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# Service Bulletin-Cylinder Bores/Liners:



## Failure analysis:

### Common problems:

- Wear
- Glazing
- Polishing
- Flange fracture
- Vertical fracture
- Cavitation erosion
- Bore distortion



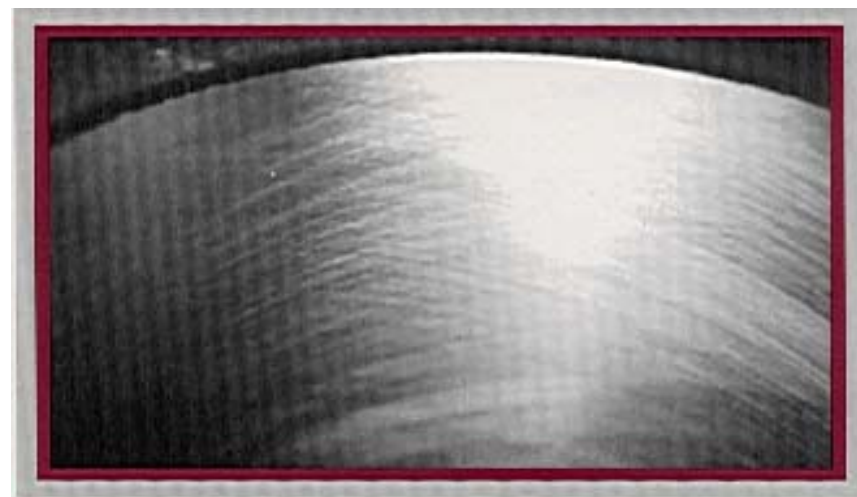
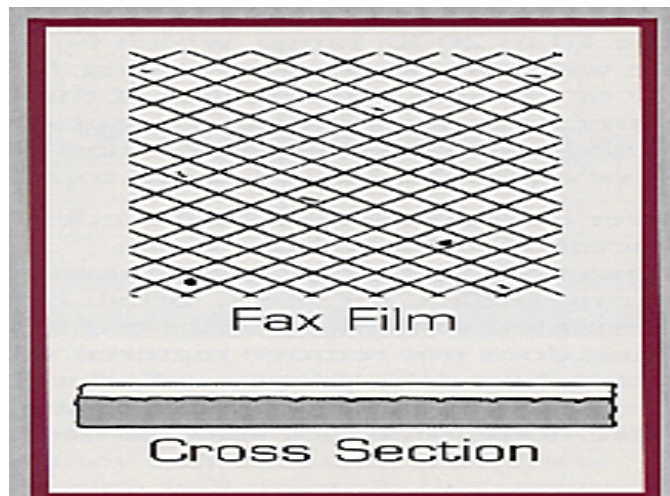
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# Service Bulletin-Cylinder Bores/Liners:



## Bore finish recommendations:

- Cross hatch angle 120°(included)
- Uniform cut in both directions
- Clean cut: free of torn and folded material
- Plateau profile; Ra = 0,6 - 1,2  $\mu\text{m}$
- Free of burnish or glaze
- Free of embedded particles



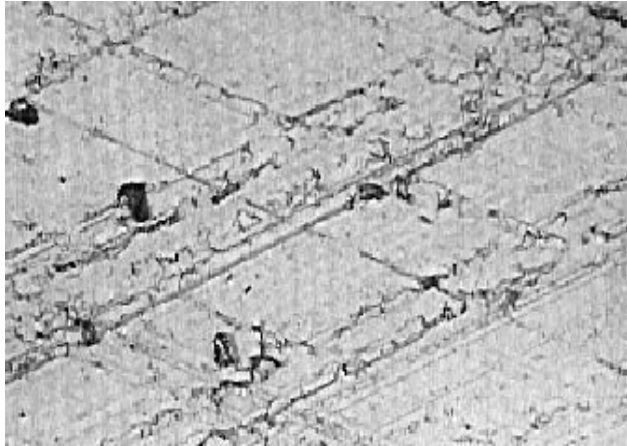


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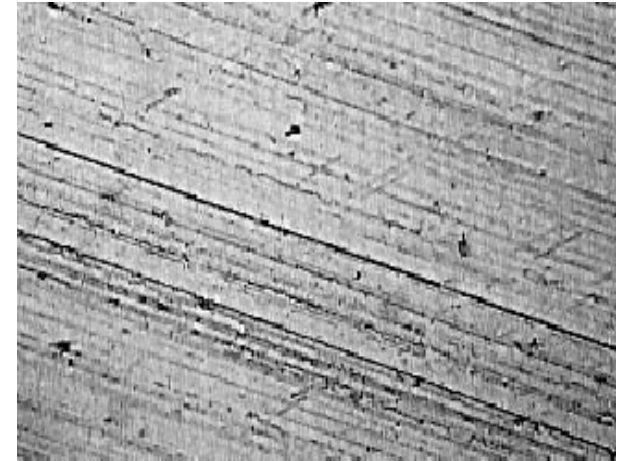
## Cylinder bore finish - problems :



**Folded and torn material**



**Turning marks in cylinder bore**



**One-directional x-hatch**







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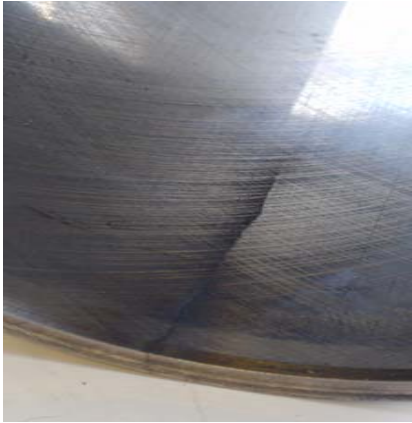


## Longitudinal fractures:

**Appearance:** An almost vertical crack running through (or from) the flange down the body of the liner.

**Cause & effect:** frequently caused by mishandling prior to or during installation. If undetected will propagate during service. Incorrect clamping, damage, distortion or debris on the flange clamping faces can also cause this type of fracture.

**Remedy:** handle cylinder liners with care and check for accidental damage & hairline cracks prior to installation. Ensure that the area where the liner seats in the block and on the head is free from damage or distortion.





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## Cavitation erosion:



**Appearance:** Pitting/erosion of liner material, forming clusters of holes, often in a vertical band on the thrust side. Also found above and below coolant sealing rings. In extreme cases the erosion has been found to penetrate through to the cylinder bore.

**Cause & effect:** Excessive harmonic engine vibrations in conjunction with the coolant flow path result in the formation of bubbles which implode against the liner body, causing material erosion.

**Remedy:** Unfortunately no cost effective material has yet been developed that can withstand cavitation erosion. However, a reduction in the occurrence of cavitation erosion can be gained by reducing the vibrations which cause the problem. I.e. check that the fuel injection system is operating correctly and that engine mountings are in good condition. Check that liner sealing rings are seating correctly and free from any damage and ensure that coolant additives and coolant pressure are correct to manufacturers specifications.



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## Flange cracking:

Liner flange fractures may go unnoticed if the liner body stays in position, however, if the liner body is pulled down the cylinder, the result could be catastrophic.

Cast iron liners, although highly resistant to wear, can fracture if mishandled or dropped.

Cracks which follow the underside of the flange, are caused when fitting the liner into the block or when installing the cylinder head. With care this type of fracture can be avoided.



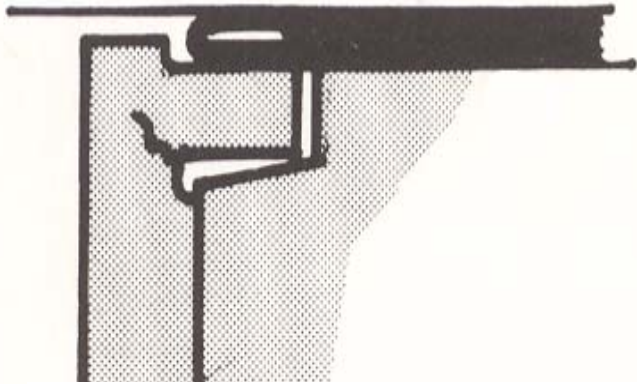


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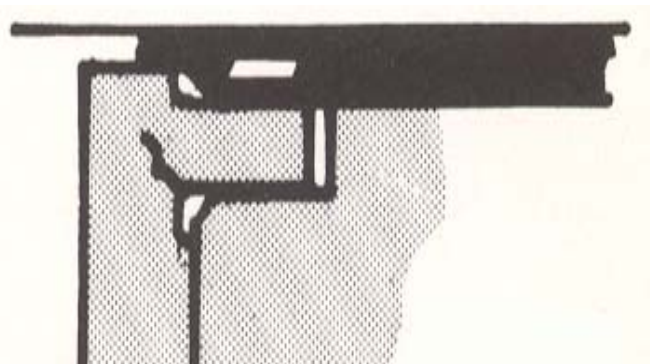
## Flange cracking (continued):



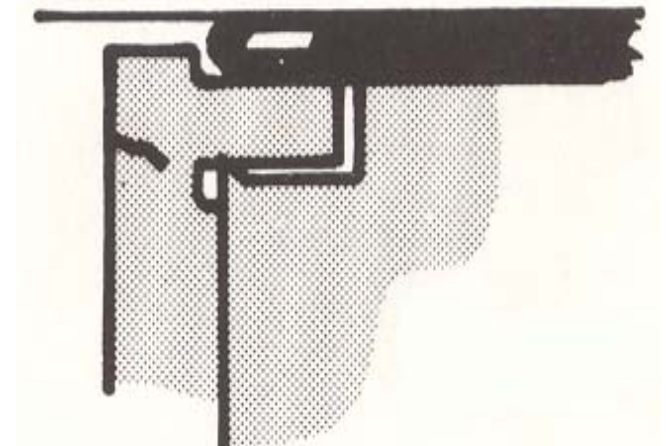
Cylinder block recess out of square.



Dirt trapped between the flange and the recess.



Incorrect location of cylinder head gasket or incorrect gasket for application.



Burr left when machining block counterbore.

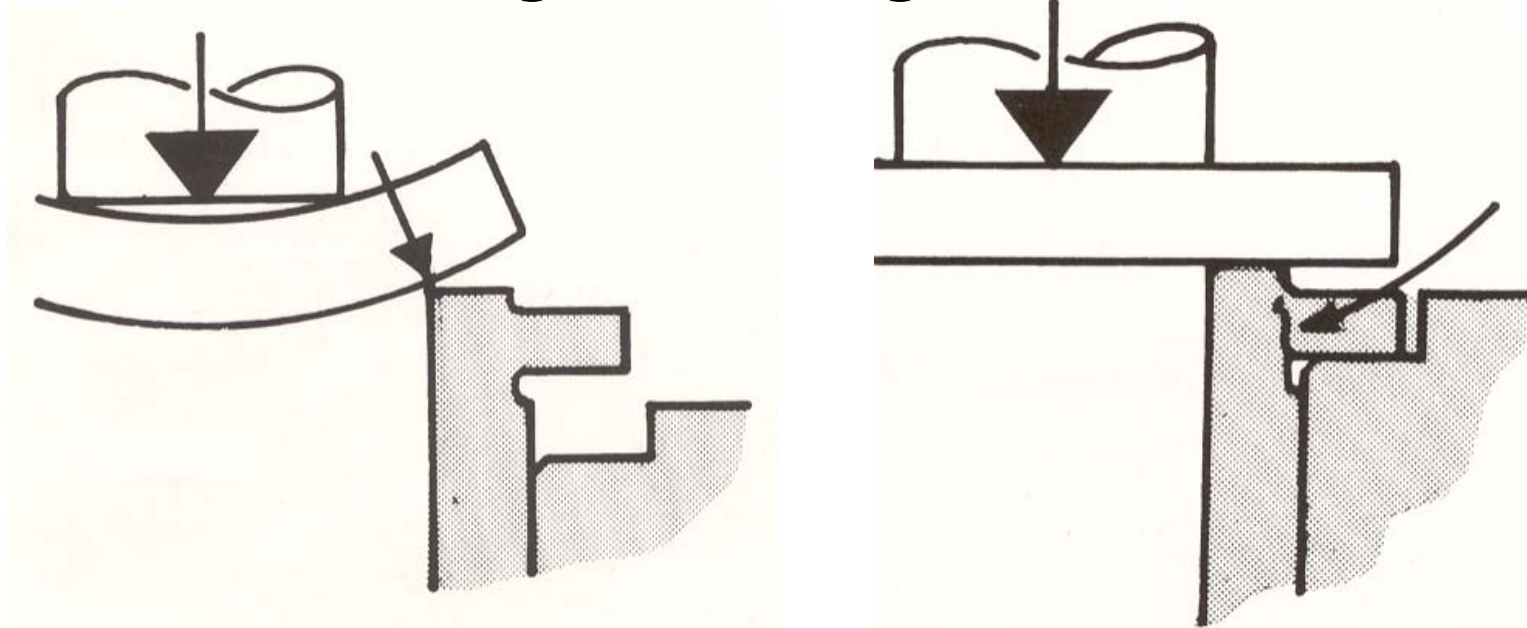


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## Flange cracking (continued):



If a press is used to push the liner into position, a rigid plate must be placed between the press and liner. If the plate bows (as shown in the left hand diagram), a bursting stress will be imposed on the liner. Care must also be taken to ensure that excessive pressure is not used which could shear off part of the liner once it has been pushed fully into the block counterbore (see right hand diagram).