MAINTENANCE MANAGEMENT FOR THE 1990s

by James E. Christenson

Break-down maintenance. Even in the abstract, the term suggests failure. There is not one of us in facilities management, however, who will pretend that breakdown maintenance has not been practiced at our college or university some time in its recent history.

Every physical plant department is different, but one task we have in common is maintenance. Much of our satisfaction and customer relations centers on how well we maintain our institution's facilities.

In recent years, we have had intensive communication concerning capital renewal and deferred maintenance. The task of rallying support for funding the rebuilding of higher education's infrastructure is critical. In many cases, it consumes a major part of the physical plant director's time. But it usually does not consume the time of the remainder of the director's staff. It is important that the efforts of these others—our people resource—not be neglected because of our preoccupation with obtaining adequate financial resources to fulfill our role as stewards of the institution's facilities.

A large part of our people resource is involved in the unglamorous job of maintaining these facilities. They are the front line troops in the battle to prevent the accumulation of deferred maintenance. The most important thing we can do to help these people with their task is to clear the obstacles, to make it easier for people to work.

Making it easy to work involves many steps, such as the prioritizing of work, project planning, material staging, scheduling, equipping, transportation, training, and supervision. If we provide the resources and guidance to do these and similar tasks well, it makes it easier for the maintenance person to do the job. In fact, loafing is not so much an indication of poor performance by the worker as poor performance by the supervisor. Most people do not like to loaf.

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Past Maintenance Management Paradigms

What, then, is the history of our attempts to clear the obstacles for the maintenance worker? In most organizations, there was a time when breakdown maintenance was the common and, perhaps, necessary approach. This view of maintenance may have its root in a philosophy that says, "If it ain't broke, don't fix it." More likely, it happens because a superintendent has felt that this is the least expensive way to maintain the facilities of an institution whose mission is not laced with terms such as "urgency" and "life-threatening." Or the superintendent, supervisors, or director have not been aware of a better way to perform maintenance.

One of the payoffs of breakdown maintenance is that one can whip up a sense of urgency and high motivation while things are falling apart all around the troops. Those who perform dramatic rescues are sometimes looked on as heros. In fact, there is a cynical saying to the effect that any manager who is competent enough to avoid a crisis should, nevertheless, create one from time to time so that he or she can receive accolades for this dramatic performance.

At the other end of the spectrum, the Navy's Bureau of Yards and Docks (now the Naval Facilities Engineering Command) created a maintenance management system in the 1950s that organized maintenance to an unprecedented degree. The system involved the following elements of control:

1. A thorough inventory of facilities and equipment.
2. Maintenance standards.
3. Work classification or categorization of work.
4. Work generation, primarily through condition inspections.
5. Work input control.
6. Planning and estimating.
7. Specific job authorization.
8. Material coordination.
9. Shop loading and scheduling.
10. Integrated reporting.

Setting maintenance standards is one of the more difficult, and most ignored, of the tasks. The standards can rarely be completely quantitative. In addition, they should be related to how important the facility is to the mission of the institution. That is, some facilities are crucial to the mission of the institution, while others are of much less importance and, therefore, can be assigned lower standards.

The Navy's maintenance management system classified work into five categories: emergency work, service work, minor work, specific jobs, and rework. Service work was a term applied to routine work requiring sixteen hours or less. There was no formal planning for the work and it was done promptly. The breakpoint between minor work and specific work was, determined by an analysis that attempted to control the majority of the labor hours while controlling a minority of the jobs. Typically, minor work, which received minimal planning, gave way to specific job orders at about forty labor hours. Specific jobs were precisely controlled using detailed estimates, staged material, and a full comparison of estimated and actual labor hours. In fact, critiques of variances exceeding 5 percent of the estimates were typically held on a monthly basis with relatively few candidates for analysis.

One of the real contributions of the maintenance management system was the formalization of condition inspections. It was intended that 65 to 80 percent of the specific jobs be originated by inspectors who conducted a thorough inspection of all facilities and equipment on an annual basis. The goal was to identify deficiencies before they became costly to repair. With today's technology, an inspector would use infrared, ultrasound, vibration analysis, and other devices to help detect deficiencies requiring correction.

One big advantage of this maintenance management system was that the work was not done on the basis of who makes friends with the maintenance foreman or whose wheel squeaks the loudest. Work was identified, prioritized, planned, and estimated by the maintenance control division, an overhead division completely separate from the maintenance division that carried out the work. The smaller jobs were authorized by the maintenance control director; the major work was typically authorized by the public works officer, the counterpart of the physical plant director.

Planning and estimating under this system typically used engineered performance standards (EPS). These standards are an approximate equivalent of an automotive flat rate manual and are specifically developed and updated for facilities maintenance and alteration work. Standards even cover preventive maintenance, custodial, and grounds work.

Another useful feature of this system was the complete packaging of the material for any significant job before the work was issued to the shop. Estimated work would be in an "awaiting materials" status until there was assurance that the materials would be on hand for a given month. The stores staging area typically contained pallets marked with job numbers, accumulating material for the next month's programmed work.

Work was programmed at least three months in advance, typically filling the available labor hour totals to 100 percent, and 70 percent for the next three months respectively. This shop load plan was prepared by the maintenance control division and authorized by the equivalent of the physical plant director. Compliance was expected. The shops, in turn, scheduled their people on a weekly basis to carry out the plan.

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This Navy maintenance management system provided the nearest thing possible to absolute control of maintenance work. The claim was made that this system could save at least 30 percent of the direct costs over a poor or nonexistent system, and would result in much better reliability.

One disadvantage of this system was that it required the addition of overhead staff, perhaps approaching 10 percent of the direct labor force. Each planner and estimator (P&E) was expected to generate work for 25 to 40 people. So a P&E group would be required, adding another 3 percent. A director and clerical staff would typically round out the maintenance control staff. If 8 to 10 percent in overhead causes a reduction of 30 percent in human and financial resources, it still sounds like a good deal. But the initial addition of overhead at the expense of direct labor is an unpopular move.

A more significant disadvantage comes into focus as we deal with the ideas raised by Tom Peters and other management gurus. While this highly structured maintenance management system provided control and information that one could depend upon, crafts workers and maintenance supervisors were not in complete control of the work. Even the workers' methods would often be dictated by the P&E. Experience with quality circles and many well-run companies suggests that people who control most aspects of their work do it better and achieve higher quality. Rigid separation between work identification and planning by one division and accomplishment by another does not fit this philosophy.

What Paradigm is "Right" Today?

So we have the dilemma: Do we throw out a maintenance management system that has been used faithfully by a major federal agency for more than thirty years and copied by other agencies and many corporations? Do we revert to breakdown maintenance?

I suggest that it is possible to use most of the elements of the formal system while adapting them to today's management philosophies and crafts workers' abilities. There are many potential maintenance management systems that fall between total control and no control. The original development of the Navy's maintenance management system was a significant shift in the viewpoint concerning maintenance—a major paradigm change. Another paradigm change from that system is now required. Some of you may have found the ideal paradigm. I confess that I have not; I am still looking. What follows are observations on what appears to have promise or what may work

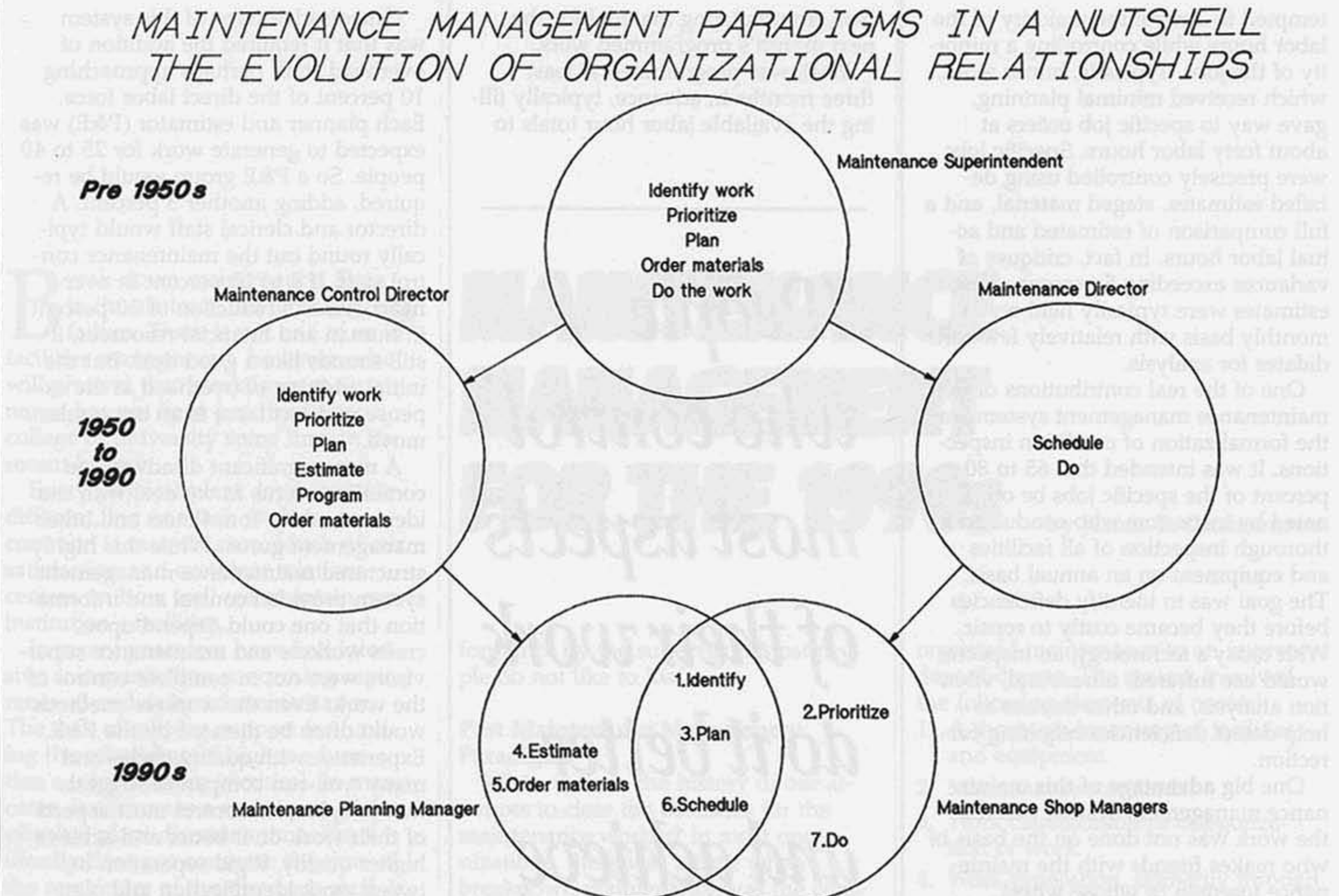

Figure 1

based on partial experience.

One way to eliminate the problem of concentrating maintenance resources in support of people that the maintenance superintendent particularly likes, is to find a maintenance superintendent who cannot make friends. At Iowa, however,we tried a different tack. We have created two groups within the building maintenance division: central shops and area shops.

There are five area shops, each headed by a shop manager who supervises approximately eleven mechanics. Each maintenance manager is responsible for the maintenance condition of that area, and will soon be responsible for the energy consumption in that area as well. The mechanics perform the preventive maintenance, typically take care of the service calls, and may, on occasion, perform some larger planned maintenance. Their primary tasks, however, are preventive maintenance and service calls.

The key is that the manager is expected to know the users and the needs of the area thoroughly. This helps the manager serve the users better, identify potential energy savings, and be the most important physical plant contact for the faculty and staff in that area. The manager is the advocate for physical plant to the occupants, and their advocate to physical plant.

In the case of the University of Iowa, the central shops consist of approximately ninety people in eight trade-specific shops with the following skills: carpenters, masons, floor coverers, painters, glaziers, sheet metal mechanics, roofers, pipe fitters, insulators, asbestos workers, electricians, systems control technicians, elevator system mechanics, environmental systems mechanics, and lock smiths. It is intended that most of the central shop people will work on planned, estimated, and scheduled work in any part of the university; their job is primarily to do planned maintenance and minor alterations.

There are some exceptions, of course. While the six insulators and asbestos workers often provide the "purification" of a site for major work, they also are available at a moment's notice to abate asbestos in connection with a service call or for any other reason. The elevator mechanics are mostly involved in preventive maintenance of vertical systems, and the locksmiths do both service calls and major work. Each shop typically also has at least one person who handles the odds and ends that are beyond the capacity of area shops.

Now, back to the question of how we plan work so that we have some benefit of planning while giving a sense of wholeness and responsibility to shop managers. One option is to allow each manager to hire a planner. That could work, but it appears that one planner per shop is excessive. In addition, the shop supervisor then must not only deal with knowing a variety of trades, but also must supervise and train a technician in inspection and EPS. Typically this arrangement results in the planner becoming a "go-fer." There is also the question of who integrates multi-discipline work plans.

Expermenting With Planners

At Iowa, we have experimented with different approaches. For the last three years, planners have been part of the engineering division, which has three branches: maintenance planning, facilities engineering, and energy management. The intent of that organizational arrangement is to provide engineering backup to the planners and to facilitate gradually moving from strictly preventive maintenance to predictive maintenance. Most of the planners came from our shops and maintain close working relationships with the shops.

Our next experiment will be to assign each planner to two of the area shops with one supporting the utilities division, while also providing shop loading and scheduling support. The planners will visit each area shop daily, specifically visiting the sites of jobs that they must plan and estimate, and discussing with the managers or their mechanics concerning ideas that they may have on methodology, products, user schedule, and interferences. The intent is that the planners and estimators be looked upon as part of the area maintenance team. In fact, they also will continue to work closely with the central shops. This is as critical as the dialogue with area maintenance people, since the planner develops most of the work for the central shops.

The planner will also serve as the project coordinator for all the projects planned. If a customer wants new laboratory casework, the planner discusses the needs with the customer using a checklist to minimize omissions and "oh, by the ways." The planner then develops an estimate, typically using EPS and incorporating suggestions by area maintenance people. Once the work is planned, it is offered to the customer on a fixed-price basis; that is, the work is guaranteed at a given price, providing the scope does not change. Any significant change in scope would require a change order. If the customer authorizes the work, the planner orders the materials and has them staged by work order number. The work is scheduled when the critical materials are all assembled or when assurance is given that they will be there at a specified time. During work performance, the planner is available to work out glitches in the work.

The planner will also be available to analyze the reports by mechanics performing the preventive maintenance. Iowa has, for many years, had a computerized preventive maintenance program. Currently, more than 7,000 pieces of equipment are covered by this program. Mechanics are asked to suggest changes in frequencies so that we are not over- or under-maintaining. The mechanics are expected to report any deficiencies that will require work by the central shops. The planner is expected to work out the adjustments that will optimize the preventive maintenance program.

Although we do not have the resources to conduct full annual condition inspections, the deficiencies identified by a variety of sources—including the area mechanics, area managers, custodians, occupants, and anybody else from physical plant—will be funneled to the planner for that area to formulate planned maintenance work orders. It is expected that the area manager will have the authority to prioritize the work in his or her area. After all, she or he is responsible for that area; for these responsibilities to be carried out both the preventive maintenance and the planned maintenance must be controlled.

The planners are still selected, trained, supervised, and evaluated by the maintenance planning manager in the engineering division. But a major portion of their evaluation is to be determined by how well they support the area manager and central shops.

Figure 1 roughly depicts the evolution in organizational relationships and level with the changing maintenance management paradigms. The significant changes are in shared responsibility and lower organizational level. This makes maintenance management more complex, but also more satisfying.

In summary, we intend that the current maintenance management system at Iowa recognizes the importance of planning, estimating, and scheduling work, as well as the importance of empowering those who do much of the work to control the work done in their area. We do not pretend that this system is perfect. We expect that we will continue to improve the system as we proceed. I offer these thoughts in the hope that they will stimulate some writing and presentations on a subject that I feel is critical to the success of physical plant directors. ■