A Variable Frequency Drive plus Three Phase Motor on a RF30 Mill/Drill

By R. G. Sparber

This article is more of an "existence proof" than one that explains how to make this upgrade of a RF30 mill/drill.

I have installed a 2 HP 240V 3 phase motor on my 20 year old RF30 mill/drill. The motor drive is a TECO N3-202CS Variable Frequency Drive.

In the lower left corner you can see my 240V outlet plus cut-off switch. When not in use, I cut power because the VFD does not have its own off switch.

Hanging from the bottom of the unit is a metal cover that protects all wiring. I stick conversion tables to the front of this cover. Each table shows the possible diameters versus frequency for a given belt position. You can see details in the Excel spreadsheet on my web site just above the link to this article.

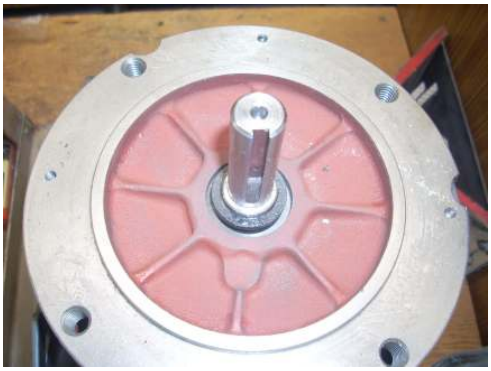
The table card is made by printing out the spreadsheet, spraying the back with 3M adhesive, placing down a thin flexible magnet material, and then trimming to just leave the text and numbers. The front is covered in clear packing tape.

When I change the belts, I swap the table card. Spare cards are stuck to the belt cover. For most machining, one belt position is adequate. If I want to get all the way to maximum spindle speed, I change belt positions. The same is true if I want to get down to 79 RPM.

[1] You are free to copy and distribute this document but not change it.

Here is my new WEG motor. It was a perfect match on base hole locations and almost perfect for shaft length. The one area that took work was matching the diameter of the motor shaft to the bore of the pulley plus the related key.

I wanted a close sliding fit for the shaft adapter to insure minimum Total Indicated Run-out.



The shaft is 0.625" in diameter and the key slot is 0.125" wide and about 1.5" long.

My old motor shaft was metric with an odd key slot width.

I make the adapter sleeve by first turning the OD for a sliding fit into the pulley. I then step drilled the inside until it was 1/2" in diameter. I wanted to bore out to 0.625" but did not have a small enough boring bar. So in the end I just drilled it to 5/8". I then had to add a 0.002" shim around the motor shaft to give me a sliding fit. Not very satisfying but it did work.

I then moved the part to my mill and cut the slot to let the key pass through. The adapter was then sawn off and the end faced on my lathe. A piece of scrap 5/8" diameter stock was placed inside so my 3 jaw chuck could tightly grab the part without distortion.

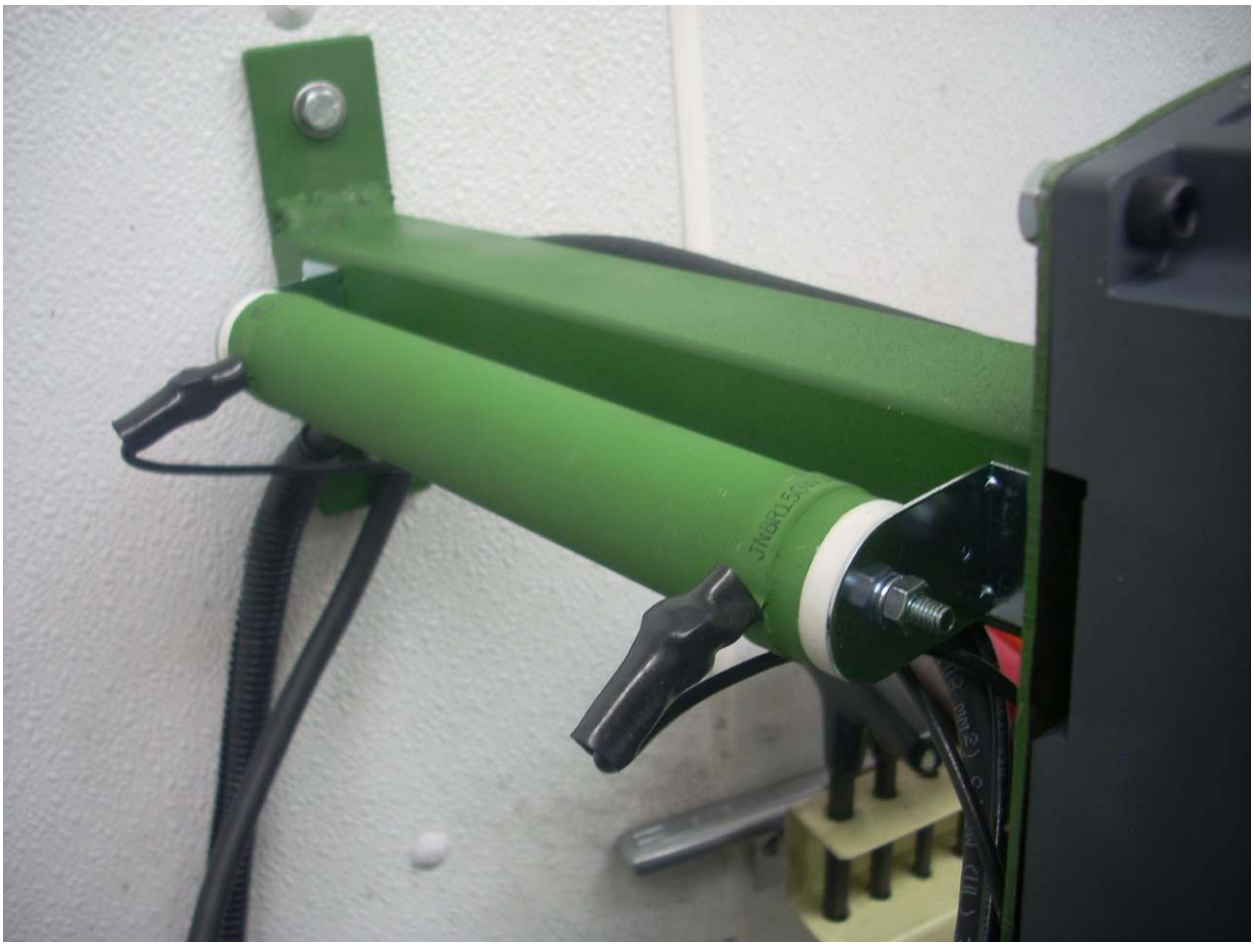
The key looks like a miniature T nut on cross section. It was made from mild steel with care taking to get a close sliding fit.

I wanted the VFD to be about 1' closer to me than if it was wall mounted. I also needed it to be away from the wall because the wall is plastic coated and therefore flammable. The user's manual says I must be at least 2" from such surfaces.
My solution was to cut 1' of 1.5" square tubing with about a 10° angle on one end. This angle let me locate on a stud yet have the VFD facing me at a comfortable angle.

The tube was welding to a piece of 3/8" thick by 1.5" wide strap that was drilled with two 1/4" holes. Lag bolts fit through these holes and into a stud inside the wall.

The other end of the tube was welded to a plate made from 10 gage steel. The plate was cut to match the profile of the VFD.

All cables from the VFD are clamped to the tube for both strain relief and to dress them to the wall.



Here is the left side of the support. It holds my 150 watt braking resistor. This resistor is tucked away so I did not see a need for any mechanical protection.

The take home price was $510 which includes $200 for the motor and $231 for the VFD. Add to that about $30 for a new 240V breaker, outlet, switch, and cover plate. The metal for the adapter sleeve plus support arm was from my own stocks. The enjoyment gained from the installation... priceless.

Acknowledgments

Many people helped me with this project. Brian and Marty of the Valley Metal Club (Phoenix, AZ) kept me out of trouble. "Beevo" from this same club was generous enough to give me the braking resistor. And various other members of the club provided further information. The vendor of the VFD and motor, Dealers Industrial Equipment, were very helpful in suggesting the best match to my needs. Thanks to Brian for suggesting them.

I welcome your comments and questions. All of us are smarter than any one of us.

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