MORRIS J.I. MORRIS COMPANY
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TAPPING MINIATURE PARTS

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Tapping miniature sizes is practical, but requires close attention to all details to ensure success. Remember, in most cases the entire thread has to be produced in one pass- a real strain on a fragile tool. The following will help in producing a satisfactory and economical outcome in these small fasteners.

EQUIPMENT: A vertical machining center with a rigid tapping program is the ideal solution and allows multiple passes (pecking) to produce a thread. Other equipment (some with torque control), including screw machines, with a controlled lead feed is next, then jewelers lathes with light, free floating holders and some tapping heads which are suitable for the larger sizes. An alternative is hand tapping by a skilled craftsman with a steady hand.

SETUP: A rigid setup is critical. The tap must be centered on the hole and perpendicular to the workpiece. Be sure there is no eccentricity when the spindle is running. The part must be held firmly (but not crushing the small cross sections of many parts being held) to withstand the high tapping pressures.

PREPARING THE HOLE: The hole must be produced accurately. .001" is a mile in miniature work. A spot drill must be used to center the tap drill and should be deep enought to leave a .005"-.010" chamfer to guide the tap, relieve the starting cut and make assembly easier as well as enabling a flush fit by clearing the part threads under the small screw head. Punching may be acceptable for very thin (less than 1/2D), easily machineable materials, but drilling is preferred. Tubing must be spotted and redrilled as the drawing process produces a hard skin which will cause tapping trouble.

TAP SELECTION: Precision ground taps are a must if you are working to gages. The are more costly, but in most cases you will find the cost per tapped hole less than other less expensive types if you have the proper setup. They also cut a cleaner hole with less friction and reduce the chance of galling with mating parts. We have found gun (spiral point) taps to be effective in even small tap depths of through holes as they cut cleaner with even less pressure, especially in the smaller sizes. We do not make roll form taps as they do not usually produce a gage fit. Our basic advice, however, is that if what you are using is satisfactory, don't pay more.

WHY USE MORRIS TAPS? They are made on a CNC grinder which produces the threads, flutes and chamfers in one chucking for absolute geometric positioning, concentricity and close dimensional accuracy, assuring consistent performance from each tap. A controlled root provides maximum torque, full teeth back tapered relieve tapping pressure and a gage finish makes a nearly friction free cut and smooth part finish, The narrow lands (thread area adjacent to each flute) preclude the need for radial thread relief found in larger sizes of standard taps. Thread cutting edges are polished to remove the fine burrs and leave a sharp surface. Three flute taps are recommended where possible for friction relief and the extra cutting edge also reduces chip size. This is not offered on the smaller sizes where the land becomes too thin to be effective. The chamfers are radially relieved to lessen cutting friction. Our small shanks, the same diameter as the thread, offer better concenctricity and more uniform heat treatment than taps with larger shanks.

TAP COATINGS: We no not recommend coatings as they tend to round the fine cutting edges we produce for clean shearing, losing any advantge gained from the usual extra performance of these additives.

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LIMITS: A .010" wall is the thinnest that can be tapped satisfactorily. The tap may tear up a thinner wall or at best leave thread bumps on the outside diameter. Tap thread depth is critical, especially in tougher materials. Counterboring is recommended wherever possible in deeper holes. Machining center rigid tapping can peck many passes for very deep holes, but at the expense of tap wear and increased costs. It is imperative to clean the chips and dab viscous coolant on the tap with each peck. A tap depth of one diameter of thread will usually provide sufficient strength to break the mating part before stripping. A thread depth must not exceed three thread diameters and 2D is the limit for any reasonable cost.

THREAD PERCENTAGE: Tests have shown that there is not a significant difference in holding power between 60% or our suggested 65% thread and the usually recommended 75%. In miniatures this difference produces a noteable improvemnent in tap performance. In fact, a 50% thread in tough materials will usually break the mating part before failing. A lower thread percentage also allows increasing the minor diameter on the mating part for greater torque strength.

TAPPING SPEEDS: Tapping speeds are generally much lower than those calculated by standard methods. It is not possible to offer a chart as the recommendation depends on equipment, tap size, thread depth and material. Call John at 508-764-4394 for specific advice.

COOLANTS: It is necessary to use a very viscous fluid which will stick to the tap cutting edge. A high fat, high sulphur/chlorine, high viscosity oil brushed on or a high flow pump will also clean chips from the tap for each cycle.