

# Cooper-Bessemer LSV reconditioning guidelines



Restoring the block, liners  
and cylinder heads to factory  
relational dimensions

Understanding the dimensional relationship of the wear surfaces of the head, to the liner, to the block

# The Relationship

- In order to function properly, the block, liners and heads need to be restored to factory dimensions.
- If any one of the three is out of spec. there is a high potential for a serious coolant leak that can end up in the combustion chamber with serious consequences.
- After years of service all of the contact surfaces wear, and the relationships becomes sloppy.
- Close inspection can reveal serious problems that require attention.
- Factory specs. dictate that all dimensions be within +/- .002”

# Head Gaskets

- Its all about the head gaskets ability to seal.
- The three head gaskets contact the block, the liner and the head at the same time.
- All three wear and all three need to be inspected and reconditioned when necessary.

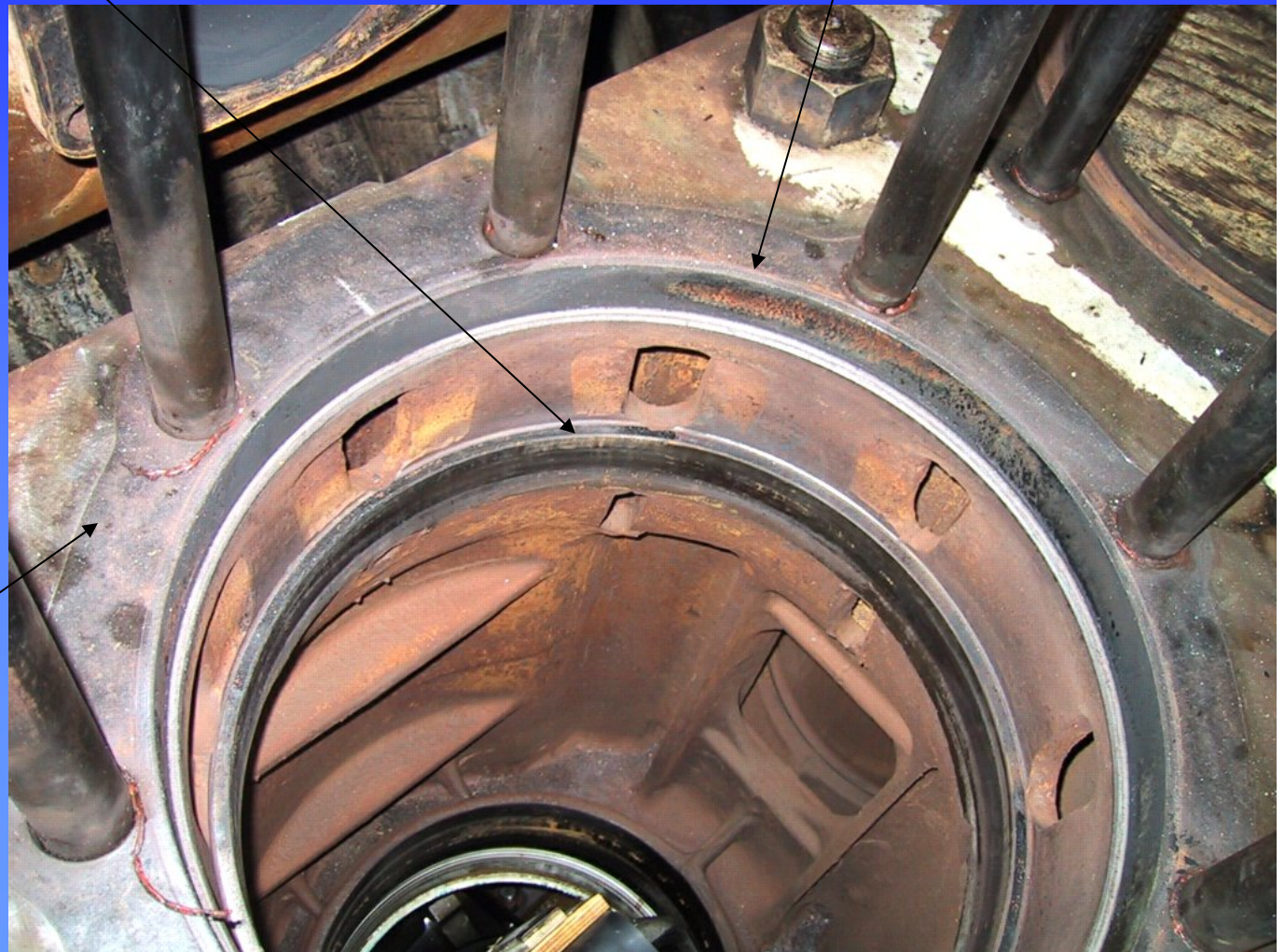
# Cylinder Block

- The block usually wears in two serious spots.
- 1. The liner height registration step that sits six inches down from the fire deck wears after years of operation and allows the liners to sink below the deck surface.
- 2. The corner of the liner bore that is inside the head stud circle where the outer head gasket sits.

Liner height registration step

Outer head gasket seal surface

This wear pattern where the cylinder head has been contacting the deck surface indicates that the liner was sitting below the fire deck surface.



# Liners

- The liners wear on all surfaces.
- The height registration step that is six inches down from the top wears and allows the liner to sink.
- The top surfaces where the inner and intermediate gaskets sit wear and cause gasket leakage.
- The bottom where the bellows gasket seal becomes pitted and requires machining.
- The lower outside diameter wears allowing the liner to be loose in the block.



Inner head gasket seal surface

Intermediate head  
gasket seal surface



Liner height registration step



# Cylinder heads

- Heads have three gasket wear surfaces that relate to the **liner and cylinder block**.
- 1. The outer head gasket groove that contains the gasket that sits on the edge of the fire deck of the block
- 2. The intermediate head gasket groove that contains the gasket that sits on the upper surface of the liner.
- 3. The inner head gasket seal surface that sits on the lower inner step of the liner.

Outer gasket groove

Intermediate gasket groove

Inner head gasket surface



- All of these important surfaces will wear over time and will require various methods to build up and machine back to the factory dimensions.
- If any one of them is not reconditioned, the others won't be able to seal properly.

# LNS recommended reconditioning procedures

- 1. Engine block fire deck repairs.
- 2. Engine block liner registration step repairs.
- 3. Liner reconditioning.
- 4. Cylinder head reconditioning

# Fire deck repairs

- Resurfacing the deck surface is costly and unnecessary. The only area that is important is the small .300” wide gasket seal surface inside the head stud circle.
- Our recommended process involves the installation of a replaceable, simple repair sleeve.
- The sleeve can be machined and installed without even removing the head studs.

Boring machines are setup to bore out the damaged edge of the fire deck to accept the repair sleeve





Repair sleeve bore ready to receive the sleeve



The repair sleeve is made oversized to the bore and frozen in liquid nitrogen



The repair sleeve is installed in the bore and expands with a .005” press fit. The top of the insert registers flush to .002” above the fire deck surface



The sleeve produces a new gasket seal surface that can be replaced in the future if necessary without need of machine work.



All cylinders are brought back to standard height with steel repair sleeves that will wear better than the original cast iron



# Liner height registration step repair

- Installing lower liner height registration step repair bushings is expensive and unnecessary.
- The lower steps can simply be machined lower to create a new flat seat surface.
- The new depth should be approximately 6.025". This is .025" deeper than factory spec.
- The difference is easily made up in the reconditioning of the liners that will require that this step be built up anyway. Adding .025" more is easy and very cost effective.
- This can cut **\$100,000.00** from the overall cost

The liner height registration step is machined in the same setup as as the upper repair sleeve boring operation to a new depth of 6.025”



# Liner reconditioning

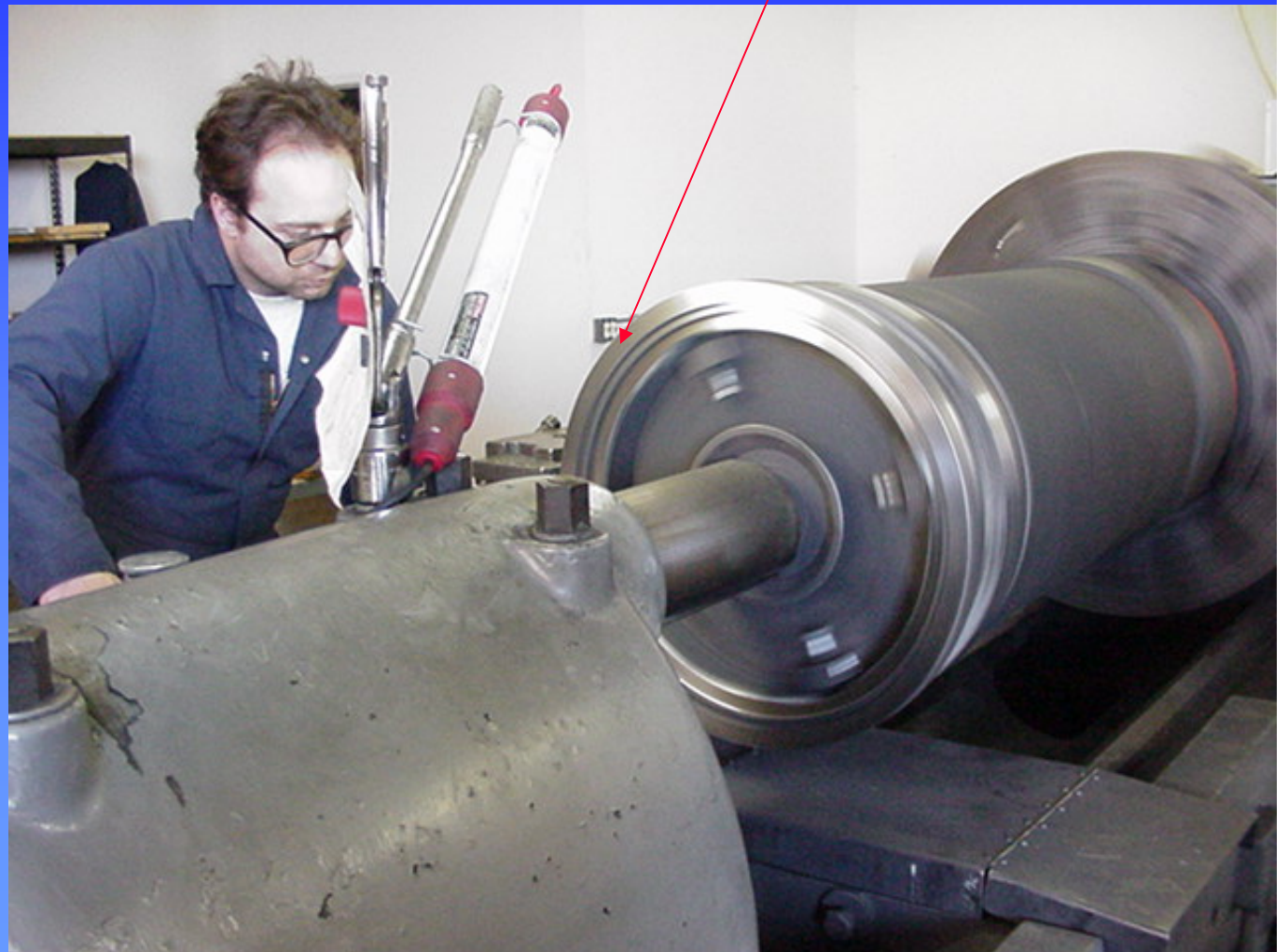
- The liners are inspected on all critical wear, seal and registration surfaces.
- The cylinder bores are re-chromed back to standard inside diameter.
- Both ends are machined to provide flat seal surfaces.
- The height registration step and o-ring steps are metal sprayed and machined.
- .025” is added to the registration step to match the dimensions of the newly machined engine block.
- If necessary, the lower outer diameter can be metal sprayed and machined back to original diameter.



**Liner registration steps are built up with metal spray**



**Liners are machined on all critical surfaces**



# Cylinder head reconditioning

- Heads require the gasket seal surfaces be built up and remachined to factory dimensions.
- All valve seats need to be replaced
- All valve guides need to be inspected and replaced if necessary.
- Any cracks need to be repaired as well.

The gasket grooves and seal surfaces are roughed out in preparation  
For metal spraying



Metco wire spray system is used to buildup the gasket area to bring it back to factory dimensions



Both gasket grooves are brought back to the proper depth and width and inner gasket step is brought back to the factory height.



# **If the liner sits low, the step on the block or liner is worn beyond the acceptable limit**

- The outer gasket holds the head up and prevents the two gaskets on the liner from crushing properly.
- Coolant can leak into the combustion chamber

# **If the liner is worn on any of the head gasket surfaces,**

- Coolant can leak into the combustion chamber.
- Compression can leak into the coolant jacket.



# **If the cylinder head gasket grooves are worn too deep,**

- Coolant can leak into the combustion chamber
- Compression can leak into the coolant jacket
- Coolant can leak externally on the fire deck and down to outside of the engine.

**They are all dependant upon  
each other to seal**

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