

Working with Machines in a Shop

Job: Machinist

Background: Tony and Jose are sitting in the machine shop office with a blueprint in front of them. They are experienced machinists who recently learned to work with new computer-controlled (CNC) machines. Each CNC machine has the capacity for performing a wide variety of operations on a single part. Tony and Jose have to plan the sequence of operations and write a computer program in alphanumeric code that instructs the machine on how to carry them out. The particular part they are working on now requires nine different machine tools and ten operations (drilling, milling, threading, etc.) which have to be coordinated in a machining plan before they even approach the machine.

Action: Tony and Jose discuss how they will sequence the turning and milling operations. Tony suggests the possibility of alternating them. Jose points out that it would save machine time if all the milling operations could be done together; they wouldn't have to keep stopping and starting rotation of the part. Tony sees the point but reminds Jose that if they do this, they will have to make sure that the threading is done before any milling takes place: milling thins the part and makes it more subject to bending and this will affect the accuracy of the threading operation. Jose agrees. After they have laid out the full sequence of operations and chosen the appropriate tools, Tony pulls a sheet of line paper from the desk drawer and starts to write the computer program. He specifies the paths the tools have to take to execute the machining plan in terms of points in Cartesian space. As Tony works on the program, Jose uses a hand calculator to figure out one of the part dimensions that was left off the blueprint but has to be specified in the program. When the program is completed they will enter it in the terminal mounted on the machine and test run it without any material. If it works, they will feed in the material and step through the program one operation at a time, correcting as they go, until they are sure they are ready to start up production.

Skills Demonstrated

Resource Management:

Time -- understands the need to plan ahead before beginning job.

Social Interaction:

Works well collaboratively in a team by contributing specific consideration to the final plan.

System Behavior and Performance:

Understands the special capabilities of the new machine and how to sequence operations efficiently. Has expert knowledge of how operation affects various metals. Can link symbolic representation to real world phenomenon through understanding programs which involve new forms of special representation, and has a knowledge of formal mathematics.

Human and Technology Interaction:

Has the ability to select and use appropriate technology to see various ways of sequencing operation to produce the same parts.

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