

A PROGRESSIVE APPROACH IN PRODUCTION IMPROVEMENT FOR TREE TRIMMING¹

by Stephen M. Genua

Meeting Washington's energy need for reliable electrical service is paramount in the overall goals of the Potomac Electric Power Company. The Company is headquartered in Washington, D.C. It provides retail service to almost two million people in a compact, heavily populated service area of 638.43 square miles. The area includes all of the District of Columbia; 61 percent of Montgomery County, Maryland; 51 percent of Prince George's County, Maryland, and 12 percent of Arlington County, Virginia.

In managing the tree trimming program, the goal of the Forestry Section is to aid in maintaining continuity of electric service by providing adequate line clearance to the overhead line facilities at the least cost. The general tree trimming policy is to provide this adequate line clearance on the PEPCO electric system in approximately a two-year rotation period. The line clearance operation is performed by contract personnel with their most efficient equipment as specified in the contract agreement. The Potomac Electric Power Company utilizes a professional forester and his staff in administering the contracts.

In 1935, we contracted for our first tree trimming crews. They were such a success that in 1937 we disbanded our two company tree crews and added three additional contract crews. In 1946, we contracted our first tree trimming crews in the District of Columbia. Since that time, we have enlarged our work force to our present day status of 48 contract tree crews totaling 120 people. We are presently in our 1980-81 (8 quarter) two-year rotation cycle. Currently our maintenance schedule calls for 12 subsections to be completed each quarter.

There are two classifications of crews within our work force. A routine crew is assigned regular maintenance work in a specific subsection. A special crew is assigned to construction work, system complaints, excessive time consuming

tree removals, special feeder work, high spotting and storm work. The majority of the bucket and manual crews are radio equipped and utilize a trailer type chipper. Each crew is equipped with power saws, ropes, extension ladders, if necessary, approved growth inhibitor tree paint, safety equipment as required under OSHA regulations, and the best possible hand tools and accessories obtainable for tree work.

To reiterate, our primary goal is to maintain continuity of reliable electric service to the customers at the least cost. The means of measurements to monitor our efficiency is production. Production identifies positive and negative management decisions. Negative indications can be capitalized on. Alternative solutions can be instituted for a possible positive gain in production. On the PEPCO system, we define production as the number of manhours required to trim or remove a single tree, with a minimum diameter breast height (dbh) of four inches. In the removal process, if trees are below the four-inch caliper, they are grouped together to meet the qualification to be counted as one removal, i.e., two 2-inch dbh trees count as one removal. Production can be recorded with relative ease by the crews on their daily time sheets. This information is recorded as the number of trees trimmed and/or removed with the appropriate time to perform that operation.

One of the first approaches to maximum efficiency was to determine the optimum crew size for a particular crew type, whether it be a manual or aerial lift crew. Historically, before the advent of the aerial lifts, the manual crews usually had seven persons per crew. These crews have been reduced to our present crew size of four-men manual crews and two-men aerial lift crews, and one-man pick-up trucks; these changes are due to the economic feasibility, mobility, and the introduction of aerial lift trucks.

One of the most important factors that we can-

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not stress enough is proper supervision. "Supervision does not cost — it pays" is more applicable today than ever. Intensified supervision by PEPCO and the contractors looking at their overall job and seeing areas of improvement on which they can capitalize, provide a better, more competent job for PEPCO.

Some pronounced factors, which we feel have a bearing on the production rates of various tree trimming crews are:

a. Type of pole line construction; secondary, primary, armless or cross-arm construction of various configurations and voltages.

b. Location of the pole line in relation to tree planting or existing tree growth; determining the type of tree trimming required, such as, rounding over, directional, side, etc. Many trees have a large percentage of their crowns overhanging the conductors which sometimes necessitates the removal of large overhanging branches and dead-wooding the tree.

c. Traffic conditions. City or suburban areas where constant traffic and parking problems require additional personnel, as a flagperson for safety purposes, require that a specific location be covered more than once to trim areas where vehicles had been parked.

d. Tree species. Different species require more or less trimming due to the differences in structural strengths, growth patterns, and growth rates.

In the last decade, technology has not advanced with any new breakthroughs in tree trimming equipment. Refinements in aerial lifts utilizing hydraulic power tools, such as the pruner, chain saw, buzz saw, and lately the hydraulic pistol-grip chain saw, can improve production if the local conditions permit their use and a properly trained tree trimmer can utilize each tool to its maximum efficiency.

The implementation of the 4-day (10 hr/day) week instead of the traditional 5-day (8 hr/day) week has provided two benefits. The first is the increased production brought about by less travel time, unnecessary movement, and more available time to work in congested areas. The second benefit is the reduction of the fuel costs of the contractor which is reflected in the Company's

costs for the services provided by the contractor. In order to insure adequate coverage by our line clearance personnel during regular work days (Monday through Friday), the contractor provides the following work force: 50% on Monday and Friday and 100% on Tuesday, Wednesday, and Thursday.

Our latest advance towards increasing production has been the categorizing of crews into routine and special crews. The routine crews report directly to a specifically assigned subsection every day and continue working there until the subsection has been completely trimmed. This reduces the crews' travel time, supervisors know where each routine crew will be working every day. The crew foremen are able to plan their day by knowing what has to be accomplished. The end result is fewer skips and continuity in completion of a subsection.

The special crews perform work in any subsection. In effect, these crews are the "hot-shot" or "hit and run" crews. The special crews amount to 20% of an entire work force. They must be able to perform difficult assigned tasks and must present themselves in a favorable image to the public representing their company and PEPCO. This is not to say the routine crews are not required to maintain good public relations too, but the special crews have more exposure, therefore, must be more experienced in dealing directly with the public. We introduced the special crews in 1980 and deducted travel time from their production records.

To better evaluate production in each area, we established certain production objectives. It is our opinion that 100 routine tree trimmers working on scheduled trimming (2000 hr/trimmer), at a productivity rate of 0.85 to 0.90 manhour/tree will trim and/or remove between 222,000 and 235,000 trees each year. Also, 20 special tree trimmers working system trouble spots (2000 hr/trimmer) working at a productivity rate of 3.0 to 3.5 manhours/tree will service an additional 11,000 to 13,000 trees each year. At this rate, we plan to work on a total of 446,000 to 496,000 trees in a 2-year period.

In 1967, our annual tree trimming expenditures amounted to \$466,000 for 106,281 trees

trimmed or removed with a complement of 99 people. This gave us 1,073 trees trimmed or removed/person/year or a cost of \$4.50/tree. In 1975, our expenditure amounted to \$787,000 for 114,670 trees trimmed or removed, with a complement of 86 people. This gives us 1,333 trees trimmed or removed/person/year or a cost of \$7.00/tree. In 1979, our expenditures amounted to \$1,127,000 for 178,018 trees trimmed or removed, with a complement of 104 people. This gave us 1,711 trees trimmed or removed/person/year or a cost of \$6.00/tree.

According to the U.S. Bureau of Labor Statistics, the inflation rate in the Washington Metropolitan Area from 1967 to 1979 was 117% during the 13 years. Tree trimming costs per tree have risen 44% during the same period. There has been a substantial increase (59%) in the number of trees trimmed or removed per man in the last 13 years, and production costs have maintained a level below the inflationary rate.

Our work load of tree trimming will continue to increase due to the large number of new subdivisions that have been developed since 1960 on the PEPCO system, resulting in trees planted by local governments, private individuals, developers, and nature. Montgomery County planted an average of 10,000 trees per year and the District of Columbia Tree Division planted 3,500 per year from 1950 to 1960. Current records indicate that Montgomery County has had a gradual decline since 1960 to their present status of planting 1,000 trees per year, while Prince George's County and the District of Columbia Tree Division are planting on the average of 3,500 trees per year. We cannot determine how many of these trees were or will be planted underneath our wires. However, efforts are being made by PEPCO to influence the counties to plant low-growing and flowering-shrub type species where possible.

Our primary monitoring system is production analysis on a monthly basis, utilizing present objectives for comparisons. These objectives are the average length of time (manhours) required to trim or remove a tree. They are determined from empirical data with an improvement factor added as a realistic goal. Each day, time sheets are sent

into the company by the individual crews. In addition to invoice information, the time sheets include tree crew type, location of work (specific subsections), work units (number of trees trimmed and/or removed), number of loads of chips, and the number of hours required to perform the task.

This information is taken from the time sheets and recorded on the data sheet for the day. The data relative to production, are computed to form the criteria for manhours per tree trimmed and manhours per tree removed. These data are then associated on a monthly basis through the use of a computer system. The total system analysis is further broken down into an area analysis and finally into individual crew analyses. If the scores are greater than 15% differential from the projected goal in manhours per tree trimmed or removed, the management is then able to respond and make necessary changes, adjustments or corrections in personnel, equipment or location. In certain locations throughout Washington, D.C. and the surrounding county areas where large trees exist, production will decrease. In the outlying areas, the number of work units is of higher density but smaller caliper and there is an increase in production. In rural areas, fewer cuts and clips have to be made, the tree equipment location and maneuverability is less time-consuming, governing restrictions are fewer, traffic is easier to contend with, and the attitude of the tree trimming personnel is improved.

Another method of monitoring is by the semi-annual line clearance crew evaluation reports. The crew's performance scores are compiled and a comparison is made with other crews. Those crew scores which are considered to be less than acceptable receive extra supervision, training, or corrective measures. A weekly tree crew inspection report is submitted by company personnel observing tree crew operations. This report also indicates the frequency of observation and notes any irregularities. These systems are open for constructive criticism, comments, suggestions, and deletions from the people they are serving. From time to time they are revised and up-dated as the situation demands. The ratings of this system aid in encouraging good tree trimming crews to maintain their confidence and good

standing, and encouraging below average tree crews to upgrade and improve deficient production.

To visually see our tree trimming operations from a logistical standpoint, we utilize maps of each separate area. We have designed a plexiglass overlay in which each area is subdivided into the sections and subsections. Each type of crew is color coded and plotted at their work location. We can note our areas of concentration, new construction work, system complaint work, routine work, and special feeder work. Also indicated on the maps are the subsections which have been completed. The maps are used to determine the most efficient starting location of the crews. The maps are also utilized as a training aid, an overview of the entire tree trimming function, and as a management tool in projecting future tree trimming operations.

Through the use of our computer system, each tree that has been trimmed or removed is recorded. Hence, we are able to determine the approximate number of trees that require line clearance during our 2-year rotation period. We are better able to project our future scheduled maintenance programs in each area with this information.

In 1977, we began a study of the different methods of applying growth regulators. These basic methods are foliar spray, injection and bark banding. The foliar spray method does not offer any possibilities for our system because of the hazard to plants and property from spray drift. The injection method is difficult to explain to the public. Bark banding offers a suitable application method in an urban area. In 1980 we began our third year of experimentation. So far, our results have been impressive. We have had growth retardation of up

to 51%.

Under certain distribution lines, we are permitted to remove, instead of trim, the small trees and brush. After removal, the stumps are sprayed with a herbicide to deter sprout growth. In the past fuel oil has been used as a carrier for the herbicides and comprised over 97% of the solution. In 1980, we experimented with a herbicide that used water as a carrier. The herbicide, Tordon 101RTU, comes from Dow Chemical Company, premixed and ready to use. It is applied with a 1-quart plastic hand sprayer. There is a cost saving of approximately 65%. The new method also eliminated the need for the 300-gallon spray truck and the 5-gallon back-pack sprayers. It should also reduce labor costs.

In an effort to increase production, several types of equipment are being tested for their productiveness. The three major pieces of equipment are: the hydraulic pistol-grip chain saw, which allows quicker maneuverability for the tree trimmer and less fatigue; the hydraulic buzz saw for removing sucker growth, especially on the interior of the tree area on large elm trees; and the hand-held hook saw, which is faster than a regular tree saw.

The tree trimming program is a vital and necessary support unit in maintaining reliable service to our customers. We feel this support unit should never be second rate in staff or in management. Every possible resource available is being studied to obtain the maximum quantity and quality control needed for Potomac Electric Power Company.

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