Taps & Tapping (including Dies)

Producing a female thread when making a model can be advantageous. Typically, I make use of this process to attach an item to a model. The latest being to attach a life raft (a resin moulding) to the cabin roof of my catamaran workboat. This means the life raft containing two tapped holes, is held on by two screws, can easily be removed for painting and/or modified in any way and then replaced in the same position. The process involves drilling a hole of a defined size, and then tapping the female thread with a tap of the correct thread size, using a tap wrench.

Tapping Drill – The size is based on the Core Diameter of the thread plus an allowance for clearance during the tapping process. Data tables (such as Zeus Tables) list all the tapping drills for threads likely to be of used by modellers. When tapping a Metric thread and due to a fluke of trigonometry the size of the tapping drill can be calculated by subtracting the Pitch from the Nominal Diameter. For example, the standard M4 thread (as used on propeller shafts) has a pitch of 0.7 mm. The corresponding tapping drill is therefore 4.0 – 0.7 = 3.3 mm. This corresponds to a No. 30 drill or obviously (if available) a 3.3 mm diameter drill.

Ideally you also need a pedestal drilling machine. Normally the tapped thread needs to be square to a datum face and achieving a drill hole for this with a free-hand pistol drill is pretty well impossible. Very reasonably priced, bench mounted, pedestal drills are often available from supermarket chains such as Lidl and Aldi.

Taps – These come in a set of three called Taper, Second and Plug and are used in that order to achieve a progressive cutting action from the hole produced by the tapping drill to the full depth female thread. However, for most modelling applications (especially as most of the materials used are relatively soft) just a `Second' tap is perfectly adequate and there is normally no need to purchase all three taps.

In descending order Taper, Second and Plug

In theory, the tapping process involves entering the Tap into the prepared hole and turning it with the Tap Wrench. As we all know theory and practice are two entirely different animals. So, in practice the following need to be taken into consideration:

- The taps (particularly in the smaller sizes likely to be used by modellers) are easy to break. The tapping process produces swarf and failure to clear the swarf during the process can cause tap breakage. So after about three forward turns of the tap, a half-turn in reverse will break up the swarf. Periodically remove the tap and clear the swarf from the hole.

- The tapped hole needs to be kept square to the datum of the workpiece and failure to do so will result in a “drunken” thread. There are a number of ways to achieve this with an engineer’s square and good eyesight being one. However, a non-textbook method is to commence the tapping whilst the job is still on the drilling machine, i.e. remove the tapping drill from the chuck, and replace it with the tap. Then turning the tap/drill chuck by hand, produce sufficient thread so that when the job is removed from the machine the tap will realign itself.

Dies – These produce a male thread and probably will not be used by modellers as often as taps (if at all). So, for producing say an M10 thread you need a piece of round material of 4 mm diameter, an M10 die and a wrench normally termed a Die Stock. It will be noted that the Die Stock has three adjustment screws which correspond to the three `dimples’ in the Die. This allows for a progressive cutting action and is the reason why the die is `split`.

Thread Forming Process – The Die is assembled in the Die Stock in the following manner:

- Note that the Die has a “lead-in” i.e. the first section of the tread forming area is tapered giving the same progressive cutting action as a Taper Tap. Normally this is on the same side of the Die which carries the thread identification, manufacturer’s name etc.

- The first cut made is with the Die fully expanded which is achieved by fully tightened the central screw of the Die Stock with the outer two screws just used for location. The subsequent cuts are made gradually closing the die with each pass, until the desired fit is acquired. Just as with tapping there is a need to keep the die/diestock square to the axis of the workpiece to avoid a drunken thread.

Die Nuts – These differ from a normal Die by virtue of them being hexagonal in shape (not round) and solid (not split). Their use is for the repair an existing male thread that has been damaged in some way preventing fitment of the nut. They are typically used in the motor and similar trades where the male thread is in situ and in close proximity to say an engine block, which prevents the use of a split die and die stock. Their use to a modeller is pretty well nil, so best to avoid.

Purchasing – For all drills and associated tooling, I always recommend a company called Tracy Tools based in Torquay. Their drills and other items such as taps and dies are of good quality and reasonably priced. The model engineering fraternity have been using them for years and for those that attend the London Model Engineering Show held at Alexandra Palace each January may be aware that Tracy Tools always have a stand there.

So, for individual taps go to Tracy Tools. You can also buy sets of taps. Somehow, I acquired a 21-piece Metric Tapping Set with the brand name CK. It contains a selection of taps (all Second) M2 to M12, plus the corresponding split dies, tap wrench, die stock and a set of Metric pitch gauges. If you want to go that route there is plenty of choice on eBay. Most probably the majority originate from China, but perfectly good enough for a bit of modelling.

www.tracytools.com

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