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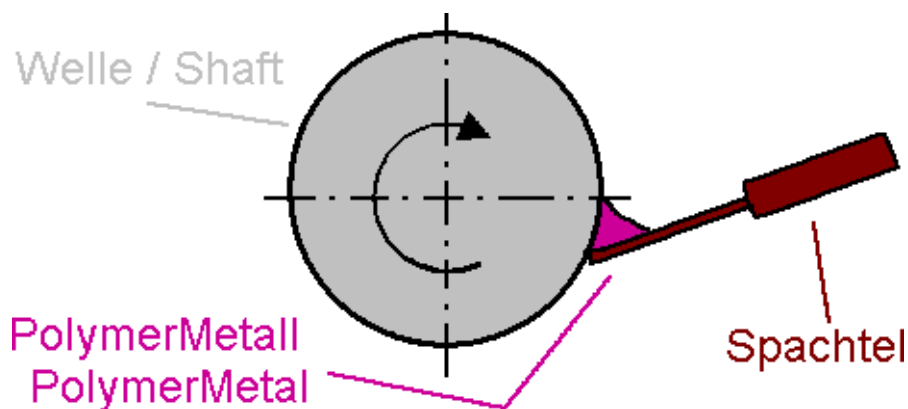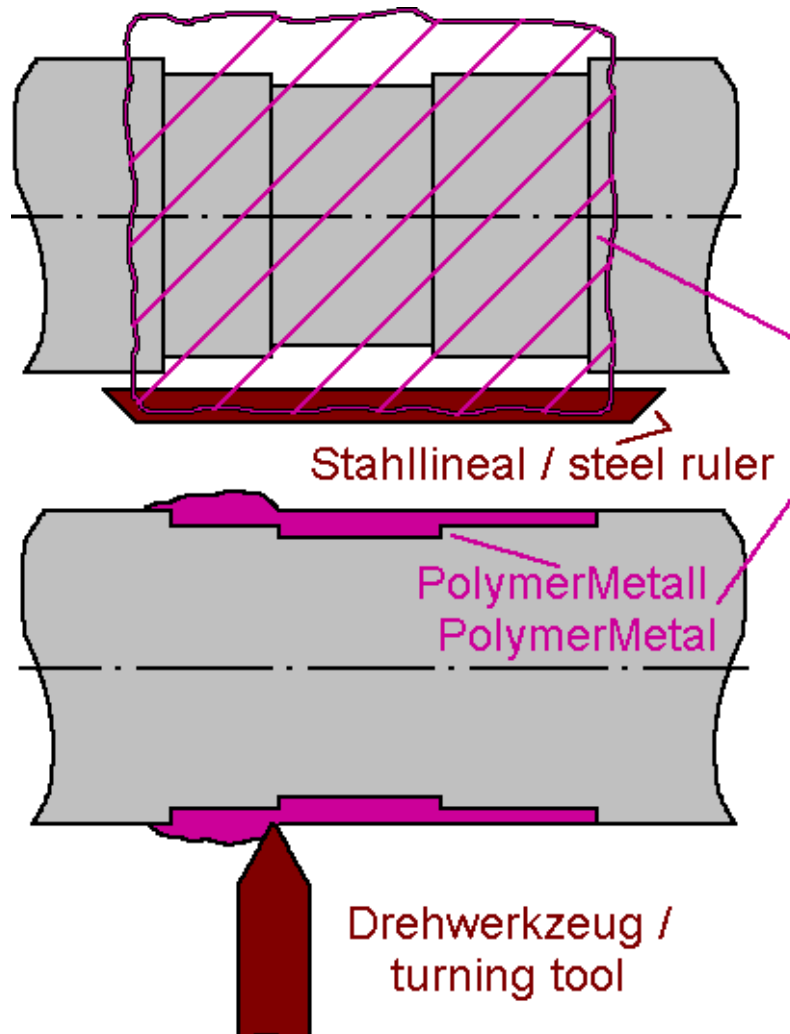
Preparation
• shaft has to be turned off in the area of the damaged part to at least 1 mm undersize from target diameter, the surface quality should be appr. Rz 100 afterwards
• clean shaft from oil, grease, coolant etc with MM-Degreaser Z
• adhere to Technical data sheet of used PolymerMetal especially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

Application of PolymerMetal
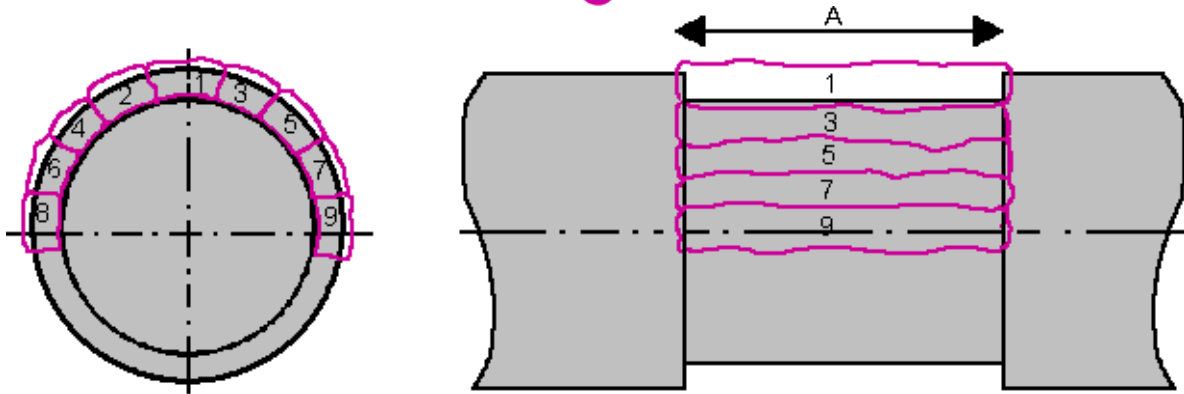**Variant 1**: Shaft length of wear area **< 150 mm** and diameter **< 200 mm**
• Shaft hold by lathe has to run with a low turning speed during all following repair steps
• Apply a thin layer (max 0,5 mm) of PolymerMetal with a spatula with pressure on the complete wear area of the shaft to avoid air 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

Welle / Shaft
PolymerMetall
PolymerMetal
Spachtel

Stahllineal / steel ruler

PolymerMetall / PolymerMetal

Drehwerkzeug / turning tool

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 e.g. between part area 1 and part area 2 are fluid and do not have to be kept strictly

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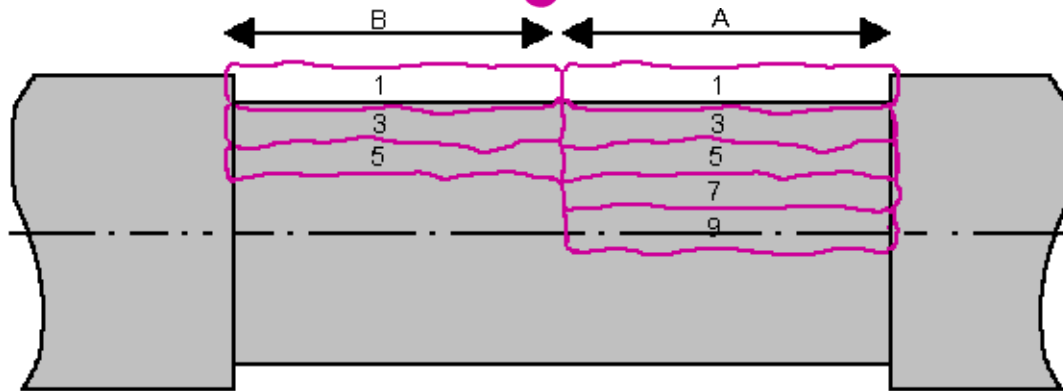
Further processing
- Wait till PolymerMetal has been totally cured (adhere to Technical data sheet)
- Further processing of the shaft without cooling/greasing agent
- Depending on used PolymerMetal machine the coated surface with Diamond or standard tools

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 (tool specification: rake angle 0°, clearance angle 5-7°). After machining with PKD tools the surface quality of the coating has a medium peak-to-valley value of Ra 3,4 µm.

MultiMetall
the MetalExistenceCompany®