# Using the Rubber Stripping Parameters Spreadsheet for Cutting Indoor Model Motors

By Ray Harlan

- Using this spreadsheet presumes that you know what length and weight you need for the motors you will be cutting. If you don't know exactly what you want, use your best guess and aim to cut a range of sizes.
- Before using the spreadsheet, invest in a high-accuracy scale to weigh stock and cut strips. A good choice is the Gemini 20 which can be found on Amazon. It weighs just to 20 grams, but resolves one milligram which is needed to eliminate rounding errors.
- You will need to make a holder for the motors to keep them on the scale and away from static electricity sensitive electronics. The photo at right shows an example. It should be very light weight, but stable on the scale platform. This one is made with a thin rigid foam base, a soda straw and a piece of foam for the rubber support.
- Cut at least **ten** lengths of rubber to either double the loop length or something longer if motor length has not been determined.
- Weigh the stock strips, place them in ascending order of weight and place tags (strips of Post-its) with each length to identify weights. This order will help minimize changes in micrometer settings from one strip to the next and will increase accuracy.
- Cut three 3" (exactly) lengths of rubber. Weigh lengths and identify with tags as above.
- Adjust the right gate stripper to an approximate width setting. Adjust the left gate to get just a tiny bit of friction. Be sure it is easy to push the rubber all the way in to the cutters.
- Enter 3 (for one of the short strips) in cell B2, the weight on its tag in cell B3, the width of the **uncut strip** in B4 and the target weight of the cut strip in B5. The width should be .125 for 1/8", .1875 for 3/16" and .25 for ¼". The target weight for the 3" strip would be the weight of a full motor multiplied by 3 and divided by twice the length of the motor.
- Cut the strip, weigh it and enter the weight of the cut strip in B9. The actual weight per inch will be shown in B10 and the percentage error will be in B11.
- If the actual weight per inch differs from the target, enter the data for a second short strip in C2, C3, C4 and C5. The required changes in the micrometer knobs will be shown in C7 and C8.
- Adjust the knobs according to the numbers in C7 and C8. If a number is positive, increase the reading on the knob. If it is negative, decrease the reading.
- Please note: if the stock strip is being cut almost exactly in half, it is very important to pay attention to which strip is coming out on the right side. It is the one to be used for getting the right adjustments. Later, when cutting full length strips, it will be the one used for motors. The left strip is the remnant strip.
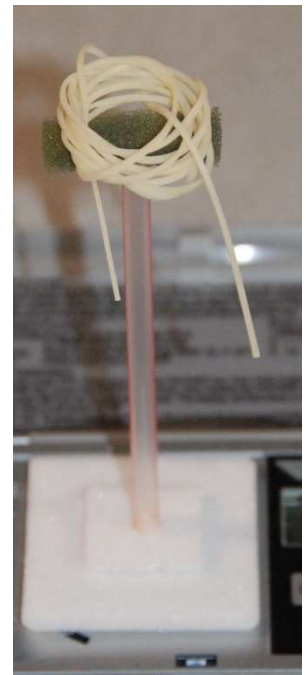
- Cut the second strip. It should be closer to the target weight per inch. If it is worse than the first strip, you may have adjusted the knobs in the wrong directions or the rubber is too loose in the gate. Check the fit of the rubber in the gate again and adjust the left knob if necessary. If the weight per inch is closer, but not close enough, use the third 3" length to try to get closer.

- Assuming at this point you have achieved the right length density of a short strip, enter the first full strip data in the next open column (length, stock weight, and target weight). Calculations carry over to the next set of columns (rows 16-20 and 31-44).

- Enter the data for the first (lightest) full length strip in E2-E4 (or columns D or C if fewer test strips were used). Adjust the micrometers according the adjustments shown in E7 and E8.

- Cut the strip and weigh it. Enter the weight in E9. Write the rubber batch name, motor weight (E9), length (E2), weight per inch (E10) and percent error (E11) on a motor envelope (2 ¼" x 3 ½" craft coin envelopes work well). Place the strip in the envelope. Place the remnant where the original strip was located and mark a tag showing its assumed weight, shown in E14, and the column the data was in.

- Continue with the next strip up the line.

- After some experience, you should be able to get within a couple of percent of the target weight or better. The spreadsheet takes into account the difference in weight between stock strips and the error in the previous cut strip to arrive at micrometer adjustments. **If successive motors have sizeable errors (a few percent) and they alternate between positive and negative, it is a sign that the rubber is too loose in the gate. Adjust the left guide a little and try again.**

- When all of the strips have been cut, if the remnants are wide enough for a second motor to be cut, change the order of strips to order of **decreasing** weight (**heaviest to lightest)**. Copy the length (row 2 or 17) and target weight (row 5 or 20) in the next open column. Copy the assumed weight of the remnant (row 14 or 29) into the first corresponding cell for the weight of stock strip (row 18 or 33). Copy the assumed width of the remnant into the cell for the width of the stock strip (row 19 or 34).

- Adjust the micrometers according to the numbers in rows 22, 23 or 37, 38. Cut the remnant. Most likely it will be off, because the strip is narrower than the previous strip cut, which was a full-width stock strip. The next strip will be closer to the target. Weigh and record as before. If there still is enough material for another strip, put it back in its place and make another tag with the new remnant weight (row 29 or 44) and new column number.

- Continue cutting as before until all strips are cut and remnants are too narrow to produce motors. If more than two strips can be cut from the stock, set up the third cut as you did at the beginning, going from the lightest stock to the heaviest.