Machinery and Mill Equipment

MOTOR DRIVES FOR WOODWORKING MACHINERY.*

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The electric motor, of itself, is not a source of energy in any respect. It affords, however, one of the most economical, flexible, and reliable means for the transformation and distribution of mechanical energy known to modern engineers. A motor without a supply of electricity is as useless a machine as a steam engine without steam.

A consideration of the advantages to be gained from the use of electric motors and the electric drive must, consequently, presuppose that a supply of electricity, obtained either from a central station or from a private plant, is available at all times when the use of power is required. The first matter to be considered, in connection with the adoption of the electric drive, therefore, is the source of electricity.

Due to the improvements in generating apparatus and transmission lines, with their accessories, which have been achieved during the past few years, it has become possible for central stations to generate and distribute current at prices so low that it may frequently become a very close question in any given case whether it is more desirable for a manufacturer to obtain his current supply from the central station or to attempt to install an isolated plant and furnish electricity for himself.

In the case of a factory requiring a large amount of power, located at a considerable distance from an electric station and making considerable waste, it is often found advantageous to install an isolated generating plant. On the contrary, if the amount of power required is moderate; if the power company is located near by and will make a low rate for current, it is frequently the case, especially when the needs of the smaller factories are considered, that it is advisable to purchase the current supply, and thus avoid the expense of installing a generating plant, with its consequent cost of operation and maintenance.

Assuming an average factory requiring 100 horse-power or less, it is, as a general statement, probably more advisable, from every standpoint, to buy current, if it can be bought at about two cents per kilowatt hour, than to attempt to make it. In purchasing current from an electric lighting company, there are marked advantages to be derived from the fact that there is usually duplicate and reserve apparatus in the central station, and that, at all times, the station is in charge of very competent and resourceful men, thereby reducing to a minimum the possibility of loss or damage from a shut-down due to failure of current supply. Very few isolated plants are provided with duplicate apparatus, and in case of damage to either boiler, engine, or the dynamo, a shut-down, involving very considerable losses, is easily possible.

The principal reasons, stated without regard to their importance, which will govern any manufacturer in deciding to adopt the electric drive in preference to the mechanical are: Elimination of waste in power transmission. Increase in production. Improvement in quality of product. Safety to operatives and machinery. Improvement in fire hazard, especially as to open flames and hot boxes. Elimination of belts and shafts, which not only interfere with the proper distribution of light and air, but, as well, limit the location of machinery, and thus frequently prevent that sequence of manufacturing operation which is so necessary to avoid rehandling of work with attendant expense, damage, and congestion. Ability to operate any section of a factory or any individual machine overtime or at unusual hours without putting the whole power equipment of the plant into operation.

In equipping a woodworking factory with motors, and assuming that either direct or alternating current supply may be made available at choice, the first point to be considered is the proportion of tools and machines which require large variation in speed. If the work is of such nature that variable speed tools are not required, then it will be wise to consider the use of alternating current motors, for these motors are somewhat simpler in structural detail than direct current motors, and, furthermore, they are somewhat better adapted to the requirements of manufacturing where dust and flyings are present.

If, then, there are no severe requirements for variable speed work, alternating current motors may be used to advantage, but if there is necessity for considerable variation of speed on the different machines, then direct current motors must usually be chosen, as speed changes are more easily effected over a wider range with the direct current motor than with the alternating current motor. If the required speed changes can be obtained by the use of two or three-step cone pulleys, either motor may be employed. It is hardly considered first-class engineering at the present day to use cone pulleys to effect speed changes, though the writer looks favorably on their use in many cases as providing the cheapest form of speed change, and one that is perfectly simple and has stood the test of time.

Having decided on the type of motor which will be employed, it next remains to determine whether the machinery shall be driven by so-called "group" drive or by individual drive. As the cost of electricity and motors becomes lower, and as the advantages of the individual drive become better known, the tendency to employ a separate motor for each tool is more and more marked. A group drive may be most advantageously employed when a number of similar machines, each requiring a comparatively small amount of power, are kept in continuous operation on the same class of work. The disadvantages of the group drive are found in the necessity for retaining considerable quantities of shafting and belting, all of which are constantly absorbing power wastefully; the variation of speed between the different machine units due to slipping of belts, and consequent loss of production of those that run slowly; the difficulty of arranging the driven machines to the best advantage, so far as the supply of light, air, and their relative positions in regard to the sequence of operations are concerned; the dependence of all machines in the group on one source of power, so that if the driving unit of the group fails, all the machines in the group will be shut down, with consequent loss of production; and the longer time needed

*Read at the meeting of the National Association of Box Manufacturers.