MANAGEMENT TECHNIQUES APPLIED TO RIGHT-OF-WAY TREE MAINTENANCE[1]

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In 1973, Duke Power Company began to evaluate the methods available for measuring the amount of distribution right-of-way maintenance being accomplished from the dollars we were investing in this area. The dollar figures indicated a large portion of our total maintenance expenses was in the right-of-way maintenance area, yet we had no standardized method of seeing the results of the trimming. We recognized that developing a standard method would require a detailed description of the work being performed. At that time, right-of-way maintenance was being scheduled, using several methods. Some locations were assigning geographical areas or sections to be trimmed, while others were assigning circuits and substations to be trimmed. Crews were scheduled out by these methods, with supervision auditing the work from a production and quality standpoint.

Measurement of the amount of trimming by the number of areas or circuits seemed far too general for our needs. The amount of trimming required varies greatly with the size of the area and/or the density of trees. It was decided to divide the right-of-way maintenance work into a set of work units we called assemblies. Other companies may refer to these as work standards or benchmarks. The assemblies would describe the work to be performed in such a manner that the amount of time could be estimated for any area, circuit or special job.

Before getting into the actual creating of work assemblies, let's take a look at the criteria that we established for the assemblies to satisfy. The criteria give some insight to goals for both now and in the future. The assemblies must: 1) describe a standard unit of work, 2) have sufficient accuracy to schedule a day's work, 3) provide performance data, 4) indicate the preferred type of crew, 5) be unique to account numbers, and 6) be associated with a dollar cost.

The assemblies will describe units of work that will be standard or the same throughout our system. All crews will be working with the same standard assemblies whether they are working in the city or county, mountains or flat country.

The assemblies will be accurate enough to assign or schedule a day's work for a crew. Although some jobs or projects may last a week or longer, a supervisor would have an estimated time of completion available to assist him in the next assignment for the crew. A backlog could build up if the tree work were pre-estimated.

The performance of the crews and crew types must be measured. The actual time spent working on the assemblies should be compared to the estimated or standard time allotted to the assemblies. We will always be trying to improve crew complements. The proper number of men and classification are factors to be considered. As new equipment becomes available on the market, performance data can aid tremendously in providing a fair evaluation.

The assemblies will indicate the most preferred type crew for a particular job. We all know that a conventional crew will not be able to trim trees which are accessible by a vehicle nearly as fast as a bucket crew with an aerial device. Supplying a crew with men and equipment best suited to the work to be accomplished is one of our goals toward an efficient right-of-way management program.

Each assembly will be unique to an account number or have provisions to charge the account number when applicable. The distinction here is to get the assembly work charged into the proper maintenance or capital account. The assemblies should do the accounting for the crew rather than require the crew to be an accountant.

The assemblies will be associated with a cost. We must have a way to get the dollars based on the number of assemblies completed to allow

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forecasting of future expenses.

Now that we have established our criteria let's look at some of the first considerations for dividing the work into assemblies. How about dividing the work into two assemblies?

(1) Trim one tree

(2) Remove one tree

This would give us the number of trees which were removed and trimmed. By using an average time per assembly, we could predict future trimming requirements. Comparing these two assemblies to our criteria, items 1, 5, and 6 are satisfied but items 2, 3, and 4 are not. Looking at why the above did not satisfy our criteria assisted us in narrowing down the possibilities.

Scheduling a day's work. One crew assigned 10 trees to trim during the day may only complete trimming on 3 trees due to their size. Another crew may finish trimming 15 small trees in a day's work.

Performance. Crew performance can be measured by comparing the estimated standard time versus the actual time. All crews will be compared to the same standards. Using the assembly TRIM ONE TREE, a crew in one location with mainly large trees could not be fairly compared to the same crew working in a location with mainly small trees. The size of trees were divided into three categories — 4-12 dbh, 13-20 dbh, and 21-over dbh. They are in inches of diameter at a point 4½ feet above ground (Diameter Breast High or dbh). By the same token neither can a roundover be compared to a side trim. Types of trimming were classified by the following definitions.

Roundover — Roundover one tree in accordance with Distribution Manual Sheets P-1.12 through P-1.18.

Side Trim Light — Trim side of one tree in accordance with Distribution Manual Sheets P-1.12 through P-1.18. Light trimming can be performed with a pruner.

Side Trim Medium — Trim side of one tree in accordance with the Distribution Manual Sheets P-1.12 through P-1.18. Branch size requires use of hand saw for removal.

Side Trim Heavy — Trim side of one tree in accordance with Distribution Manual Sheets P-1.12 through P-1.18. Heavy trimming requires the use of power saw.

Preferred type crew. Trimming is basically accomplished by two types of crews on our system, conventional and bucket crews. We decided to use the following definitions to indicate the preferred crew:

Front Line — Along a street, alley way, or any location accessible to a tree equipment vehicle

Back Line — An area not accessible to a tree equipment vehicle.

One other area needs to be stabilized before we start writing out assemblies for tree maintenance work. Brush cutting is needed periodically to maintain right-of-way conditions where lines are accessible to line construction vehicles and restringing of wire can be performed expeditiously during emergency storm outages. We adopted industry standard definitions for trees and brush:

Tree — A woody plant 4 inches or larger dbh.

Brush — Plants with a dbh smaller than 4 inches. Brush will be measured in square yards. Brush shall be cut in accordance to Distribution Manual Sheet P-1.28. (4840 sq. yds. = 1 acre).

Brush assemblies will be made to indicate the type of equipment to be used since some equipment is considerably faster than others (not necessarily less expensive).

Putting all the definitions together to describe the work, we created a group of assemblies which are self-explanatory if one is familiar with the basic definitions above.

Front Line Removal 4-12dbh
13-20dbh
21-Over dbh
Back Line Removal 4-12dbh
13-20dbh
21-Over dbh
Front Line Roundover 4-15dbh
16-30dbh
31-Over dbh
Back Line Roundover 4-15dbh
16-30dbh
31-Over dbh
Front Line Side Trim — Light
— Medium
— Heavy
Back Line Side Trim — Light

— *Medium*
— *Heavy*
Brush Cutting (4-5 yr) — *Hand*
— *HOG*
— *Kershaw*
Brush Cutting (6-8 yr) — *Hand*
— *HOG*
— *Kershaw*

Once the assemblies were made and given a standard manhour figure, how did we use them? Some district locations began pre-estimating projects for tree crews and believe it is well worth the extra cost of sending a man in front of the crew to draw up the jobs. If necessary, this person will contact customers prior to the arrival of the crews. Locations using this method believe that sending a tree crew out without a drawing or job would be the same as sending a line construction crew to build a line to a customer without a pre-engineered job. One of the main advantages of pre-engineered work seems to be getting the best *type* crew to do the job. A conventional crew might take hours to do brush cutting which could be done in a few minutes with a brush hog.

Other locations are self reporting the assemblies described above. As the assemblies are performed, they will be indicated on a log sheet carried by the crew. The log sheet will show the total quantity of each assembly and the total time spent working on the group of assemblies. This time will be compared to the estimated time for the assemblies to give the crew performance. Also, the quantity of assemblies can be obtained over any time period for each crew, crew type, and contractor. Totalizing of the quantities of assemblies will be extended to location, division, and system reports to assist in budgeting future needs.

Both methods of using the assemblies (pre-engineering and self reporting) are being used. Local option is available to our locations for reporting tree maintenance work since the input data and output reports will be the same.

Our first generation of output reports showed quantities of assemblies and their associated estimated and actual manhours along with an efficiency ratio which is the estimated MHs $\div$ actual MHs $\times$ 100. As mentioned earlier, they can be accumulated by crew, crew type, and contractor and totalized by location, division and system.

The second generation of output reports which are being programmed will add the dollar cost by assemblies. The dollar cost will be the actual crew and equipment costs rather than some estimated or averaged cost. The cost data will then provide information such as our actual system cost to remove a 13-20 dbh tree, cost to side trim a tree, cost for a conventional crew to remove a square yard of brush versus a kershaw cutter, cost of a three-man conventional crew to do an assembly versus a four, five, or six-man crew, etc. We believe the addition of the dollars to the reports will provide a much clearer picture of our program that can be projected by the use of manhours.

Briefly, we would like to expand on another use which was made with our assemblies. Utilizing sampling techniques we chose a geographically random sample of spot locations on our system in several divisions. Each spot was a square containing 2000 ft. sides. The trees which were growing into our lines or would be in our lines within the next 5 years were surveyed. In the sample locations, assemblies were estimated and placed in the year the trees actually would touch our lines. By using the sample data, we projected a picture of what our present tree conditions were and what to expect in the future. The conditions and extended forecast comprised of assemblies gave us some data to either verify or not verify the opinions and statements made by supervision in the past. Some of the more generalized conclusions were as follows:

1) Some locations are behind in their right-of-way maintenance because a sufficient number of crews were not available.
2) Some locations are behind in back-line trimming and should have more conventional crews to correct their conditions.
3) Large crew reductions in 1974 and 1975 due to austerity did not drastically increase their right-of-way maintenance conditions in all areas even though the growing season was longer during 1975. These locations had very little backlog of work in 1975 because of their efforts the previous year.

4) An additional brush hog is needed on a full-time basis in one division.
5) Our present tree conditions predict a variance in work load from year to year. The sample indicated a shift of 1975 work into 1976 as expected by the crew reductions. This will cause our work loads to peak in 1979, 1981, 1984, etc. Hopefully we can smooth or balance out our peak work load during the next five years.

Although we feel we have come a long way toward successful management of our distribution right-of-way maintenance by creating assemblies and using sampling techniques for forecasting, Duke Power Company has only begun to meet our goals of improving our maintenance work. By using these new tools to monitor our work, we will in the future be continually evaluating in more detail subjects such as crew complements, equipment usage, contractors, and our organization for supervision. Research needs to be done to find better ways to schedule work assignments and measure or audit the quality of our right-of-way maintenance work.

We are all familiar with the high degree of professionalism given to the art of trimming and shaping our trees. We at Duke Power Company have attempted to retain this professionalism by establishing similar production techniques used by other areas of industry to monitor the production and quality of their product. Right-of-way maintenance by our Company is considered an important area which affects the environment in which we live. For this reason we will be continually upgrading where possible our own production techniques.

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ABSTRACTS

KEMMERER, H. 1979. **Transplanting large trees.** Grounds Maintenance 14(9): 22-24, 58.

The best way to have large trees in the landscape without waiting is to preserve existing trees during landscape development. Barring this, transplanting has merit. Trees of suitable size and quality can be purchased from nurseries, collected from the countryside or moved from another area within the grounds. There are several techniques for moving trees. A tree spade digs, lifts, transports, and replants the tree with a ball of earth in one operation. A more conventional approach is to dig the ball separately; burlapping, lifting, transporting, and replanting are completed as separate techniques. Another procedure is to grow the plant in a container (usually a box) in the nursery. When it is ready to be planted, it is transported to the site and placed in the hole; the box is removed and the hole filled.

NATIONAL ARBORIST ASSOCIATION. 1979. **Safe chain saw use linked to technique, size.** Weeds, Trees and Turf 18(8): 16-18.

Although chain saws have made the work of the arborist easier, improper use can result in personal injury. The potential for accidents seems to have increased in direct proportion to chain saws decreasing in weight. When using a chain saw, personal protective equipment must be worn. This includes work gloves, hard hat, and safety shoes. Ear protection should be worn if there will be prolonged exposure. A chain saw operator should never work alone. Only experienced personnel should use a chain saw aloft in a tree. Most chain saw accidents are a result of the saw kicking back. This can occur if the chain suddenly hits a solid object or takes too large a cut. The chain stops for an instant transferring the engine torque to the bar and engine. Proper hand holds and stance can prevent an accident from kickback. Each chain saw operator has a responsibility to himself to function safely. Carelessness can and will result in injury.