

REBUILDING WORN RUBBER IMPELLERS

UPS Flexi-Tech 80 EG (320) is ideal for rebuilding rubber impellers operating in abrasive slurries.

The impellers should be thoroughly washed down with detergent solution followed by hosing with clean water ensuring that no foreign particles are wedged between the rubber and the iron core.

Any loose areas of rubber should be cut away and the edges of the areas undercut. Surfaces should now be thoroughly roughened with a rotary wire brush then degreased using UPS Universal Cleaner and the surface allowed to completely dry.

Any exposed metal should be cleaned as above and thoroughly roughened preferably by grit blasting to remove loose rust and give a key. All metal and rubber areas should then be primed with UPS Flexi-Tech Primer and allowed to cure.



To help obtain accurate contours, light gauge aluminium or thin plastic should be bent to the required dimensions. The internal areas of the former should then be treated with UPS Release Agent and allowed to dry for 15-20 minutes. Sufficient product for the repair should be mixed in accordance with the product tech sheet. The mixed product should be pressed firmly into position over the primed area, or pressing the former ensuring minimum air entrapment.

The repair must then be allowed to cure as detailed on the product tech sheet. The former should be peeled carefully from the surface after the repair material has cured. Perfectly formed contours will result.

GASKET REPAIRS

Worn or damaged rubber gaskets are easily repaired or replaced by using UPS Flexi-Tech Materials.

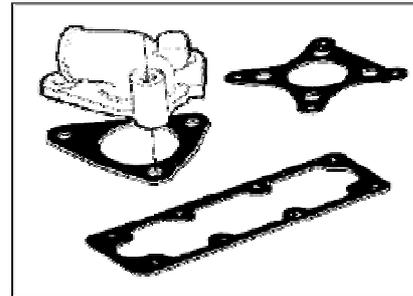
GASKETS BETWEEN MATING SURFACES

The two mating surfaces should be disconnected and separated and the old gasket removed.

The surfaces should then be thoroughly cleaned to remove all contamination and degraded gaskets.

Pegs treated with UPS Release Agent should be fitted into the bolts holes, and the flange surfaces should also be treated with UPS Release Agent which should then be allowed to dry.

Sufficient UPS Flexi-Tech 60/80 EG (305 / 320) should be mixed in accordance with the product tech sheet then spread with the tool provided, onto the flange faces taking care that no air is trapped.



The pegs can now be removed carefully and the two faces bolted together with the bolts being equally tightened 95% squeezing out excess material. Excess material should be scraped away and the product left to cure. Once the product has cured the bolts can be fully tightened and a new gasket is formed.

MOULDING A GASKET/SEAL

The worn / perished rubber gasket/ seal should be removed from its seating and surfaces of the seating completely cleaned. The cleaned surfaces should then be treated with UPS Release Agent in accordance with the product tech sheet and allowed to dry.

Sufficient UPS Flexi-Tech 60/80 FG (305 / 315) to refill the seating should be mixed in accordance with the product tech sheet.

A thin coat of the mixed UPS Flexi-Tech 60/80 FG (305 / 315) should be brushed onto the sides of the seating surface. The remaining material can be poured carefully into the seating taking care to minimise any air bubbles. Gentle vibrations of the component will bring air to the surface, and the bubbles can be removed by gentle heat applied above the surface.

The seating should be completely filled leaving the product slightly proud of the surrounding metal, and once the UPS Flexi-Tech Material is cured the component can be assembled.

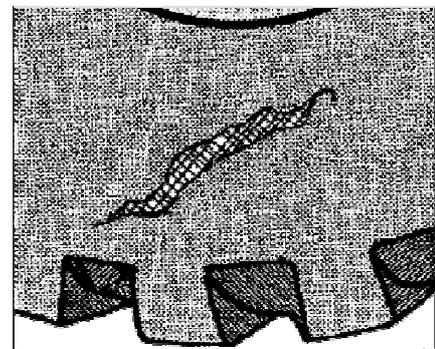
REPAIRING OF SPLITS AND CUTS IN SIDEWALLS OF OFF ROAD TYRES USING FLEXI-TECH 60 EG (300) SURFACE PREPARATION

Effective repairs are best carried out with the wheel/tyre on the vehicle with the area to be repaired under load at the bottom.

Any splits must be rounded out at the ends to prevent them extending, this can be carried out by using a sharp knife, care should be taken to ensure that the fabric of the tyre is not cut.

Loose sections of rubber should be cut away, then all edges of the damaged area should be undercut to give an increased bonding area and a clean surface.

Surfaces should be wiped with UPS Universal Cleaner to ensure any oil or grease is removed, and the area should be allowed to dry before proceeding.



PRODUCT APPLICATION

The prepared surface should now be primed with Unique Polymers Flexi-Tech Primer.

The Unique Polymers Flexi-Tech 60 EG should be mixed in accordance with the product tech sheet then applied to the primed area. The mixed Unique Polymers Flexi-Tech should be pressed firmly into the prepared area ensuring no air entrapment with the rebuilding being left slightly proud of the surrounding surface.

The surface profile of the repair can then be moulded to match the tyre by pressing a piece of flexible plastic or polythene over the surface using hand pressure to trace the surface profile. This plastic can be removed when the UPS Flexi-Tech has been allowed to cure then the surface can be buffed down using a rotary grinding stone.

NOTE: This repair method should not be carried out to repair tyres where the structural fabric of the tyre has been damaged.

CONVEYOR BELT REPAIRS

UPS Flexi-Tech Products can be used to repair damage to edges of conveyor belts, to holes and cuts in belt surfaces and to rebuild worn surfaces.

The choice of which UPS Flexi-Tech product will depend on the nature of the conveyor belt, the extent of the damage, the hardness of the parent rubber and whether or not additional strength is required.

Application is generally made with the belt in place, simply rotating the damaged area to a point of easy access. Plywood supports under the belt may be required as a work surface.

Ripped or Torn Conveyor Belts

SURFACE PREPARATION

Surfaces should first be degreased using hot detergent or steam cleaning. Worn fabric or torn rubber should first be cut away.

Splits and cuts should be undercut using a sharp knife. Where exposed fabric has become wet, it must be allowed to dry out.

The complete area of damage and an area at least 10 cm around the damage, should be abraded to produce a "woolley finish". This can be achieved by use of a rotary wire brush, or a special roughening tool. The entire area should then be thoroughly cleaned to remove all dust and abrasive residue.

For rips and tears longer than 15 cm, or where the ultimate strength of the belt is questionable, it may be advisable to incorporate mechanical fasteners at approximately 8 cm centres. These then ultimately become an integral part of the Unique Polymer repair.

PRODUCT APPLICATION

Prepared surfaces should now be coated with Universal Polymers Flexi-Tech Primer.

The chosen UPS Flexi-Tech product should now be mixed in accordance with the Product Tech Sheet and applied over the prepared area, fully encapsulating any mechanical reinforcement used. Where belt reinforcement is worn away, UPS Reinforcement Tape should be embedded into the UPS Flexi-Tech product and completely encapsulated.

Multiple layers of this reinforcement may be used where severe wear has occurred. To achieve a perfectly smooth surface, stiff polyethylene sheeting can be pressed onto the uncured material. This should be removed when the product has completely cured and excess material removed with a sharp knife or a grinder.

Holes in the belt may be filled with a UPS Flexi-Tech product incorporating layers of UPS Reinforcement Tape. If these holes are large or the belt strength questionable, it is best to square off the damaged area with a Stanley knife and peel back the surface rubber over the plies. Another piece of similar conveyor belt is then cut, stepped and bonded into place, essentially creating a four sided lapped joint.

LAP JOINT LAMINATED BELTS

SURFACE PREPARATION

The belt to be treated should be positioned on a flat working surface and clamped in place, belt ends should now be cut square with a sharp knife. The joint should be marked out using chalk. The overlap of the belt should be a minimum of 75% of the belt width and should be made in steps dependent upon the number of layers of reinforcement. For example, a 3 ply belt would require two steps, a 4 ply would require three steps, etc. The width of each step should be equal and equally divided into the length of the joint overlap.

After marking out, a sharp stanley knife should be used to carefully cut through the plies at each step. The plies are then removed by cutting horizontally between reinforcement layers at each step and easing up the delaminated edge with a suitable tool.

The delaminated edge may then be gripped using a set of pliers or vice grips attached to a chain pulley and the plies carefully stripped from the belt carcass.

After removal of the plies is complete, a rotary wire brush or roughening tool must be used to fluff up the exposed plies, belt edges and an area extending at least 8 cm onto the belt surface.

PRODUCT APPLICATION

Unique Polymers Flexi-Tech Primer should now be applied to the prepared surfaces in a thin film avoiding ponding. Great care must be taken to keep the primer within the prepared area.

The chosen Unique Polymers Flexi-Tech product should be mixed, in accordance with the product tech sheet.

The prepared joint should be laid flat on the working surface and a polyethylene sheet inserted below the joint. The belt should be aligned and clamped in position.

The Unique Polymers Flexi-Tech should then be applied to thoroughly wet out all mating surfaces. The two halves of the joint should then be brought together and wrapped in polyethylene sheeting.

To ensure all air pockets are driven out, heavy steel plate should then be placed on top of the joint and clamped firmly until full cure of the repair is effected.

Following the cure, excess material can be cut away using a sharp stanley knife and the belt put back into service.



QUALITY AND ENVIRONMENTAL MANAGEMENT

Manufacturing operates a quality management system compliant with the requirements of BS EN ISO 9001:2000; we are one of the first UK companies in this industry to achieve this level of registration after originally achieving the ISO 9002 standard. The Manufacture also operates an Environment Management System compliant with the requirements of BS EN ISO 14001:2004. This reflects the companies commitment to the environment both in the range of mainly water based and solvent free systems that are manufactured and the manner in which they are manufactured.

The Head Office based manufacturing facility covers in excess of 40,000 sqm.

Continuous investment in state of the art manufacturing equipment ensures that manufacturing is able to respond efficiently and effectively to all manufacturing requirements and strict quality procedures ensures consistency and high standards of manufacturing are maintained.

As an industry leader, manufacturer continues to invest in its on-site research and development laboratory to ensure the products offered reflect the very latest advances in water based and solvent free polymer technology.

The development of new and innovative products has seen a push forward the boundaries of coatings technology.

Ground breaking research has resulted in several national and international awards. Numerous independent tests have shown that the manufactured products offer superb performance properties. Continuous product development and the introduction of new innovative systems enable UPS to meet its customers' unique requirements for special projects.

APPROVALS AND CERTIFICATES

The UPS product range holds an extensive number of national and international approvals and test certifications; these include:-

- BBA
- Fire Test Certifications
- Nuclear Decontamination
- Drinking Water
- Germanischer Lloyd
- American Bureau of Shipping
- Lloyds
- Railtrack
- Shell

•as well as meeting the requirements of FDA and USDA

TRAINING

Any company wishing to use UPS products can access our product training either at our Head Office based Training Centre or specific training can be arranged on site.

COMMERCIAL AND TECHNICAL SUPPORT

UPS provides comprehensive commercial and technical support for our customers worldwide. This is provided by our Customer Service Centre and Technical Information Centre at Head Office.

ISO 9001:2000 (ISO 9000) Certification

WHAT IS IT?

ISO 9000 is the internationally recognised standard for an organisation's internal Quality Management. The term 'quality' refers to all those features of a product or service which are required by the customer.

An organisation's 'Quality Management' refers to an organisation's actions to ensure that its products or services satisfy its customers' quality requirements and complies with any regulations applicable to those products or services

BENEFITS OF ISO 9000

Most organisations want ISO 9000 certification to qualify for a tender or to achieve preferred supplier status: typically for a Local Authority. However, there are many other benefits that can be added to these, including:-

- 1.Improved internal working leading to less errors and re-work.
- 2.Improved customer satisfaction and loyalty.
- 3.Improved morale and motivation.
- 4.Preferential insurance premiums.
- 5.Competitive advantage.
- 6.Increased profitability.
- 7.Enhanced status.

In addition, ISO 9000 is designed to be compatible with other management system standards such as ISO 14001 (Environmental), OHSAS 18001 (Health and Safety) and ISO 27001 (Information Security). All or any combination of these complementary standards can be integrated seamlessly. They share many principles, so choosing an integrated management system can provide you with outstanding value for money.

ISO 14001 (ISO 14001:2004) Certification

WHAT IS IT?

ISO 14001 was first published as a standard in 1996 and it specifies the requirements for an organisation's environmental management system. It applies to those environmental aspects over which an organisation has control and where it can be expected to have an influence.

BENEFITS OF ISO 14001

By having your organisation's environmental management system independently assessed by the British Accreditation Bureau, you will be making a powerful statement about your organisation's environmental credentials. Other benefits of ISO 14001 certification include:

- Better management of environmental risks, now and in the future
- Increased access to new customers and business partners
- Demonstration of legal and regulatory compliance
- Potential for reduced public liability insurance costs
- Overall cost savings

In addition, ISO 14001 is designed to be compatible with other management system standards such as ISO 9001 (Quality), OHSAS 18001 (Health and Safety) and ISO 27001 (Information Security). All or any combination of these complementary standards can be integrated seamlessly. They share many principles, so choosing an integrated management system can provide you with outstanding value for money



The Unique Polymer Product Range of Maintenance Polymer Solutions are used in MANY MANY industries including but not limited to:

- MARINE
- CHEMICAL
- POWER GENERATION
- WATER CLEAN
- WATER DIRTY
- PAPER AND PULP
- OIL AND GAS
- STEEL MANUFACTURE
- HEAVY INDUSTRY
- GENERAL INDUSTRY

The following list is meant as a GUIDE as to where and what you can use the **REPAIR DON'T REPLACE** polymers Maintenance products –

This list in no way limits the product to use for the applications.

Application	Product Recommendations		
Agitators - Rebuilding	200	205	
Anchor Bolts - Rebuilding	105	610	
Autoclaves - Rebuild - Lining	200	205	220
Base Plates - Cracked	105		
Bearing Housing - Rebuild	105		
Bearing Support - Rebuild	105		
Bow Thrusters - Rebuild/Line	200	205	
Chutes Liquid - Rebuild	200		
Chutes Powder - Rebuild	200		
Chutes Aggregates - Rebuild	240		
Castings - Repairing	315	320	
Chocking - Leveling	605	610	
Compressor Blocks - Repair	105		
Concrete Coating	605	610	621
Condensers - Coating/Repair	210	200	
Conveyor Repairs	305	300	
Crank Cases - Repairs	105	19060	
Engine Blocks - Rebuild	105	19060	
Evaporators - Rebuild/Lining	200	205	

Exhausters - Rebuild	105			
Expansion Joints - Repair	300			
Feeder Bowls	200	205		
Flexible Hoses - Repair	305			
Floor Resurfacing	605	610	621	
Flange Faces - Leaking	19000	19007/9	19601	
Flange Faces - Rebuilding	105	200		
Heat Exchangers End Plate - Rebuild	105	200		
Holding Fixtures	200	240		
Hoppers - Lining/Repair	325			
Hoods - Coating	205			
Hydraulic Rams - Rebuild	105	19060		
Keyways - Rebuild	105			
Kort Nozzles - Rebuild	200	205		
Mold Making	320			
Mountings	320			
Noise Reduction	320	315		
Pintle Sleeves - Rebuild	105	205	19000	19002
Pipe Elbow Lining	240	200	205	
Pipe Work Leaking	19000	19007/9	19601	
Pipe Work Internal Liquid	200	205	240	
Pipe Work Internal Powder	200	205		
Pipe Work Internal Aggregate	200	240	205	
Process Vessels - Rebuild/Lining	200	205		
Propeller Rebuild/Resurface	230	235		
Pump Casing Internal Liquid	200	205		
Pump Casing Internal Powder	200	205		
Pump Casing Internal Slurry	205	240		
Pump Casing g Internal Sewage	200	240	205	
Pump Impeller Powder	200	205		
Pump Impeller Liquid	200	205		
Pump Impeller Aggregate	200	240	205	
Pump Impeller Slurry	200	240	205	
Pulverizers	200	205	240	
Rubber Rollers	305	300		
Rudders	230	235		
Radiators	105	19060		
Slug Catchers - Rebuild	200	205	240	
Sour Gas Treatment - Coating	211			
Steering Gear - Rebuilding	105	19000		
Sump - Leaking	19000	19007/9		
Shaft - Rebuild	105			
Shaft Sleeves - Repair	105			
Shims - Rebuild	105	19060		
Stairs - Safety	605	610		
Stripped Threads - Rebuild	105			
Sump Rebuild	19000	19007/9		
Tube Sheets - Rebuild/Lining	200	205		
Turbine Blades - Rebuild/Lining	200	205		
Tank Leaking Seams Raw Water	19000	19007/9		

Tank Leaking Seams Chemical	105	205	19000	19007/9
Tank Leaking Seams Sewage	105	205	19000	19007/9
Tank Leaking Seams Slurry	105	205	19000	19007/9
Tank Lining Sewage	105	205	19000	19007/9
Tank Lining Slurry	105	205	19000	19007/9
Tank Lining Chemical	105	205	19000	19007/9
Tank Lining High Temp	220			
Valve Repair - Rebuild	105	19060		
Vessel Linings	210			
Walkways - Catwalks	605	610		

NOTES:

Where there are High Temperature Applications that require either REPAIR and/or Coating 220 High Temp Coating is the preferred choice.

Where possible please ASK what products they have USED before – IF they were successful we can offer a more cost effective solution. If NOT successful then we KNOW what product NOT to offer.

The above list is by no means a RULE for the product for the applications. As with all things – thought needs to be given to the final solution to be offered.

ESSENTIAL to the APPLICATION process is the CORRECT product to be applied and so the following BASIC information is a must:

MAXIMUM OPERATING TEMPERATURE –

IS THIS WET or DRY

IS THE APPLICATION EROSION WEAR OR CHEMICAL WEAR

IS THERE AN INVOLVEMENT OF CHEMICALS IF SO WHAT %

•METALS that can be used:

105 is the BEST BASIC METAL REPAIR PRODUCT

19060 is the BEST TEMPORARY REPAIR METAL AS IS SELF CONTAINED

19065 is for applications where SPEED OF CURE is essential

•CERAMICS that can be used:

200 is the BEST BASIC ENGINEERING GRADE CERAMIC

205 is the BEST FLUID GRADE CERAMIC (will overcoat the 200 extremely well)

220 is the BEST HIGH TEMPERATURE CERAMIC

210 is the BEST ENERGY EFFICIENT CERAMIC

230 is the BEST PASTE CERAMIC FOR CAVITATIONS DAMAGE REPAIR AND RUDDERS

235 is the BEST FLUID CERAMIC PROTECTION FOR CAVITATIONS DAMAGE PREVENTION

•**ELASTOMERS that can be used:**

305 is the BEST PASTE RUBBER COMPOUND for repairs to CONVEYER BELTS

300 is the BEST FLUID RUBBER COMPOUND for the protection of Plant and Equipment parts

where some degree of FLEXIBILITY is required

310 is the BEST RAPID GRADE RUBBER repair compound with MANY USES

325 is the BEST BRUSH GRADE RUBBER for COATING HOPERS and CHUTES where

aggressive products are being used

320 is the BEST PASTE GRADE RUBBER for IMPACT resistance of many surfaces

315 is the BEST FLUID GRADE RUBBER available for castings and where TEAR resistance is required

•**PIPE REPAIR and PIPE PROTECTION:**

The SINGLE COMPONENT bandage is suitable for pipe sizes 20mm – 400mm

The STANDARD RESIN AND HARDENER combined with SPECIAL GLASS TAPES is the BEST repair and protection system for ALL PIPE SIZES where a more permanent repair is required

If in any DOUBT please ask!

sales@uniquepolymersystems.com

Web sites @

www.uniquepolymersystems.com

www.pipewrap.co.uk

www.thistelbond.info

Unique Polymer Systems Liquid Coatings



UniquePolymerSystems.com

The Engineer's Choice

... for Solutions

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www.uniquepolymersystems.com

SYSTEM RECOMMENDATION TXE.60B – (1004)

For Application of

UPS CERAMI-TECH EG200

UPS CERAMI-TECH FG205

To PUMPS, PIPES AND VALVES

1. SURFACE PREPARATION

Surfaces should be thoroughly degreased using high pressure detergent cleaning followed by wiping with **UPS Universal Cleaner**.

Any sharp protuberances, surface laminations, weld spatter, etc. should be removed by thorough cleaning and grinding.

Surfaces should then be blast cleaned to a minimum SA2½ BS7079 PART A1 1989/ISO 8501-1: 1988. All abrasive dust etc. should be removed from the surface prior to application, care should be taken to ensure all corrosion products are removed from pitted areas.

When refurbishing old equipment which may have become salt impregnated due to the service conditions, surfaces should first be wet blasted or ultra high pressure water cleaned, then dry abrasive blasted. Surfaces should be checked for the presence of salts, and if salts are found this process should be repeated.

For large applications or where it is not possible to coat the prepared surface within 4 hours of blast cleaning, dehumidification equipment should be used during the whole of the blast cleaning and coating operations, the equipment should be capable and must maintain a relative humidity of 50% or less to prevent the onset of flash rusting.

In line heaters should be utilised if required with the dehumidification equipment to ensure that the substrate temperature is at least 3°C above dew point. The substrate temperature should be a minimum of 10°C.

If flash rusting of the blast cleaned surface occurs prior to coating, then affected areas should be re-blasted to the standards laid down.

The abrasive blasting should remove all existing coating and produce a 'coarse' profile in accordance with BS7079 PART C1/ISO8503. The abrasive should only be used once.

Prior to the application of the **UPS Cerami-Tech System** all dust, residues and debris left on the surface after blast cleaning should be removed.

NOTE: Where the **UPS Cerami-Tech System** is being used to refurbish existing equipment where all the existing coating is not being removed, the edge of the existing coating should be flash blasted extending some 75-100 mm onto the coating to allow the **Unique Polymer Systems - System** to be overlapped onto the coating.

2. RESURFACING / FILLING OF PITTED AREAS WITH Unique Polymers CERAMI-TECH EG200 (IF REQUIRED)

Any eroded or badly pitted surfaces should be made good with **UPS Cerami-Tech EG200**. Prepared surfaces must be dry and free from dust and other contamination, particular care should be taken to ensure pitted areas are completely clean.

UPS Cerami-Tech EG200 is a two component material supplied as a Base component and an Activator component. Three volumes of Base component and one volume of Activator component should be measured out onto a suitable mixing board.

The material should be thoroughly mixed to provide a streak free mix. The mixed **UPS Cerami-Tech EG200** must be used within 25 minutes of mixing at 20°C.

The mixed **UPS Cerami-Tech EG200** should be applied using the plastic applicator provided, or similar, should be pressed firmly into the surface to ensure no air is trapped in the pitted areas. The pits should be filled level with the surrounding surface.

3. OVERCOATING INTERVAL

As soon as the **UPS Cerami-Tech EG200** has become resistant to movement under normal brush application, (approximately 60 minutes at 20°C) and within 2 hours the material can be overcoated with **UPS Cerami-Tech FG205**.

Where delays occur between application of the **UPS Cerami-Tech EG200** and the **UPS Cerami-Tech FG205** the **UPS Cerami-Tech EG200** surface should be lightly flash blasted or abraded and all resultant dust swept from the surface.

4. APPLICATION OF UPS CERAMI-TECH FG205 STRIPE COAT

Prepared and filled surfaces should be clean, dry and free from contamination.

To maintain the specified film thickness at weld edges, around bolt holes and other sharp protuberances, a stripe coat should be applied to these areas prior to carrying out the overall application.

UPS Cerami-Tech FG205 is a two component material comprising a Base component and an Activator component which must be mixed together thoroughly prior to use.

The Base component should be stirred, and with continued stirring the Activator should be added with stirring continuing until a completely homogeneous mix is achieved.

The stripe coat should be applied by brush to a nominal dry film thickness of 250 microns.

5. APPLICATION OF UPS CERAMI-TECH FG205 FIRST COAT- Red

As soon as any areas of stripe coating are resistant to subsequent brush application, the first overall coat of **UPS Cerami-Tech FG205** mixed in accordance with Section 4 of this recommendation can be applied.

UPS Cerami-Tech FG205 should be applied as evenly as possible by brush or roller to a nominal dry film thickness of 250 microns, excessive build up of coating should be avoided. Each area coated should be visually checked for misses or holidays. Any area found should be recoated prior to moving on to the next area. The application properties by brush are best at a minimum material temperature of 20°C and minimum surface temperature of 15°C. The material should not be applied at temperatures below 5°C.

During application the applicator should carry out regular checks to wet thickness with a wet thickness gauge, observing a consistent mean value of 250 microns per coat.

6. OVERCOATING INTERVAL

UPS Cerami-Tech FG205 must be overcoated within the initial set line of 3 hours at 20°C, after this time the first coat must be thoroughly abraded or flash blasted.

INITIAL SET TIME

10°C	5 hours
15°C	4 hours

20°C	3 hours
25°C	2½ hours
30°C	2 hours

7. APPLICATION OF UPOS CERAMI-TECH FG205 SECOND COAT- Grey

The first coat of **UPS Cerami-Tech FG205** should be clean, dry and free from contamination. A second overall coat of **UPS Cerami-Tech FG205** in an alternative colour should now be applied as evenly as possible in accordance with Section 6 of this recommendation.

8. FINAL CURE TIMES

The applied system should be allowed to cure for a minimum period of 5 days at 20°C before being put into service. This time will be extended at lower temperatures, and shorter at higher temperatures, with the following figures being used as a guide:-

	FINAL CURE TIME
10°C	7 days
15°C	6 days
20°C	5 days
25°C	4 days
30°C	3 days

9. QUALITY CONTROL TESTING

•i) The contractor shall carry out the following tests at:

Surface Preparation Stage

- i) Comparison with Blasting Standards for surface preparation
- ii) Comparison with Blasting Standards for blast profile
- iii) Cleanliness of blast surface prior to coating
- iv) Humidity, dew point and surface temperature during blast cleaning

Application Stage

- i) Wet thickness
- ii) Visual
- iii) Humidity, dew point and surface temperature

Test for full cure

- i) M.E.K. swab test prior to commissioning.

Repair and Minimum and Maximum – Overcoating

OVERCOATING INTERVAL UPS205 / UPS110

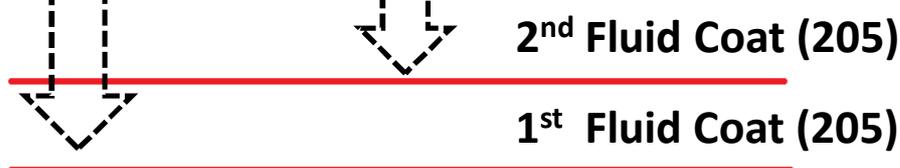
UPS Cerami-Tech FG205 must be overcoated within the initial set line of 3 hours at 20°C, after this time the first coat must be thoroughly abraded or flash blasted.

	INITIAL SET TIME
10°C	5 hours
15°C	4 hours
20°C	3 hours
25°C	2½ hours
30°C	2 hours

APPLICATION OF UPS CERAMI-TECH FG205 SECOND COAT- Grey

The first coat of UPS Cerami-Tech FG205 should be clean, dry and free from contamination.

A second overall coat of UPS Cerami-Tech FG205 in an alternative colour should now be applied as evenly as possible in accordance with above of this recommendation.



OVERCOATING INTERVAL UPS200 / UPS105

As soon as the UPS Cerami-Tech EG200 has become resistant to movement under normal brush application, (approximately 60 minutes at 20°C) and within 2 hours the material can be overcoated with UPS Cerami-Tech FG205.

Where delays occur between application of the UPS Cerami-Tech EG200 and the UPS Cerami-Tech FG205 the UPS Cerami-Tech EG200 surface should be lightly flash blasted or abraded and all resultant dust swept from the surface.

Which Flexi-Tech To Use On A Repair

Shore A Hardness 60

Flexi-tech 60 RG

FAST SET

"Paste grade "

UPS310

RG for rebuilding Rubber components where operation must be back on line soon.

RG sets in one hour and can be returned to service. Comes with fast primer.

- Conveyor belts
- Valves
- Diaphragms
- Hoses
- Rubber Rollers
- Gaskets
- Tires "off road"
- Rubber Tracks
- Abrasion wear sites

Flexi-tech 60 EG

"Paste Grade"

UPS305

EG is used in all the repairs RG is used, but allows more working time for the larger repairs.

EG is slightly stronger.

Flexi-tech 60 FG

"Fluid grade "

UPS300

FG is used for smoothing and resurfacing. Brush applied, it can also be use over top RG or EG.

- Conveyor Clip Joints
- Interlaminary adhesive
- Butterfly Valves
- Poured gaskets
- Chutes
- Fuel Hoses

Shore A hardness 80

Flexi-tech 80 EG

"Paste Grade"

UPS320

Harder Durometer, and stronger physical properties for tougher applications

- Heavy Equipment Tracks
- Rollers
- Coal chutes
- Hoppers
- Rock Belts
- Abrasion & wear

Flexi-tech 80 FG

"Fluid Grade"

UPS315

Fluid grade for resurfacing, casting, smoothing and molding.

- Casting & molding
- Rollers
- Pump casing
- Pump impellers
- Gaskets
- Abrasion & wear.

Flexi-tech 80 BG

" Thick Fluid Grade" UPS3325

BG is thick for brushing on vertical surfaces for High Build tough applications.

- Fan Blades
- Large Impellers
- Diaphragms
- Pumps
- Gaskets
- Pipe Elbows
- Hoppers
- Abrasion & wear
- Valves

WHICH ELASTOMER FLEXI TECH TO USE ON A REPAIR REPAIRS

Which Metal To Use On A Repair

Machinable / Equipment : Shop

Metal-Tech EG

"Paste grade" **UPS105**

- Shaft journals
- Sloppy key ways
- Cracked blocks, casings
- Bonds any Metal; PVC

- Bearing housings
- Bush housings
- Spline Repairs
- Bonds to fibreglass

- Scored hyd. rams
- Resurfacing Flange
- Holed pans & casings
- General machining repairs

Metal-Tech RG Metal-Tech SG

Emergency repairs
5 min. set

"Paste grade" **UPS19065**
"Twist Stick grade" **19060**

- Leaks
- Sloppy key ways

- Transformers
- Scored rams

- Pipes
- Holed pans & casings

Metal-Tech FG

"Fluid grade" **UPS110**

- Injectable liquid
- Casting

- Smoothing over EG-RG
- Non-Skid w / aggregate

- Resurfacing

Non Machinable / Fluid Flow Repairs

Cerami-Tech EG Cerami-Tech FG

"Paste grade" **UPS200**

"Fluid grade" **UPS205**

EG for rebuilding deep erosion and pitting; FG for protecting and smoothing.
EROSION AND CORROSION PROTECTION

- Valves
- Pumps
- Impellers
- Turbines

- Tail Shafting
- Propellers
- Head covers
- Head exchangers

- Water Boxes
- Guide vanes
- Piping
- Steam cut flanges

Cerami-Flex EG Cerami-Flex FG

"Paste grade" **UPS230**

"Fluid grade" **UPS235**

Tough abrasion and cavitation resistant coating for rebuilding & resurfacing

- Hydro turbines
- Pump casing

- Impellers
- Water Boxes

- Sand & Silt Flow
- Fluid flow Equipment

Cerami-Tech CR

"Fluid grade" **UPS210**

The low friction, efficiency, protection overlay for liquid flow equipment.
EROSION AND CORROSION PROTECTION economical for larger jobs.

- Pumps
- Turbines

- Impellers
- Water boxes

- Sprayable
- longer pot life

Cerami-Tech HG

"Heavy grade" **UPS240**

Hardened ceramic carbide chips imbedded in abrasion resistant paste for

- Chipper Disks
- Flatbacks

- Coal chutes
- hoppers

- Slurry pumps
- Pipe elbows

TABLE 1
Unique Polymer Systems METAL-TECH EG 105
MACHINING RECOMMENDATIONS*

	TURNING	VERTICAL MILLING	SLOT DRILLING
Surface Cutting Speed	100 cm/sec 200ft/min	100 cm/sec 200 ft/min	100 cm/sec 200 ft/min
Feed Rate for Rough Cutting	1.27 mm/rev. 0.01 in/rev		
Feed Rate for Finishing	0.25 mm/rev. 0.01 in/rev		
Table Traverse	—	7.1-15.2 cm/min 2.8-6.0 in/min	15.2 cm/min 6.0 in/min
Tool	Tungsten Carbide or Diamond Tipped	Tungsten Carbide or Diamond Tipped	Tungsten Carbide or Diamond Tipped
Top Rake	3°	Standard	
Side Clearance	3°		
Front Clearance	3°		
Comments	Cut Dry	Cut Dry	Cut Dry

•These figures apply for machining 4 hours after mixing. If longer curing is allowed it is recommended that the speeds be halved.

When machining UPS Metal-Tech EG105 , a rough cut should be made first to within 150 microns (0.006 Inches) of the finished size. Allow to cure for a further ½-1 hour then make the finish cut.

**MAJOR APPLICATIONS WITH UNIQUE POLYMER SYSTEMS IN POWER PLANTS and UTILITIES
NUCLEAR, COAL, OIL, GAS, and HYDRO DISTRIBUTION/TRANSMISSION FACILITIES, REPAIRS and
PREVENTATIVE MAINTENANCE.**

METAL REPAIRS: 105 Engineering Grade Metal Repair – 19065 Rapid Metal Repair

Scored hydraulic coal-sampler shafts
Coal crusher shafts
Diverters at tripper belt and bunker fill points
Constant weight gates and feeders
Pitted clinker grinders
Damaged diverters in transfer houses
Worn electric motor shafts
Scored pump shafts
Repairing warped shafts due to welding
Rebuilding of shafts where metal-spray is peeling
Shafts damaged by collapsed bearings
Shafts damaged by seized bearings
Worn keyways due to frequent stop/start
Damaged keyways due to poor fitting or vibration
Torn housing due to sized bearings
Damaged shafts due to localised stress (welding)
Shafts damaged due to poor lubrication
Oversized bearings

Repairs where welding can not be done due to:

- Flammable liquids, solids and gases around
- Cast iron
- Risk of distortion to extreme precision
- Lack of time
- Lack of equipment
- Lack of trained personnel
- Sulphur impregnation
- Risk of embrittlement and cracking
- Risk of explosion (ammunition factories and similar explosives)
- Unavailability of stress relief process
- Limited access to parts or repair area
- Cost of outside contracting Vs in-house repair in minutes
- Pinholes in welds

Press-fitting crushers in coal mills to avoid cracking
Press fitting bowls in coal mills to prevent damage by impact
Rebuilding of eroded coal mill door panels
Damaged access door jams in coal mills
Eroded classifier doors in Ce pressurised coal mill
Fitting new plows by rebuilding support structures
Bonding tiles to transition piping

Bonding tiles to elbow pipes
Rebuilding splitters on Raymond coal mills
Coal mill floors
Eroded exhaust housing
Bonding new liners to eroded chutes
Leaks in transformer fins
Sealing discs
Rebuilding eroded case ring saddles
Scored impeller clearance diameter
Stuffing boxes

FLUID FLOW REPAIRS: 200 Engineering Grade Ceramic Paste – 205 Fluid Ceramic Lining – 210 High Efficiency Ceramic Coating – 240 HEAVY DUTY CERAMIC LINING

Worn ash sluice pumps
Pump casings
Impellers (New or Old)
Valve bodies
Eroded bronze or cast iron bowls on lift pumps
Eroded cast iron diffuser vanes on lift pumps
Surfacing new pump bowls and impellers as a “preventative” measure
Washouts in split case and centrifugal pumps
Discs and seats on gate valves
Turbine flange faces
Water boxes
Condenser tube sheets
Eroded Hydrogen cooler heads on turbines
Leaky seams
Cracked or porous welds
Coating eroded chutes
Pinholes on welds
Eroded butterfly discs in Ce pressurised coal mill
Venturi hydro-ejectors
Bottom ash slide gates

RUBBER REPAIRS: 305 ‘60’ Durometer Rubber Paste – 300 ‘60’ Durometer Elastomeric Coating – 310 Rapid Rubber Repair (all supplied also in ‘80’ Durometer versions for those more abrasive applications).

Damaged rubber-coated impellers and pump liners
Abrasion resistant lining for new valves, pipes, pumps
Making gaskets for irregular flange faces
Save on repairs by making expensive vulcanising process obsolete
Save on downtime by making conventional vulcanising unnecessary
Worn conveyer belts
Damaged tripper belts
Scored gravimetric feeder belts by tramp metal caught in wipers
Transfer belts
Torn extension boots between turbine and condenser
Ripped boots that are unable to hold vacuum
Protection of new expansion boots
Sealing of “alligator” cracks on boots

COATINGS: 675 High Chemical Resistant Polymer Coating – 152LV General Purpose Corrosion Protection – 210 Spray Coating – High Slip Deterrent Systems

Repairs carried out side “below or near freezing temperatures”
Chemical resistant linings of old valves, pipes, and pumps
Chemical resistant linings of new valves, pipes, and pumps
“Improved grip” surfaces on drive drums to prevent slippage

Non-skid walkways
Non-skid machine base areas
Rendering step noses “non-skid”
Non-skid stairs
Lining of vessels
Abrasion resistant surfaces on chutes
Spill protection in bund areas

CONCRETE REPAIRS: 610 Patch Repair Concrete –

Anchor bolts for machinery or pump bases
Rebuilding of broken steps
Damaged floor and walkways
Bottom ash hoppers and chutes
Abrasion resistant T-joints, J-joints, and elbows
Impact and abrasion resistance surfaces on chutes and slide gates in the ash “doghouse”
Chemical attack damage on concrete expansion joints
Shimming feather edges slopes on walkways
Levelling floors
For long term repairs of concrete damaged by impact, abrasion, chemical attack, managers, feed bunks, milking parlour, milk house floors, silo floors and feed bunk pads.

PIPE REPAIRS: 19601 Rapid Repair Bandage – 19000 Resin & Hardener + 19007/9 Tapes

All types of pipe repair
All size pipe repairs
Pipe erosion and corrosion protection

WEB SITE SUPPORT – www.pipewrap.co.uk

FOR FURTHER INFORMATION CONTACT YOUR LOCAL DISTRIBUTOR OR UNIQUE POLYMER INDUSTRIES ON:

Email: sales@uniquepolymersystems.com

Quarry House, Hollybush, Ledbury, Herefordshire HR8 1ET England

THISTLEBOND REPAIR KITS
THISTLEBOND UNIQUE POLYMER SYSTEMS.COM

Instruction Manual

THISTLEBOND REPAIR LAMINATES

ThistleBond Repair Kits

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United Kingdom

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Introduction

Description of ThistleBond Repair System Materials

ThistleBond Resin

A liquid epoxide resin, which, when mixed with the appropriate amount of ThistleBond Hardener produces the ThistleBond Resin Mix that will cure at normal ambient temperatures producing a strong homogeneous mass, having exceptional adhesive properties when applied to metals, wood, glass and synthetic materials.

ThistleBond Hardener

A specially developed epoxide hardener, which ensures that the ThistleBond Resin Mix not only cures at normal ambient temperatures but also attains maximum strength in a reasonable working time.

ThistleBond Resin Pack

A carton containing ten units of ThistleBond Resin and ThistleBond Hardener. Each unit consists of one container of Resin and one container of Hardener in the correct proportions for subsequent mixing. The Resin Container is apply proportioned to facilitate its use as a mixing vessel.

ThistleBond A & B Cement

A specially developed epoxide compound supplied in two separate packs marked A and B. When mixed together in equal portions by volume the Cement will cure to an extremely strong mass with a better adhesive bond than that produced by the ThistleBond Resin mix. Apart from its use as an adhesive for repairs it can be applied, prior to carrying out a ThistleBond repair, where difficult adhesion conditions exist.

ThistleBond Rapid Setting Super Metal Repair Paste

A specially developed urethane rapid repair compound supplied in two separate packs marked Resin and Hardener when mixed together in equal portions by volume the paste will cure to an extremely strong mass, having exceptional adhesive properties when applied to metals.

ThistleBond PlasSteel Twist Stick

This is a two part epoxide putty which is colour coded so that the user can see when it is thoroughly mixed. The mixed putty can be used for emergency repair of metal components, The mixed putty will also cure underwater.

Glass Cloth

A specially treated glass fibre fabric that ensures that the Resin Mix will fully permeate the fabric and give the resultant glass fibre resin laminate repair excellent mechanical properties. Glass Cloth is often used for "Plate" Repairs.

Glass Tape

The Glass Tape is also a specially treated glass fibre fabric that ensures the Resin Mix will fully permeate the fabric and give the resultant glass fibre resin laminate repair, excellent mechanical properties. Glass Tape is normally used from the roll for Pipe Repairs but can also be used in short lengths for repairs where access is difficult.

Contour Cloth

This is a resin reinforced fabric which can be contoured to the surface of a pipe. Its main purpose is to bridge holes in pipes so that Glass Tape can be applied evenly to ensure the original contour is maintained.

Glass Mat

A fabric consisting of a random collection of glass fibres which will absorb a considerable quantity of the Resin Mix and which, when the mixture is cured, will produce a mechanically strong mass. Glass Mat is often used as a backing for repairs where Glass Cloth or Glass Tape have already been used and is normally applied using Linen Scrim as a backing.

Linen Scrim

An open weave linen fabric, used as a backing for Glass Mat, to make it easier to handle when being applied to the repair. Linen Scrim Remains an integral part of the repair.

Cellophane

Applied to the outside of a repair after the application of the Linen Scrim. Its purpose is to contain the Resin Mix until it has cured. Cellophane, which also ensures a smooth surface finish, is held in-situ with masking tape.

Masking Tape

A self-adhesive tape used to retain the Cellophane in position.

Sealer Filler

Special non-asbestos filler, in powder form, for addition to the Resin Mix after the initial mixing has taken place. The resultant Sealer Filler Resin Mix has two useful properties. (See chapter 'Preparation and Application of Sealer Filler Resin Mix').

Fairing Compound

Filler, consisting of glass fibre strands, for addition to the Resin Mix after the initial mixing has taken place. Fairing Compound Resin Mix is used for filling in undulations prior to, or in conjunction with, a ThistleBond repair. (See chapter 'Preparation and Application of Sealer Filler Resin Mix').

ThistleBond ThistleWrap Pipe Repair Tape

A specially treated woven glass fabric impregnated with a polyurethane resin which is activated by immersion in water.

The base unit of 'Thistlewrap' comprised 1 roll impregnated tape, 50mm wide x 1.5m long, wound on a plastic cone and vacuum packed in a foil bag.

Accessories

Instruction Manual

The ThistleBond Instruction Manuals gives ample information to enable you, safely to produce effective laminate repairs using the materials available from the ThistleBond range of laminate repair systems. It is essential that you familiarise yourself with the Instructions that apply to the types of repair to be carried out.

Barrier Cream

A vanishing type cream compounded with mineral oils and waxes to form a protective film to the skin against resin based components in the ThistleBond Repair Kits. It is recommended that the cream be applied to hands and bare arms. It can, if necessary, be applied to the face. (See chapter 'Instructions for The Safe Handling of ThistleBond Repair Kit Materials').

Gloves

Industrial gloves are supplied with all ThistleBond Repair Kits. Although the selection of materials for these kits takes account of possible skin irritation problems, it is impossible to be precise about this hazard since no two people react in the same way. E. Wood Ltd consider it prudent to recommend that when using the component materials of the ThistleBond Repair Kits, Gloves should always be worn. (See chapter 'Instructions for The Safe Handling of ThistleBond Repair Kit Materials').

Resin Removing Cream

This cream is specially formulated to remove deposits of resins and adhesives easily and quickly from the skin. (See chapter 'Instructions for The Safe Handling of ThistleBond Repair Kit Materials').

Stirring Tools

Wooden spatulas, those are included for mixing the ThistleBond Resin and the ThistleBond Hardener in the Resin Container.

Brushes

Supplied for the easy application of the Resin Mix to surfaces and also for stippling the mix into the various fabrics supplied with the kit.

Plastic Coated Paper

This paper is plastic coated on one surface and is used with the coated side uppermost. It is first of all recommended that this paper is spread out on the bench or on an area adjacent to where the ThistleBond repair is to be carried out. It will catch any drips of Resin mix which may fall and prevent the unsightly permanent disfiguration of the area involved. The Plastic Coated Paper can also be used as a working surface when stippling the Resin mix into pieces of Glass Cloth, Glass Mat or Linen Scrim before they are applied to the repair. The plastic coating permits the easy removal of the materials before final application to the repair.

Trowelling Tool

This is used for applying the Resin mixes that have been filled with Fairing Compound or Sealer Fille

Scissors

The scissors included in your ThistleBond Repair Kit have been selected because of their suitability for cutting glass fibre fabrics. They can also be used for the other sheet materials included in the kit.

Additional Products

Please refer to the current 'ThistleBond Price List' for full details of further Engineering , Laminate Repair, Adhesives and Accessories available.

Repairs Using ThistleBond Repair Kits

The ThistleBond repair Kit is a maintenance tool, which as the experience of the user broadens, can resolve an increasing number of the Maintenance Engineer's problems.

The instructions in this manual describe three types of 'standard' repairs as typical examples. Ultimately, the individual engineers who use the Kits will, through experience, establish the best designs of repairs for their particular maintenance problem. The fundamental principle involved in the ThistleBond Repair Kit system is to produce a glass fibre resin laminate and to bond effectively that laminate to the sound portions of the item being repaired – the parent body.

Invariably the problem area is the bond between the resin laminate and the parent body. E. Wood Ltd has achieved pressures of 56 – 112 kg/cm² (800 – 1600 ibf/in²) before failure of the resin laminate bond when testing High Pressure Pipe Repairs. 28 – 35 kg/cm² (400 – 500 ibf/in²) when testing Low Pressure Pipe Repairs.

The following primary points should be considered during or prior to carrying out a repair.

IS THE APPLIATION SUITABLE?

Before commencing a repair using a ThistleBond Repair Kit, ensure that the Repair Systems Materials are suitable for the intended application. Reference to the chemical resistance charts in this manual should be of assistance.

The physical demands on the repair when it is returned to operating conditions must also be taken into account. The hydraulic test pressures detailed above give a good indication of mechanical strengths achievable with a ThistleBond Repair. The question of operating temperatures must also be considered. This glass fibre reinforced resin laminate can give effective results up to a maximum of 170 degrees Celsius. It must be stressed however that the ultimate strength and performance of a ThistleBond Repair is very much dependent on the operating conditions and the correct repair procedure being adopted as indicated in this manual. The THISTLEBOND Technical Department are pleased at any time to comment on particular applications that you may have in mind and to advise if similar repairs have been satisfactorily been undertaken by other users. Ultimately, the individual Maintenance Engineer must use his/her own 'engineering judgement' as to the suitability of the application. It should also be stressed that ThistleBond Repair Kits have been marketed and sold for over 20 years and their success as a maintenance tool is well proven and established.

INITIAL PREPARATION

Before starting a repair, always ensure that all the required contents of the Kit are at the site of the repair, clean and serviceable. Once the Resin and Hardener have been mixed, there will be no time to look for the scissors, etc. The repair once started will have to be completed in one smooth continuous operation. To ensure that the best possible repair can be achieved, it is recommended that the areas of repair be isolated and/or pressure reduced as much as possible.

CLEANING THE REPAIR SURFACE

The surface to which the repair is to be applied must be clean since, as has already been stated. It is the bond between the repair and the parent body, which dictates the ultimate strength of the repair. The resin will adhere best to a clean, grease-free surface. It is essential that before applying a repair to a surface it should be clean, free from paint, rust, scale and grease. It is also essential that the surface areas being repaired are solvent wiped with ThistleBond Cleaner/Degreaser before the repair commences.

APPLICATION OF THE THISTLEBOND RESIN MIX

To maximise the strength of the repair, it is essential that a complete coating of the Resin Mix is applied prior to the laying up of each layer of Glass Fabric.

By doing so, a homogeneous glass fibre resin laminate will be achieved.

The principle strength of the glass fibre resin laminate lies in the Tape or Glass Cloth layers which are either wound or laid on the surface of the repair.

When using Tape, this should be wound on with a half overlap and care must be taken to ensure that it is applied evenly and flat. This will eliminate a possible cause of weakness in the laminate. When applying multiple layers of Tape, each subsequent layer should be applied in the reverse direction and the Tape should not be found difficult to keep the winding smooth. When the repair is on a pipe bend, it is better to cut short lengths of Tape and lap them one on the other.

The purpose of Glass Mat is to provide a rigid backing layer to a repair that has been effected using Glass Tape. To achieve this result, it is essential that the Glass Mat be thoroughly saturated with the Resin Mix. This can best be achieved by working the Resin Mix into the Mat, by stippling with the brush supplied before applying it to the repair.

MIXING THISTLEBOND RESIN AND THISTLEBOND HARDENER

Each unit consists of one container of ThistleBond Resin and one container of ThistleBond Hardener. The Resin Container is slack filled to permit the addition of the complete contents of the Hardener Container. The quantities supplied in each container of the unit are exactly those required to produce the correct Resin Mix and should not be altered in any way. Immediately after the addition of the Hardener, the contents of the Resin Container should be thoroughly mixed using the Stirring Tool supplied. The resultant Resin Mix has a usable life of approximately 12 minutes at an ambient temperature of 24 degrees Celsius before it starts to 'gel'. The gel time is approximate and can be affected by a variety of conditions. It should be noted that the reaction between the Resin and the Hardener produces heat and this in turn can reduce the time to gel. When the ambient temperature is high or when it is desired to increase the time to gel, then the Resin Mix should be transferred into a shallow tray prior to use. By this means, gel time will be slightly extended.

In cold weather conditions the Resin and Hardener may be found to be viscous and if this is the case, it is advisable to warm the containers prior to attempting mixing. Warming the containers can be achieved by placing them into hot water for a few minutes. Do not allow the materials to become too hot and always remove from water before opening the tins and mixing. Under no circumstances should water be allowed to contaminate the materials since steam can be generated in the Resin Mix and will cause foaming.

It should be noted that the time for the mixed resin to gel is not the time taken for it to cure. The time to cure is dependent on many factors but is mainly affected by temperature. The higher the temperature, the quicker the cure. As a general guide, over 50% repair strength is developed in approximately 4 hours at 18 – 20 degrees Celsius. Full mechanical cure is achieved under the above conditions in approximately 24 hours.

PREPARATION AND APPLICATION OF SEALER FILLER RESIN MIX

Sealer Filler is a special, non-asbestos powder. It is supplied in a polythene bag containing sufficient material to add to the quantity of Resin Mix resulting from one unit of ThistleBond Resin and Hardener. It should be added to the Resin Mix, which should already have been transferred to a suitable sized container. The Sealer Filler and Resin Mix should be stirred with a Stirring Tool in order to disperse the Filler uniformly through the Mix. The resultant Sealer Filler Resin Mix should be applied to the repair areas as required using the Trowelling Tool. The Sealer Filler Resin Mix has the following distinct properties which are of great assistance in certain types of repairs:

The mix is thixotropic and can therefore be applied to vertical surfaces for filling in surface irregularities prior to or in conjunction with the ThistleBond repair.

The mix can be applied to operate at temperatures up to approximately 180 degrees Celsius. When it is applied as a pre-coat, prior to carrying out a ThistleBond repair. It will help to insulate the resin laminate from the operating temperature of the parent body.

The Sealer Filler Resin Mix can also be used on its own for certain types of repair.

PREPARATION AND APPLICATION OF FAIRING COMPOUND RESIN MIX

Fairing Compound is a filler which consists of glass fibre strands. This is also supplied in a polythene bag containing sufficient materials to add to the quantity of Resin Mix resulting from one unit of ThistleBond Resin and Hardener. The methods of mixing and application are similar to those for the Sealer Filler Resin Mix.

The main purpose of the Fairing Compound Resin Mix is to fill in undulations prior to the application of a ThistleBond repair

WARNING: The application of the Fairing Compound Resin Mix must always be followed by a further Resin Mix application incorporating Glass fabric or Linen Scrim. This will eliminate the possible hazard of single glass filaments reinforced with cured Resin Mix protruding from the surface of the finished repair and causing subsequent injury to personnel.

METHOD OF MIXING AND APPLICATION OF THISTLEBOND A & B CEMENT

Equal quantities by volume of the resin and hardener of this epoxide resin based cement are taken from the separate containers that are marked A and B. The resin and hardener should be thoroughly mixed. The different colours of the two constituent parts assist in showing when the cement is fully mixed as these will blend together to a uniform colour. Pre-warming the two containers in cold weather facilitates mixing. The use of a warm mixing container will also assist but the container must be clean and dry. The application of gentle heat during the curing process will reduce the time taken to cure.

Apart from its use as an adhesive for repairs (it should be noted that its bond strength is greater than that of the ThistleBond Resin Mix). ThistleBond A & B Cement can also be used in the following applications.

Where it proves impossible to clean thoroughly the surface to which a ThistleBond repair is to be applied, then pre-coating this surface with ThistleBond A & B Cement to overlap the areas of the repair by 50mm (2") all round will greatly assist in obtaining the required bond strength between the resin laminate and the parent body. Once this pre-coating operation has been completed, then a conventional ThistleBond repair as previously described can be carried out.

Where a ThistleBond repair is to be carried out on a cracked pipe or plate then ThistleBond A & B Cement should be trowelled into the crack before proceeding with the repair. Where the crack is still leaking a little, it is recommended that the ThistleBond A & B Cement should be left partially to cure before being trowelled into the crack. It is emphasized that in many instances, the problem of sealing off a crack prior to carrying out a ThistleBond repair can be solved by the application of the ThistleBond PlasSteel Twist Stick which is included with each ThistleBond Repair Kit

METHOD OF APPLICATION OF A THISTLEBOND LOW PRESSURE, PIPE REPAIR

This repair method represents the standard approach, which should be adopted when repairing a damaged section of pipe. This type of repair has been tested and achieved pressures in excess of 35kg/cm² (500ibf/in²) before failure. The following is the sequence of steps to be taken in the repair procedure.

- Read through the whole of this procedure and ensure that all the Kit Contents required are available at the location of the repair and are clean and serviceable.
- Read through the section of this manual entitled 'Instructions for the Safe Handling of ThistleBond Repair System Materials'.
- The area beneath the repair and also that area where the ThistleBond Resin Mix, etc., is to be prepared should be covered with the Plastic Coated Paper supplied. This will ensure ease of cleaning these areas on completion of the repair.
- The overall size of the repair should extend at least 50mm (2") onto sound parent material on either end of the repair.
- Thoroughly clean the surface to which the ThistleBond repair is to be applied.
- If the contours of the surface to which the repair is to be applied are irregular or cracked, then apply ThistleBond A & B Cement, Sealer Filler Resin Mix, Fairing Compound Resin Mix or ThistleBond Rapid Setting Super Metal Repair Paste as appropriate.
- If the repair is to bridge a hole in a pipe, then a piece of Contour Cloth of a suitable size should be prepared to retain the original contour.
- Mix sufficient ThistleBond A & B Cement to coat the area to which the Contour cloth is to be applied. Once coated, the Contour Cloth should be positioned over the hole. In most applications ThistleBond Resin Mix can be used instead of ThistleBond A & B Cement and some users prefer to apply the Contour Cloth in this manner. The main requirement is to ensure that the Contour Cloth remains in contact with and therefore bonds to the surface of the repair whilst the Glass Tape is applied.
- At this stage, the ThistleBond Resin Mix for the repair should be prepared. See the section entitled 'Mixing Instructions for ThistleBond Resin and ThistleBond Hardener'.
- Thoroughly coat the surface of the repair area with the ThistleBond Resin Mix.

When Glass Tape is being used for the repair, then this should be wound round the pipe directly from the roll. The Tape should be wound reasonably tight on to the Resin Mix coated surface of the repair area to ensure that the Mix permeates through the

•interstices of the Tape. The Tape should be wound to overlap by half its width. When applying multiple layers of Tape, do not cut the Tape at the end of each pass.

12. When Glass Cloth or pieces of Glass Tape are being used, then each piece of materials should overlap the adjacent pieces by approximately 12mm (½"). Resin Mix should be then stippled into the interstices of the Cloth or Tape.

13. A further coat of the ThistleBond Resin Mix should now be applied to the first layer of Glass Cloth or Tape.

14. Two additional layers of Glass Cloth or Tape should now be placed or wound on to the first layer. When Tape is used, the winding of the second and third layers should each be in the reverse direction to that of the previous layer. A coating of Resin Mix is applied between each layer of Cloth or Tape.

15. Cut a piece of Cellophane a little larger than the length of the repair and at least 100mm (4") longer than the circumference.

16. This is applied to the surface of the repair and should be retained in position by means of Masking Tape. Masking Tape is applied to each end of the repair and also in an open spiral along its length.

17. The repair is now complete and the Resin Mix must be left to cure before returning the repaired item back into service. Curing times generally depend upon ambient temperature. For a general guide, in excess of 50% strength is developed in approximately 4 hours at 18 – 20 degrees Celsius. Full mechanical cure is achieved under these conditions in approximately 24 hours from time of application.

18. Gloves, Trowelling Tools, etc., used during the repair should be cleaned thoroughly immediately after use.

METHOD OF APPLICATION OF A THISTLEBOND HIGH PRESSURE, PIPE REPAIR

This repair method represents the standard approach which should be adopted when repairing a damaged section of pipe which is going to be subject to pressure. This type of repair has been tested and achieved pressures of up to 112 kg/cm² (1600 lbf/in²) before failure.

The incorporation of Glass Mat into this type of repair improves the strength. It should be noted that larger volumes of Resin Mix are involved in this type of repair and with the greater mass of Mix the gel time will be reduced accordingly.

The sequence of steps to be taken in the repair procedure is as follows:

1 – 14. Proceed as steps 1 – 14 of the 'Method of Application of a ThistleBond, Low Pressure Pipe Repair'. With reference to step 4 E. Wood Ltd recommend the repair be extended at least 100 mm (4")

•Cut a piece of Glass Mat, so that it will fully cover the repair and overlap at the joint by approximately 100 mm (4").

•Cut a piece of Linen Scrim approximately 100 mm (4") larger all round than the piece of Glass Mat.

•Lay out an adequately sized piece of Plastic Coated Paper.

•The piece of Linen Scrim should be laid out on the plastic coated side of the Plastic Coated Paper.

•The piece of Glass Mat should be laid on the Linen Scrim. The Glass Mat should be well saturated with Resin Mix.

•The combination of Linen Scrim and Glass Mat should now be removed from the Plastic Coated Paper and the Glass Mat side applied to the Glass Tape or Cloth surface of the repair. At the joint, the Glass Mat should be overlapped on to itself by peeling back the Linen Scrim, which is then replaced, and itself overlapped. By moulding the combination to the repair with gloved hands, the Resin Mix will satisfactorily permeate through the Linen Scrim.

•Cut a piece of Cellophane a little longer than the length of the repair and at least 100 mm (4") larger than the circumference.

•Apply the piece of Cellophane to the Linen Scrim surface of the repair with a 50 mm (2") overlap at the joint. It should be moulded onto the repair with Gloved hands to expel as much air as possible.

•The Cellophane is held in position by Masking Tape applied to each end of the repair. Masking Tape is also applied in an open spiral along its length.

•The repair is now complete and the Resin Mix must be left to cure before returning the pipeline, plant or equipment into service. Curing times generally depend upon ambient temperature. For a general guide, in excess of 50% strength is developed in approximately 4 hours at 18 – 20 degrees Celsius. Full mechanical cure is achieved under these conditions in approximately 24 hours from time of application. This type of repair, because of the larger volume of Resin Mix required, will gel more quickly, under given conditions because of the greater amount of heat generated during the curing process.

•Gloves, Trowelling Tool etc., used during the repair should be cleaned thoroughly immediately after use.

METHOD OF APPLICATION OF A THISTLEBOND PLATE REPAIR

In a ThistleBond Pipe Repair, the resin laminate will be in the form of a complete cylinder around the circumference of the pipe. Where a repair is required on a flat surface, a very large diameter surface or a complex surface, this will not normally be possible and the repair will require to be in the form of a patch.

The sequences of steps involved in the High or Low Pressure types of Plate Repair are the same as those required for Pipe Repairs and the reasons for the choice of type are identical. Normally Glass Cloth will be used in the repair instead of Glass Tape and this should be read into the sequences of steps indicated previously in this manual. The use of Linen Scrim, Cellophane, etc., will not necessarily be required in all cases as this is dependent upon the nature of the repair.

METHOD OF MIXING AND APPLICATION OF THISTLEBOND RAPID SETTING SUPER METAL REPAIR PASTE

This adhesive has been included in the ThistleBond Repair Kit because there has been a consistent demand from engineer for a quick curing urethane resin material for certain types of emergency repairs. Its inclusion broadens the scope of the ThistleBond Repair Kit as a maintenance tool. The adhesive can be applied, if required, prior to a standard ThistleBond repair.

The method of mixing applying ThistleBond Rapid Setting Super Metal Repair Paste is as follows:

- The precautions to be taken prior to handling this material are set out previously in this manual.
- All surfaces to be bonded must be clean, dry and free from grease, oil etc. Metal surfaces should be abraded. Once all surfaces to be bonded have been cleaned they should not be touched.
- Measure out equal amounts of Resin and Hardener onto a clean mixing surface. Mix thoroughly then apply a thin film on both surfaces to be bonded and unite immediately. Maintain pressure on the bonded surfaces until the adhesive sets (approximately 5 minutes at 25 degrees Celsius). Wipe off excess adhesive whilst still wet or scrape off with a razor blade before the material fully sets. Once set, the bond is permanent

and at normal ambient temperatures the strength of the bond will continue to develop for about 7 days. This can if required be accelerated by the application of a gentle heat.

Most materials except thermoplastics can be bonded with ThistleBond Rapid Setting Super Metal Repair Paste. The flexibility of the cured resin permits the bonding of materials with different coefficients of thermal expansion with minimum stress in the bonded joint.

METHOD OF MIXING AND APPLICATION OF THISTLEBOND PLASSTEEL

These unique 'twist stick' grade products are specially formulated two part epoxy repair compounds in the form of a concentric coloured stick of putty consistency (so that the user can see when the materials are thoroughly mixed). PlasSteel incorporates a metal filler.

Sticks are packaged in approximate weight/lengths of 125gm, 175mm long in clear plastic tubes, capped at the ends. They are easily applied after twisting off the required amount from the stick and mixed by kneading in a gloved hand to a uniform consistency.

PlasSteel set initially within approximately one hour and can be machined after about 30 minutes. One stick of PlasSteel is provided in the ThistleWrap Pipe Repair Kit and in each of the Thistlebond 'A' and 'C' Kits.

METHOD OF MIXING AND APPLICATION OF THISTLEBOND THISTLEWRAP

ThistleBond 'ThistleWrap Pipe Repair Tape' is ideal for pipe repairs to low pressure systems. As a general guide, a repair built up to a thickness of approximately 12mm ($\frac{1}{2}$ ") will withstand a maximum service pressure of 10 bar (150 psi). Higher pressures, up to 50 bar, can be achieved by first applying over the leak, a 'plug' of **ThistleBond 'PlasSteel'** twiststick grade metal-filled epoxy putty.

Pipes up to a nominal diameter of 65mm may be repaired using **ThistleBond 'ThistleWrap Pipe Repair Tape'** with holes approximately 3mm to 6mm diameter, although slightly larger pipes and holes can be effectively repaired using a plug of putty as described herein, always at users discretion.

Before proceeding, please read the following information carefully to ensure that the correct application procedure is fully understood.

All pressure within the pipe should be released. For leaks where pressure cannot be removed, holes should be stopped using a pipe repair clamp.

Remove all oil, grease, loose rust scale, sealant tape and paint from the repair area. Rough score a 10 cm (4 inch) patch around the pipe centering on the leak site.

If the pipe surface is pitted by rust, surfaces must be wire brushed to remove the loose scale. If the surface is smooth, as with copper or stainless steel, surfaces should be roughened with a coarse file, rasp or saw blade.

For plastic pipe, the external mould release must be removed.

Abrade surfaces with a coarse grit sandpaper. A saw blade may also be used to create a cross hatch pattern. This is particularly useful on polypropylene and PVDF piping.

During mixing and during application, lightweight disposable gloves should be worn to protect the

ThistleBond 'ThistleWrap Pipe Repair Tape' should be immersed in water and squeezed two or three times for about 10 to 20 seconds prior to use.

Remove roll from water and wrap quickly and tightly as follows.

Centre tape over leak site, wrap from bottom of roll, pulling firmly throughout application. After 5-7 plies, resin foam will come through the tape, which is desirable and aided by pulling tightly. Continue until entire roll is applied, building to a minimum thickness of ½ inch (12 mm), use a second roll if necessary. Firmly press and smooth end of roll into wrap in the direction of application. Wet gloves in water, smooth and firmly press the wet resin back into the wrap.

KEEP HANDS MOVING QUICKLY AND WET GLOVES FREQUENTLY TO AVOID STICKING.

Continue rapid hand movement pressing and polishing resin in motions around and parallel to the pipe. Continue process until resins are no longer tacky. The repair should now have a smooth, hard surface and an enamel-like appearance with no fabric protruding through the surface.

When used in conjunction with a plug of **ThistleBond 'PlasSteel' Putty** repeat the above instructions but having first plugged the hole. Knead a small bead of putty in gloved hand and flatten into a disc centrally over the hole pressing gently and feathering out the edges.

Leave to semi-harden (full cure 30 minutes) before applying tape, although tape may be applied immediately if necessary.

After application dispose of gloves.

NOTE: If a thicker application is needed, spend a little less time finishing the first roll and immediately begin the application of the next. Finish the final roll as if a single roll application.

Chemical Resistance Chart for ThistleBond Epoxide Resin Products

Chemicals	ThistleBond A&B Cement	ThistleBond Resin & Hardener	ThistleBond Plasteel
Acetic Acid (greater than 10%)	P	P	P
Acetic Acid (less than 10%)	G	G	F
Alum	E	E	G
NH ₄ Cl (10% Solution)	E	E	G
Ammonium Sulphate (10 % solution)	E	E	G
Ammonium Bisulphate	G	F	F
Ammonium Chloride	G	G	G
Ammonium Nitrate	G	G	G
Animal Fats	G	G	G
Aviation Spirits	U	U	U
Benzene	P	P	U
Butanol	P	P	U
Carbon Tetra-chloride	U	U	U
Carbonic Acid	G	G	E
Chlorine Gas	U	U	U
Chromic Acid	U	U	U
Chrome Plating Solutions	U	U	U
Copper Sulphate	F	F	P
Creosote	U	U	U
Cyclohexanol	U	U	U
Detergent Solution (5%)	G	G	F
Ethylene Glycol	U	U	U
Ferric Chloride	F	F	P
Ferric Sulphate	G	G	G
Formic Acid (less than 10%)	P	P	U
Formaldehyde (37%)	G	G	P
Glucose	G	G	F
Glycerine	G	G	F
Hydrochloric Acid (10%)	E	E	G
Hydrochloric Acid (20%)	G	G	G
Hydrochloric Acid (30%)	F	F	F
Hydrofluoric Acid (less than 10%)	G	F	F

Chemicals	ThistleBond A&B Cement	ThistleBond Resin & Hardener	ThistleBond PlasSteel
Lactic Acid (less than 5%)	F	P	U
Lead Nitrate	G	G	F
Magnesium Chloride	G	G	G
Mineral Oil	E	G	G
Nitric Acid (10%)	G	F	P
Nitric Acid (30%)	F	P	U
Oil	F	F	F
Paraffin (low grade)	G	G	G
Petrol	F	F	F
Phenol	P	P	U
Phosphoric Acid (10%)	F	F	P
Potassium Cyanide	U	U	U
Potassium Dichromate	F	F	F
Potassium Hydroxide	E	G	G
Potassium Nitrate	G	G	G
Potassium Sulphate	G	G	G
Sea Water	E	E	E
Sewage	G	G	G
Sodium Bisulphate	G	G	F
Sodium Bisulphite	F	F	F
Sodium Dichromate	F	F	F
Sodium Cyanide	P	P	U
Sodium Hydroxide (40%)	E	E	G
Sodium Nitrate	G	G	G
Sodium Phosphate	G	G	G
Sodium Sulphite	F	F	F
Sulphuric Acid (10%)	G	G	G
Sulphuric Acid (30%)	G	G	G
Sulphuric Acid (greater than 30%)	U	U	U
Toluene	F	P	U
Triethanolamine	E	G	G
Turpentine	P	P	P
Water	E	E	E
Zinc Chloride	F	F	F
Zinc Sulphate	F	F	F



UPS Marine Kits **SEALING COMPOUND**

Unique Polymer Systems
England.
www.uniquepolymersystems.com

UPS19000 Standard Resin and Hardener

A solvent free epoxy based **Resin** and **Hardener**, produces an extraordinarily strong resinous mass, having exceptional adhesive properties when applied to metals, wood, glass and synthetic materials.

UPS A & B Cement

A specially developed epoxide compound supplied in two separate packs marked A and B. When mixed together in equal portions by volume the Cement will cure to an extremely strong mass with a better adhesive bond than that produced by the **Unique Polymers Resin** mix. Apart from its use as an adhesive for repairs it can be applied, prior to carrying out a Unique Polymers repair, where difficult adhesion conditions exist.

UPS19010 Glass Cloth

A woven cloth 2.75 metres squared, 0.007" thick, which can be used for large repairs to tanks and pipework, specially developed for use with the **Standard Resin** and **Hardener**.

UPS19020 Glass Mat

A random collection of glass fibres which will absorb a considerable amount of the **Resin** and **Hardener** and which, when set will give an extremely strong inflexible mass for backing up repairs.

UPS19031 Linen Scrim

An open woven linen fabric which is used as a backing to **Glass Mat** to make it easier to handle when being applied to a repair.

UPS19006/7/8/9 Glass Tape

A square woven glass tape 0.007" thick which when combined with the **Standard Resin** and **Hardener** will give maximum hoop strength for the mending of pipes. This tape has been specially treated for use with **UPS Standard Resin** and **Hardener**.

Mixing and Preparation

Mixing the Resins

It will be found that the containers in which the resin is packed are not filled to the top. This is to allow space for the introduction of the activator. Sufficient activator is included in each container to set the resin in each pack and this should be poured into the resin container shortly before it is required for use and stirred for at least 1½ minutes using one of the stirring tools.

Mixing A & B Cement

Equal quantities of the cement are to be taken from either the tins or tubes (depending on which size product bought) and mixed together using the spatula provided. When using the **A & B Cement** for repairs to a leaking pipe, it is advisable to allow the cement to harden, before applying it to the cracked pipe.

Effects of Temperature on the Standard Resin and Hardener

Once the **Resin** and **Hardener** have been mixed, the rate of cure is dependent on the temperature to which it is allowed to rise. The hardness, strength and rapidity is increased the higher the temperature. In cold conditions it is advisable when possible, to apply some external source of heat to a mend to make sure that the cure reaction is complete and so reach it's maximum strength.

Cleaning the Surface

It must be appreciated that the strength of a repair with the **Unique Polymer Systems Repair Kit** depends chiefly upon the strength of the adhesive bond between the **Standard Resin** and **Hardener** and the surface to which it is applied. The **Standard Resin** and **Hardener** will adhere best to a clean, grease free surface and it is therefore essential that before applying a repair to a surface it should be cleaned using **UPS Degreaser** and **Universal Cleaner**. In areas where it is impossible to clean the surface thoroughly, it is recommended that a layer of **UPS A & B Cement** is smeared on the surface to be repaired and for a distance of 2" around.

Evenness of Lay Up

The principle strength of a repair lies in the tape or glass cloth layers which are either wound or laid on the surface of the metal. When using tape it is customary to wind this with a half overlap and care should be taken to see that there are no kinks in the tape, as this will leave a path of weakness in the final mend, which the pressure from inside will attack and may cause a breakdown. It will sometimes be found to be difficult to keep the winding smooth and free from kinks, especially when the mend is over a bend section of a pipe. In these cases it is preferable to cut short lengths of tape and lap them one on the other, while winding over the bend

It is obviously necessary that a continuous film of resin must be applied to each layer of the tape wound round the repair.

Thorough Saturation of the Glass Mat

The purpose of the **Glass Mat** is to provide a rigid backing to the tape mend and also to enclose a considerable volume of **Standard Even Application of the Standard Resin and Hardener Resin and Hardener**, which will heat up during cure and thereby make the adhesion to the metal considerably stronger. This object will never be attained unless the **Glass Mat** is thoroughly saturated. This can be achieved by working the resin up through the mat with the fingers, particular attention should be paid to the edges of the mat strip.

Simple Repair for Low Pressures

1. Thoroughly clean the surface to which the repair patch is to be applied, using **UPS Degreaser** and **Universal Cleaner**.
2. Measure the extent of the repair to be effected. As a rough guide the patch should extend 2" on either side of the damaged portion of the pipe.
3. When **Glass Tape** is to be used and the repair is in a confined position or close to a flange, it is advisable to cut the tape into suitable lengths and roll it up into small rolls. In this manner it will be much easier to roll the tape on to the pipe.
4. Cut the **Glass Mat** to such a size that it will form two layers over the repair, with 1" or 2" overlaps covering the whole extent of the repair area.
5. When a hole in a pipe is being repaired cut a piece of **Contour Cloth** of adequate size to bridge the gap.
6. When it has not been possible to remove the final traces of rust or paint from the pipe, mix a quantity of **A & B Cement** in accordance with the instructions and smear this over the area of damage and for a distance of 2" all around.
7. Mix the **Standard Resin** and **Hardener**, mixing thoroughly for 1½ minutes.
8. When the temperature of the mix has become sufficiently high, paint the **Resin** and **Hardener** mix onto the surface where the repair patch is being applied. When the contour cloth is being used, this should be coated with **Unique Polymers A & B Cement** and placed in the position over the hole.
9. When **Glass Tape** is being used a layer of this is now wound over the resin surface, allowing the resin to squeeze through the interstices in the **Glass Tape**. The **Glass Tape** should be wound as tightly as possible with one half overlap.
10. When **Glass Cloth** is being used, a layer of **Glass Cloth** is laid on the resin surface and the **Standard Resin** and **Hardener** stippled through by means of the paint brush.
11. In the case of further layers of the **Glass Tape** or **Cloth** being used, then the **Standard Resin** and **Hardener** should be painted on after each layer. In the case of **Glass Tape**, the winding of any additional layer should be in the reverse direction to the previous layer.

Reinforced Repair for Higher Pressure and More Rapid Setting

In cases where it is necessary to give additional strength to a repair to withstand higher pressures within the pipe or where it is desired that a rapid setting of the resin be achieved, it is suggested that a layer of saturated Glass Mat should be applied to the outside of the simple repair in accordance with the following procedure:-

1. Proceed with the instructions of the low pressure repair 1-11.
2. Cut a piece of **Linen Scrim** the same size as the **Glass Mat**.

A square of **Kraft Paper** (paper coated in plastic on one side) 3" larger in each direction than the strip of **Glass Mat**, it is cut and laid on a flat surface.

1. The **Linen Scrim** is laid on the paper.
2. A pool of mixed **Standard Resin** and **Hardener** is poured into the centre of the **Linen Scrim** and is brushed out so that it evenly coats the **Linen Scrim**.
3. The **Glass Mat** is laid on top of the first layer of the **Linen Scrim**.
4. The **Standard Resin** and **Hardener** is stippled through the **Glass Mat** with the fingers.
5. The **Glass Mat** and **Linen Scrim** are now carefully removed from the coated paper and applied over the surface of the tape or cloth. With the **Linen Scrim** being the outer layer of the repair.
6. In the case of a pipe they are covered with a sheet of cellophane, which is cut 4" longer than the area of the repair (2" overlap each end).
7. The **cellophane** is moulded down on to the surface of the **linen scrim** with the hands, to squeeze out as much air as possible and is then secured in position by means of masking tape at each end.
8. The repair can now be left to cure, taking any time from half an hour to two hours depending on the air temperature.

Other Repairs Performed by Unique Polymers Engineers Kits

Plugging of Large Holes

Large cavities can be filled by using the **UPS Fairing Compound**.

Method of Use

1. The bag of fairing compound is emptied into the tin of mixed standard Resin and Hardener.
2. The two components should be mixed for 3 minutes, when sufficient heat has been produced by the mix, the **Fairing Compound** mix can be applied to the split or crack that needs to be filled, approximate cure time ranges from ½ hour to 2 hours depending on air temperature, When the mix has set, **Glass Tape** or **Mat** can be wound over the repair.

Uneven Surfaces

Where the surface of a repair is extremely uneven, it is normally advantageous to use the Sealer Filler to smooth the surface, thus making the winding of the **Glass Tape** or **Cloth** more easily accomplished.

Cracked Plates, Bulkheads, castings, Pipes etc

Fill the crack with **UPS A & B Cement**. Paint mixed **Standard Resin** and **Hardener** over the surface of the plate and apply two layers of **Glass Cloth**. Where a certain amount of flexibility is required, apply **UPS Rapid Setting Super Metal Repair Paste** in the crack or split. This will allow a certain amount of flexibility in the repair and will prevent the patch being torn off during movement of the plate.

Storage Tanks, Leaks at Rivets, Welded Seams etc

This type of repair is best carried out by means of the **UPS Sealing Compound**, a special resin composition which, when mixed in conjunction with the fibrous filler, will set to an extremely hard tenacious mass, ideal for the plugging of holes and the filling of leaks in pipe threads etc. **Sealing Compound** is also useful for repairing pipes where the welded flange is leaking. The **Standard Resin** and **Hardener** and **Sealing Compound** when thoroughly mixed together, should be trowelled onto the problem area

PLEASE NOTE:

The GLASS TAPE PRODUCTS have been specially formulated to our exacting standards and that all TESTING and PUBLISHED technical data as to the abilities of the whole system solution are based upon this SPECIAL GLASS TAPE. We make no statements regarding using other GLASS TAPE Brands or liabilities.

For more information sales@uniquepolymersystems