

Walter M Higgins Generating Station

ACC GEARBOX SEAL CHANGE

NEW APPROACH TO REPAIRING LEAKING
INPUT SEALS ON FLENDER GEARBOXES

INPUT SEAL DEVELOPS LEAK



SAFETY FIRST!!!!

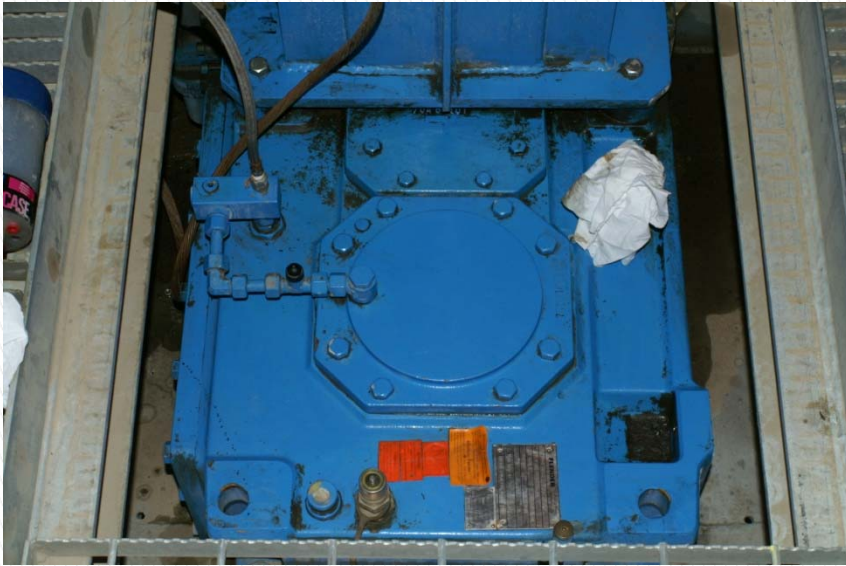
- ▶ Always lock-out/tag-out (LOTO) motor and associated system before working on unit.
- ▶ Attempt start of unit to verify LOTO is correct.
- ▶ Secure blades from rotating by tying off to structure with rope. (Updraft/downdraft can cause blades to rotate)



INPUT SEAL LEAKING OIL >>

AT THE START OF THE JOB WE WIPE DOWN THE PARTS OF THE GEARBOX WE CAN GET TO FIRST, IN ORDER TO REDUCE THE POSSIBILITY OF CONTAMINATION. THE SEAL IS ON THE TOP OF THE GEARBOX BUT BELOW THE WALKWAY GRATING. NOTE: lack of room at coupling.

Pre-clean gearbox before removing parts.



Wiped down before motor removal.



Base wiped down prior to motor removal.

Access to parts of gearbox can be difficult.



Lower motor mount bolts and accelerometer.

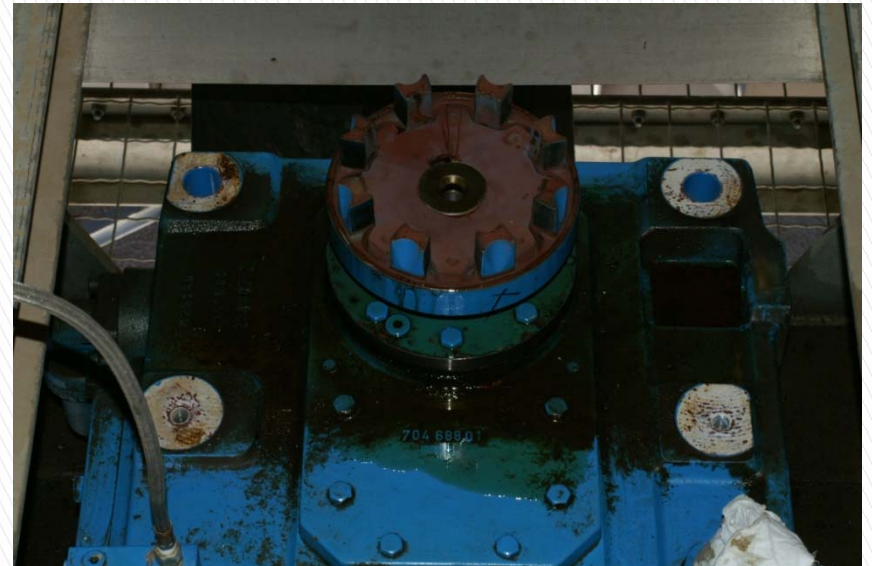


Oil pump and regulator (Hex cap covering adjustment nut).

Motor removed

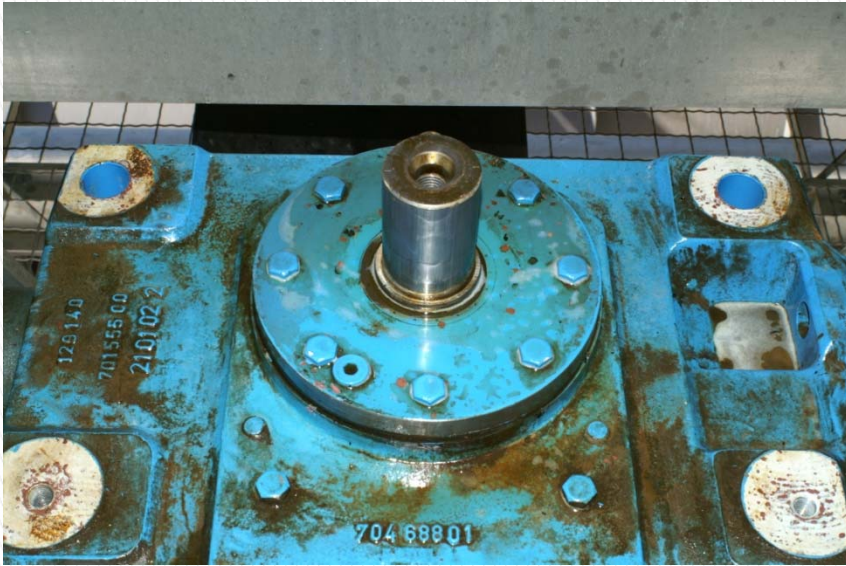


Motor sitting on crib block, hoist still attached and slightly lifting.



Oil and dirt that needs to be cleaned up before proceeding. Not accessible prior to motor removal.

Wiped versus cleaned

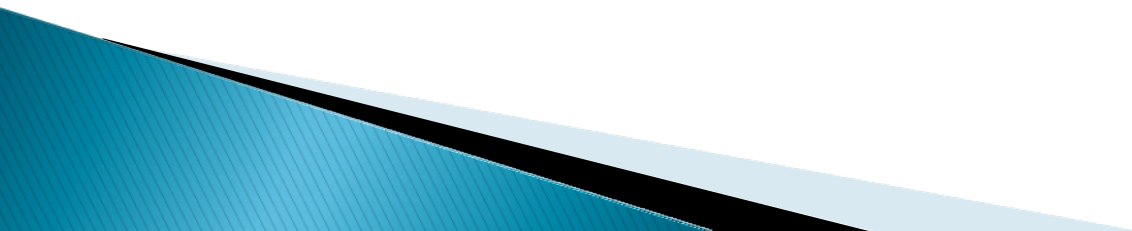


Just oil wiped off with loose dirt.

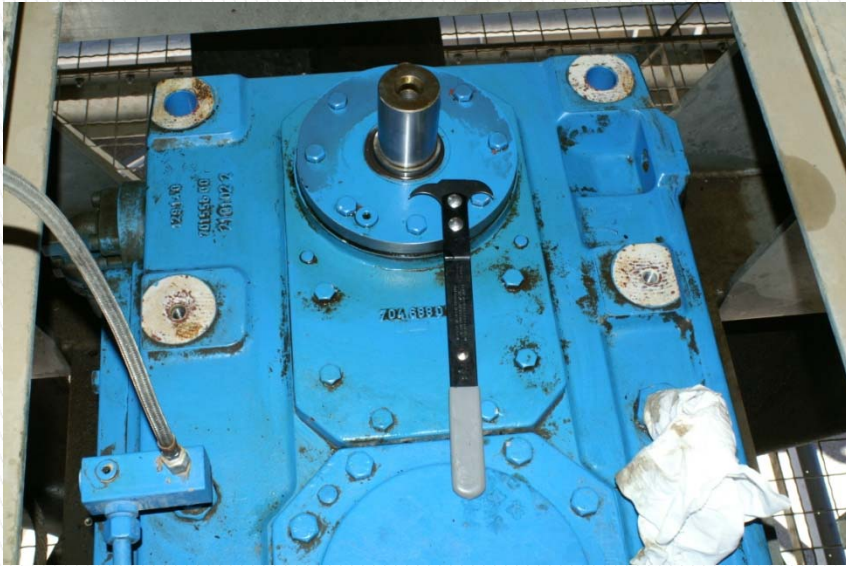


Gearbox cleaned with LPS cleaner/degreaser and Scotch-Brite pads

Cleaning prior to gearbox repairs, why we do it.

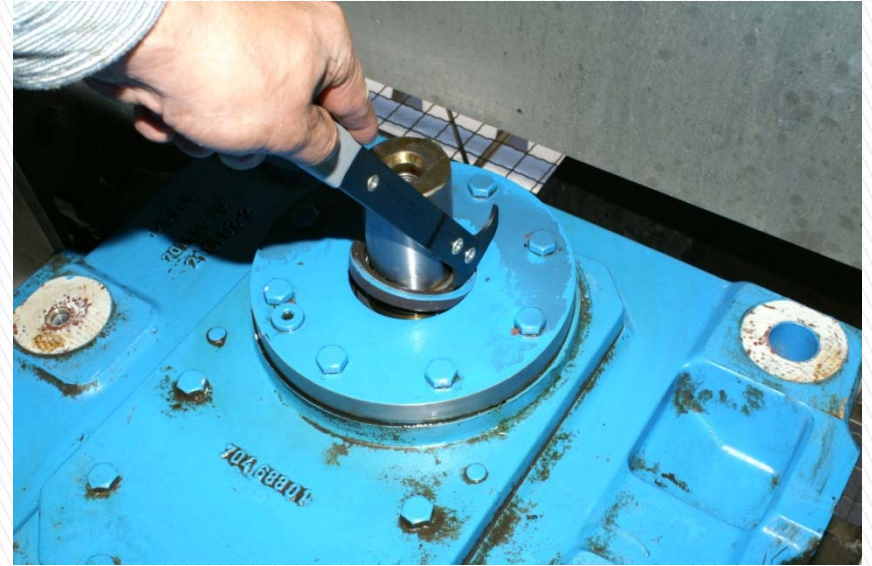
- ▶ Loose dirt and contaminated oil could enter seal area while working on unit.
 - ▶ Safety hazard of slippery oil on top of gearbox could cause an accident.
 - ▶ Allows for close inspection of unit while cleaning in case there could be other issues.
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Seal removal



Seal removal tool, over-the-counter tool item.

McMaster Carr Part # 6887A11



Simple process to remove old seal.

Why we don't remove the seal plate during seal change.


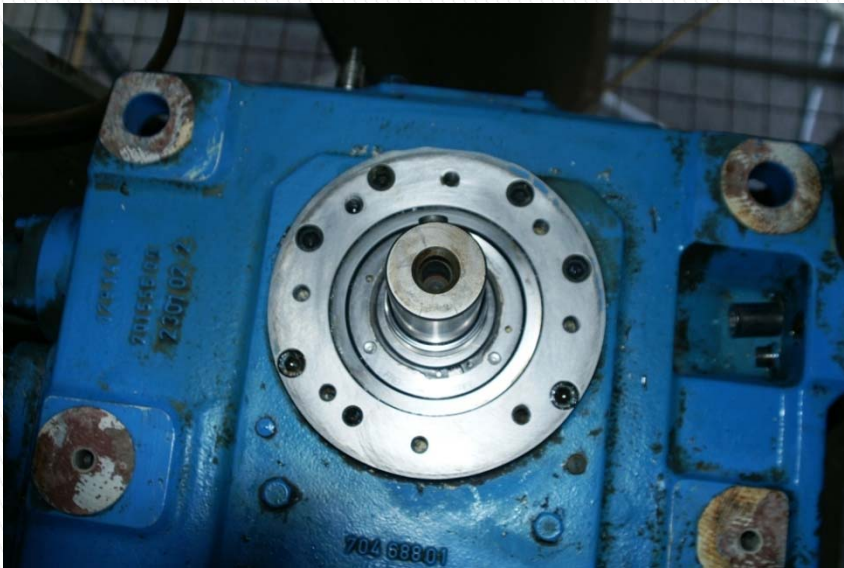
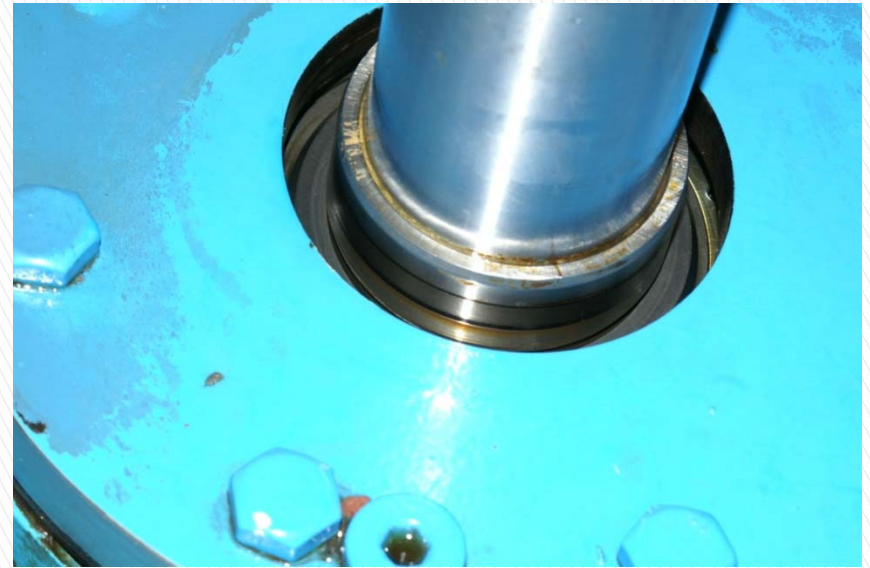
- ▶ When seal plate is removed, a large area of internal components are exposed.
 - ▶ Possibility of dropping bolts while removing from plate.
 - ▶ On some gear boxes the plate needs to be tapped in order to utilize a pair of bolts to push off the plate from it's fit. Tapping adds metal flakes to the immediate area of seal plate.
 - ▶ No specific need to remove plate to change out seal or install speedi-sleeve.
 - ▶ Less time involved on repairs.
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Plate removed versus not removing plate.



Large area exposed to air. Eight bolts removed. Oil pathway opened. Plate tapped for push bolts.

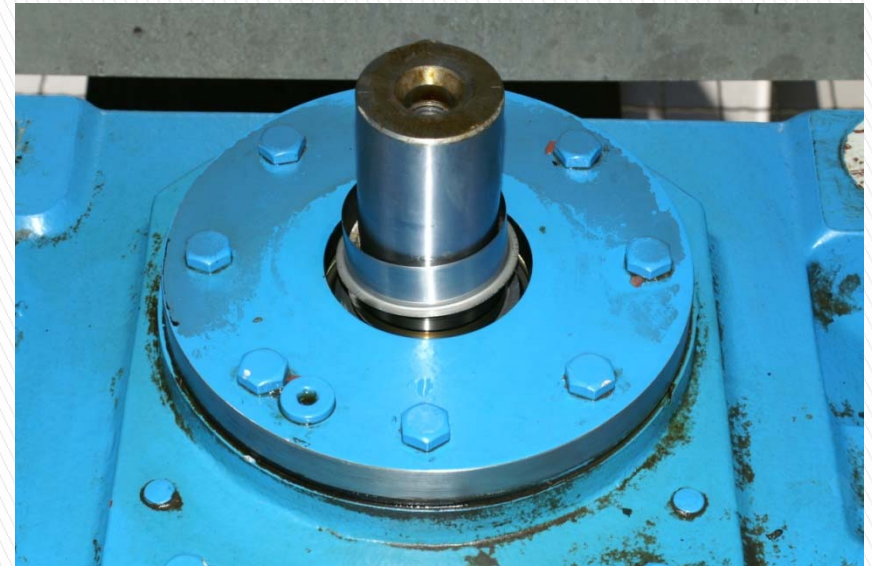


Very small area exposed. No bolts removed, no oil pathways exposed.

Speedi-Sleeve (SKF product)



SKF Speedi-sleeve
Part # 99276 – 2.753” – 2.759”



Speedi-sleeve ready to
install.

Installation of Speedi-sleeve

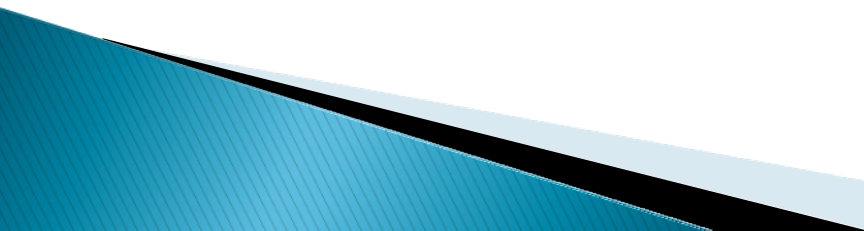


Tool on left is for Speedi-sleeve installations. Tool on right is for seals.



Note stepped bore. Clearances of shaft and OEM sleeve require internal tool I.D. changes when making.

Speedi-sleeve and Seal tools

- ▶ The Speedi-sleeve and seal tools were designed and fabricated in house at Higgins Station.
 - ▶ The Speedi-sleeve comes with an installation tool but that tool will not work on the Flender Gearboxes due to the length of input shaft on the unit.
 - ▶ The tools were made to facilitate proper and safe sleeve and seal installations.
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Speedi-sleeve tool in use.

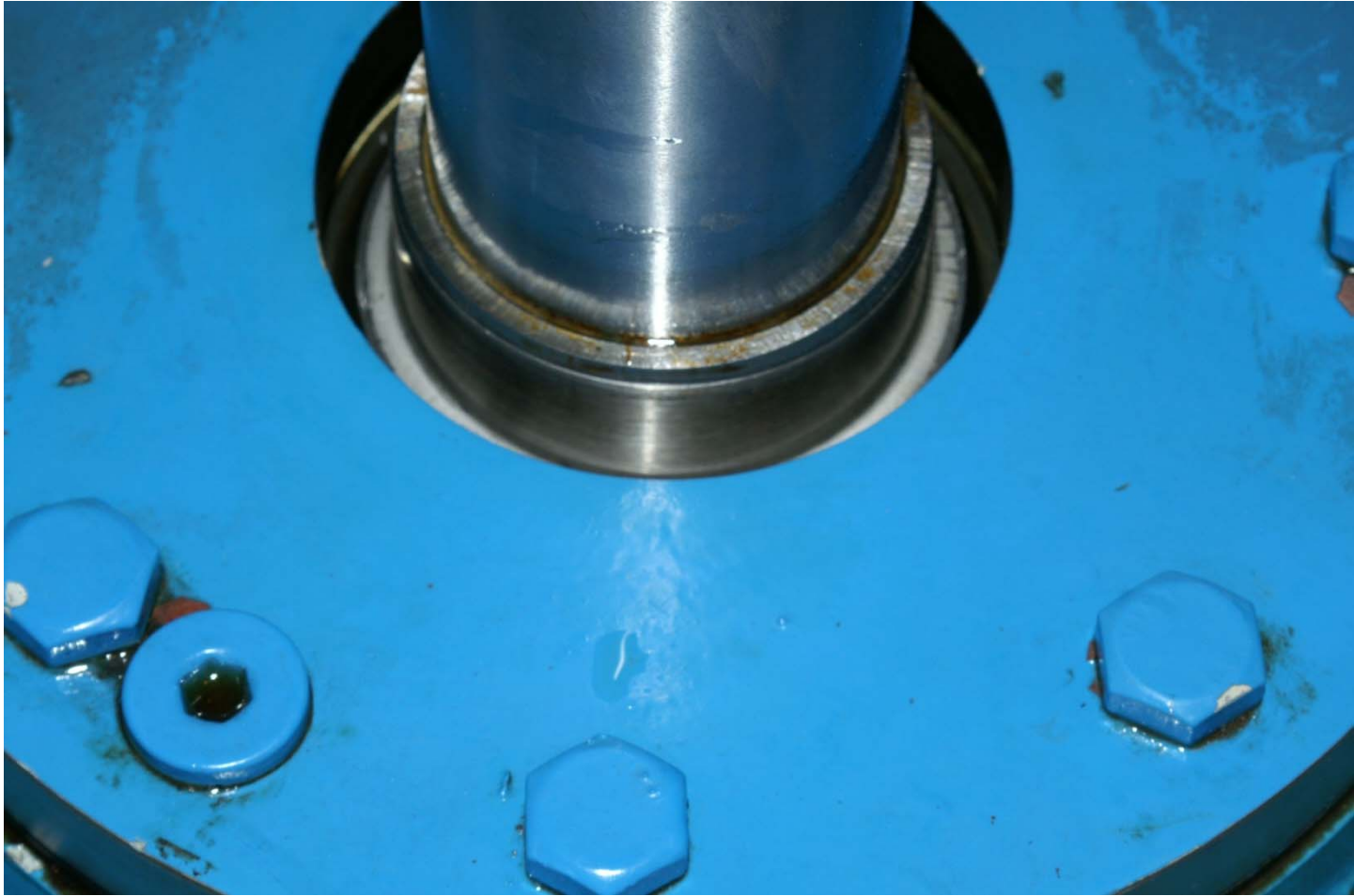


Tool, shop made at Higgins has open top.



Hammer is used to lightly tap speedi-sleeve into position.

Speedi-sleeve installed in position.



Installation of new seal using Higgins built seal installation tool.

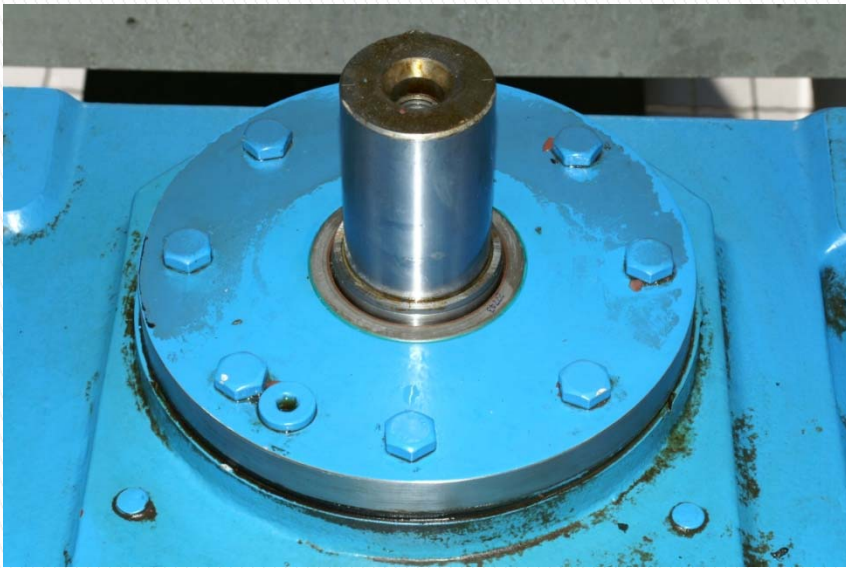


Setting up tool.

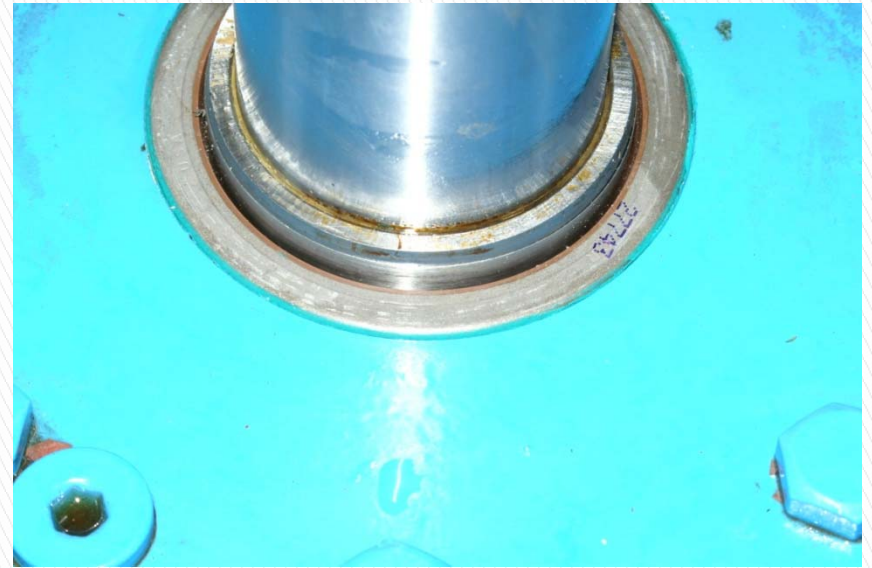


Lightly tapping seal into position.

Speedi-sleeve and seal installed.

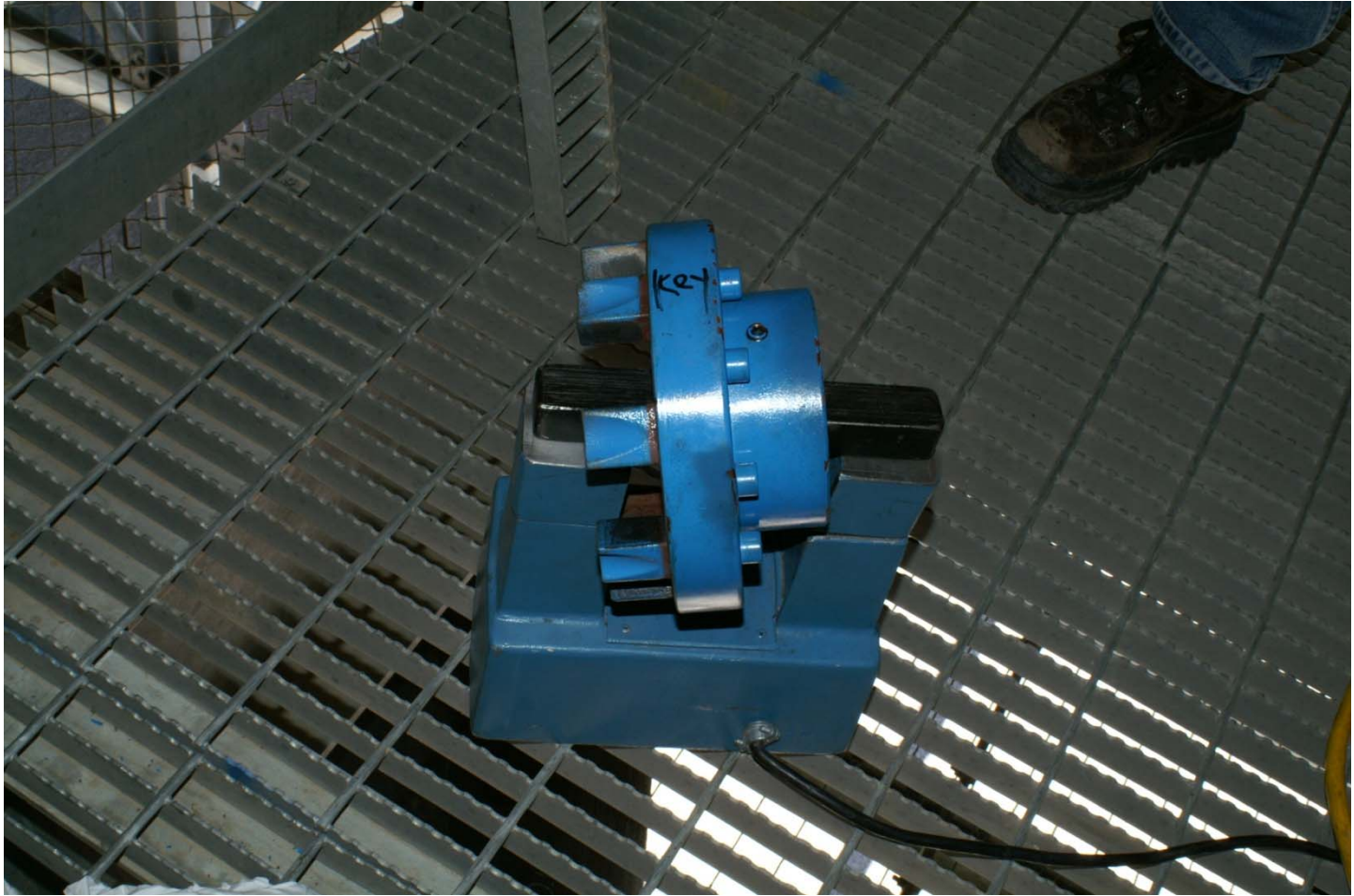


Whole view.



Close up view.

Coupling warmed up for re- installation on gearbox.



Change out coupling inserts during job.

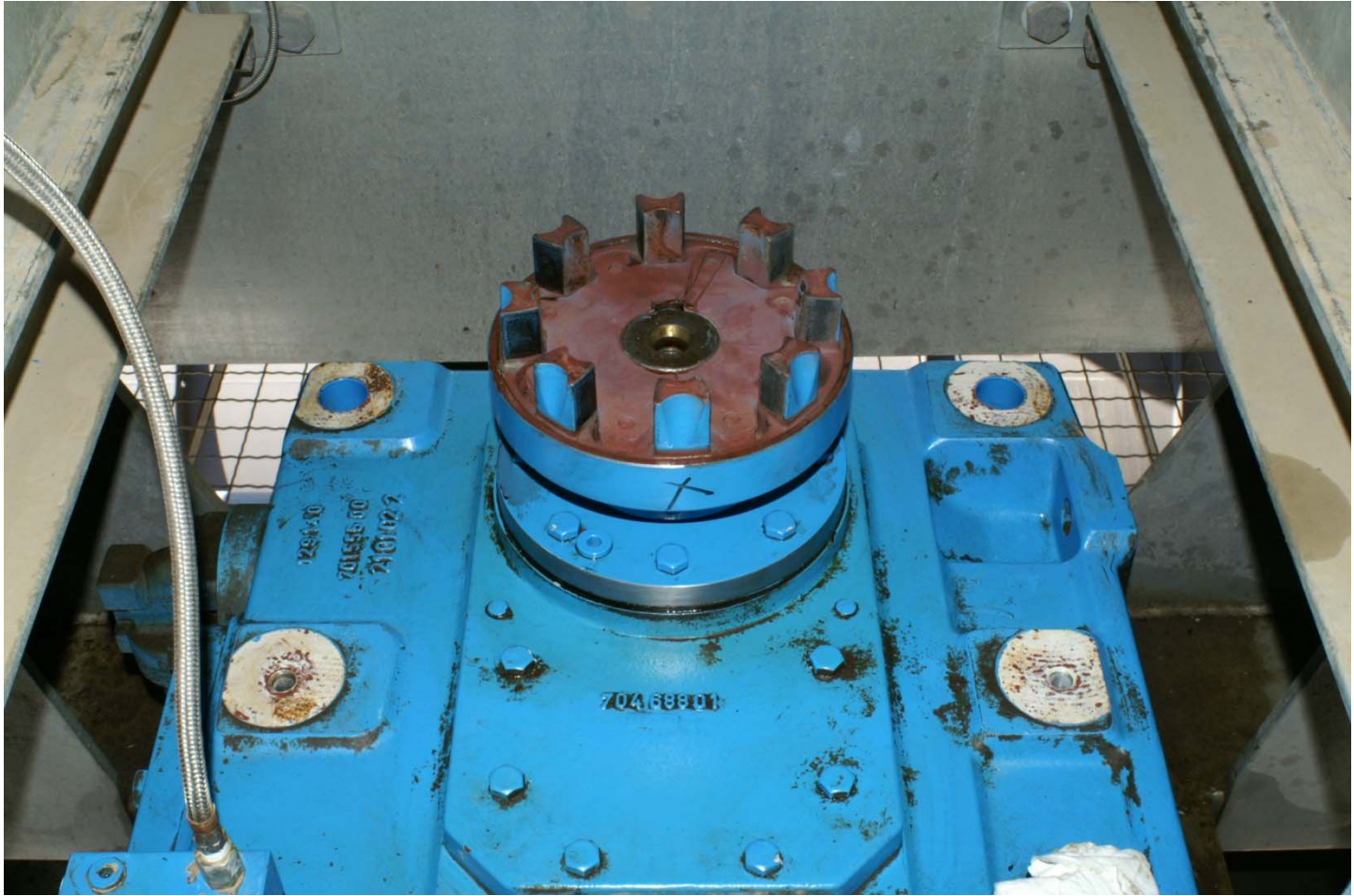


Old worn insert beginning to fail.

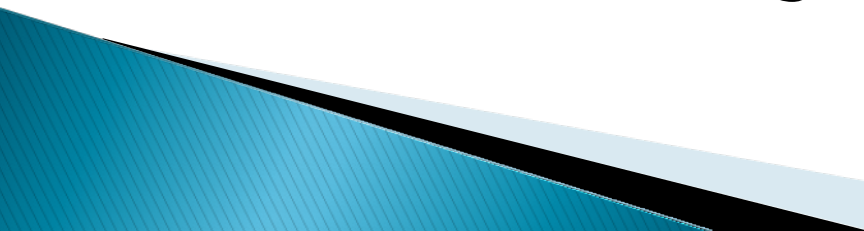


Second view of same insert. Note cracking and indentation.

Coupling installed ready for motor installation.



New method improvements

- ▶ Cut time to repair input seal leaking by a minimum of six hours. (We've done the whole job in less than two hours, when doing more than one reducer).
 - ▶ Exposed less area to outside world.
 - ▶ Allows for close inspection of gearbox while working on unit.
 - ▶ Enhances safe work, reducing accident possibilities.
 - ▶ Keeps time in a hot area to a minimum, further enhancing safety of workers.
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Thank you

NV ENERGY

Walter M Higgins III Generating Station

Primm Nevada