Dramatically Extend Roll Die Life and Improve Thread Quality Using Improved Set-up Procedure

By Joe Greenslade

Pressure is constantly on fastener manufacturers to lower prices while improving quality. Roll thread dies are usually the source of the largest tooling costs in most screw and bolt making operations. The cause of most customer complaints is associated with thread quality. These two facts make the threading operation a good place to look for both savings and quality improvements. Better roll die set-up can contribute to both tool savings and better, more consistent thread quality.

"Thread differential analysis" is the procedure of using variable thread gages to measure a thread's pitch diameter and functional diameter and then comparing the size of the two measurements. The purpose of the comparison is to determine the magnitude of the cumulative effect of the deviations in the individual thread elements. This procedure provides the machine operator an objective means of determining thread die match during the setup of the threading process. The closer these two measurements are to each other the better is the match between the two rolling dies. This analytical procedure is far superior to an operator working on a die set-up until the thread enters the GO ring, does not enter the NOGO ring, and he subjectively decides that the thread crests appear to be "sharp enough".

Manufacturers should make it a standard setup requirement that the process will not be turned on until the difference between the measurement of the thread's pitch diameter and its functional diameter is less than 40% of the thread's total pitch diameter tolerance, or .0010 inches which ever is less. What is accomplished by working on the set-up until these two measurements are very close to each other is the reduction of the thread's lead error.

This procedure provides the operator with an empirical means of determining perfect or near perfect die match. The closer the measurements of pitch diameter and functional diameter are on a given thread, the closer the dies are to perfect match. The more perfect the die match, the lower the pressure on the die plate faces. The lower die face pressure, the longer the dies will last and the longer

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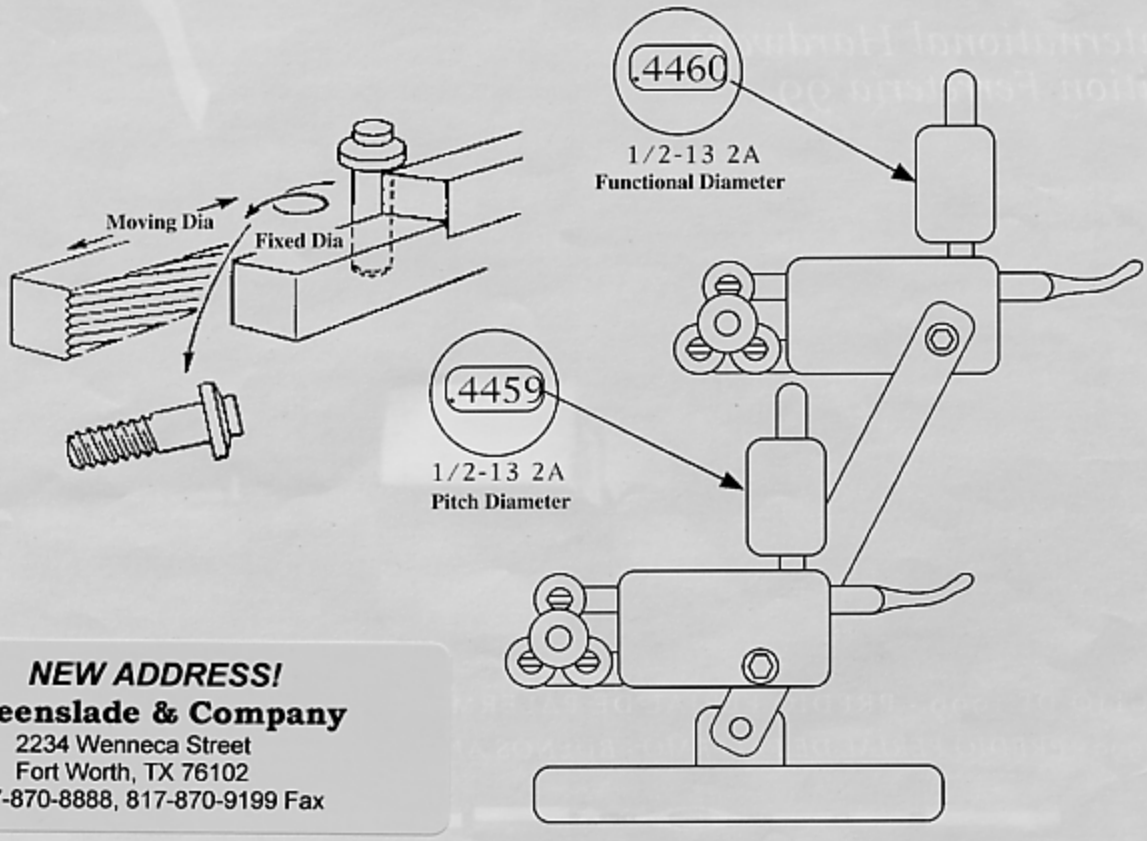
the threader's ram will go without adjustment or replacement. Longer thread die life and machine life result in substantial operation saving over time.

A manufacturer can usually recover the cost of variable thread gaging within one year as a result of the savings realized in thread rolling dies alone. It is reasonable to expect roll die savings between 20% and 35% by using differential analysis when setting up roll threaders. The amount of savings associated with the use of differential analysis during threader set-up is directly related to the hardness of the screw or bolt blanks being rolled. The greatest savings will be realized by those rolling hardened blanks such as ASTM A193 B7 bolts and studs, and those thread rolling 300 series stainless steel screws and bolts.

Before turning the threading operation on for full production the major diameter, pitch diameter, and functional diameter must all be within specification. It is also a good practice to make sure the thread will enter a GO gage freely. If the set-up procedure described in this article is followed so that the pitch diameter and functional diameter are within .0010 inches of each other, but those measurements are not near the middle of the pitch diameter tolerance the size of the blank diameter should be altered for future jobs so that relationship can be achieved.

Fastener users worldwide are demanding more consistent quality and continue to pressure manufacturers for lower prices. Fastener manufacturers must continually improve their operations and their methods to meet these demands. Using differential analysis in roll threading set-up will help manufacturers provide more consistent thread quality while saving tooling costs by greatly extending roll die life.



Differential Analysis During Thread Rolling Set-up with Tri-Roll Gages