GETTING STARTED ON A DATA DEVELOPMENT SYSTEM

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Experience has shown that getting started is the most difficult part of any program to develop data for improving maintenance. Why? Principally because engineers and administrators who want to undertake such a program immediately encounter four major problems: (1) What kinds of data will be needed, (2) how can these data be obtained, (3) how should they be developed, and (4) where can personnel to conduct the program be obtained?

Now your first reaction might be that the engineers and administrators shouldn't have much difficulty in solving these problems if they really want to undertake an improvement program. But, experience has shown that they are real stumbling blocks that require months or even years to get solved. Virginia is a good example. It was a full six months from the time that initial discussions regarding a maintenance research program and a program to develop data were begun until work actually got under way. There are other States that are interested in such programs and they have been working on it for a couple of years or even longer and have not yet managed to get into the active phase. Let us take a look at each of these problems and see why they present such difficulties.

First, what kind of data will be needed? Mr. Jorgenson and Mr. Leigh have already given us a good description of the kinds which have been found necessary in Virginia. To a large extent, these will be needed for any broad field program to improve maintenance performance. Why do we need so many different kinds? In order to answer this question it is necessary to recognize that highway maintenance is a very complex field. There are about 150 distinct activities which vary widely as to nature, extent and frequency of occurrence. Further, the performance of each of these activities is influenced by a variety of factors. For example, let us take tractor mowing which is the principal activity involved in vegetation control. Its performance is influenced by mowing standards, roadway design, terrain, weather, type of equipment, work methods, labor and equipment time utilization, production rates and several other factors. It is even influenced by the interaction from other operations such as weed spraying. Similar lists could be prepared for each of the other activities which have been outlined by Mr. Jorgenson and Mr. Leigh. In order to substantially improve any maintenance activity, it will be necessary to have data concerning not just one or two, but all of the factors which have a major influence on performance.

It all boils down to this: In order to realize an overall improvement in maintenance performance we must have detailed factual information about nearly every aspect of maintenance. And this is a very large order, which bring us directly to the second problem. How can these data be obtained? Some engineers and administrators make the mistake of assuming that there is an easy solution.

After all, the current reporting systems in their organization already produce a great deal of data concerning expenditures, general type of work performed, material utilization, and so forth, which logically should satisfy requirements. Unfortunately, practically all of these reporting systems are designed to produce fiscal data, rather than the data which are needed for improvement. These fiscal data are so inadequate or lacking in details that they really have very little value for our purpose.

How then can the needed data be obtained? The only solution which has proven feasible is to conduct a comprehensive program of maintenance research similar to the work which is now underway in Virginia. Such a program involves a whole series of special investigations. In some of these, research personnel obtain data directly from field observations; in others, as Mr. Leigh pointed out, regular maintenance employees working under the direction of research personnel supply the needed data. Generally it takes about one year to accumulate a basic fund of the data needed for improving performance. However, this does not mean that we can then stop collecting data. Rather we must continue because there is need to continually update this information for future use.

Now, let us consider the next problem. How should these data be developed? First let me say that in my opinion the real problem is not what techniques to use for analyzing data but rather what process to use for development. There is only one real solution to this problem. Someone has to sit down and (1) analyze all of the data which concerns the factors influencing a particular activity or groups of activities, (2) pinpoint those areas which need improved performance, and (3) outline the necessary changes to obtain the improvement. There is also one final step that is vital to any full development program. The results must be utilized. Too often the research personnel who analyze data tend to adopt the attitude that here's what ought to be done--now it is up to somebody else to take the ball. When this happens, nine times out of ten, performance will not be improved in actual practice.

Here again a comprehensive program for maintenance research is advantageous for it can easily provide the means for both developing the data and testing results under actual field conditions.

To illustrate the possibilities I would like to use an example from the Iowa maintenance study which was conducted in 1959 and 1960. While this particular research effort was largely limited to collection and development of data, in one case the process was carried through an actual field test. The activity involved was sealing which was widely used in Iowa for repairing deteriorated bituminous surfaces. A great deal of data concerning this operation was obtained from special investigations over a one year period. Analyses of this data showed that there were wide variations in work methods, crew sizes, type of equipment, labor equipment, time utilization, material application rates, and some of the other factors which had an influence on performance. Research personnel were convinced that both performance and end results could have been substantially better in many cases. Without going into details, the researchers prepared a plan for sealing deteriorated areas on a specific road section, utilizing the work methods, equipment complement and crew size that they thought were the best for that particular situation. This plan was tested using regular State maintenance employees and equipment at hand. Results exceeded those which

had been predicted. Most important of all, some of the concepts which had been tested were later adopted as standard by the State.

The last problem on our list is, where can personnel to conduct the program be obtained? This is probably the most serious of the four problems which face administrators and engineers. All of us know how difficult it is to obtain qualified personnel under any circumstances. When we consider that maintenance organizations have very limited staffs it is easy to see that the problem could be particularly acute for them.

There are at least three possible solutions. First, the maintenance organization could form a special staff group to conduct an improvement program by drafting personnel from other organizations within the highway department or hiring new employees. Second, the program could be turned over to a highway department's research organization. However, this might merely be a case of passing the buck with the research organization forced to follow the same procedures of drafting or hiring personnel. Third, and perhaps the most obvious solution is for the maintenance organization to employ a consultant. Each of these courses has certain advantages and disadvantages. In many cases the optimum solution will be to conduct a program by combining personnel from the maintenance organization, research organization and a consultant, as was done in Virginia. If the solution that is selected does not include the use of maintenance organization personnel, then some other means must be found to involve the maintenance organization directly in the program. Experience has shown that this is absolutely an essential point.

A comprehensive program for maintenance research can also help solve the personnel problem. First, it is large enough to justify formation of semi-permanent staff group which can provide continuity between various specific investigations. Second, its early stages are an ideal training program for personnel who are otherwise well qualified but do not have experience with research and/or maintenance. In some cases, this latter point may even apply to consultant personnel. Third, the trained personnel will be available to continue work on developing data for improved performance in the future.

It should be clear by now that I am strongly in favor of developing data to improve maintenance performance by means of a comprehensive program for maintenance research. In my opinion, only this type of program can produce the overall improvement that maintenance organizations need to meet their obligations to the public while keeping expenditures at reasonable levels. When we consider how large these obligations are now and how much they will increase in the future, it seems quite clear that there is a pressing need to get started on such programs in many States in the near future. The initial problems will be difficult, but they are by no means insolvable. I hope that these comments will provide ideas for those engineers and administrators who must solve them.