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Thin Wall Cylinder Liners - Semi-Finished Vs. Finished

Thin wall cylinder liners are a common choice of many diesel engine manufacturers as an alternative means of providing a renewable cylinder bore when reconditioning their engines. These liners are made of either steel or alloyed cast iron - the steel liners have chrome plated finished bores and the cast iron liners can have either semi-finished or finished bores. Like crankshaft bearing shells, thin wall cylinder liners tend to conform to the shape of their parent housing - the cylinder block parent bore. Distorted, damaged or unclean parent bores will be reflected on the internal surface of the fitted liners. Piston rings cannot bed or seal effectively on distorted or out-of-round bores, with high oil consumption and loss of compression and power being the most likely outcomes. Distorted or dirty parent bores can also reduce the liner to parent bore contact, which inhibits heat transfer from the liner. The subsequent localised liner overheating and further liner distortion results in accelerated bore and ring wear and possible ring and piston scuffing and seizure.

While there are *many exceptions*, there are general guidelines for the fitment of finished and semi-finished liners. Finished liners can have interference, transitional or clearance fits. Interference fits are usually in the 0.001 - 0.030 mm range, transitional fits in the ± 0.03 range and clearance fits in the 0.001 - 0.030 mm range. The liner bores and outside diameters are sized to accommodate the specified fit in the block and produce the desired finished bore size. Many finished liners are graded to even finer tolerance fits and extra care must be taken to ensure the correct grade liner is fitted. Semi-finished liners have a large interference fit to compensate for the less-than-ideal parent bore condition and this is usually in the 0.03 - 0.08 mm range.

When fitting thin wall liners the following guidelines should be considered:

- Where available, follow the engine manufacturer's recommended procedures.
- The cylinder block parent bores must be thoroughly cleaned of all foreign matter and residue.
- The parent bore diameters must be within specification.
- The parent bores out-of-round and taper must be within specifications.
- Thin wall liners are more easily fitted after chilling them in dry ice or liquid nitrogen and slightly warming the block.
- If the parent bore diameters, out-of- round or taper are out of specification or even marginal, semi-finished liners should be fitted and then bored and honed to size.
- If the parent bores are too distorted to allow the correct interference fit of semi-finished liners, then the block should be replaced or bored to allow for the fit of oversize back liners.
- Fit and tension the main bearing caps before fitting thin wall liners.
- In some cases it is advisable to use a torque plate when boring and honing the block parent bores or the fitted semi-finished liners.

Note: Chrome bore thin wall steel finished liners must *never* be honed. Phosphated (matte black appearance) cast iron finished liners can be honed if necessary. Phosphating (i.e. manganese phosphate) is an etching process applied to liners to promote oil retention and provide limited scuff resistance in early engine operation. The coating is heavy, porous and relatively soft. It also provides rust protection during storage and handling.