Worldwide repairs carried out with PolymerMetal®

REP-# 076

A seized oil pump was repaired by using Molymetall.

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Interested parties, please contact
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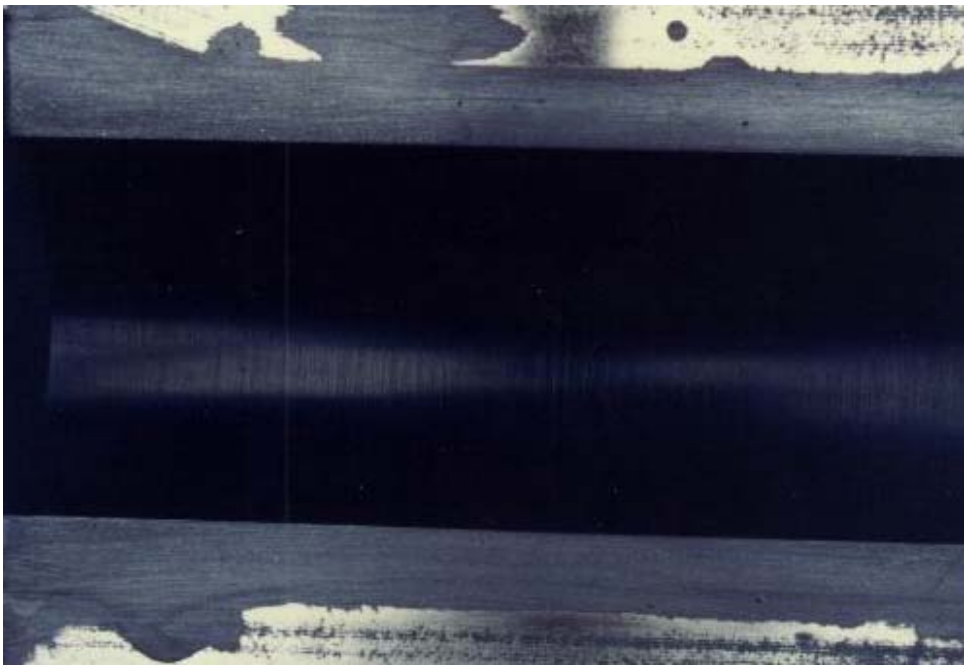
Worldwide repairs carried out with PolymerMetal®

REP-# 080



Repairing a damaged bearing bush using Molymetall.

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Worldwide repairs carried out with PolymerMetal®

REP-# 085

Axial and radial groves on drilling upright machines and bed ways were filled with Molymetall and machined down to size.

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Worldwide repairs carried out with PolymerMetal®

REP-# 106

A chrome plated hydraulic piston showed strong surface flaking. As there were thinnest layers and antifriction properties required, the repair was affected with Molymetall.

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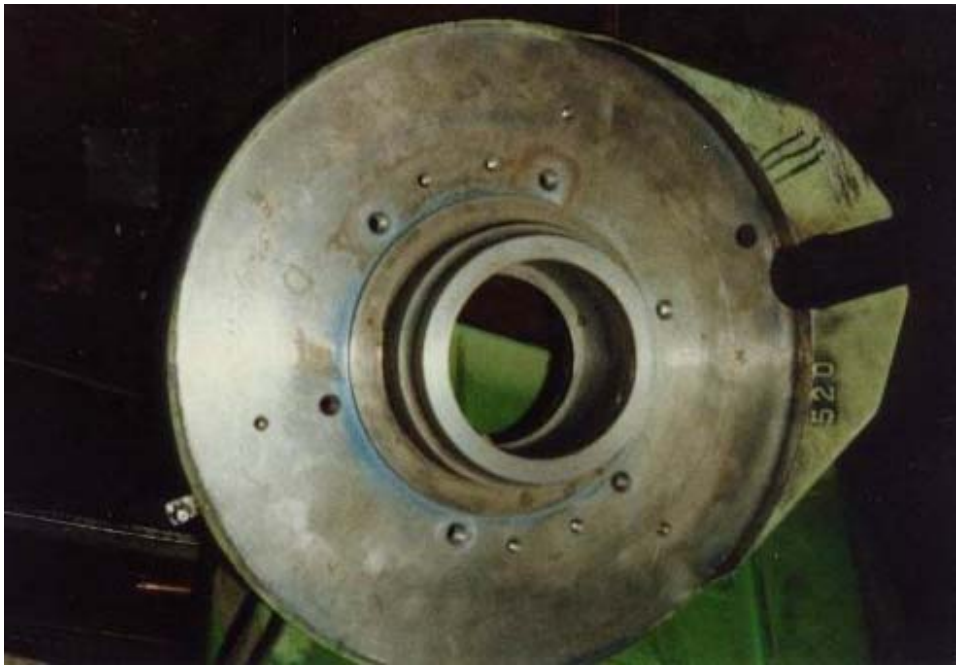
Worldwide repairs carried out with PolymerMetal®

REP-# 121



The bearing seat of a brake shield was reconstructed to its original size with Molymetall. First 2 mm were turned down and then Molymetall was applied. After total curing (appr. 12 h) the size of the original diameter of the seat was reached by turning down again.

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Worldwide repairs carried out with PolymerMetal®

REP-# 131

Due to ageing and sea water corrosion, the hard chrome coating in the top section of some hydraulic rams of several vessel deck hatch covers was peeled off. To avoid re-chroming, the hydraulic rams were repaired with Molymetall. First the corroded areas were machined down. Then Molymetall was applied and after curing machined down to size. The 270 kg heavy hydraulic cylinders with a diameter of 125 mm work with a pressure of 280 kg/cm^2 and a stroke of 635 mm. Tests, carried out 5 years after the repair, show that the hydraulic rams are still in good condition and fully functional.

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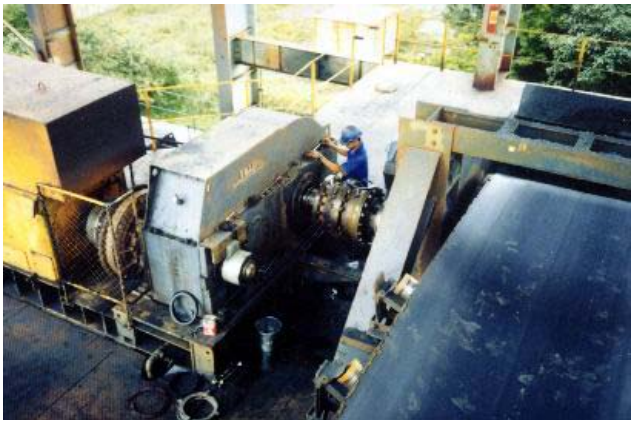
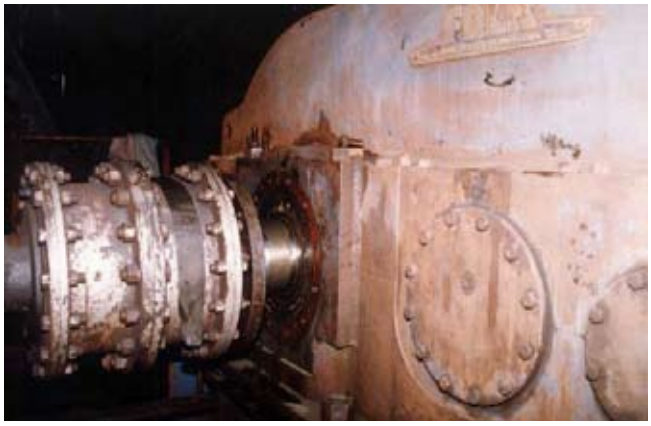
Worldwide repairs carried out with PolymerMetal®

REP-#138





The worn-out shaft of a gear motor for moving an ore conveyer belt was repaired with PolymerMetal. For this the polymer material Molymetall was applied to the damaged shaft on the spot and after partial curing reduced to the desired dimension by grinding by hand with abrasive paper. The solution of the problem by using a PolymerMetal had the big advantage that through this a dismantling of the facility or shaft was not necessary. Due to this modern type of repair, the customer was able to save around 67 hours of machine shut-down.

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Technical Report PolymerMetal®

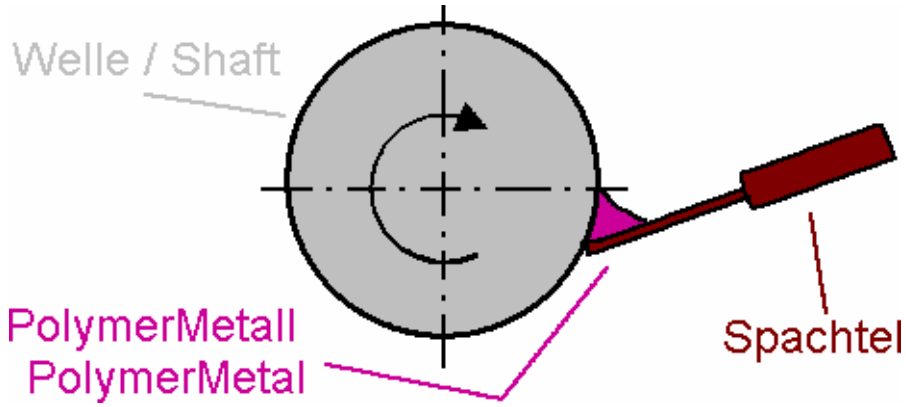
TEC-# 008
Repair of a shaft with PolymerMetals

Used products
MM-metal SS-steelceramic / MM-metal SS-steel 382 / MM-metal SS-steel / MM-metal SS-aluminium / MM-metal SS-copper / MM-metal SS-bronze / Ceramium® / Molymetall®

Introduction
The high quality PolymerMetals from MultiMetall can be used to repair worn shafts by restoring material. This report is supposed to assist the applicator during the repair. Because of the different sizes of wear length areas and diameters of the shaft to be repaired and the available processing time of the PolymerMetals (pot life appr. 30-35 min at 20 °C) the application of the PolymerMetals was divided into four variants.

Preparation
- shaft has to be turned off in the area of the damaged part to at least 1 mm undersize from target diameter, the surface quality should be appr. Rz 100 afterwards
- clean shaft from oil, grease, coolant etc with MM-Degreaser Z or MM-Degreaser C
- adhere to Technical data sheet of used PolymerMetal especially consider the available processing time (pot life)

Application of PolymerMetal
Variant 1: Shaft length of wear area **< 150 mm** and diameter **< 200 mm**
- Shaft hold by lathe has to run with a low turning speed during all following repair steps
- Apply a thin layer (max 0,5 mm) of PolymerMetal with a spatula with pressure on the complete wear area of the shaft to avoid air bubbles in the interface between metal and PolymerMetal
- Apply PolymerMetal on complete wear length of shaft in a layer of appr. 2 mm oversize against target diameter
- By using a metal rule which is long enough (and therefore reaching over the complete wear length) the surface of the PolymerMetal should be smoothened so that an oversize of only 1-2 mm remains



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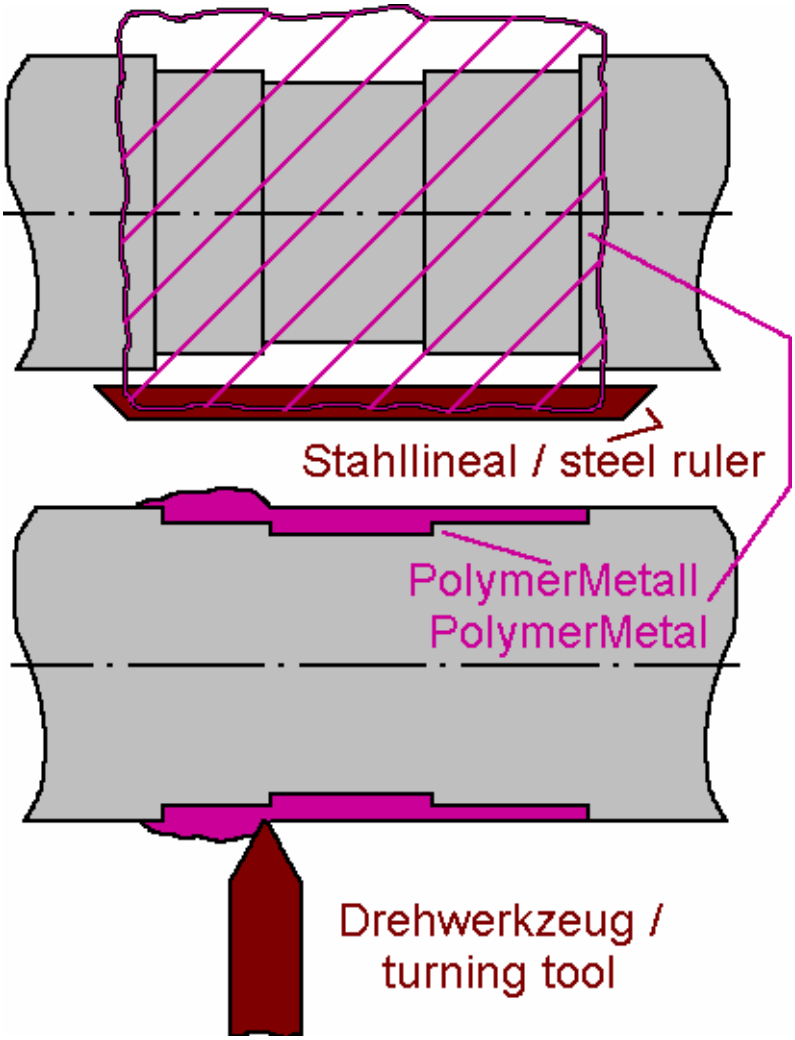

Variant 2: Shaft length of wear area **< 150 mm** and diameter **> 200 mm**

- Shaft hold by lathe has to be turned by hand during all following repair steps
- Apply a thin layer (max 0,5 mm) of PolymerMetal with a spatula with pressure on the first part of the wear area („1“ on sketch) of the shaft to avoid air bubbles in the interface between metal and PolymerMetal; then apply PolymerMetal on the same part of the wear area in oversize of appr. 2 mm against the target diameter
- Apply a thin layer (max 0,5 mm) of PolymerMetal with a spatula with pressure on the second part of the wear area („2“ on sketch) of the shaft to avoid air bubbles in the interface between metal and PolymerMetal; then apply PolymerMetal on the same part of the wear area in oversize of appr. 2 mm against the target diameter
- Go on applying PolymerMetal in the same way on all other parts of the wear area till the complete wear area is coated
- If possibly there is enough pot life, use a metal rule which is long enough (and therefore reaching over the complete wear length) to smoothen the surface of the PolymerMetal so that an oversize of only 1-2 mm remains
- Hint: the transitions shown in the sketch i.e. between part area 1 and part area 2 are fluid and do not have to be kept strictly

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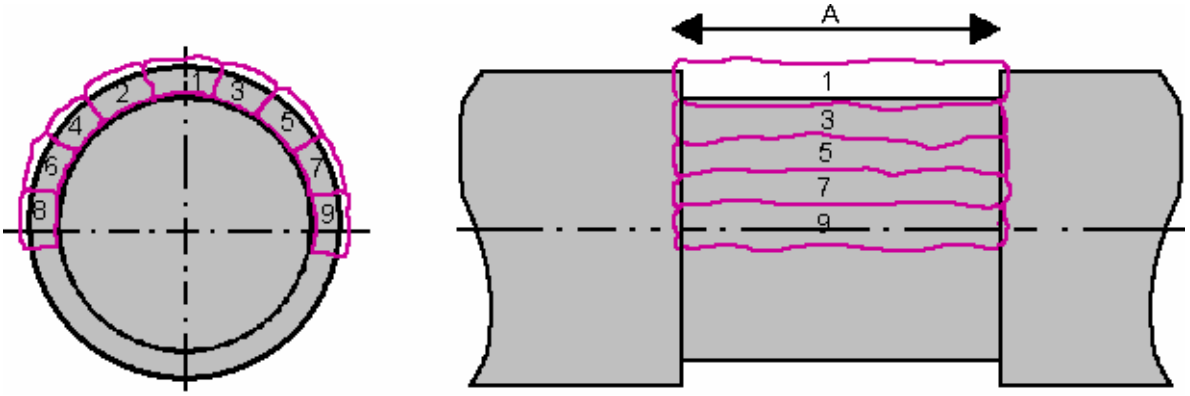

Variant 3: Shaft length of wear area **> 150 mm** and diameter **< 200 mm**

- Shaft hold by lathe has to run with a low turning speed during all following repair steps
- Apply a thin layer (max 0,5 mm) of PolymerMetal with a spatula with pressure on the first part of the wear area on the length of appr. 150 mm on the complete shaft perimeter to avoid air bubbles in the interface between metal and PolymerMetal; then apply PolymerMetal on the same part of the wear area in oversize of appr. 2 mm against the target diameter; use a metal rule which is long enough (and therefore reaching over the complete wear length) to smoothen the surface of the PolymerMetal so that an oversize of only 1-2 mm remains
- Apply a thin layer (max 0,5 mm) of PolymerMetal with a spatula with pressure on the second part of the wear area on the length of appr. 150 mm on the complete shaft perimeter; then apply PolymerMetal on the same part of the wear area in oversize of appr. 2 mm against the target diameter; use a metal rule which is long enough (and therefore reaching over the complete wear length) to smoothen the surface of the PolymerMetal so that an oversize of only 1-2 mm remains
- Go on applying PolymerMetal in the same way on all other parts and smoothen the surface of the PolymerMetal till the complete wear area is coated and pulled

Variant 4: Shaft length of wear area **> 150 mm** and diameter **> 200 mm**

- Shaft hold by lathe has to be turned by hand during all following repair steps
- Divide the shaft into several max appr. 150 mm long areas
- Apply a thin layer (max 0,5 mm) of PolymerMetal with a spatula with pressure on the first shaft section of the wear area („A“ on sketch) on the length of appr. 150 mm of the first part of the wear area to avoid air bubbles in the interface between metal and PolymerMetal; then apply PolymerMetal on the same part of the wear area in oversize of appr. 2 mm against the target diameter
- Apply a thin layer (max 0,5 mm) of PolymerMetal with a spatula with pressure on the first shaft section of the wear area („A“ on sketch) on the length of appr. 150 mm of the second part of the wear area; then apply PolymerMetal on the same part of the wear area in oversize of appr. 2 mm against the target diameter
- Go on applying PolymerMetal in the same way on all other shaft sections and parts till the complete wear area is coated
- If possibly there is enough pot life, use a metal rule which is long enough (and therefore reaching over the complete wear length) to smoothen the surface of the PolymerMetal so that an oversize of only 1-2 mm remains

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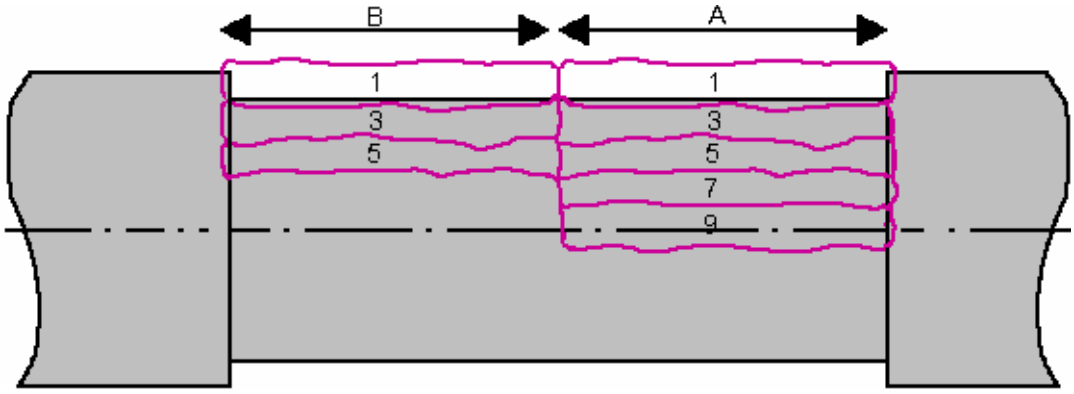

Further processing

- Wait till PolymerMetal has been totally cured (adhere to Technical data sheet)
- Further processing of the shaft without cooling/greasing agent
- Depending on used PolymerMetal machine the coated surface with Diamond or standard tools

Material	MM-metal SS-steel 382 MM-metal SS-steel MM-metal SS-aluminium MM-metal SS-copper MM-metal SS-bronze each with Hardener yellow Molymetall® with Hardener Molymetall®	MM-metal SS-steelceramic with Hardener yellow Ceramium® with Hardener CE
Type of machining	**standard tools**	**diamond tools**
General machining data Cutting speed v_c Cutting depth a_p Feed f	 40...55 m/min 0,5...1 mm 0,1...0,2 mm/U	 60...125 m/min 0,5...1 mm 0,1...0,2 mm/U
Recommended machining data at rough turning Cutting speed v_c Cutting depth a_p Feed f		 80 m/min 2 mm 0,125 mm/U
Recommended machining data at finish turning Cutting speed v_c Cutting depth a_p Feed f		 125 m/min 0,5 mm 0,125 mm/U
* For machining we recommend to use Syndite (trademark of the „De Beers Industrial Diamond Division“) PKD tools grade 010 respectively 025. After machining with PKD tools the surface quality of the coating has a medium peak-to-valley value of Ra 3,4 µm.		

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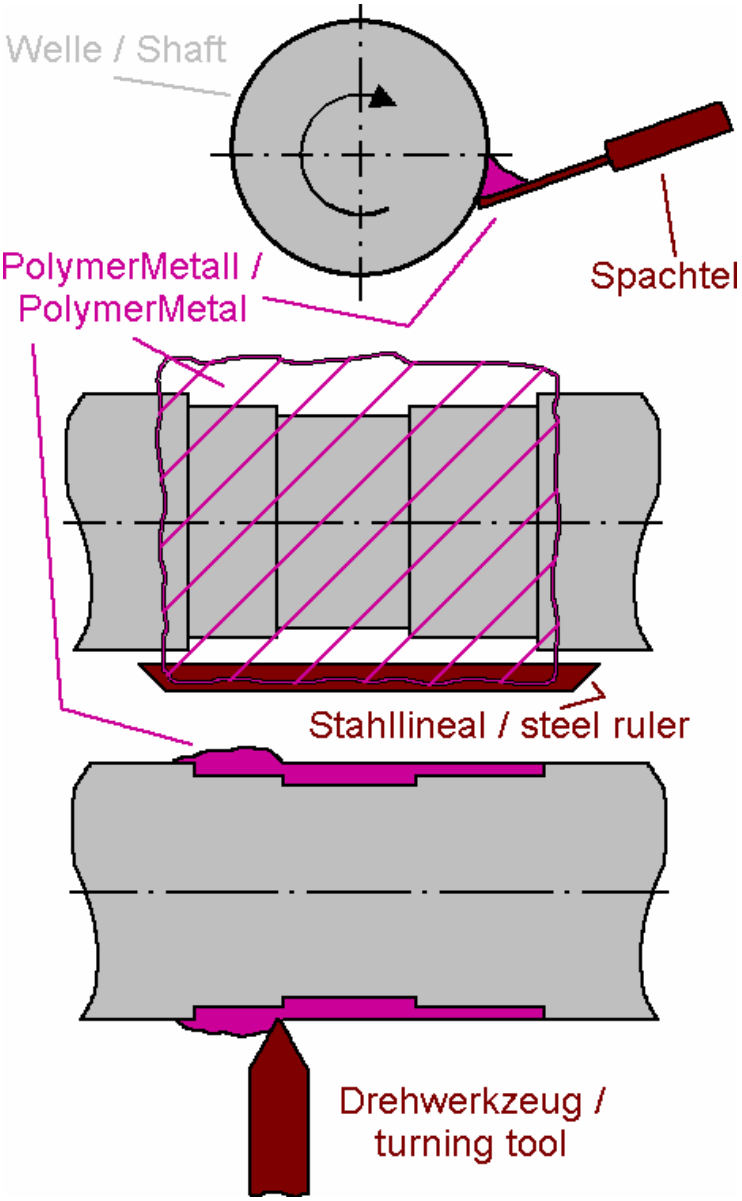
Technical Report PolymerMetal®

TEC-# 020
Repair of a propeller shaft with PolymerMetals (short version)

Used products
MM-metal SS-steelceramic / MM-metal SS-steel 382 / MM-metal SS-steel/aluminium/copper/bronze / Ceramium® / Molymetall®



Description
PolymerMetals can be used to repair worn shafts by restoring material. Here the PolymerMetal can be applied during running shaft followed by turning down to nominal diameter. For this repair should be used one of the above mentioned PolymerMetals. Further information concerning the repair of a shaft with PolymerMetals can be found in the „Technical Report TEC-# 008“.

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Technical Report PolymerMetal®

TEC-# 028
Surface preparation before the coating of hydraulic rams

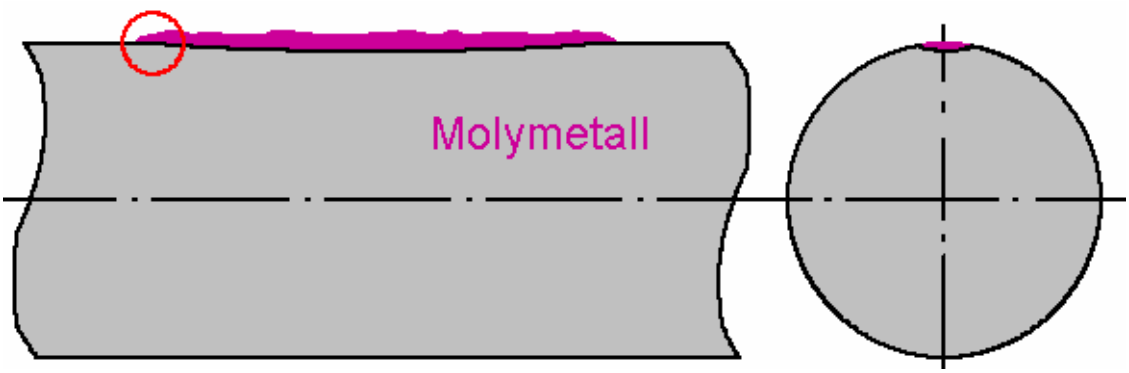
Used products
Molymetall®

Introduction
Molymetall® is a PolymerMetal with a very low coefficient of friction and self-lubricating properties. The emergency running properties against solid dry friction such as sliding wear and stick-slip are excellent. After full curing, Molymetall can be processed to a finished measure up to the µ-area. Possible applications are i.e. hydraulic pistons, pillar guides, slide bearings, slide ways, tappet guides.

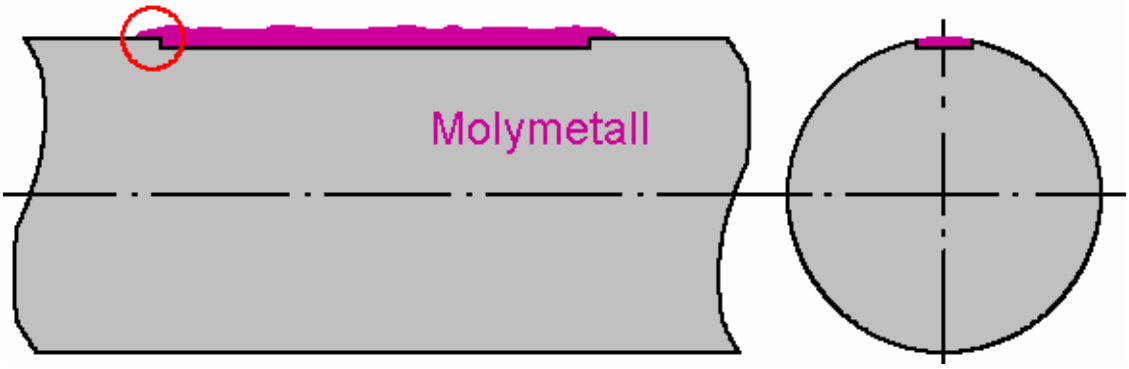
Description
Especially when Molymetall® is used for the repair of hydraulic rams, it is important that the surface of the work piece is thoroughly prepared before coating. Therefore

make the surface metallically clean and carryable &
rough up the surface mechanically by sandblasting, cutting, grinding etc.

Wrong:



Right:



Especially during the creation of a metallically clean and carryable surface, it is very important that any pittings and cracks on the work piece surface, which were caused by wear won't be let run out, but machined instead. That means that before the application of Molymetall® covering the complete area, any cracks should be grinded down by appr. 1 mm. This way the bonding of Molymetall® on the surface is secured.

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clean again by sweeping, blowing or sucking off
thoroughly degrease with MM-Degreaser Z

It is important that only suitable degreasers like i.e. MM-Degreaser Z, MM-Degreaser C, acetone or ethyl acetate are used. Benzine, alcohol, varnish and paint thinner or other unknown substances are not suitable. Remains of oil diffused in the work piece can be removed by heating up the damaged area by using a Bunsen burner or a gas flame. Through this the adhesion of Molymetall® on the surface won't be affected by remainders of oil.

MM-Release agent

Apply a thin layer of MM-Release agent on the surfaces, where a compound should not be formed with the PolymerMetal and polish after a short drying period

Hints for the application of Molymetall®

During the application of the PolymerMetal we recommend striking out a thin layer of the mixed PolymerMetal on a clean (metal) plate or any similar suitable substrate before starting to coat the work piece. Through this small air bubbles arisen in the still soft PolymerMetal during mixing of the components can be avoided or removed. Molymetall® should be applied to up to appr. 0,5 mm above the wanted nominal layer thickness, because normally a machining of the initially or fully cured Molymetall® is desired or necessary later to achieve a very smooth and regular surface of the damaged area. In every case it is important that first some Molymetall® is applied over the nominal diameter because if sufficient material has not been applied, a surface preparation must be done again. We recommend applying more material because Molymetall® can be machined quite easily. The machining can be done by i.e. using first coarse and later fine sand paper.

Following some examples of hydraulic rams, which have been repaired with Molymetall®:

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