ELECTRIC DRIVE IN MACHINE SHOPS.

At the Philadelphia meeting of the American Institute of Electrical Engineers, Oct. 13, 1913, Mr. Charles Fair read a paper dealing with the possibilities of the electric drive for machine tools. He points out the two important questions before the manufacturer as being to increase products and to decrease cost. Since labor is the greatest cost of production, then, where machine tools are a considerable factor in the production, maximum output from the tool is a necessity. Tools that are limited in production because of a lack of power at the tool are a source of expense to the manufacturer. Power cost is low while labor cost is high. The well designed motor-driven machine of to-day shows the motor as one of the main elements of the tool, it having done away with much of the old mechanical drive, and is no longer a mere adjunct to the tool. Mr. Fair's paper is as follows:—

The importance of the motor drive for the machine shop is every day becoming more evident. Due to the great improvement in motors, accessories and methods of application and to the large number and variety of motor-driven tools in service to-day, the relationship of motors and control to machine tools is much better understood by the machine builder and the user than heretofore and, consequently, comparatively little trouble is experienced with either motors or control for the ordinary type of machine tool. Misapplications of both motor and control occur occasionally due largely to insufficient or unreliable information regarding the characteristics of the machine, but the number of these misapplications is relatively small. The tendency to both over- and under-motor machines is constantly growing less, owing to the large number of tests made and to accurate information available. There is still, however, a tendency on the part of some machine builders to over-motor their machines either with the mistaken idea of the strength of their machine or with the idea that possibly prospective customers will be impressed with the enormous power that their "heavy type" machines take. Conversely, other manufacturers want to show how little power it takes to operate their "very efficient" machines and consequently get into trouble. These extremes are gradually disappearing and a more normal condition is taking its place. In a comparatively short time the greatly over-motored and under-motored machine will be a thing of the past, at least so far as the general type of machine is concerned. A number of manufacturers have already recognized three ratings of motor drive on certain of their machines; namely, heavy, medium and light. Much of the existing trouble in motor applications to special machines or to machines rigged for special operations could easily be avoided if only preliminary tests were made with a temporary motor before making the permanent installation. A not uncommon source of trouble, and one that could easily be avoided, is that of attempting to increase considerably the productiveness of a tool by speeding up the machine, increasing the cuts and attaching automatic feeding devices, etc.; all of which increases production but, in doing so, the motor is often overlooked and, if the tool were originally under-motored and the power is not increased, trouble is apt to result. Increased production often calls for an increase in power although there are cases where this is not true.

To increase production and to decrease cost are two important questions continually before the manufacturer to-day. In the majority of cases labor is the greatest cost of production, thus where machine tools are a considerable factor in the production, the importance of obtaining maximum output from the tool is evident. Although the advantages of the motor drive have been dwelt upon at length numerous times, a brief statement of the advantages derived from electrical installations will perhaps be worth repeating:—

Maximum output of tool due to greater power and overload capacity.—Too much stress cannot be laid on maximum output of tools.

Closer speed regulation.—Allows maximum speed for varying materials and size of work.

Power distribution not only for the tools, stationary or portable, but for cranes, lights, etc.—This means that power and light can be had in any part of the building, buildings or yard, permanent or temporary without regard to structural conditions. Numerous belts obstruct light, whether natural or artificial.

Elasticity in the arrangement of tools.—Tools can be arranged to the greatest advantage for sequence of operation in routing work and for light as well as for compactness when necessary.

Ease of adding new tools and of moving and rearranging tools.—Ease of adding new tools means a great deal in growing plants. Rearranging becomes necessary after reasonable growth or to improvements in methods of manufacture which call for a better routing of work.

Head room for cranes, hoists, etc.—For example, note the expensive manner in which work is often handled because of belt or shafting interference with the installation of cranes or hoists.

Facility for running only such tools as are required, for overtime work.

To a large extent the elimination of belts and belt troubles.

Unobstructed light and sanitation.

Under modern structural conditions, avoidance of the well-understood difficulties of line shaft installations in concrete buildings.

The general use of high-speed steel has made it not only possible, but necessary, for economical production that the cutting speed be increased in order to meet competition. Increasing the cutting speed means more power and while much has been said from time to time regarding the increased production and saving in power due to applying power direct to the tool, yet the writer has very serious doubts if anything like the real importance of this direct application of power is realized in many cases even by those who are advocating it. For instance, the saving of power is looked upon generally as a matter of how much can be saved of the transmission friction load, and though this saving may amount to 50 per cent., it is in many cases only a part of the real saving, as proved by numerous tests made by the writer.

The slipping, due to a belt not being able to pull its cut, means waste power and loss of production. If the cut be heavy enough the maximum slip will be reached when the machine is stalled, the power input remaining approximately the same, the loss being entirely one of friction due to slip in the belt. A familiar illustration of the above is that of an operator decreasing the depth of his cut on account of slow down, because the belt will