Monarch VMC150 Retrofit

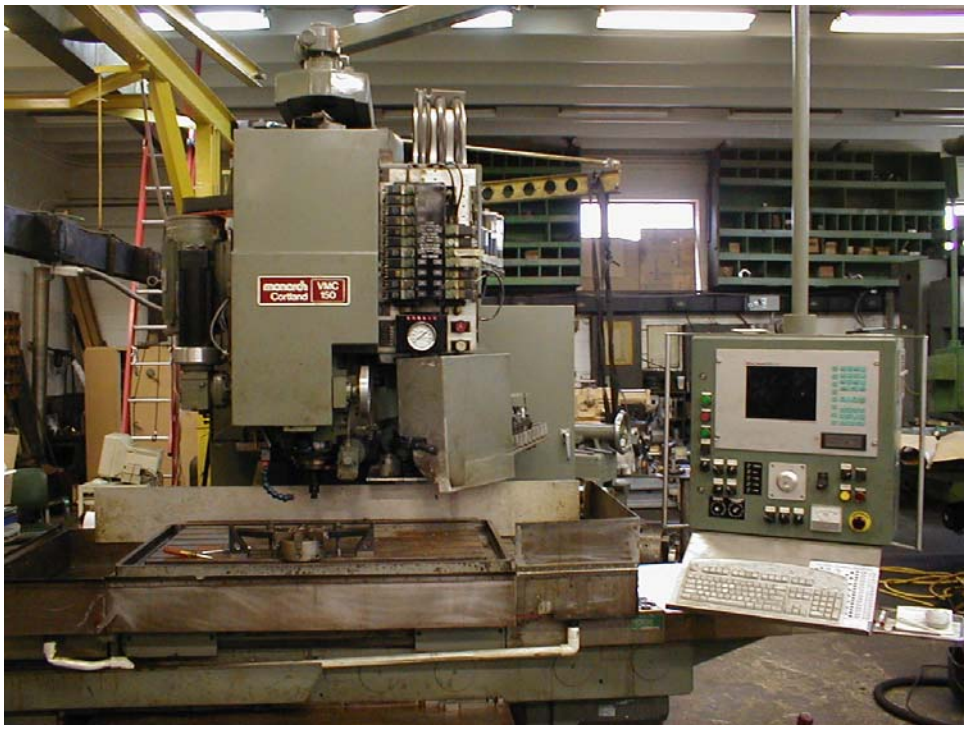
There are many old CNC machines that were built solidly but their electronics are degrading due to age. By retrofitting the machine with new electronics, the machine can run like new. However, the retrofit process can be complicated as the new electronics have to work with the existing mechanical design. If the retrofitter does not understand the mechanics, the transition can take a little longer.

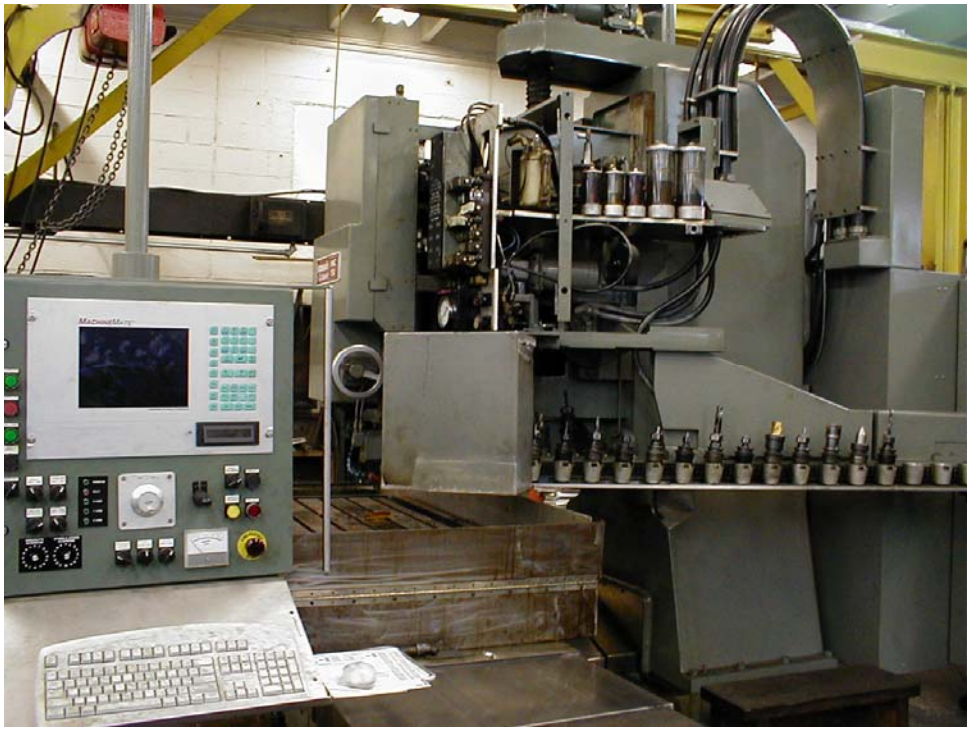
O.A. Caughron is a company, based in Knoxville Tennessee, specializing in 'rapid response' part orders from local companies. In December 1998, OA Caughron began the retrofit of a Monarch VMC150 with a **MACHINEMATE** control. A local vendor had done the mechanical work and the electrical design. OA Caughron contracted Mark Rice to complete the control portion of the retrofit. Mark Rice had done other **MACHINEMATE** retrofits and he had a wide range of CNC experience to help tackle a machine like this. Even though Mark lives in Texas, not Tennessee, the remaining tasks involved the control integration, not all the mechanical work, so the effort required to complete the retrofit did not require too much time. After visiting the customer and reviewing the machine and its prints, Mark was able to complete the PLC application from his home in just a few weeks.

The electrical design of the retrofit done, by the local Knoxville Tennessee company, resulted in more work for Mark than might have been required under the circumstances. For example, several operator buttons duplicated control soft keys so the PLC had to handle the duplications. The override switches were 4-bit gray scale switches, rather than the normal 5-bit, so to get the expected override behavior the PLC had to handle the discrepancy for an acceptable override range. The control had been specified to use Interbus-S fieldbus I/O, rather than a simpler I/O mechanism such as the **MACHINEMATE** Modular I/O that requires no additional PC interface card. The fieldbus interface card requires its own 'network' programming to define the I/O modules connected on the Interbus-S network.

The machine used an air quill for tapping cycles, especially fine threads. This machine feature required special PLC programming to integrate the CNC with the machine for the operation. The PLC would open loop the quill (Z) servo axis when the axis required air solenoid control. The PLC would close loop the quill servo axis when the axis moved under servo motor control rather than air solenoid control. The only PLC requirement for these transitions was no axis motion at the instant the motion control change was made (even when running a part program in automatic mode). Mark was able to take advantage of the clutch to somewhat brake the axis during the transition between air control and servo control.

Part program subroutines were written to replace the old canned cycles provided by the old machine control. This resulted in minimal impact to the part programs involved. The quill processing required the PLC to monitor the CNC axis commands, positions and offsets so that the control could properly imitate the original canned cycles.





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