*LOCK-N-STITCH* Inc. 800-736-8261
Casting Repair Specialists 209 632-2345
1015 S. Soderquist Rd. Fax 209-632-1740
Turlock CA 95380 *www.locknstitch.com*

# ***Inspection / Repair Report***

Date: 04-08-2013

Part: Worthington Compressor 27 ½" bore

Serial number: A11675-22A2 Inspected by: Alaa Al'Robaie

1. Base metal
   - x cast iron
   - □ ductile iron
   - □ cast steel
   - □ cast aluminum
   - □ other _____

2. Machinability
   - □ no previous repairs
   - □ arc-welded
   - □ brazed
   - □ heat-related cracks
   - x other: Bores and stud holes were filled in with epoxy. 16 separate stud holes were filled in with lead.

3. Casting shape where cracked
   - x flat
   - x inside/outside corner
   - x radius
   - □ other _____

4. Cause of damage
   - □ impact
   - □ heat
   - □ freezing
   - □ normal operation
   - x other: Previous repairs

5. Length of crack(s) / low spots
   65"
   _____
   _____

6. Material thickness
   3/8", ½", ¾"
   _____
   _____

7. Operating pressure
   Rated pressure 236.7psi
   Max. work pressure 300psi

8. Operating temperature
   Max 350 degrees
   _____
   _____

9. Working environment
   □ hot
   □ cold
   □ safety concerns
   describe:

   □ other N/A

10. Remachining requirements
   x bolt holes
   □ bearing bores
   □ machined surfaces
   x other: Valve cover bores

11. Customer's needs
   x permanent repair
   □ temporary repair
   □ turnaround time
   describe: _____
   _____
   _____
   □ other _____

12. Accessibility
   □ room for the tools?
   □ room for the operator/s?
   □ need for disassembly?
   describe: N/A
   _____
   _____
   □ other _____

13. Inspection method(s)
   NDT

14. Damage found:

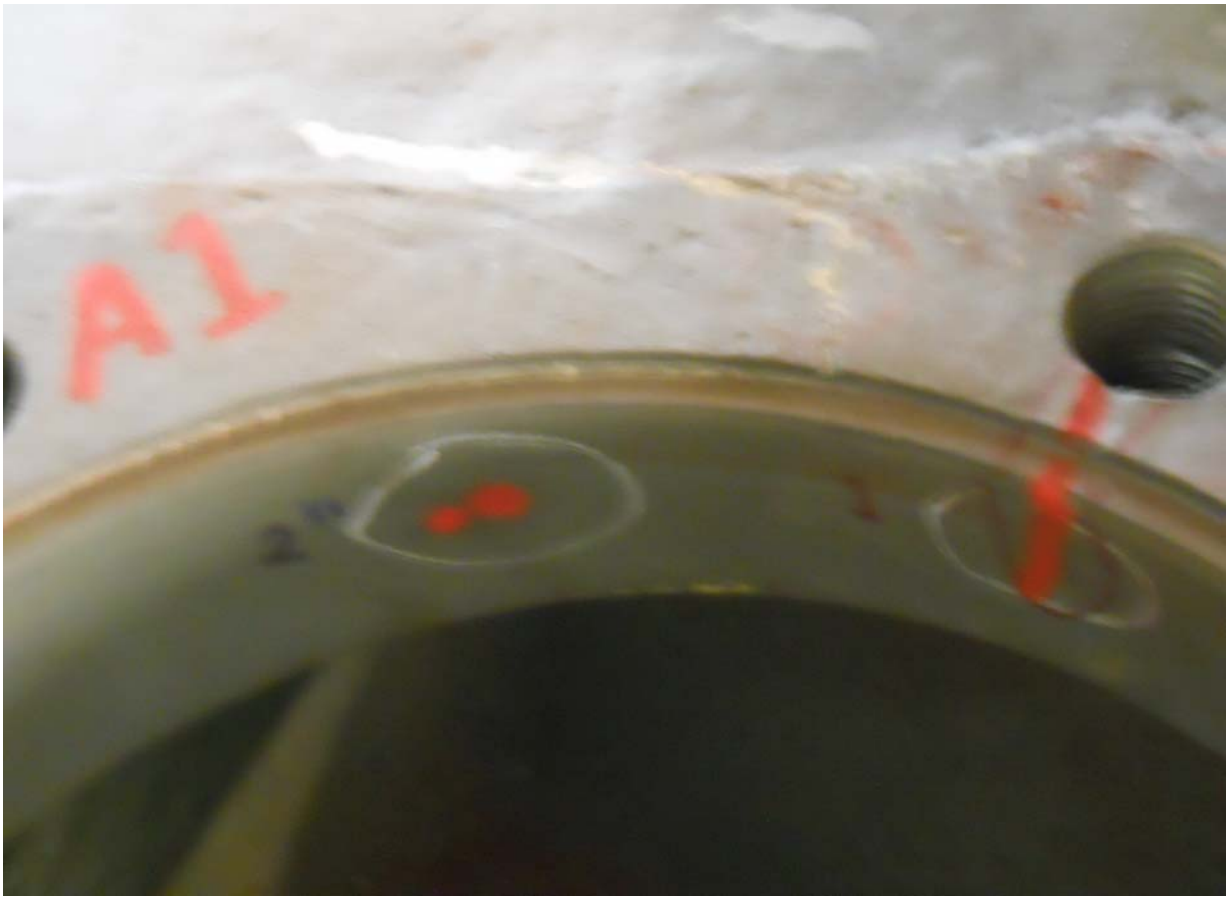
#1 Found numerous low spots on the valve cover bores
#2 Cracks in valve cap stud holes
#3 Through holes in existing valve cap stud holes

- The first 18 pictures show the extent of the damaged valve cover bores. Some of the bores as you will see were quite deep and long. Some of the valve cover stud holes were cracked and had protruded thru the back of the valve cover stud holes.

- The next 8 pictures show the repair process of the valve cover bores and the valve cover stud holes.

- The next 6 pictures show the final repairs of the bores and stud holes. Pressure gage @ 400psi

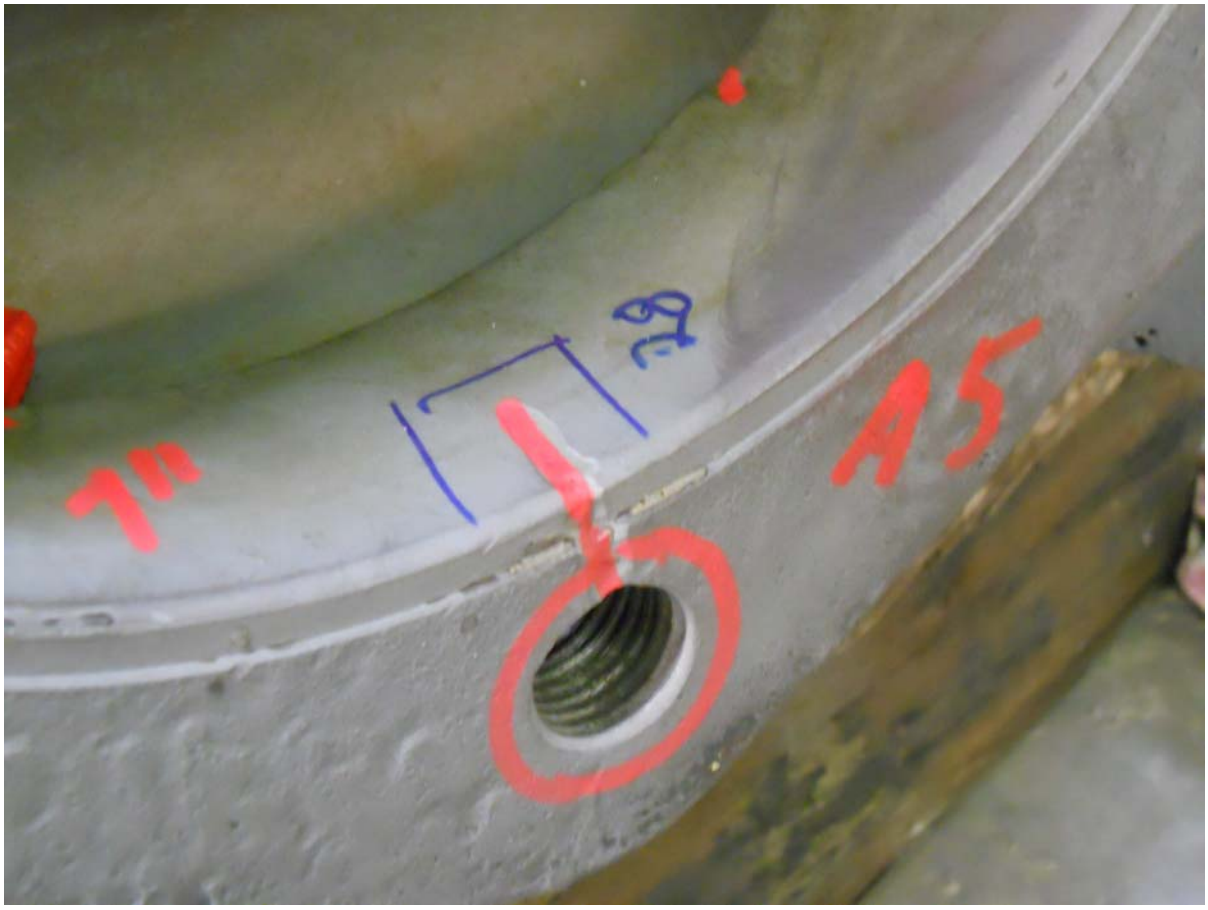
# Worthington Compressor Name Plate


A1

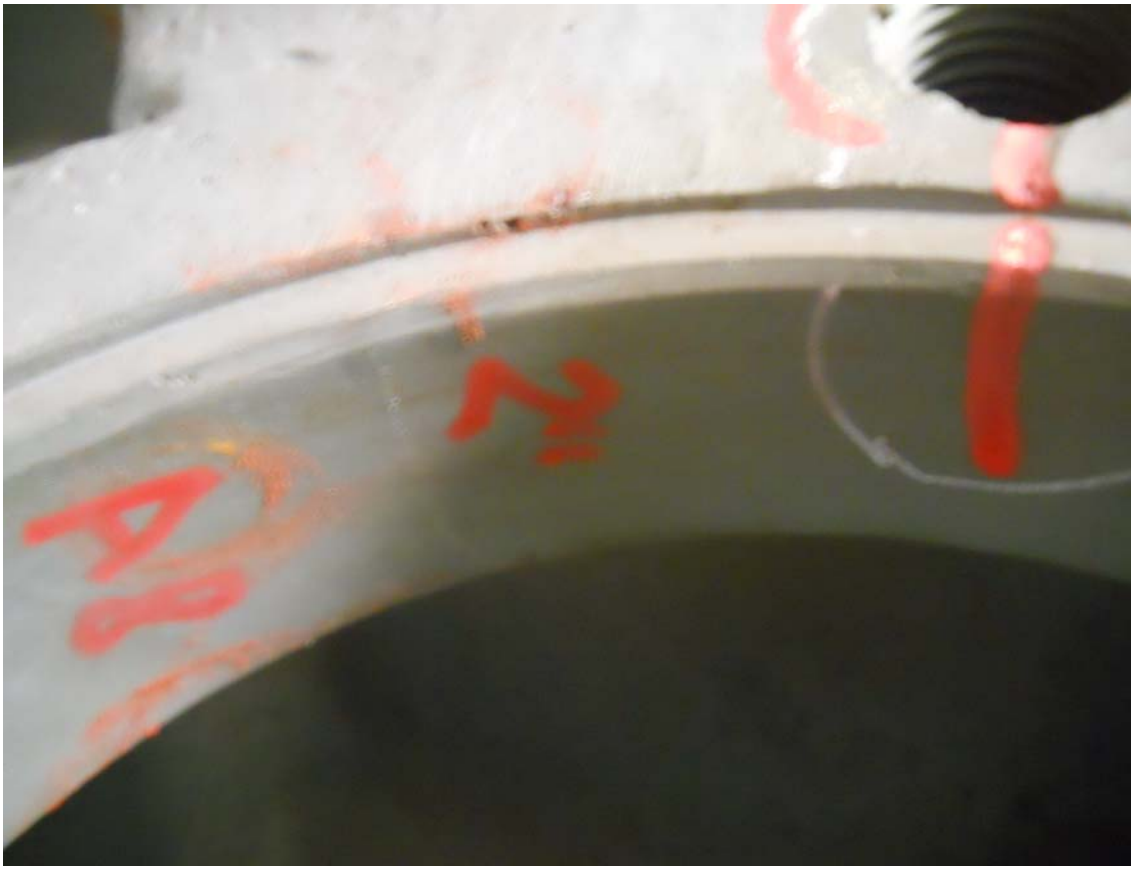

A2


A3


A4


7"
A5


3 1/2"
A6

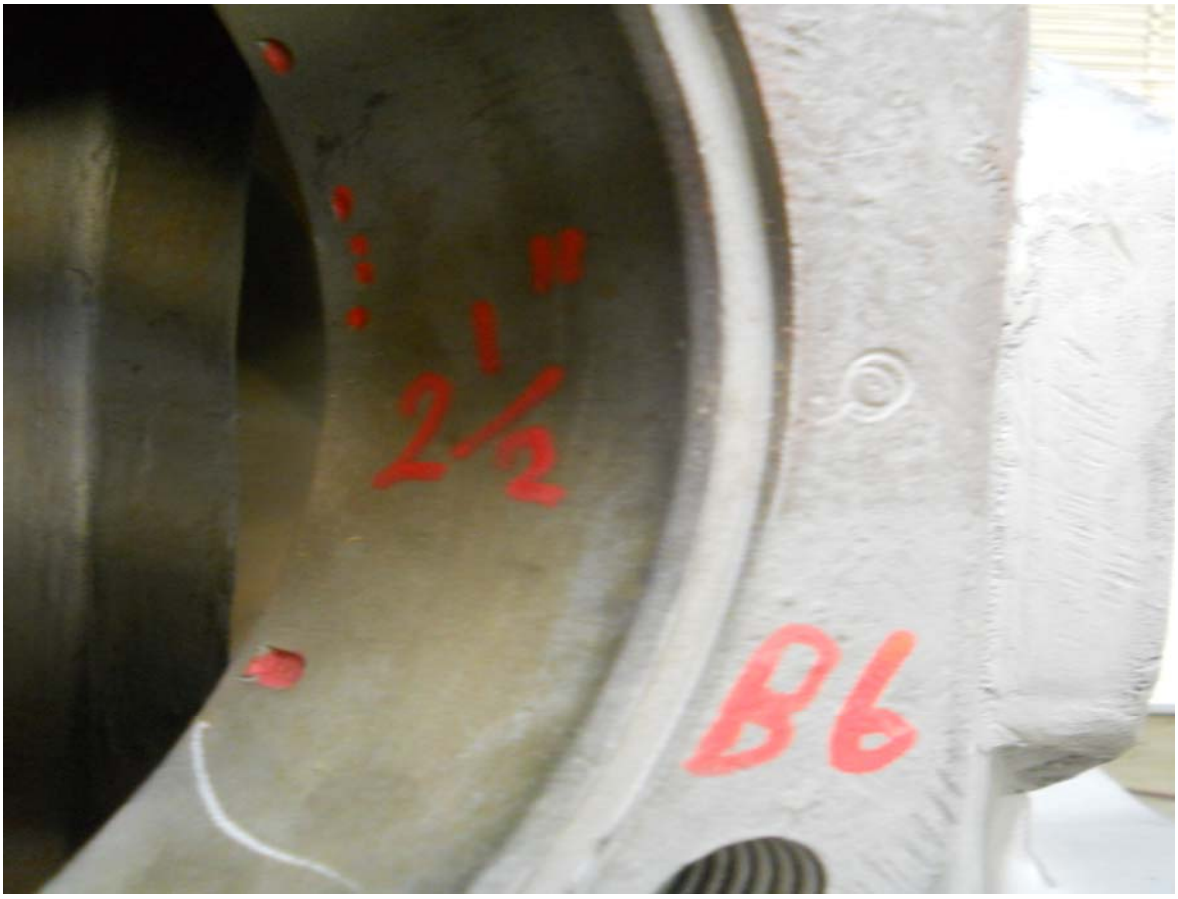


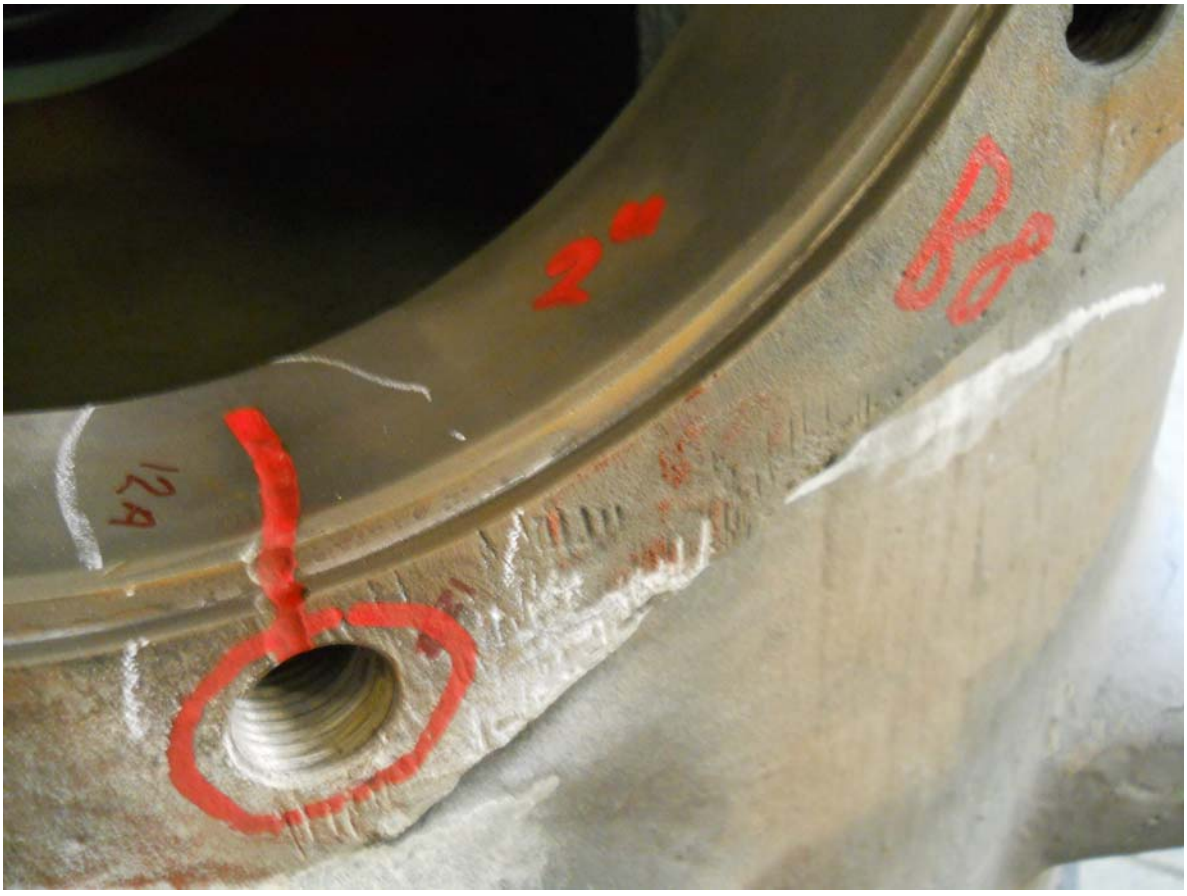

10
11
B1

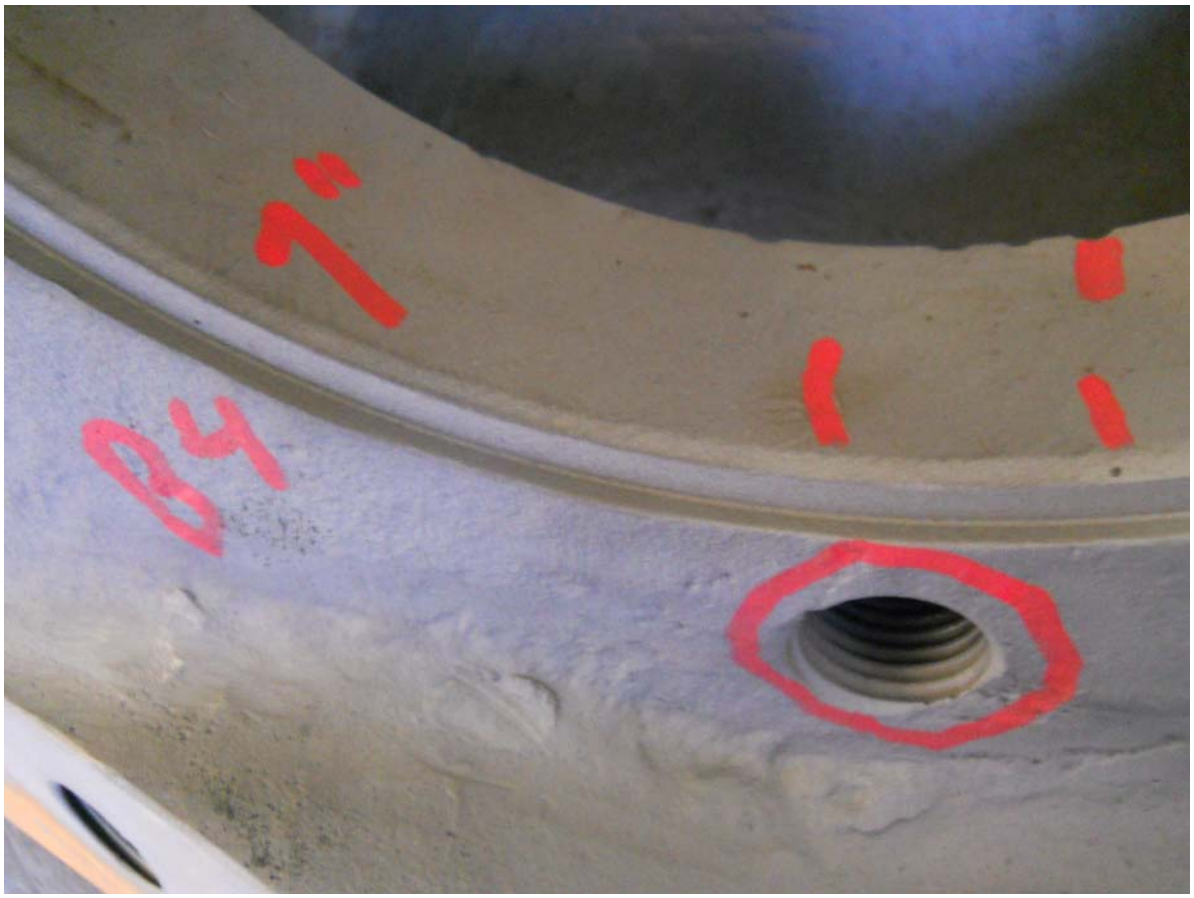

B2
1 1/4"


2 3/4
BS
L

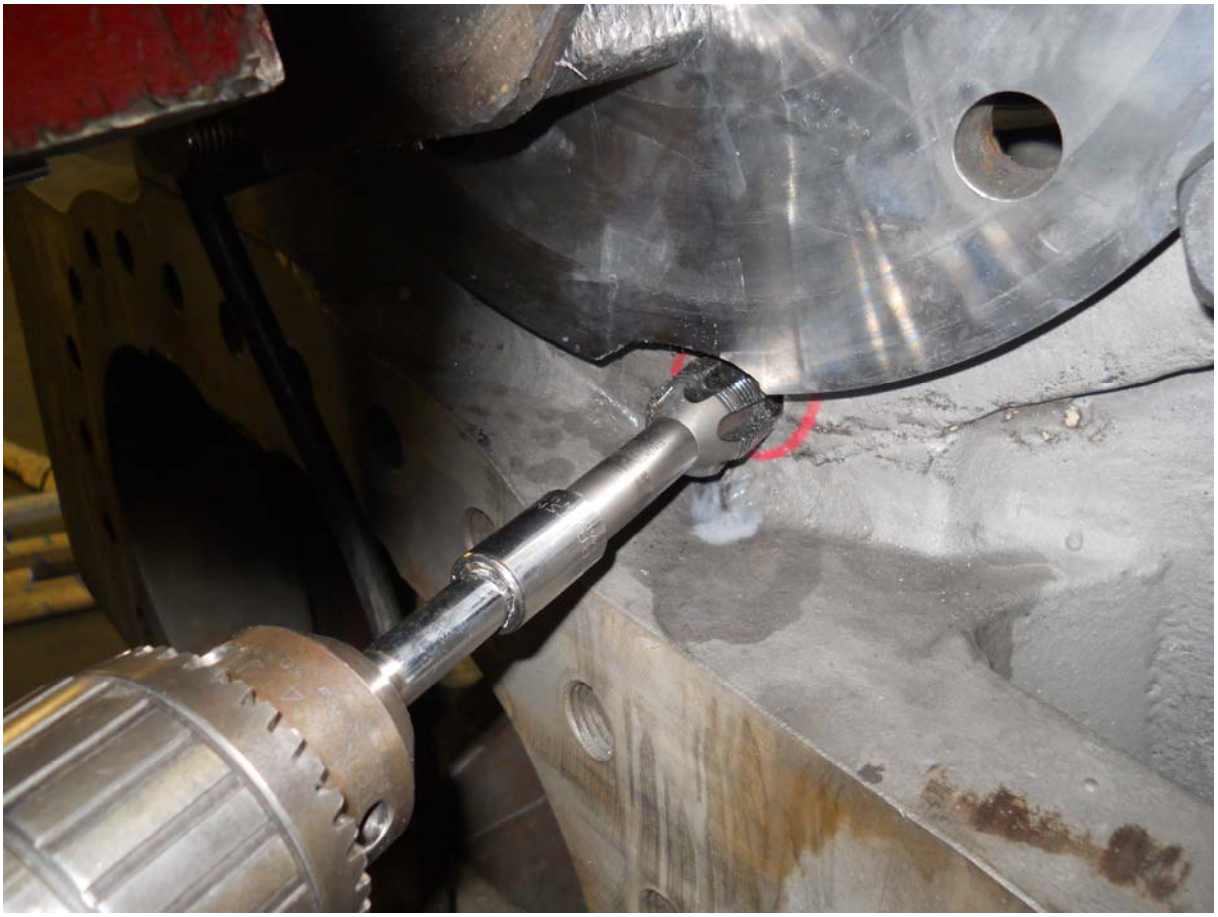

BS
6"


1"
2½
B6


2"
B6
12A



# Repair in Progress

# Completion of Stitching and Insert Repair



22


100
200
psi
300
400

Conclusion:

Here are the results of the repair work and pressure testing of the compressor cylinder

After completing the stitching and thread repair insert installation processes following our initial NDT inspection, we started the pressure testing process of the cylinder using compressed nitrogen gas. We found (4) four valve bores leaking @200psi. Testing was stopped at this point to determine the cause of the leaks. Roundness of the four outer valve bores were checked and found to be .008" out of round. We then honed the (4) four Bores and changed O-rings from 50 durometer to 70 durometer on all bores. We found 16 of the valve cap stud holes had short steel plugs installed at the bottom of the stud holes with lead used to seal them. These 16 stud holes had only 1" of thread depth when it should have had 2" of depth. We removed the lead by melting it out and chasing the holes with a tap.

We then reassembled the valve caps and pressure tested the cylinder again, and found 3 of the 4 stud hole that we cleaned out were leaking. We manufactured and installed additional blind thread repair inserts into the leaking stud holes and tested them again. The next pressure test showed three O-rings leaking slightly so we bled of the pressure again and inspected the O-rings and found minor miss alignment where the ends were glued together. The caps were reassembled and the testing proceeded again. At 400 psi some of the inserts developed very tiny leaks around their outside threads.

Our conclusion was that because of the way these stud holes had been sealed off in the bottom half, they must have had some small porosity that was causing these leaks. We decided to metal stitch around the inserts to seal them off permanently. It required a total of 14" of metal stitching around the thread repair inserts to get them to pass the 400 psi nitrogen pressure test. The final test at 400 psi was monitored for one hour with no leaks. The coolant jacked was sealed off and monitored for pressure build up during the one hour test with no pressure increase.