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Designing the Best Maintenance Organization

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BACKGROUND

We find a lot of uncertainty about optimizing plant organization among maintenance and plant leadership. This is manifest by frequent change in the organization design, typically swinging from centralized maintenance to decentralized maintenance, and back again.

The result of this frequent change is the uncertainty of leadership, responsibility channels and direction (other than the familiar and maligned reactive maintenance) of the new organization's accomplishments versus the accomplishments of the former structure.

Improvement initiatives usually lose momentum as people get acquainted with the change of relationship, and look for new cues for how to act. If there has been no communication plan executed as part of the change, the craftsman has time to adjust to the new role, and finds no reason to initiate anything new. Reactive maintenance maintains its tenacious grip.

Is there an objective method we can use to design the organization? What are the major factors that influence the design? We present a model in this article that uses organizational competencies and improvement strategy as the driving considerations behind organization design.

CURRENT CRITERIA FOR ORGANIZATIONAL CHANGE

We find many organizations designed to fix a perceived problem, that in many cases raise more issues that they solve. Rather than having a clear rationale, the design is made reactively. The intent of the design is more important, actually, than the structure. (consider re-phrasing: The intent of the design actually become more important that the actual structure.)

Among the reasons we see for specific design are:

1. We see a lot of dissatisfaction with maintenance by the plant manager or production. Results: Distributing of decentralizing resources. "Give me the crafts", says Mr. Production Manager. "I'll show you how maintenance should be done".

2. In a desire for increased accountability, many plants have gone to an autonomous unit-based structure, and divide all resources among the units to eliminate excuses. Results: Decentralized resources. It now becomes virtually impossible to move resources between units.

3. In order to minimize costs, maintenance resources are moved to report to a production supervisor, eliminating the (perceived) need for the maintenance supervisor. Results: Distributing or decentralizing resources. Usually the production supervisor had a full-time job, and no maintenance experience, leaving crafts on their own to find work to do. Over a period of time, craft skills deteriorate and incidents outside the unit increase (e.g. utilities).

4. Many plant managers are frustrated that maintenance seems monolithic, slow paced, every job requires excessive time to get done. Maintenance people fail to understand the business of manufacturing, and don't seem part of the team. Results: Decentralize or distribute resources. Maintenance

becomes more responsive to unit or department needs. They learn the equipment, work to eliminate chronic failures (because they are so tiresome), and now feel a part of the core business.

5. Maintenance costs seem to rise each quarter. More and more contractors are brought in for larger jobs that used to get done in-house. Expediting parts becomes more common, and planners don't seem to find time to plan. Results: Resources are centralized, perhaps to the chagrin of the craftsmen, who often feel more part of the business out in the unit or department.

Criteria to Judge Organizational Effectiveness

Rather than designing the organization to solve a specific problem, we need a set of criteria to identify an effective organization. We propose the following as a starting point:

1. You Have Control Of The Work

- Work is accurately and completely identified
- When work is written up, there is confidence it will be done in a reasonable timeframe
- Activity is performed according to the priority of operational criticality and safety
- Work scheduled is consistently work done
- Work is executed efficiently. Little waste during the course of the craftsman's day
- Results of the work are properly recorded and periodically analyzed for opportunities to improve the system, or an individual's performance

2. Defects Are Routinely Being Eliminated

- Prevention is the bias of the maintenance department (PM, PdM)
- Operations takes responsibility for equipment, including routine surveillance, proper operating procedures (to minimize breakage), raw materials are appropriate for the equipment application
- Equipment health in maintained (lubricants applied, alignment checked, tensions maintained, critical operating performance levels are charted)
- Materials management assures appropriate service levels are maintained and lifecycle cost, rather than purchase price, is the primary consideration
- Failures events are evaluated, prioritized, analyzed and failure modes eliminated

3. Maintenance Costs Are Minimized

- Jobs and skills are matched in the scheduling process
- Jobs are planned (estimated, parts & tools reserved, drawing available) & materials available prior to scheduling
- Equipment is prepared prior to crafts arrival to job:
  - a Cleaned, isolated mechanically & electrically
  - b Safety procedures observed
  - c Proper shutdown and start-up procedures observed
  - d Operators perform tasks according to their ability and the level of sophistication of the facility (see *Developing an Asset Management Strategy*, Maintenance Technology, September 1997, for a description of these stages.)
  - e Stage 1: Prepare equipment, identify work, learn equipment function, act as craftsman's helper
  - f Stage 2: Perform Operational Maintenance (Surveillance, Lubrication, Adjustments, Cleaning)
  - g Stage 3: Perform simple maintenance (e.g. packing valves), troubleshooting, participates in repair
  - h Stage 4: Work with defect elimination, participating in RCFA's, RCM's, etc.

Basic Types of Organizational Models

What are our options, then, to consistently provide the capabilities listed above? Simply put, there are three types of organization design.

- Central Maintenance. All crafts and related maintenance functions report to a central maintenance manager.
- Decentralized. All crafts and maintenance craft support staff report to operations
- Distributed. A combination of the above. Typically centralized maintenance leadership function, with maintenance and reliability staff functions reporting here. Crafts are in some

proportion allocated to production units and to a central maintenance function.

Models for Decision-Makers

All quality theory suggests one study the value chain, that is, where is value created in the organization. What value does maintenance (and its counterpart, the reliability team) create? And what organization enables that value?

VALUE	MEASURE	BEST ORG. STRUCTURE
1. Repairs Equipment	Mean time to repair Maintenance Rework	Distributed Distributed
2. Trouble-shoots	Mean time to repair Maintenance Rework	Distributed Distributed
3. Improves Operability	Throughput	Distributed
4. Improves Maintainability	Mean Time to Repair	Distributed
5. .Monitors Equipment Condition	Throughput Mean time between Failures Maintenance Cost	Centralized
6. Overhauls, Capital Projects	Efficiency, Schedule Compliance	Centralized
7. Controls Cost	Maintenance Cost	Centralized
8. Manages Materials	Availability, Cost	Centralized
9. Increases Reliability	Throughput Mean time between Failure Maintenance Cost	Centralized/Distributed

While this list may not be comprehensive, it does indicate that neither a centralized nor decentralized organization is ideal to accomplish all the value-added requirements of maintenance and reliability functions.

The Reliability Maturity Continuum

Stage I, Planned Maintenance, has as its primary goals to gain control of the work and to minimize maintenance cost. Often referred to as planning and scheduling, it attempts to maximize the effective use of the craftsman's time. This is done by assuring a complete work package, tools, parts and permits are ready before work is started. Also, by careful scheduling, we may perform several jobs on a piece of equipment when it is down, instead of just one. Defect elimination is a by-product as well. By prioritizing jobs, and assuring the right parts and tools are available, we spend our time doing the most important things right the first time, rather than patching a patch.

Stage I Optimal Organization. Establishing and enforcing a common system across all units in a plant requires strong central authority. Important new skills must be learned and continuously reinforced. Planners

must be dedicated to their jobs, and while assigned by area or unit, their concentration cannot be scattered by a variety of extra assignments. So until this new system is firmly in place as a way of doing business, the best organization, we believe, is **centralized.**

Stage 2, Proactive Maintenance**,** is aimed at defect elimination, which of course reduces costs. It also increases control of the work, because schedule breakers decline as failure modes are eliminated. The goal of proactive maintenance is to eliminate common failure modes and effects across the entire facility. We have seen concerted efforts on rotating equipment, for example, increase mean time between failure of pumps from six months to four years, or one-eighth as many jobs to perform. Consider this stage operating under the 80/20 rule: 80% of the failures come from 20% of the failure modes.

Stage 2 Optimal Organization. Since we are looking for failure modes across the entire plant, and not in only one area, the reliability teams continue to be organized **centrally.** New skills must be acquired for crafts and engineers. Costs for acquisition of condition monitoring equipment need to be carefully evaluated for best application and value. These decisions are best made cross-functionally, and executed centrally.

Stage 3, Organizational Excellence**,** now engages the rest of the operation in Asset Health Care activities. In Stage I, operators prepared equipment for maintenance; in Stage 2, operators helped to identify and diagnose chronic problems. Now in Stage 3, we ask operators to begin to take ownership for equipment condition. Part of this ownership is to perform Basic Care activities, including lubrication, adjustments, obervation and recording of operating parameters, and other tasks we might label *operational maintenance.*

In addition, we now move a portion of the maintenance crews to work under production. Why can we do this? We are in control. Our work management process clearly identifies, plans, schedules and assures proper execution of the work, and our proactive maintenance has eliminated most of the common failures in the plant. We are now set to focus on cross training, craftsmen learning the equipment from operators, and operators learning equipment care from craftsmen. We still maintain, at least for some time, the maintenance supervisor, but the role changes to that of facilitator and coach.

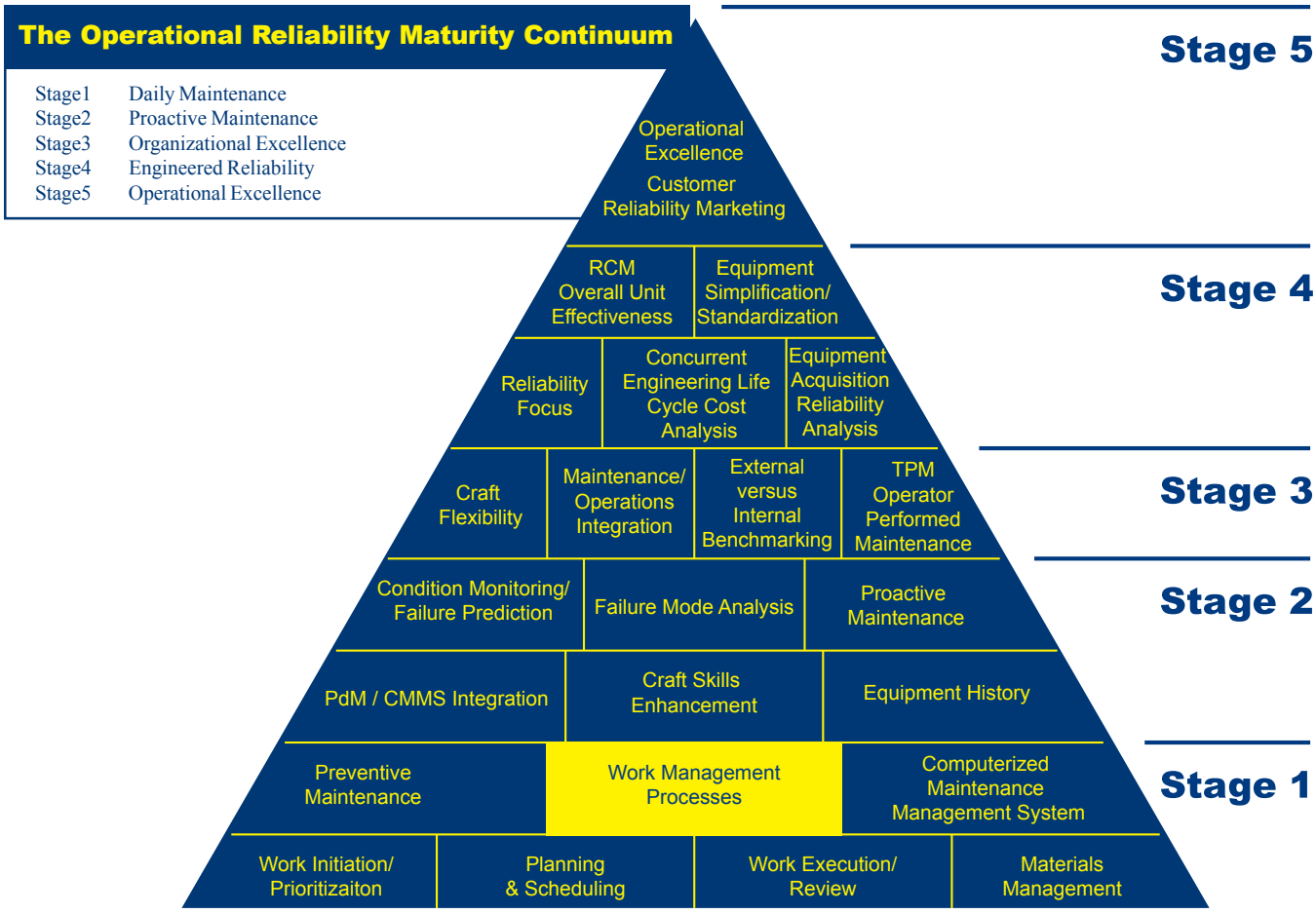
Stage 3 Optimal Organization. While we have moved a portion of the craftsmen to the areas, we continue to maintain a central group for overhauls, turnarounds, shops, and common services. Planning and engineering continue to report centrally, but get increasingly specialized as to their equipment responsibility. This is possible because there are fewer fires (schedule breakers) to put out. This organization is best described as **distributed.**

Stage 4, Engineered Reliability**,** is primarily unit-based, working on defect elimination on specific systems, rather than common failure modes. As much of this work is equipment unique, it further requires unit-based collaboration. At this point process engineers and planners may report in to the units, depending on complexity of the equipment, and the amount of work to be done.

Stage 4 Optimal Organization. While we have distributed more resources to the unit or department, we continue to have a central maintenance manager who oversees *systems*. Examples of these systems may be craft training systems, the CMMS, a reliability reporting system, a maintenance cost system, etc. At this point, the size of shops or turnaround teams may diminish, and it is a good time to review outsourcing certain functions. This organization is best described as **distributed.**

Stage 5, Operational Excellence, adds a dimension of business goals driving and determining all maintenance and reliability efforts. We are now truly trying to *optimize the plant*, and the role of the shift-based teams increases. They now have primary charge of monitoring and maintaining asset health, as well as optimizing production and yields. By this point, there are few unanticipated equipment breakdowns, work management is a way of life as is continuous improvement. Responsibilities are clear, but work practice is very fluid, calling upon resources flexibly, but in a completely planned manner.

Stage 5 Optimal Organization. The ownership of resources is now a minor issue. Since nearly all maintenance is preplanned, as much as a year in advance,



resources are assigned by priority of the work needing to be accomplished. Much work will continue to be unit based, but the opportunity to share across units is available, since the planning horizon is long, as the discipline to make value-based resourcing assignments is in place. We think the best way to characterize this organization is actually decentralized or **matrixed,** but the level of self-management, discipline and planning is so high, that organization charts are replaced by a work management process that accounts for all the resources in the facility.

Summary

In summary then, the organization needs to account for the *intent* of the managers. If a systems orientation for control and cost are an issue, or if the solutions we are looking for transverse the entire facility, we believe the successful strategy will be centralized. If the issue is unit-based, then distributed is the highest value strategy. Finally, we believe that only a very mature, high-performing organization can be optimized with a decentralized structure.

Most of our readers will not have the luxury of making immediate organization changes to reflect this philosophy. Nor do we think they should, as the application of these rules must be done in the context of the capabilities, attitudes and history of the plant. We do think, however, that setting out a list of objectives before any organization change, and identifying how these will be accomplished in a revised organization, is the key to any success.