

Overhaul and Repair Procedures and Practices For Speed Reducers and Assemblies

General Mechanical Repair Specifications

1. All speed reducers will be:

- Sandblasted and primed (for purposes of inspecting housing for cracks).
- Dismantled completely.
- Cleaned free of all rust and grease.
- Inspected and / or tested as follows:
 - Measure all "fits" and compare with original drawing dimensions. Provide sketches for assembly.
 - Cases, housings, etc. - will be visually inspected for cracks and other signs of wear.
 - Shaft Gearing - visually inspect and dimensionally checked, for possible reuse.

2. A report of work required to recondition the assembly / speed reducer will be prepared and include:

- Listing of new parts required.
- Summary of required reconditioning to return reusable parts to print specification.
- Summary of price for labor and all materials to complete the job.

3. Customer is to approve repair prior to any work proceeding.

- Penn Machine Company will give a one-year warranty when we have replaced all parts, bearings, and seals as recommended in our quote.
- If the job is not awarded to Penn Machine Company, compensation for disassembly labor, cleaning, inspection, and freight will be made to Penn Machine Company.

Repair Specifications

1. Fits

- All fits will be returned to original size and relative centers using either; plating, sleeving and / or welding as approved by the customer.

2. Shafting

- Repair may be made by plating and grinding or sleeving and machining.
- Will be straight and finished in accordance with tolerances and finish specifications as indicated on appropriate drawings.
- New shafting provided will match the specifications and dimensions of the original part as per customer print.
- Exposed threads and shaft ends will be protected with at least one layer of cardboard or similar material, held firmly in place with tape.

3. Gearing

- Will be dimensionally inspected to customer prints.
- New gearing provided will match the specifications and dimensions of the original parts as per customer print.

3. Cases, Housing, etc.

- Fits - See 4-a. above.
- All bolts, studs, pipe plugs, and other fittings will be removed and the holes re-tapped as necessary.
- Bolts, studs, and pipe fittings may be reused if in good condition.
- Replacement bolts, studs, and pipe fittings will be of equivalent grade and material unless otherwise specified.

4. All print modifications must be approved by customer prior to implementation.

Assembly and Test Procedures

1. All seals, gaskets and hardware will be replaced.

2. All bearings will be replaced.

3. All speed reducer overhauls and repairs will be run tested to check freedom of movement clearances, contact patterns, and backlash.

4. Where pressure lubricated units are involved, the assembly will be pressure tested where applicable.

6. Painting and Identification

- All speed reducers will have:
 - Exterior surfaces cleaned of all loose scale and rust.
 - Exterior surfaces will have one coat of Red Oxide Primer applied, unless otherwise specified by the customer.
 - A new identification tag will be installed to each overhauled speed reducer with the following information:
 - Date overhauled
 - Serial number
 - Ratio

7. Shipment

- All openings are to be properly protected with plugs or cover.
- The unit shall be marked to indicate that lubricant must be added prior to operation.

Run Test Procedure

1. Firmly mount gearbox to be tested to run test stand.

2. Fill the unit with Penn Machine Company run test lubricant.

3. Attach the oil pumping station to the unit if required.

4. Hook up all run test equipment including vibration analysis monitor.

5. Check plant noise level with decibel meter.

6. Start test motor and set variable RPM to the gearbox requirements.

7. Check test motor noise level with decibel meter.

8. Attach gearbox to test motor and record decibel reading during run test.

9. Check all gearbox sealed areas for any oil leakage.

10. Record vibration analysis data and gearbox bearing temperature after one hour of testing.