



F3[®]
**Flaw Free
Form™**

Lap Free Threaded
Fasteners

Reed-Rico
PCC Specialty Products, Inc.

F3[®] Flaw Free Form[™]

Introduction

Reed-Rico[®], the leader for over 80 years in the manufacture of machines and tooling for the fastener industry, has created a revolutionary new technology called F3[®] (Flaw Free Form[™]). These tools were designed in response to the increasing demands of critical aerospace and automotive fasteners. The intention was to roll the best quality fasteners without changing any of the processes (i.e. the same blank preparation and machine operation).

F3[®] Technology

The easiest way to describe the F3[®] rolling process is to say it is a controlled progressive movement of the blank material into a finished lap free threaded part. Standard thread rolling dies do not control the penetration rate of the die or the amount of material pushed up into the dies.

The blank, depending on the rollability of the material, will take the path of least resistance with the crest being formed last, typically forming a crest seam.

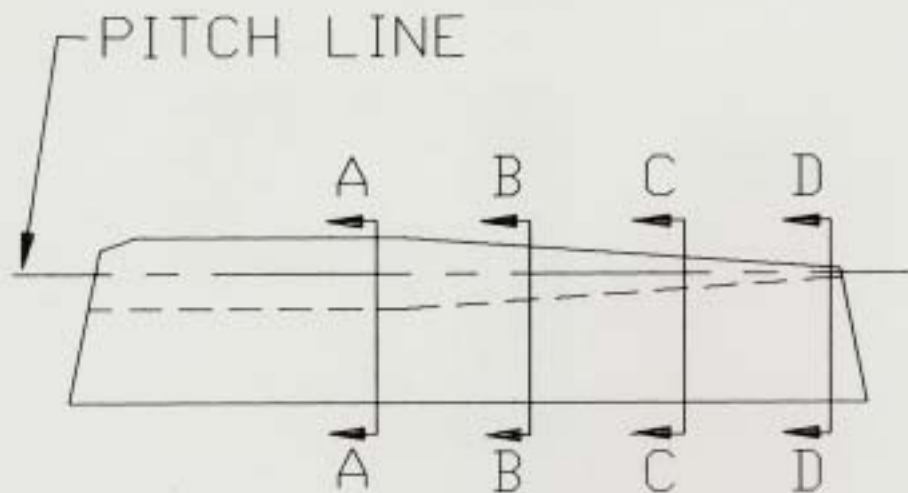
The F3[®] die design eliminates the crest seam.

F3[®] Dies Solve Problems of Laps

F3[®] dies are designed with a wide thread angle in the starting portion of the dies with a very shallow thread depth. This angle helps create much more flank angle contact with the blank, increasing the die load and friction while decreasing slippage.

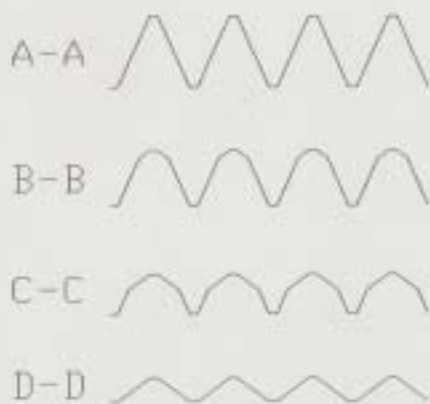
F3[®] dies are not supplied with crossnicks but are provided with a coarse finish to help maintain positive blank pickup and decrease chances of slippage.

The die pockets should be perfectly parallel when installing F3[®] dies into the machine. The dies by design are open at the starting end to allow the blank into the die.



Die Profile

The blank is progressively formed up into the dwell portion of the die where the die faces should be parallel and the finish rolling is completed.



Thread Profile Along Die Profile

Controlled Material Flow — F3[®] dies begin forming what will become the thread crest almost immediately. The die forces control grain flow. No other thread rolling die in the world can do this. No magic — F3[®] technology.



Applications

F3[®] dies have been developed for all common 60° thread profiles. For diameters out of the range of standard flat die capabilities, an F3[®] cylindrical die design is available.

Cylindrical Dies

F3[®] cylindrical dies are a single revolution die where the part is formed in one rotation of the die using the same F3[®] geometry and grinding technology. Designs can be incorporated for most 2-die cylindrical machines where 6-7 part revolutions can be achieved.

Causes of Laps

There are five major reasons for laps:

1. slipping of the blanks during rolling
2. crossnicks or starting serrations
3. uncontrolled material flow
4. die set up
5. machine condition

In order to consistently roll lap free parts, the blank material flow needs to be controlled during the rolling process.

More Information

Call our knowledgeable F3[®] Customer Service Representatives at (800) 343-6068 or (508) 829-4491 for more information.

Flaw Free Form™



Photomicrographs of single thread, with and without roots, show complete elimination of all laps and crest seam.

Conventional Rolled Form



Photomicrographs of high-quality conventional thread show crest seam.

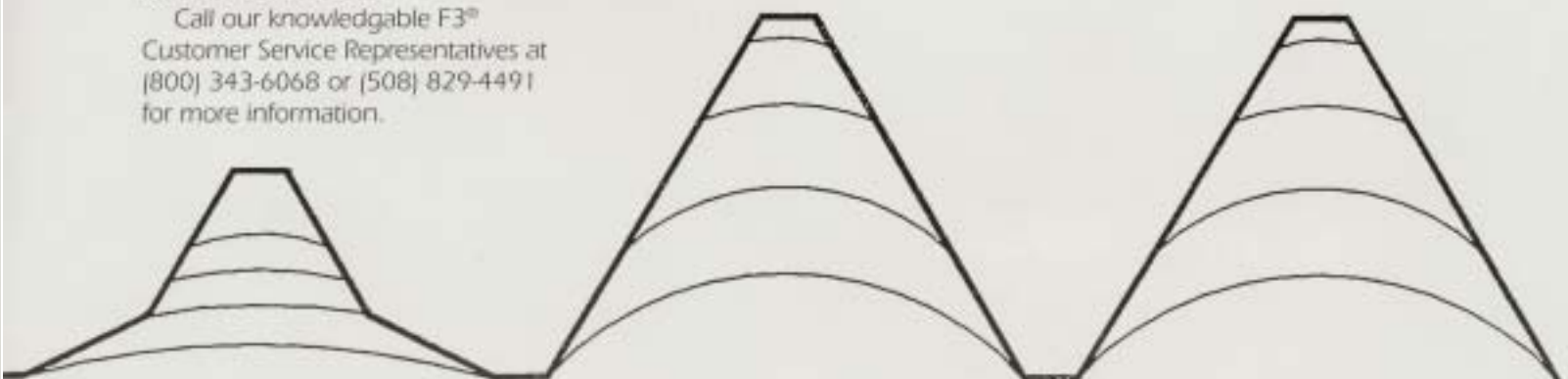
The Future of Quality

As the cost of quality for all companies continues to climb, Reed-Rico[®] believes that the F3[®] die helps control the variables of fastener manufacturing.

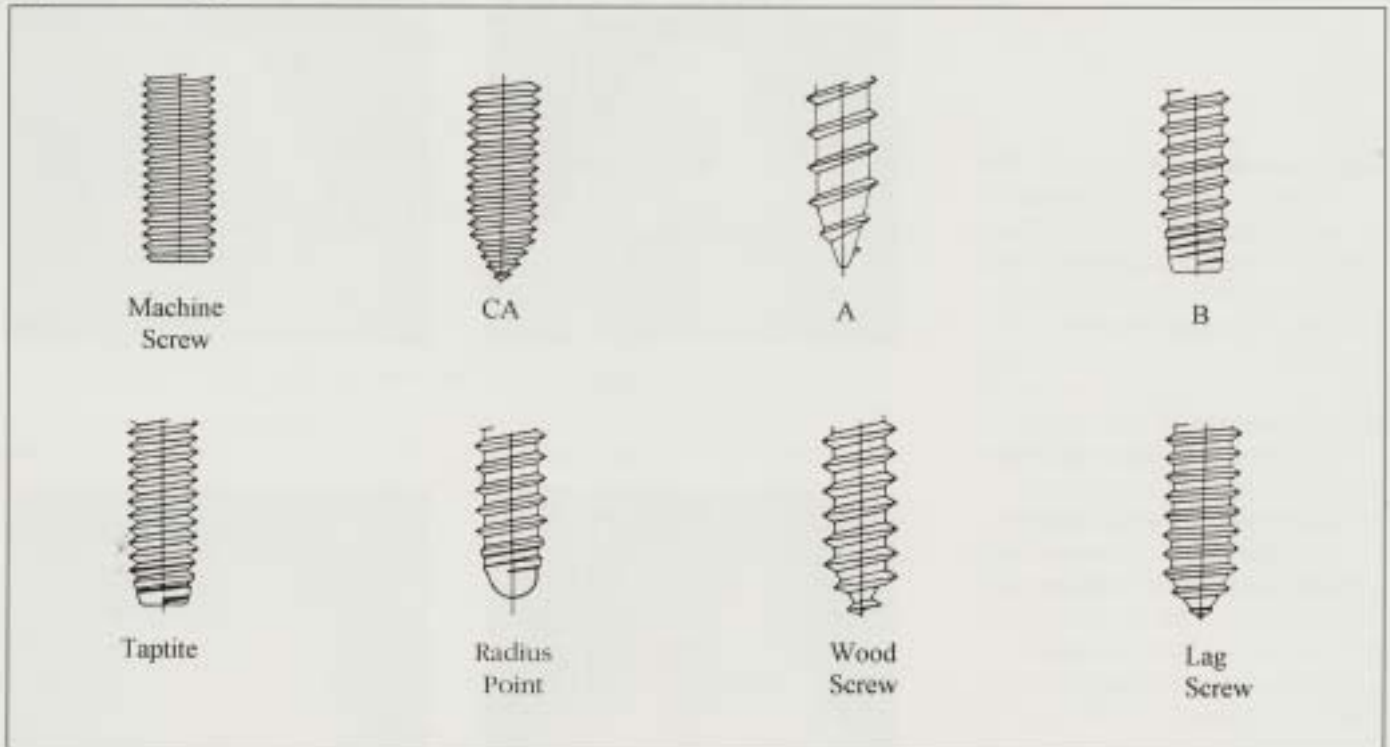
The advantages of thread rolling with F3[®] versus standard tooling are subtle yet can greatly impact quality. The first obvious advantage is production rate. Where fastener manufacturers are slowing down production rates to roll critical fasteners, especially in harder

materials, F3[®] dies allow them to return their machine to normal speeds while rolling better fasteners.

The physical characteristics of the fasteners are improved due to F3[®] rolling because of the controlled nature of the material displacement. The smooth surface finish and compressive residual surface stresses introduced by rolling make rolled fasteners stronger in fatigue, shear and tensile strength.



Typical F3® Applications



Other Reed-Rico Products

Flat, Cylindrical & Planetary Dies
Thread Rolls • Knurls
Cross-Slide Attachments
End Rolling Heads
Punches
Header Tooling
Gages
2 & 3 Die Cylindrical Machines
Planetary Machines
Hartford® Flat Die Machines
Rebuilt Equipment
Replacement Parts



Smooth, Even Finish — No Die Serration Marks
Because of their improved thread forming action, F3® dies do not use crossnicking to prevent skidding or slippage. As a result, root defects caused by the rolling process such as laps and scalloping are eliminated.

Reed-Rico

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