

8 NUMERICAL CONTROL OF MACHINE TOOLS

8.1 FUNDAMENTAL CONCEPTS, CLASSIFICATION AND STRUCTURE OF NUMERICAL CONTROL SYSTEMS

A machine tool is said to be numerically controlled if it operates in a semi-automatic or automatic cycle as per instructions transmitted to it in a coded form. Strictly speaking, the term 'numerical control' is a misnomer, because the coded instructions are expressed not only through numerals, but also through letters, punctuation marks and other symbols. However, although 'symbolic control' would have, perhaps, been a more appropriate name, the term 'numerical control' (NC) has come to be so closely associated with control through symbols that it is now universally accepted and applied in the latter sense.

It is obvious that numbers by themselves cannot do any work, leave aside operating a machine. A comprehensive electrical, electronic and mechanical processing and transmission system is required to affect the movement of a slide or cutting tool from information coded on a program medium, such as a punch card, punch tape, magnetic tape, etc.

The path from the program medium to the workpiece is often the most baffling, but also the most fundamental to a proper understanding of the functioning of numerical control systems. It, therefore, appears logical that this aspect should be dealt with in the very beginning. The elements of numerical control systems and their operating principle will now be described, starting with the example of turning (Fig. 8.1).

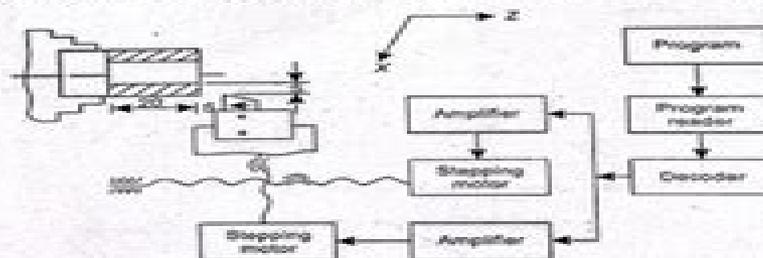


Fig. 8.1 Schematic diagram of a numerical control system for simple turning operation

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