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CLEARING OUT THE DATA CLUTTER: HOW WELL-MAINTAINED DATA CAN ADD VALUE TO YOUR RELIABILITY PROGRAM

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INTRODUCTION

We have all heard the phrase, “Good data in, good data out. Bad data in, bad data out.” While this concept is well known in theory, there is often a large amount of focus spent on acquiring the latest software and participating in the latest reliability trends, without ensuring that the basic data managed in our facilities is of good quality. In reality, data management is an integral part of maintaining efficient business processes. Properly maintained data can enable facilities to make better-informed business decisions, leading to optimized maintenance costs, improved safety, and greater compliance. On the other hand, bad data causes severe inefficiencies, a false sense of confidence in facility reliability, and an inability to accurately forecast a facility’s operational budgets.

GOOD DATA IN (AND BAD DATA OUT)

Data, in pure form, consists of raw, unorganized facts that need to be processed. Data can be found in databases, documents, drawings, reports, spreadsheets, and numerous other sources. Having data on hand is useful, however, it’s often inefficient and counter-productive to make decisions based on data in its raw form.

Instead, data should be processed, organized and structured—within a given context—to create information. Information consists of the findings generated by the data and is used to drive mature decision-making processes at all levels of an organization, including between departments, and between facilities and corporate stakeholders. These cross-functional teams depend on reliable information to help guide key business decisions. In order to gather reliable information, it is critical that the data under

analysis is clear, correct and accessible.

At a high-level, good data management will result in the following:

1. The ability to identify potential risks and mitigate accordingly.
2. Identification and mitigation of root causes that can prevent future failures.
3. Increased confidence in business decisions.
4. Enhanced accuracy in business forecasting.
5. Optimized costs due to improved planning and budgeting.
6. Ability to maintain regulatory compliance.

Good data enables optimized inspection and maintenance strategies. Facilities collecting good data are able to proactively identify potential risks and mitigate accordingly, thereby reducing a number of unplanned failures. Facilities with well-maintained data also have increased confidence in business decisions. For example, information derived from well-maintained data can identify when to repair or replace an asset, when an asset should receive a material upgrade, whether any detailed engineering services should be performed (e.g. fitness for service), or which spare parts should be kept on hand.

Maintaining accurate data also allows facilities to improve business planning and forecasting. Several activities are involved with inspection planning, and accurate data helps facilities



Figure 1. Business drivers affected by data management.

understand the extent of time and inspection needed to ensure assets continue to operate reliably. Therefore, by reducing the uncertainty associated with reliability and overall facility utilization and uptime, facilities can use good data to adequately plan turnarounds.

Additionally, information generated from reliable data can assist with cost optimization. By identifying and prioritizing risks, facilities are able to proactively reduce failures, while also reducing unnecessary inspection and maintenance activities. Likewise, good data management of maintenance procedures and repair documents helps facilities reduce or even eliminate rework. Facilities that maintain and leverage good data can complete the right tasks at the right time, and will thus avoid performing redundant corrective activities. Ultimately, each of these advantages helps ensure better cost optimization.

BAD DATA BLUES

On the other hand, neglecting to properly organize, record, and update data can unknowingly lead to misguided business decisions, potentially compromising safety and putting an unnecessary drain on financial resources. Let's take a look at the effects bad data can have on a facility.

Data related to asset integrity includes inspection data, process data, design data, work orders and management of change (MOC), drawings, and other various types of documentation. Many of these sources are used to predict potential degradation mechanisms and their associated failure modes. These data sources also help with understanding an asset's configuration and general operating conditions. Thus, all of these resources enable facilities to identify potential risks and any appropriate mitigation activities (e.g., asset replacement, upgrades, spare assets, inspection). In regards to inspection planning, for example, this information helps determine the number, the type, and the frequency of inspections required, and can also help identify appropriate condition monitoring location (CML) coverage.

These risk-mitigation activities, in turn, affect a facility's key performance indicators (KPIs), which includes capital expenditures, reliability asset utilization, facility compliance, and inspection costs. Imagine, for a moment, that any of this specific data is incorrect, outdated or missing – inaccurate data will then be used as a basis to make decisions, leading to unknown and unmitigated risks, potential safety incidents, and increased associated costs. For example, if an MOC package is processed, but databases and/or associated drawings were never updated, facilities would be operating without an accurate understanding of the actual risk(s) associated with a particular asset or process. Additionally, facilities could be carrying out inefficient risk mitigation by performing inspections that don't identify all forms of degradation.

Bad data can also affect the time and money involved in a facility's maintenance plan. If there is any missing or incorrect data in a facility's Computerized Maintenance Management System (CMMS), inefficiencies will occur. For example, if an asset breaks down in the field and the notification is entered with the wrong asset identified, the planner must then spend extended time in

the field trying to gather the correct information, which will increase total maintenance costs.

Appropriate repair procedure data should also be stored in the CMMS. If a facility maintains bad repair procedure data, two outcomes can result. The first option involves the craftsman spending time researching repair requirements, which reduces wrench time, and the second option involves the repair being completed without a proper procedure, thereby resulting in decreased KPI success and an increased likelihood of rework. An improper repair may even result in unplanned failures, which will cause a schedule break, reduce the mean time between failures (MTBF), and affect availability. This schedule break may also increase overtime, affecting annual maintenance costs.

HOW TO EFFECTIVELY MANAGE DATA

To effectively maintain data, facilities should know what type of data to store, the best methods to store it, and how to ensure its accuracy. To begin, facilities should maintain the following pertinent data:

- Asset taxonomies
- Process data
- Operating conditions
- Inspection and repair history
- Design data
- Work orders
- Business interrupt events

Process data, operating conditions, inspection history, and design data are integral for the successful implementation of risk-based solutions like Risk-Based Inspection (RBI) and Reliability Centered Maintenance (RCM). Information derived from these data sources is used to help establish Integrity Operating Windows (IOWs) and Reliability Operating Envelopes (ROEs). Additionally, work orders and business interruption information helps identify poorly performing assets, as well as which events are causing lost opportunities.

Once it is understood what type of data to maintain, the next step is to focus on how to properly store your data. In the realm of reliability, two primary systems are used to store data: Inspection Data Management Systems (IDMS) and CMMS. Within these platforms, archived data can be useful to make important reliability decisions. Key data points can be pulled from both of these systems to help formulate KPIs, which are used to track performance. Therefore, the way data is managed at a facility directly affects the ability of KPIs to measure alignment with business drivers (e.g. safety, cost and compliance). Gathering and retaining good information enables organizations to make strategic business decisions regarding their facility's safety, asset risk, regulatory compliance, and/or budgeting.

As your facility begins efforts to ensure successful data management practices, the following questions can be used to guide effective data storage strategies and identify areas for improvement:

- What type of documentation/data management system does your facility employ?
- What information is stored digitally vs. physically?
- Is the same data stored in multiple locations?
- Is data stored in an intuitive location?
- Is a document control system in place?
- Do all assets follow standard taxonomy and nomenclature?
- Who is maintaining the information?
- Is vital information stored in notes/comments fields?
- Do all teams and individuals have access to information they need?

Once the current state of data management is understood, the final step is to ensure that facility data is stored in the correct manner to maintain the accuracy of information and ensure intelligent business decisions can be made. To ensure recorded data remains accurate and reliable, facilities should follow these guidelines:

- **Ensure qualified personnel are handling data.** Make sure that only qualified personnel have access to view, record, and manage data.
- **Store data in a single location.** Data should exist in one centralized location. If a facility stores data in multiple locations, every data source and location will need to be updated. If one location does not receive updated data, quality issues can arise. This issue can also cause problems if multiple teams manage data in different locations.
- **Streamline data-input.** Make use of data entry drop-down menus and additional data fields. This will enable personnel to quickly perform search queries and run calculations associated with the data.
- **Reduce the number of master databases.** Reducing the number of master databases will minimize confusion and simplify data organization to improve the accessibility of critical information.
- **Ensure data is frequently updated.** Data should always be updated (in all locations) to match the changing conditions in the field. Changes to data also need to propagate through a single query and/or calculation in order to avoid some calculations being updated and others not.
- **Incorporate a strong MOC program.** As plants evolve, facilities must be diligent with updating process safety documents, such as piping and instrumentation diagrams (P&IDs), process flow diagrams (PFDs), operating manuals, repair procedures, and asset critical documentation.

HOW TO PERFORM A DATA CLEANUP

After making sure you are storing accurate data in the appropriate locations, your next steps should be to both clean up existing/

historical data and to plan for a sustainable data management practice of maintaining up-to-date and accurate information. Facilities can organize and streamline data by following these guidelines:

- **Periodically review existing data.** Qualified personnel should regularly review data on hand to verify accuracy and completeness of information. Qualified personnel includes those who maintain data and those who own decisions derived from data.
- **Apply statistical analysis.** Facilities should run statistical analyses to identify data outliers, potential discrepancies or erroneous data.
- **Run lookup functions to cross-reference information** (if data is stored in multiple locations). This function will ensure that data (such as, whether an asset scheduled for maintenance is actually in service) lines up, if it's stored in multiple locations.
- **Review all critical data inputs and associated calculated outputs.** Engineering should review these data inputs, especially in regards to risk-based reliability programs such as RBI and RCM.
- **Review critical business KPIs.** Management should regularly review business KPI success to check for any red flags. Management should utilize KPIs that align with business goals. The data that drives these KPIs should be derived from good data based in the CMMS and IDMS.
- **Verify field uncertainties.** Facilities should regularly perform field walk downs to verify data such as asset configuration and metallurgy.

THE VALUE OF GOOD DATA



Figure 2. The value of good data.

Well maintained data helps a facility in the long run by controlling the inputs used to generate information upon which important decisions are made. Organized, accurate, clean data enables facilities to meet their KPI targets and maintain efficient business operations. Overall, good data allows for proactive identification of risks and increased confidence in business decisions, as business plans, forecasts and budgets are based on accurate information. In return, applying the correct maintenance and inspection tasks leads to increased reliability, reduced failures, and optimization of costs. ■

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