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Operational Excellence and Improved Reliability

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Integrating Asset-Based Operational and Reliability Programs to Achieve Excellence

The real improvement in plant performance occurs when operational excellence programs are integrated with reliability programs and are built around each asset. In many companies, reliability is a stand-alone engineering or maintenance program that only indirectly involves operations. Operational excellence programs focus on operations only. Safety and environmental programs are also separate. To achieve true excellence, operations, maintenance, and reliability programs must focus on assets and be integrated with safety and environmental programs.

Assets are installed to increase profitability, but asset reliability problems can negatively impact those profits between excessive maintenance costs and down time that results in lost production and lost revenue. Assets can also be the source of significant and costly safety and environmental incidents. Companies set goals focused on safety, environmental compliance, production, and profitability, and implement expansive (and expensive) programs to achieve those goals. Unfortunately, such programs are usually not integrated and only address specific problem areas, so they fail to reach their full potential.

A number of studies have shown a correlation between reliability and safety performance. Environmental performance is also generally associated with reliability, yet companies approach reliability, safety, environmental, and operational performance as separate initiatives with separate champions. Top-down safety, environmental, and operational excellence programs have great value, but treat all assets the same. Top-down initiatives usually favor broad brush programs, such as general operator training, overall company safety standards, and environmental regulatory compliance. They do not get far enough into the difference in asset details to truly understand how individual assets contribute to production, safety, and environmental problems. Many plants use a "system owner" approach, but this method frequently results in one person tracking asset documentation and trying to keep the equipment operating; it does not offer the power of a team focused comprehensively on the most critical asset.

Over the past 25 years, MRG has found that in many companies the reliability-centered maintenance effort is a stand-alone engineering or maintenance program that only indirectly involves operations. Reliability-centered maintenance programs go into detail on the selected assets, but frequently neglect to address safety aspects and ignore many problems induced by people. They consider human-caused problems at the component level, but do not address the wide variation in operator and maintenance skill and qualifications. Operational excellence programs focus on operations only. Safety and environmental programs are also separate, yet people get hurt around assets, and assets contribute to environmental issues and need to work correctly for production. Plant improvement programs should be viewed as one program. Operations and maintenance programs need to be asset based and integrate with safety and environmental programs to achieve true excellence.

Many plants perform an asset criticality ranking and use it to develop a reliability program. There are significant benefits that can be realized by simultaneously using the asset criticality ranking to develop the appropriate safety, environmental, and operational improvements.

MRG recommends approaching the problem from the asset perspective, using criticality as a prioritization tool, and developing the underlying elements that are required for all higher-level programs to achieve success. This approach encourages the use of the many well thought-out techniques from common safety, environmental, maintenance and reliability, and production programs. The programs have great elements, and will help improve the plant. The only difference is that these techniques are used from the asset up.

Using asset criticality ranking addresses the most significant problems first and allows this effort to be divided into manageable pieces. This approach requires a team of engineers, operators, maintenance, technicians, and safety and environmental professionals. As with any team, it is critical to select good people and follow good project management procedures.

Beginning

Proper identification of the plant's critical assets is the first step. The criticality ranking must take into account production, safety, environmental risk, quality, and cost. The asset may be a single piece of equipment, such as a pump, or if it is logical to view it as a small system, the asset can include the associated piping and controls. The most critical asset is selected and will be the focus of the plant team.

The next step is to review asset name consistency across different systems. Often there is inconsistency in asset names and descriptions across operations, maintenance, the CMMS/EAM system, I&E calibration sheets, the predictive maintenance software, the DCS system, engineering, and the financial system. While the team may not be able to change all the naming conventions, they need to understand the terms and link them together to get a true picture of asset performance and functionality.

There are some basic questions that the team needs to answer about an asset.

- Are we operating the equipment the way it was designed to operate, (or to put it the other way was the equipment designed to operate the way we are currently operating it)?
- Was it built properly?
- Was it installed properly?
- Do we maintain it properly?
- Do we have appropriate spare parts, and are they stored properly?
- Is it clean, and is area lighting adequate for proper inspection and servicing?

Design and Documentation Review

This step includes finding the drawings and manuals, and updating them as needed to accurately reflect what is installed. The same accurate drawings and manuals should be readily accessible by operations, maintenance, and engineering. An asset may have been built for one purpose, and over time its use has changed to meet current needs. A classic example is a critical pump that was designed to be base loaded, operating at the best efficiency point on the pump curve at full output, but that is now operating at a different point on the curve due to system changes. At the time of the purchase, the pump was the right choice, but it may now have reliability problems due to other system changes. Without this knowledge, how can the pump be kept reliable? The system must be reviewed to determine if changes can be made. Generally, the plant will have to live with the existing pump, but this is the time for the team to find ways to minimize the risk to the pump. Once the team knows the actual pump operation, other components on this asset can be examined for their suitability, including the motor, piping components, and instrumentation.

The team should then review the construction and installation of the asset, if possible. Based on the asset's history and team experience, was it installed properly? Are there performance issues? Is there enough misalignment of the suction piping that was pulled into place during construction? Is the base constructed properly? Is the piping design adequate? These problems must be addressed before reliability goals can be met.

Operations

A new driver would not normally be allowed to take the wheel of an expensive sports car without reviewing the operating instructions. Yet, we typically give operators an overall training program without ensuring that the operator fully understands how the asset is intended to function. Does the facility have specific startup, shutdown, and routine operating procedures for this asset? Are operators trained to those asset-specific procedures, and is there a way to ensure the operator meets qualification standards? Are the qualifications documented?

This includes both floor operators and remote control-room operators. Are the operators qualified to the procedure? Are the people operating this particular asset qualified for the asset?

Are proper operating procedures in writing? Are the procedures proactive and well thought out? Do they make sense to the operator, and have they been implemented? Are the instrumentation, controls, and monitoring devices correct and working properly? Does this give the remote operator a full understanding of the asset's operating performance?

Maintenance

Are maintenance personnel qualified to work on this equipment, and are there maintenance standards that must be followed? Does the entire maintenance department practice precision maintenance standards? While there can be department-wide standards and procedures, such as tightening a flange or alignment criteria, they must be reviewed for applicability for this most critical asset.

Are precision maintenance procedures always used on this asset? Are these procedures documented and asset specific? Are the maintenance personnel qualified to the procedure?

Does the EAM/CMMS have a complete asset description, complete bill of materials, work plans, work order history, lockout/tagout information, MSDS, job safety analysis, and access to drawings and technical manuals?

This is the time to look at spare parts, both in the storeroom and on the list for direct purchases. Is the spare parts inventory based on a reliability-centered maintenance analysis and an analysis of inventory needs, or is it based on original OEM recommendations? Does the actual inventory match the inventory records? Is the inventory stored properly?

Lubrication

Is there a specific lubrication program for this asset? Are the lubricants used adequate for the operating conditions, and are the right quantities applied at the right frequency? Are ultrasonics used for greasing? Is oil kept in clean stored containers for transport, and are there specific procedures for adding oil where needed?

Asset Health Monitoring

Is there an effective asset health monitoring program in place? This must include continuous monitoring, alarms, predictive maintenance techniques, and testing where appropriate. If multiple technologies are employed on the asset, does anyone look at the results in an integrated manner?

Safety

Are there proper safety procedures in writing? Do they fully comply with OSHA and other regulatory requirements? Are these procedures proactive and well thought out? Do they make sense to the employees, and have they been implemented? Many safety procedures have been written after a failure and were developed to prevent that failure from ever happening again. While this is an improvement, the safety procedure development must include a what-else-could-go-wrong approach. The team must review the safety component of the criticality ranking for the asset and determine if they have addressed the safety risk.

Environmental

Are there proper environmental procedures in writing? In addition to compliance with regulatory requirements, are procedures proactive and well thought out? Do they make sense to employees, and have they been implemented? The team must review the environmental component of the criticality ranking for the asset and determine if they have addressed the safety risk.

Integration

The team should then assess how well the asset management program for this asset compares to company safety and environmental programs. This is an excellent opportunity to find any gaps in the management of this asset and to strengthen the program. If there are conflicts between the management of this asset and the safety program, these must be appropriately resolved. Plant employees can never be caught between two programs.

Finally, perform a Reliability Centered Maintenance Analysis of the asset to ensure your asset management plan is complete.

Conclusion

The asset management plan for the second most critical asset will be easier. Standards of excellence in operations and maintenance have been developed, and the process for design review and updating asset naming and hierarchy has been implemented. Safety and environmental professionals have already committed support to the project. As you build out your program, one asset at a time based upon criticality ranking, you will find common areas to improve across the facility.

Implementation of this approach based on asset criticality in conjunction with existing programs will improve plant performance in all areas.

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