

Reducing Downtime with Reverse Engineering

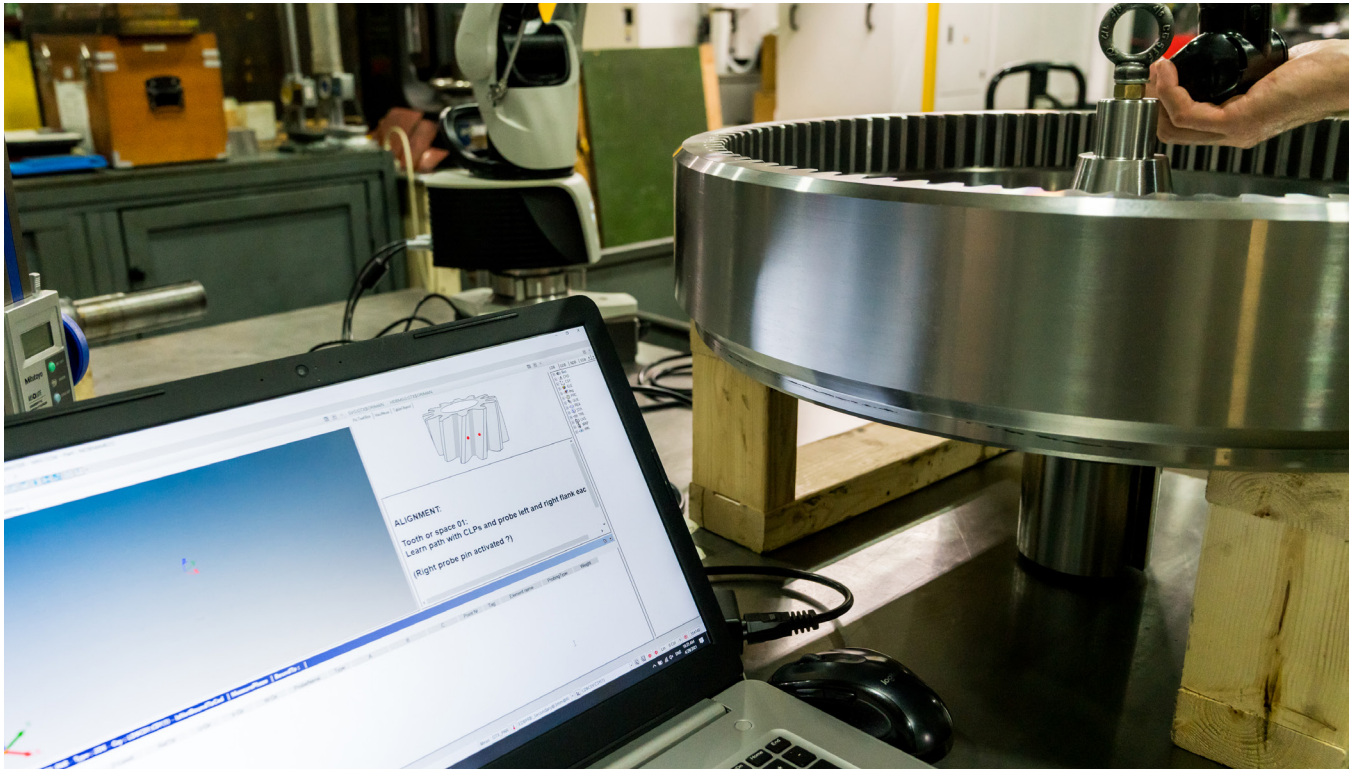


Photo courtesy of Rapid Gear.

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KNOWING WHAT YOU HAVE is not always easy. Incomplete drawing packages, modifications made without proper documentation, and obsolete machine parts from original equipment manufacturers (OEMs) that have changed ownership or are long gone can wreak havoc on your operations.

While this article will focus on power transmission gear reducers and gearing, the concepts can be transferred to any mechanical part that is worn or broken.

It's not uncommon for wear and tear on gears to cause a catastrophic failure. Particles in the system can cause an abrupt stop, leading to immediate downtime. If you don't have the parts on hand to fix the problem, additional manufacturing could be

required. The good news is that wear usually happens slowly and can often be seen well in advance. The bad news is that having all the parts you need on hand just in case can be expensive because you really don't know when a failure will occur. Time becomes your enemy.

One way to get in front of the problem is to reach out to machine shops for their expertise on how to avoid potential issues and expensive situations. The problem with this is that they'll want accurate data, which can be difficult to obtain if you don't have a supply of sample parts, you can't stop production to access parts, the machine shops are far away, parts are too big to transport to machine shops, and the parts won't come out of the assembly.


While old drawings can help, gearing requires all parts to mesh exactly. For example, the pinion will often wear down faster than the larger bull gear, even though the pinion is a harder material. If the data on the gearing is not available, it becomes challenging to determine the following:

- Helix pitch;
- Center line distance;
- Number of teeth (should be easy but mistakes can happen). Make sure to mark each tooth;
- Diameters of the parts;
- Basic type of gear (the easy part);
- Full depth of tooth;
- Grade of metal (can be hard to tell);
- Hardness of metal on tooth and on shaft;

- Type of heat treating: induction, carburization, flame, thru harden, Nitride (also hard to determine without lab testing);
- All keyway information;
- AGMA quality;
- Circular pitch and modular pitch; and
- A good and accurate sketch or drawing showing tolerances.

If you have accurate data on all these points, a fully integrated gear shop should be able to manufacture the gear. However, if data is missing or incomplete, the job becomes riskier to manufacture. This is why you need to work with a gear shop that is experienced and knowledgeable; when you do, the engineers can make recommended assumptions to present to you, and a suitable part can usually be made. Making a matching set also eliminates some of these issues, as long as you have accurate centre distances for the gear pairs. Information like the helix angle will not matter in this instance.

Another factor to consider is whether the part was built offshore and is small. In this case, it's likely better to dispose of the old gear and buy something new. However, if a reducer is over 250 pounds, it is likely more economical to rebuild. Size matters.

Each circumstance will necessitate a different course of action, which is another reason why you should always work with experienced gear shops, and why the better the supplied data, the better the result you'll get. Better shop + better data = a better end product that will get you up and running in the least amount of time.. 

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