GENERAL SUMMARY REMARKS

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•FUNDAMENTAL management processes such as organization, planning, scheduling, performance (or directing), control, and management reporting were suggested as requiring our attention.

ORGANIZATION

All managers ask themselves: "What is the best system for my operation and what control measures are required?" Developers of successful programs have considered this question and, as a result, added additional headquarters staff for methods study, record keeping, instructional purposes, and research. They wrestled less successfully with the problem of organizing computer resources to their needs.

The trend toward ever larger central computers has taken computer control from the hands of engineering managers into the hands of professional data processors. This avoids inefficient programming and insures maximum utilization of costly computer time but, in turn, the development of management information systems is hampered by the lack of control of managers over the programmers who write programs for the information systems. These individuals are generalists, not specialists. They have heavy work loads and are reluctant to rewrite programs as changes are required. Consequently, frustrated managers have found it necessary to rely frequently on inefficient manual data-storage systems. I suggest that maintenance managers will not solve the computer "bottleneck" until they assume authority and responsibility in this field rather than relying entirely on "outsiders" to meet automatic data processing needs.

Organization of government workers by labor unions is a fact of life and a problem of increasing concern to public agencies, yet little evidence was presented here to indicate that organizational structures have been changed to reflect this new concern. Commonly, state maintenance engineers personally handle labor negotiations, which is a specialized field requiring special training. Maintenance engineers probably will not have time, in the future, to devote to this activity. State highway departments, or state governments, may need to establish special staffs for labor negotiations. I understand some states have already done this.

PLANNING

The development of an improved methodology of planning was in evidence here. Giant strides have been taken toward defining and analyzing the group of operations and activities called highway maintenance, and maintenance managers can take pride in their accomplishments! Their work is serving as an example for other highway divisions, other state agencies, and private contractors. The basic outline of a performance budgeting system for highway maintenance has been developed. We now need to refine the system.

A good start has been made toward setting levels of maintenance but much remains to be done. Typically, maintenance quality levels have been set for maintenance tasks by consensus of knowledgeable maintenance staff personnel. This is a reasonable approach and perhaps the only feasible approach in the initial stages of development of maintenance performance budgeting systems; but it is inadequate.

Quality standards established in this manner are probably biased toward a higher level than that previously considered acceptable. Given the constraints imposed on most organizations by budget limitations, I question whether organizations should upgrade standards without making a careful estimate of the incremental costs entailed in the change.

I suggest that a need exists to measure maintenance quality on a national basis, and the approach outlined in the Ohio study by Ross and Miller seems to be worthy of emulation in a national study. We may expect that a need will come in future years to judge whether or not the quality of maintenance of the nation's highways is changing. A well-controlled statistically visable sample taken now to define existing levels would provide a useful yardstick against which to measure future conditions.

Further, Oliver reports that "the doctrine of state immunity is in retreat." We should consider protective measures. A national sample, of the sort mentioned, should define normal highway conditions that a prudent driver can reasonably expect to find.

It was encouraging to hear that performance standards are transferable between jurisdictions. Organizations can be reasonably confident that they may adopt performance standards for work operations developed through methods studies by other organizations with the expectation that the standards are applicable to their own conditions. Seemingly, it would be worthwhile for a central body to undertake the task of assembling standards, delineating common elements, and distributing the results. Perhaps it should start by producing a document similar to the report assembled and published under the aegis of the British Marshall Committee.

BUDGETING

Performance budgets for maintenance have survived preliminary tests and shown that they are workable and useful. They have shown their value in presenting and justifying maintenance budgets to legislatures and the general public.

SCHEDULING

Yet, we have only begun to learn of the benefits derived from a performance budget in planning and scheduling work. Roy Jorgensen described an experiment involving use of a work order system for planning and scheduling. Such a system has many worthwhile attributes and has shown its usefulness in large operations, both for industrial and for street and highway maintenance purposes. Records provided by work orders can indicate to a manager whether or not a work backlog is increasing or declining, show the response time for citizens' complaints, outline work methods and crew sizes for optimum production, and insure compliance with the objectives set by the manager. On the other hand, many experienced maintenance supervisors think that a work order system will stifle incentive and prove cumbersome in practice.

Modifications may be necessary and careful explanation will undoubtedly be required to gain workers' acceptance, but I suggest the advantages to be gained in planning, scheduling, and controlling work are likely to outweigh the disadvantages.

PERFORMANCE AND CONTROL

Discussion leaders asked how to produce a permanent evolution in an organization and a spirit of change. They asked how to apply social skills and relevant knowledge to the process of installing new systems, but a use mentioned by some speakers is likely to create backlash against the system. They mentioned using performance records as a management tool to identify laggard crews and, further, implied that records would be used as a "whip" to improve performance.

Records should be used as planning and scheduling tools, to assist in identifying improved methods and techniques and to help plan training sessions. If used as a disciplinary device the records will soon be discredited and rendered valueless as a measure of productivity.

MANAGEMENT REPORTING

Much discussion time was devoted to management information systems. We should consider that information basically is provided to maintenance managers for one purpose—to allow better decisions to be made—and it is valuable only so long as it helps in the decision process. I did not gather, in listening to the discussion, that this concept is fully understood.

Participants recognized that different management levels need different types of information and basic concepts were discussed. But speakers seemed to be hard pressed to differentiate between types of information required at different management levels or to compare different ways of communicating information. Students of management science have identified at least two groupings of decisions—routine decisions made periodically and decisions requiring special study. I am not sure that this separation has been adequately made in many of the studies to date.

The first, routine decisions, requires only a display of information, producing nearly automatic decisions. The second type of information requires analysis and perhaps a cost-effectiveness study or development of a simulation model. I believe we need to tabulate and analyze in greater depth decisions made by managers; to then design management information systems to meet their needs.

OTHER AREAS OF CONCERN

We need to attract research and development funds to improve maintenance equipment. It is worthy of note that railroad maintenance has been almost completely mechanized since World War II yet mechanization of highway maintenance has been a relatively slow process. Perhaps our methods-improvement studies should derive needed information on criteria for new equipment. Manufacturers are more likely to be attracted toward an area where a need has been identified and criteria set. Rapid mechanization of railroad maintenance occurred as a result of cooperative efforts of railroads and industry. Perhaps a university would institute a student project to study the forces that created that change. Is the process transferable to our needs?

Ecology will require greater attention by managers. We should institute stronger control measures on deicing-chemical usage. A demonstration project, applying current knowledge, would probably show that a substantial decrease in chemical usage is possible. Failure of management to respond to this challenge may lead to public criticism and damaging law suits.

CONCLUSION

This is the best of all times to be involved in highway maintenance management. Never before has so much talent been brought to bear on this subject and never before has there been a greater opportunity to improve operations. We have better educated workers, better equipment, more knowledge of human behavior, and more departmental support. I can only look forward with enthusiasm to the changes to come.