Aluminum Crack Repair

**Without** Welding
Topics

• Crack detection/inspection
• Metal stitching
• Threaded hole repair
Crack Detection

- Visual
- Pressure testing
- Dye-penetrant
Visual

- Practiced by many as the only way of finding cracks.
- You wouldn’t inspect cast iron this way.
- Inconclusive.
- You cannot find the ends of the crack.
After Dye-Penetrant Inspection
Pressure Testing

- Only shows cracks that leak.
- Helps determine the extent of the repair needed.
- Must be done following any repair.
Dye-Penetrant

- Cleaner
- Penetrant
- Developer
Cleaner

- Do not use to clean the test area.
- Do not spray directly on the test area.
- Spray only on a dry shop towel or other clean cloth.
Penetrant

- Use small amount.
- Can be applied with a brush.
- Messy, difficult to remove.
- You must wipe as much as possible off before applying the developer.
Applying Penetrant With a Brush
Developer

- Test area must be wiped clean of penetrant by applying cleaner to the cloth before applying developer.
- Apply developer as dry as possible. Use compressed air to speed drying process.
Step by step procedure

1
Step by step procedure

2

Wait 5 minutes
Apply cleaner to clean cloth
Wipe off all visible penetrant
Keep cleaning until all penetrant is gone
Spray on developer very dry
Use compressed air to accelerate drying
Wait 1 minute before inspecting
Metal Stitching
or
Cold Repair
Objective

1. Stop leaks
2. Prevent crack propagation
3. Structural integrity
4. Prevent seats from coming out
5. Remove the crack for cosmetic reasons
6. $$$
Two Types of Stitching Pins
Standard Threaded Pins

- Straight thread L Series pins
- Seal by interference fit of the threads
- Exert spreading pressure
- For sealing, seat retention and crack removal
CASTMASTER Threaded Pins

- Spiralhook threads
- Radial drawing force creates structural integrity
- Not used for seat retention
- Seal leaks
- Prevent crack propagation
Working With Aluminum

- Requires cutting fluid for drilling and tapping.
- Galls easily.
- Cuts easier than cast iron.
- Very easy to oversize and egg-shape drilled holes.
- Aluminum stitching pins are required in combustion chambers of cylinder heads.
- Steel pins can be used for structural repairs.
Cylinder Heads

- Many cracks can be repaired without removing the seat inserts by using L Series pins.
- Do not drill into water if the crack does not leak.
- When the crack does leak you must install pins under and behind the seat to stop the leak.
Cylinder Heads

• Only when the crack goes between two seats can you use a steel pin.
• Cracks on the top side and between cylinders on the deck surface require CASTMASTER pins for structural integrity.
Ford Escort cylinder head
Crack over exhaust port
Install C1 CASTMASTER stitching pin
Install L Series pin intersecting the seat insert
Install L Series pin into the floor of the water hole
Finished repair
Stitching Pin Selection

- Most aluminum cyl heads have fairly thin walls so you should use L4 pins that have very fine threads.
- The fine threads also work well when tapping into the hard seat insert.
- L4 pins will fit in between the seats in most cases.
- Larger diameter pins are used when the casting is thicker.
Structural Repair Using
CASTMASTER Stitching Pins
Inspection
Drill the first hole
Spotface the hole
Apply tapping fluid
Tap the hole
Apply thread sealant
Install a C1A aluminum CASTMASTER stitching pin
The head of the pin twists off when tight
Grind off excess shoulder close to flush
Drill so that pins slightly overlap
Continue installing pins until the crack is removed.
Grind pins flush and peen lightly with a needle scaler
Completed Repair
Pressure test to 40 PSI
Advantages Over Welding

- Faster
- Very cost effective
- No distortion
- Will not anneal the surrounding aluminum
Advantages of Welding Over Stitching

• Welding can repair erosion and electrolysis damage.
• Welding can add reinforcement by adding material to weak areas such as around head bolt holes.
• Welding can replace missing pieces.
• Welding can build up bearing bores.
Other Aluminum Castings That Can Be Repaired by Stitching

- Aluminum oil pans for Cummins, Cat and other diesel engines
- Water cooled marine manifolds
- Bell housings and transmission cases
- Engine blocks and intake manifold
LOCK-N-STITCH Inc.
1015 S. Soderquist Rd
Turlock, CA 95380
800-736-8261
209-632-2345
www.locknstitch.com
Email for technical support
gary@locknstitch.com