Tune In for Better Electronic Edge Finder Accuracy

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I own a modified Fowler® Electronic Edge Finder. The LED and battery have been removed and a wire attached to the pin. This wire connects through an interface circuit to my Shumatech Digital Read Out. More on this circuit and how the EEF works can be found on my web site.

The EEF has a Total Indicated Runout[1] of around .0002" which is good. But there is more to the story. The EEF fits in a collet, which then fits into the spindle of my RF30 mill/drill. The result is a TIR of between .001" and .0015". This error directly effects the accuracy of setting zero. With the zero point off, all DRO readings are off by the same amount. I will reluctantly accept error in my DRO if I must. In this case, I can eliminate it.

The first step is to place calibration marks on both the EEF and collet. The EEF has 6 holes through the black plastic part of the body. I numbered these holes 0 to 5. I did not have to mark the collet since it was already stamped with "R8".

The collet has a groove on its side that accepts a pin inside the spindle to prevent collet rotation. I can use the "R" on the collet as a pointer to the numbers marked around the EEF's body. Once I find the best position of the EEF with respect to the collet, I simply note which number is opposite the "R". Since the collet does not turn, I can be assured a consistent TIR.

Next the quill is locked to minimize side play. There is still some play from the spindle bearings but that cannot be canceled. It will contribute to the overall error of the machine. Some error cannot be avoided.

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[1] If the term Total Indicated Runout confuses you, please feel free to contact me for an explanation. A search of the web gave disappointing results. I will provide a full explanation in the text if there is a need.

I used my Starrett Last Word® Dial Test Indicator to find the maximum and minimum runout. Note these locations on the EEF's perimeter. I turned the EEF so "0" lined up with the "R' on the collet. In my case maximum is at hole 4 and minimum is at hole 2. The maximum DTI reading was +.002" and the minimum reading was +.0005. Ideally, the maximum and minimum should be exactly opposite from each other but this is good enough. The TIR equals the maximum minus the minimum so .0015".

Next we need to calculate the tool offset which is used by the DRO. The EEF's pin is .2000" according to my mic. If the TIR was zero, I would input .200 into the DRO as tool offset and be done. Zero TIR means that the center of the DRO is also its center of rotation.

I will skip the logic and math and just say:

> Add the TIR to the mic'ed diameter of the
> EEF's pin and use that value as the tool offset.

In my case, the tool offset would be .2000" + .0015" = .2015". There is a catch here. The DRO only accepts numbers to the nearest thou for tool offset so I must round up or down and accept *avoidable* error. I'm not about to do that even with an error of .0005". Time to tune in the EEF. As I rotate the EEF relative to the collet, the total TIRs changes. The idea is to find a new position for the EEF with respect to the collet that will give me a TIR with a zero value in the tenths position.

I loosened the collet and rotated the EEF so hole number 2 lined up with the "R" stamped into the end of the collet. This will change the TIR. The result was a maximum half way between hole number 2 and 3 with a value of +.002". Minimum was found half way between hole 5 and hole 0 with a value of +.001". Note that this time the maximum value and minimum value are 180 degrees apart as predicted by the theory. The TIR now equals .002" - .001" = .001" so the tool offset equals .201". No more round off error.

To use the EEF, I call up the tool offset and tell the DRO which face of the EEF I will use for touch down. Then I rotate the EEF to the mark showing the maximum. For me the tool offset is .201" and my touch down point is half way between holes 2 and 3. By simply being mindful of where to perform touchdown, I am able to eliminate an error of .001".

For many jobs, I do not care about this error. But when it matters, I just have to be sure I line up hole 2 with the "R" in "R8" and then touch down between holes 2 and 3 in order to attain the best possible accuracy from my EEF.

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Comments and questions are always welcome. All of us are smarter than any one of us.

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