



Technical Report PolymerMetal®

TEC-# 017

Elimination of oil leaks from electrical components like transformers, shunt reactors, transducers, etc.

Used products

MM-metal oL-steelceramic, MM-Elastomer

Introduction

The laws and requirements for environment protection determine, that no oil should leak out of the operating electrical machinery and plants. This demands that tightness of seams and flange connections are checked during inspections on regular basis. Power transformers are particularly vulnerable due to their construction, which has oil reservoirs, oil connections, large number of seams and age of the sealing material. By usage of cold curing PolymerMetals and MM-Elastomer a part of these oil leakages can be eliminated on the site itself.

Repair possibilities for PolymerMetals and MM-Elastomer

Transformers	Flange connections	Switches
Pumps	Shunt reactors	Condensers
Cables	Oil reservoirs	Cable boxes
Bushings	Transducers	

PolymerMetals

PolymerMetals are pasty, liquid or brushable materials, which are subjected to a special chemical process with the hardener (Polyaddition) right before processing. The polymers, which are a combination of resin, filler and additives, are processed in a specific way. By the mixing of the basis material and the hardener the PolymerMetals do totally cure and achieve properties similar to metal. The choice of the combining components dictates the final quality of the material and its characteristic profile.

When the repair of electrical components is necessary often it can't be done by welding or soldering because of specific dangers of fire etc. More favourable and often only possible is a repair with PolymerMetals.

The liquidation of oil leakages at the repair site is possible, because a special PolymerMetal is applied to oily work pieces or work pieces contaminated by grease or petrol, where colour rests have been removed from. This PolymerMetal is not applied to a cleaned or prepared metal surface as common for most other materials. By applying the PolymerMetal that means working it up onto the metal surface an excellent bonding is reached.

Most important applications of PolymerMetals at electrical components

- Sealing of oil leakages on seams under oil pressure (e.g. on transformers, shunt reactors, transducers or oil-conservators)
- Sealing of air pressure leaks on seams (e.g. on compressed air lines, other compressed air equipment)
- Sealing of SF₆ leaks
- Repair of bushings and ducts on mounting flanges
- Repair of oil filled frames (e.g. gearboxes, transducer frames)
- Repair of bushings for high voltage cables which are laid underground and display oil

leakages

- Repair of porcelain insulators with damaged parts
- Repair of coils

MM-Elastomer

The cold curing MM-Elastomer is a polyurethane based on polyisocyanate. This process helps to produce an oil resistant material from high grade polyurethane. Shortly before processing the pasty or liquid basis component is subjected to a chemical process (polyaddition) by adding a hardener. Hereby the MM-Elastomer does totally cure and acquires rubber like properties. The elasticity and abrasion resistance of MM-Elastomer (Shore A hardness = 95, 85, 65 or 40) can reach values better than conventional rubber. Whenever MM-Elastomer is used there is not necessary any primer. When subjected to elongation or compression, MM-Elastomer reverts back to its original shape and has a high electrical and chemical resistance. Basis of MM-Elastomer's multipurpose usage is the good bonding on rubber, metal and ceramics and sufficient bonding on pvc, polycarbo-nate, neoprene, fibreglass, glass, plywood and similar materials. The operating temperature of MM-Elastomer is limited to 130 °C (=266 °F).

Surface preparation

- Make the surface metallically clean and carriable
- Mechanically rough up the surface by sandblasting, cutting, grinding etc.
- Clean again by sweeping, blowing off, evaporating
- Thoroughly degrease with MM-Degreaser Z or do bind the oil with the PolymerMetal MM-metal oL-steelceramic
- When applying on rubber just mechanically rough up and clean the surface
- Apply a thin layer of MM-Release agent on surfaces, where a compound with the PolymerMetal should not be formed and polish after a short drying period

MM-Elastomer should be carefully mixed with the Hardener under consideration of the recommended mixing ratio and applied to the prepared surface. The exact application procedure will depend on the type and extent of the oil leak.

Repair methods

method1: There is slow oil leak from the seat of the damage, which reappears after about one hour of degreasing operation. In this case, repairs are done directly with MM-Elastomer after degreasing the seat of the oil leak. By the time the oil reappears at the leaky point again, the MM-Elastomer would have been cured enough to bond to the seat of damage. This type of repair is applicable to oil leaks between head and diverter-switch-vessel of a transformer. It should be considered that MM-Elastomer covers the sealing edges and overlaps the flanged edges as well.





method2: This is a situation where oil pours out immediately or within a short period again after sweeping away from the leakage. This method should be chosen when the component is loaded by switching or vibration. First the oil must be binded with the PolymerMetal MM-metal oL-steelceramic. Then an overlapping coating with the cold hardening MM-Elastomer should be applied to the PolymerMetal.

method3: In this case an oil jet is coming out of the leakage. Here the repair site must be made pressure-free. This could be done by e.g. valving off the leakage, creating a vacuum at transformers, self tapping screws, calking, etc. If the leakage occurs at a position where there isn't enough surface e.g. at the edge of a heat exchanger, further assisting materials e.g. fabric tape should be used.



method4: Situations, where the damaged components are not subjected to vibration, or any other movements, oil leaks can be repaired by application of the PolymerMetal MM-metal oL-steelceramic alone.



Summary

Main users in electric industry are big power plants, heating and power stations, electricity stations, substations, repair departments of the energy supply companies, electric railway stations and similar companies and service companies. PolymerMetals and MM-Elastomer are not electrically conductive and can therefore be used as protection against corrosion, too. After full curing they can normally be metal-cutted. Depending on the hardness of the used PolymerMetal there can be used Diamonds or SiC-grinding plates or normal tools.

MultiMetal

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