Topic 6 Section 6

Managing Plant

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The two most important considerations necessary for efficient plant management are:

- Select the right type and size of plant for the work to be done
- Organise the job to ensure that all items of plant are kept working to capacity.

Sometimes the most suitable item of plant will not be available and a less satisfactory machine will have to be used. In this case, the best procedure is:

- Decide which alternative plant item would be most suitable for the work
- Find out what plant items are available and choose that which has the power, speed, capacity, etc. closest to the job requirements.

The following discussion covers the subject in terms of plant selection, plant availability and the role of the supervisor in managing plant. Other aspects of the use of plant and machinery on the job are covered in more detail in the following Topics in this training series:

- Topic 2, Planning and Scheduling (see especially Section 2, Determine Resources)
- Topic 3, Estimating and Cost Control.

Plant Selection

It is not possible to give strict rules for plant selection since the plant, labour and materials vary from job to job, as do the job requirements, soil conditions, weather, season and locality. There are a number of factors that will affect plant selection and performance:

1. The size of the job — large jobs warrant the hiring of large, highly priced machines because their greater outputs will reduce operation time and give lower costs per unit of production.
2. Site conditions — plant output is greatly affected by such site conditions as:
   - Type of local materials - trees, rock, clay, sand, gravel etc.
   - Loading, compaction characteristics and weights of material.
   - Quantity of each material (e.g. volume in cubic metres).
   - Distances over which materials must be pushed or hauled.
   - Steepness and direction of grades
   - Footing for traction and flotation - rough, slippery, wet, soft, loose firm, smooth, sharp, abrasive etc.
   - Space available for equipment maneuvering.
   - Relative cost-saving importance of speed and mobility in going from one assignment to another on the project.
   - Auxiliary machines required for maintaining haul roads, assisting in loosening, loading, dumping and compacting materials, and for moving plant on and off the job.

3. Any time limitations (i.e. completion deadlines)
4. Nature of the work to be performed
5. The cost of hiring and operating the various machines
6. The work output expected from each machine in view of the nature of the work and the site conditions
7. The characteristics of available machines. Important aspects would include:
   - Whether the machine is crawler mounted or rubber-tyred.
   - The power needed to overcome resistance to movement as a result of the condition and grade of the surface.
   - The power available at various speeds in various gears.
   - The loss of traction due to underfoot conditions.
   - The cycle of operations of the machine and time taken to complete one cycle or round trip.
   - Dependence on other machines.
8. How each machine's capacity balances with that of other plant to be used on the same operation.

Having considered these points, it becomes possible to say what plant items are most suited for the job and the next consideration then is plant availability.

Plant Availability

In making decisions to select plant for the job, the following factors should be considered regarding availability:

a. Plant items already on the job
b. Plant available for transfer from within the district or from other districts
c. Plant available for hire locally
d. Plant available for hire throughout the state
e. Specialist plant items that may have to be purchased
f. Period during which plant is likely to be available.

The aim must be to keep every plant item on the job, working for the maximum possible time. This does not mean that a plant item should be used on a task for which it is not suited.

If consideration is being given to hiring privately owned plant, the following must be determined:

a. Is it the cheapest and/or most cost-effective machine available?
b. Is it suitable, safe and in sound working condition?
c. What is the all-up hourly hire rate and anticipated hourly output?
d. How much will it cost to get it onto job and to return it after the job?
e. What company plant items will be idle if this machine is hired and what are the hire costs of these items?

The item of plant which (in conjunction with other available plant if applicable) produces a unit of work at the lowest unit rate is the item to be selected. This will not necessarily be the item with the lowest hire rate.

The Supervisor's Role in Plant Management

The way the job is supervised and managed has a strong influence on plant output and hence the cost of the job. To maximise productivity on the construction site, supervisors should focus their attention on the following two areas:

- Estimating and supervision
- Knowledge of plant performance.

Estimating and Supervision

A large part of the money spent in road construction goes on plant operations, so the job supervisor needs to spend a large proportion of his/her time on plant supervision and management. The supervisor should:

- Work with the supervising engineer to estimate the anticipated (target) output per hour, per day or per week (as appropriate) for each machine. Then select the plant to be used and estimate the plant hours required to complete each major task.
- Work with the cost clerk to estimate, from plant hire and wages etc., the cost of completing the work in the programmed time using the plant selected. Check to ensure that the work can be performed within the total amount provided in the estimate.
- Study each operation carefully as it begins and check cycle times etc. to see if improvements can be made.
- During the progress of the work, check that target outputs are being achieved (i.e. by using bar charts).
- Always think ahead and anticipate problems. What happens, for example, if a grader or roller breaks down? Have an alternative plan ready.
- Ensure that the plant fleet is balanced, i.e. machine capacities are matched as far as possible, e.g. loader output matches trucking capacity.
- Ensure that operations are properly directed by a plant supervisor.
- Watch plant operations closely for faulty techniques and have these corrected. (Poor operating techniques can reduce output by 50%).
- Use good communication and human relations skills to get the best out of the plant operators. They are key people on the job.
- Ensure machines are not abused. If a machine has to be continually pushed beyond its capacity, look for a better way of doing the job or get a better machine.
- Check that the servicing of plant is being carried out.

Knowledge of Plant Performance

In order to carry out the duties listed above the supervisor needs a working knowledge not only of the characteristics and capabilities of machines but also of the factors affecting plant performance.

Plant performance (output) is affected by the following factors:

1. Speed of operation
2. The properties of the material being moved
3. Carrying capacity of the plant
4. Efficiency
5. Forces resisting movement:
    a. Rolling resistance
    b. Grade resistance (and assistance).
6. Available power
7. Traction and Usable Power.
8. Haul distances and haul road conditions
9. Accessibility of the job site
10. Time spent in servicing and plant inspection
11. Time spent in unproductive work
12. Overtime work
13. Natural disasters (e.g. floods).