

### **Repairing Equipment When Replacement Parts are Unavailable**

By Jeff Spira

If you've had a piece of equipment go down and find out that repair parts are obsolete, unavailable in a reasonable amount of time, or just so outrageously expensive, you can't fit the repairs into your budget, it's time to look at some options for getting the equipment back up and running. There are two options you have: to locate a substitute part, or "reverse engineer" the bad part and make a replacement yourself.

The first option, locating a substitute part is the most desirable since it means you'll get back up and running for the least cost in the least amount of time. It takes knowledge of the intimate workings of the machinery you wish to repair to be able to successfully accomplish a swap-out, but often a direct replacement can be located. Companies often re-number standard components, such as electrical products or hydraulic components, so a replacement part made by the same manufacturer to the same specification may still be in production.

If an exact change cannot be found, an equivalent part from a different manufacturer may be able to be identified. One with similar performance can often be found even if some adaptation may be necessary to fit the alternate part into your assembly. Sometimes this is just things like mounting brackets, or changing coupling sizes or the like, but sometimes it involves making modifications to the new parts to bring either the fit or the function in-line with the original part you are replacing.

Caution is advised here, since the alternate part may or may not completely agree with the operating parameters of your system. A competent engineer with experience in the kind of machinery you're trying to get back up-and-running, should be able to do the necessary calculations to ensure the substitute part is up to the job. He or she may also be

able to specify the required modifications and design any additional hardware needed to mount the new part.

If no alternate part is available, you're left with making a new part to replace your old. This requires a specialized knowledge known as "reverse engineering." It is not as simple as just making another part the same dimensions as your old one. When this is attempted, often the new part is made already worn out. It takes a thorough examination of the rest of your system to figure out what the part should look like to perform properly. Experienced design engineering practices are the only way to make sure.

Sometimes, not only does the new part have to be made, but the mating parts need to be modified as well. For instance, when an automobile engine is rebuilt, it is standard practice to bore the cylinders oversized to clean up uneven wear, then use oversized pistons and piston rings. If you tried to simply replace the old piston with one made to the original factory specifications, your rebuild job wouldn't last long at all, and you'd be faced with rebuilding again in a fraction of the time a rebuild job would have lasted if done right.

It is incredulous how much stationary and mobile equipment is just sitting around waiting for replacement parts when the owners, often government agencies, could press that equipment back into needed service if the proper reverse engineering or part substitution methods were employed.

Jeff Spira is a mechanical engineering consultant and runs <http://www.spiraengineering.com> specializing not only in design and engineering, but also in tooling, design, process design and quality system consulting. He also is a trained and experienced reverse engineer who has assisted many companies and government agencies get obsolete equipment back up and running.