

THE ART & SCIENCE OF REVERSE ENGINEER PRESS PARTS

BY RAYMOND TOKARCZYK

One of your main presses is down; you've analyzed the situation and have determined that a key component part is broken. The original manufacturer is either out of business or does not have a replacement part in stock and you cannot wait for them to manufacture a new one. Management tells you that the press absolutely must be making parts and it is your responsibility to get it running. What do you do?

Virtually every press shop maintenance manager or engineer has found himself in this situation at one time or another. The options are limited: You can look for a used part, repair the old one, or have a new one manufactured to your specifications. If you elect the third option you will need to utilize a procedure known as "reverse engineering".

Use of the term "reverse engineering" has become fairly widespread in recent years. I first heard it used in the 1980's by press rebuilders who were attempting to repair worn and/or broken parts in order to get a machine back up and running. This process should probably better be described as refurbishing, rebuilding or reconditioning.

Reverse engineering can be described as the process of taking an existing machine part, usually worn or broken, and producing an engineering drawing which can then be used to produce a new replacement part. On its surface this seems like a simple enough procedure, you simply copy the old part.

Things can become much more complicated however if for example there are gear teeth or screw threads involved, especially if they are worn or broken. The person involved must have a comprehensive knowledge of engineering fundamentals as well as some experience in press design and usage. Attempting to reverse engineer a worn part without knowing the application of where or how it will be used can be a frustrating and risky undertaking. We've probably all heard a story or two about the machine shop who when handed a shear collar, or a stretch link from a bottom drive press, decided to make the replacement part from tool steel thinking he was doing his customer a favor by upgrading the material. As we all know these parts are used for mechanical overload protection and are meant to be the weakest link and fail when the presses rated tonnage is exceeded. The unwitting machine shop obviously had no press experience or knowledge of the parts application. The moral of the story is that you and/or the person actually making the replacement part needs to have a complete understanding of how this part will be used in the press and why it was designed the way that it was.

When reverse engineering a worn part it is very helpful to remember that that part was originally engineered by the O.E.M. to industry wide standards. For example virtually all gears are manufactured to A.G.M.A. (or some other international organization) standards as to the type, tooth form, back lash, etc. If the part is worn beyond recognition you may be able to determine its original form, etc. from the mating parts. If the mating parts are also worn they should be replaced or repaired. This gives you some additional latitude in that you can now design both parts so that they will function within the guidelines and framework of the machine. Once again, remember that the vast majority of parts are made to nominal dimensions (either inch or metric) and industry standards (i.e. S.A.E., etc.)

Often times the manufacturer can be helpful if all you need is a critical key dimension, etc. and they are aware of the critical nature of the situation. This varies widely between the various O.E.M.'s but most, if not all, have a company policy that they do not give away detailed engineering drawings of parts for their presses. This is very understandable since they are in the business of supplying replacement parts and do not want to give away proprietary information.

Other sources of valuable information and assistance are the various reputable press rebuilding and repair shops. Good quality machine shops can also be very helpful, especially if they also have press expertise.

While this may seem somewhat intimidating at first glance, like all complex problems, it become much easier if broken down into many smaller, simpler problems. Getting your machine back up and running may only be a matter of reverse engineering that one broken part.

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