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2014 – 2015
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Chairman’s Corner
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Welcome to the latest Issue of the PEMD Newsletter! In addition to the technical articles in this issue we are offering some information on ASME’s organization. As you may have heard, ASME is transitioning to a different organization and we thought we’d use this communication vehicle to share some of what we know at this time. Let’s start with why the change is being pursued.

Why was it done?
• To align with ASME’s mission and strategic direction, including Pathway 2025
• To break down silos, overcome existing obstacles that fostered division and become ONE ASME with synergistic focus, and provide more engagement opportunities.
• To enhance, create and diversify products, programs and services that meet the needs of members, industry, academia and others. This will ensure we can continue to fulfill our mission well into the 21st Century.

With that understanding of why, let’s cover the basic structure to begin understanding where PEMD fits. The Knowledge and Community (K&C) and Institutes will be replaced with Technical Events and Content (TEC), which will have 4 initial segments. PEMD will be part of the Design, Materials and Manufacturing Segment.
Technical divisions like PEMD will continue to be a key part of ASME’s success going forward for a number of reasons, not the least of which being the divisions are where a great deal of volunteers and talent, that keep ASME relevant, reside within the organization.

The technical divisions and institutes and their technical committees are crucial to the success of PATHWAY 2025

- Development of the technical content that can be delivered through multiple channels and venues
- Subject matter experts who know the market for who needs the technical information and how they need it
- The peer reviewers who make ASME content such high quality
- Ideas on how to reach more people with the products and services that ASME offers.

ASME needs your leadership

- Your experience in creating and reviewing technical content
- Your knowledge of your industry (including education and research) and your contacts with key people in that community
- Your dedication to achieving personal and professional society success
- Your ability to lead change and continuous improvement

Summary

- ASME is moving forward with PATHWAY 2025 to not only stay relevant, but prosper and excel
- The Board of Governors have approved an organizational realignment to address current and foreseen operational issues
- Member groups including division, institutes, sections, geographical and topical affinity are being placed at the center of the ASME enterprise to engage more directly with all products, services, and outreach programs
- The contributions and leadership of members of divisions and institutes are crucial to the success of the Society

These slides were taken from a presentation containing much more information. If you would like to know more please contact anyone on the executive committee of PEMD.

As a reminder, this year will present leadership volunteer opportunities within the Plant Engineering and Maintenance Division of ASME. If you would like to volunteer please contact anyone on the executive committee. You can find our contact information at https://community.asme.org/pemd_executive/groupleadership.aspx.
As we traditionally point out in our newsletter, this division exists for the purpose of serving our professional community and our membership. Once again, we thank you and remind you to: Get Active and Get Involved by Volunteering!
Is Reliability Really Everyone’s Responsibility

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The word reliability is the buzzword in industries across the world. We often hear statements such as “our company is a reliability based organization” or “we are an RCM organization” or we are a “world class in reliability”. Other words such as best practice, lean, Six Sigma and 5S are used as well. Most companies talk a good talk and say the right things when prompted, but in the end do not follow good basic principles of equipment and process reliability. In other words, the basic fundamentals to implement and sustain all of the concepts above have never been established.

Most organizations today live in a reactive culture. They thrive on it and love the hero mentality and firefighting persona that goes along with it. Reacting to a failure or incident appears heroic. This type culture garners accolades, frequent pats on the back, awards and recognition.

So why would any organization want to change from a reactive to a proactive culture? The primary reason to progress into a proactive culture is employee and environmental safety. Reactive cultures are extremely dangerous. Have you ever neglected to replace the worn tires on your car and consequently suffered a blow-out on an interstate? Did you feel safe navigating your vehicle to the road side on three inflated tires? It would have been much safer to replace your tires based on the worn condition and avoided the incident altogether.

When equipment fails, it often fails at the most inopportune time and is dangerous in the process. Incidents of explosion, arc flash, contamination, spillage, chemical release and airborne projectiles are just a few of the results of equipment failure. When your technicians and mechanics rush in to save the day, they may be putting themselves, the plant and the environment at risk.

The secondary reason to progress into a proactive culture is to save your company money. It is estimated that reactive maintenance normally costs 3-5 times more than planned or proactive maintenance. When an equipment failure occurs and an organization is not prepared, there are ancillary costs involved to bring the equipment back on line. For example, an undetected bearing defect was not identified and a process pump failed. During failure, the pump shaft, impeller, housing, seal, motor, and coupling were also destroyed along the way. A complete new pump assembly must then be procured. Of course a spare pump was not on site and there was no redundant pump to switch to. The lead time on the replacement pump order is 4-6 weeks away and manufacturing for that particular pumping system has stopped.

A more cost effective way to deal with this issue is to identify the bearing defect early in the equipment life cycle through Condition Based Monitoring, ensure the repair parts are on site and then plan and schedule the repair without significant downtime or costs.

So why do organizations continue to operate in a reactive nature?

1. Companies do not know how to change. Reactivity is ingrained into most plant cultures today.
2. Companies have poor executive leadership. The “reliability” message has to be driven from the top down or it will fail.
3. The initial investment for equipment reliability can be expensive. One of the primary building blocks of equipment reliability is a good CMMS/EAM system. These systems can range anywhere from $100K to $1M and tie up company resources during configuration and implementation. A world class reliability program is a lifetime commitment not a project. Resources such as planners, schedulers, reliability engineers, predictive maintenance and data specialists are required. Refusal for allocation of these resources will lead to employees being overworked, frustrated and failure of the new reliability initiative.
To create and sustain a proactive reliability based culture, the following groups and team members must be aligned and work cohesively as one unit.

**CEO/COO/CFO:** The buck starts and stops here. The reliability initiative and message must originate from this group. The message must be strong, loud and consistent. Without support from this group, a reactive culture will remain. In these roles, company strategy, vision and budgets are defined.

**Sales/Marketing:** I know what you are asking. What does the sales department have to do with reliability? Let’s say for instance that sales makes a commitment to a customer to provide 10 million widgets by months end, but your plant operation and equipment are only capable of producing 5 million widgets. The sales and marketing team should have a basic understanding of equipment capabilities and operational parameters before making customer commitments.

**Plant Manager:** Most plant managers focus primarily on production goals and costs. There is nothing wrong with having production goals and we must certainly be concerned with manufacturing costs. In general, most plant managers do not recognize the maintenance and reliability team as a profit center. The plant manager must understand that he is an integral player to a successful reliability program which will lead to production goals achieved and lower costs. He puts his name and face on your program and says “I am behind you in our reliability effort and will move heaven and earth to help get it done”. That is what a plant manager should do for your organization to implement and sustain a world class reliability program.

**Design Engineer:** Inherent reliability of an asset or system is fully determined during the design engineering phase of its life cycle. The 2 primary attributes of an asset that a design engineer should focus on are (MTBF) Mean Time Between Failure and (MTTR) Mean Time To Repair. In addition, total life cycle performance and costs should be evaluated and not just lowest purchase price. Here are a few simple questions a design engineer should ask when designing new equipment for your plant:

- Do I know the quality of the sub-components in this asset? Is there potential that these bearings or other parts could be inferior or even counterfeit?
- Are critical wear parts available when I need them and will the OEM form a partnership with my plant to ensure optimal up time and pricing?
- Does the OEM have current (FMEA) Failure Modes And Effects information to understand how the asset can fail and provide mitigation/prevention strategies?
- What will the (MTBF) Mean Time Between Failure of this asset be?
- Has the asset been installed in a location that reduces (MTTR) Mean Time To Repair? In other words, what will the ease or difficulty of maintenance be to ensure minimal downtime.
- Can the OEM provide an electronic O&M manual including diagrams as well as critical and recommended spare parts list?
- Can the OEM provide operations and maintenance support during installation and qualification?
- Has the design engineer collaborated with Purchase, Finance, MRO, Operations, Maintenance and Reliability departments to determine the optimal design?

Design engineers must ask and answer these basic questions to effectively break the reactive plant life cycle.

**Purchasing:** As mentioned before, purchasing plays a huge role in overall life cycle cost of your plant. One can save a few dollars here and there buying low cost parts, but the long term results of unplanned downtime, rejected products, production losses and increased manufacturing costs can be astronomical. The purchasing department must be aligned with reliability, maintenance and operations to understand what parts and materials are needed, what parts perform and don’t perform well and which are best to maintain optimal reliability. To summarize, overall equipment life cycle costs must be evaluated carefully when making purchasing decisions.
**MRO Stores:** We will define MRO Stores as to how we store and maintain the plant maintenance repair, operations, parts and supplies in your particular environment. In short, the MRO store is your store. It must look like a store, be clean, functional and organized like a store and have what you need when you need it. Let’s face it, equipment parts wear out and fail at all manufacturing plants. We now have data that supports that 80% of equipment failures are random in nature. Preventive, Predictive and Condition-based strategies are necessary but critical parts must be stored on site. Your MRO store should understand which parts are the critical to your operation, lead times when ordering, the minimum and maximum quantities to stock, the (EOQ) economical order quantities and the inventory and carrying costs involved.

Planning and scheduling repairs also requires alignment with MRO stores. The stores should have a method and resources for kitting and delivery of parts for scheduled repairs. The MRO inventory should also be linked to the plant CMMS/EAM system using the proper equipment hierarchy and BOM’s.

Finally, your MRO store should provides a safe, secure and stable environment for your parts. For example, bearings should remain in their original packaging and are to be stored lying down and not on edge. The storeroom itself should not exceed 60 percent humidity and be free of shaking and vibration. V-belts have a shelf life of 2 years and should not be hung vertically on pegboard but be stored flat on shelves or in drawers out of direct sunlight. These MRO best practices will aid in reducing unplanned downtime and overall manufacturing costs.

**Installation:** There is a common misnomer that new equipment always runs well and acts like new. This is not normally the case. Here are a few important checklist items one should ask prior to starting up any new asset or system.

- Have all manufacture, model and serial numbers been verified. In other words, did we really receive the equipment that we ordered?
- What is the condition of the asset upon arrival on site? Did damage occur during transport?
- Has the asset or system been properly anchored to the structure? Is the equipment plumb, level and square with the environment surrounding it. Is there any obvious mechanical looseness?
- Are the correct utilities supplying the asset? Have voltage, steam, water supply and air pressure been measured and verified prior to start up? Does each utility have disconnecting means for employee safety and lock out tag out procedures?
- Are there any signs of mechanical looseness or improper torquing of fasteners?
- Have all motor-coupling-pump-gearboxes been laser aligned?
- Have all v-belts and sheaves been aligned and tightened properly?
- Have all lubrication requirements been determined? Was the equipment shipped dry and requires lubrication before start-up? Was the initial lubrication already performed by the OEM? Are the required lubricants on site and in a properly stored location?
- Has an (ACR) Asset Criticality Ranking been assigned and PM and PdM strategies determined?
- Are all critical spare parts in the CMMS, on site and being managed by the MRO store?
- Have maintenance and operations been trained prior to start up by the OEM to ensure equipment capabilities, parameters and requirements are understood?

**Operations:** Operators spend far more time with assets than any other department on site. They know how it sounds, feels, smells and looks like on its good days and bad days. They are aware of what its capabilities are and are not. They understand what happens when the asset is sped up or slowed down. Operators should be the front lines of basic equipment reliability. In the industry, the terminology is referred to as (TPM) Total Productive Maintenance or Manufacturing. TPM focuses on keeping all equipment in top condition to avoid breakdowns and delays in the manufacturing process.
In addition, the production planner/scheduler should have a collaborative role with the maintenance planner/scheduler to ensure that necessary planned maintenance is executed on time.

**Maintenance:** Maintenance is the group that gets thrown under the proverbial bus most often. How many times have you heard the phrase “If our maintenance department would just get their act together, we would be all right”. As you can see from the previous responsibilities above, equipment reliability requires more than just good “maintenance or fixing things”. Maintenance is defined as “To keep an asset or system in designed or acceptable condition, maintain functional capabilities and to preserve and protect the asset. That is it in a nutshell. With that being said, I will give you some guidelines on creating and sustaining an effective maintenance group for optimal reliability.

- Develop a skills matrix to determine the skills required to effectively maintain your equipment. Identify training gaps between current skills and what is needed. Provide the maintenance technicians with the proper level of OEM training. There will be some initial training costs involved, but you will glad and enjoy the long term benefits. It is unfair and unrealistic to ask a technician to maintain an asset he has never seen before.
- Provide the technician with a written procedure or job plan on what you ask them to do. Don't assume the tech knows what to do just because he/she has been employed at your plant for a lengthy tenure. Many times either best or worst practices are merely passed down through tribal knowledge or the “we have always done it this way” philosophy is prevalent. The job plan should include all safety requirements including LOTO, a job hazard analysis, tools, parts, consumables, tasks and specifications.
- Document, document, document. How often have you asked a question similar to this? Hey Joe...how many times have you worked on that pump in the last year? You get the standard deer in the headlights look, a shoulder shrug and then a “I don't know”. Please don't gloss over this next statement. It is critical that your technicians consistently document on the work order their actual labor hours, parts used, failure codes and any feedback that may aid in future analysis.
- Have a mechanism in place to monitor, audit and approve the technicians work. Technicians will agree that if their work is being checked, it will be done right. Get lax on checking their work and poor execution, performance, quality and results will soon follow.
- Let maintenance supervisors...supervise. Most supervisors I see in industry today do everything but. They are required to do what little planning and scheduling takes place, order and maintain parts and supplies, attend production meetings and ensure proper training requirements are met. How much time does that really leave for a maintenance supervisor to spend on the floor teaching, training, mentoring and disciplining his team? You get the picture.

To summarize, “Maintenance” frequently gets a bad rap. The question really is, has your organization set your maintenance group up for success or failure?

**Reliability:**

- **Reliability Engineer:** In general this person is the overseer of all plant reliability. Facilities, manufacturing, process and packaging. This position ensures that all maintenance and reliability best practices are being followed. This person consistently monitors work order history and trends such as MTBF, MTTR and early signs of equipment failure. The RE is integral in defining (ACR) Asset Criticality Rankings and their associated critical spare parts. In addition, the RE is responsible to define all preventive, predictive and condition based monitoring strategies and fosters change to a pro-active culture. To be effective in this role, the RE must work collaboratively with purchasing, design engineering, MRO stores, installation, operations and maintenance. The RE must also understand the plant culture and process and spend ample time on the plant floor. The RE must be a person of integrity.
that can be trusted to make decisions. Without this role in place, your reliability program will flounder and the plant will remain in a reactive state.

- **Planner/Scheduler:** Planning and scheduling work is a cornerstone to a safe and reliable plant. Planning is simply defined as the "what to do and how to do it" and scheduling is defined as "who will do it and when it will be done". The planner/scheduler is like the quarterback of your reliability team. This person views the field for incoming maintenance requests, ensures that they are valid and coded properly, provides a detailed job plan and then distributes to the right team member. Imagine trying to run a team without a quarterback in the huddle. The same holds true for the planner/scheduler. The planner/scheduler ensures the work management process flows smoothly and is seamless. In large organizations, you will need at least one planner and one scheduler. In small organizations the planner and scheduler may be the same person. A planner should typically plan for 8-15 technicians. Any less than 8 and they may be underutilized, any more than 15 and they may not be able to plan effectively and keep up.

You may be asking why the planner/scheduler is reporting under the Reliability department and not the maintenance department. This person should not be involved in the day to day reactive maintenance. The planner/scheduler should be looking at future work at least one week ahead. They should also be collaborating with the production planner/scheduler on a routine basis to coordinate necessary work into the production schedule. The planner/scheduler is a special breed of person. They should come from a maintenance background preferably working on the shop floor and should understand basic principles of equipment repair, operation and design. The planner/scheduler should also be computer savvy or at least literate, be a good listener, collaborate well with differing work groups and yet be meticulous in what they do. Planning and scheduling work is a basic building block for improving plant reliability. If you decide to omit the planner/scheduler from your reliability journey, you will end up lost along the way.

- **CMMS Administrator:** Many organizations try and add this responsibility to the maintenance planner, maintenance supervisor, reliability engineer or an IT specialist. You must understand proper roles and responsibilities for reliability. Adding these CMMS administrative duties to these particular roles will end in failure of your fancy new system and long term reliability program. Similar to the planner/scheduler, the CMMS admin should have specific skills. They must have exceptional computer understanding and experience with basic SQL programming and query development skills. The CMMS admin must understand the back end of your CMMS system and how it relates to typical user function. The role doesn’t end there. The CMMS admin must understand the day in the life of a maintenance technician and how their day to day responsibilities correlate with the CMMS. The CMMS admin must understand that the system functionality must support planning and scheduling to eventually progress into a pro-active culture.

- **Data Entry Specialist:** Last but certainly not least is the data entry specialist. Again, many organizations dump this duty on the technicians, planners or supervisors. The DES plays a key role in ensuring work order accuracy in the CMMS. This person must have an attentive eye for detail, work well with technicians and have exceptional typing skills. At a minimum, the DES is your last line of defense to ensure that all work orders closed out include the following:
  
  - All labor hours recorded
  - All parts used recorded
  - Failure code, Cause Code, Remedy Code
  - Feedback for any work performed. (Feedback such as “fixed” is unacceptable.)

  If any of the information above is omitted, the DES has the authority to reject a completed work order and route back to the appropriate supervisor or technician for correction. Do not get
frustrated with the DES if he/she rejects a work order for improper documentation. They are simply doing what they are instructed to do. What the DES does or does not do may directly affect your organization when OSHA, the FDA or FM Global show up in your lobby and ask to see maintenance records.

There are other roles and responsibilities not covered in this article such as Human Resources, Quality Assurance, EHS, etc. These are equally important as well.

Reliability really is everyone’s responsibility. It takes each of us to create and sustain a safe and reliable plant. The important question remains for your personal consideration? What are you doing today to make a difference and improve the reliability in your own plant?

**About the Author**

Dale B. Wilson is a Certified Maintenance and Reliability Professional and is currently the reliability engineer for Qualitest Pharmaceuticals. He has over 30 year’s experience maintaining electrical and mechanical systems as a maintenance manager, planner/scheduler, senior consultant, preventive maintenance specialist and licensed journeyman electrician. He has been involved in numerous implementations of EAM/CMMS systems while introducing best practices for reliability and transforming companies from a reactive to proactive culture.
CMMS Return on Investment

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Background
Process automation has been a source of phenomenal leaps in productivity in the last thirty years. Enterprise asset management systems (EAMS) and computerized maintenance management systems (CMMS) are the indispensable neural networks of large corporations. Information is structured and sent instantly where it is needed. Data is available for powerful analysis at the fingertips of any user. The result is a significant increase in performance and reduction in cost. Industry authors such as Terry Wireman and Doc Palmer both point out significant improvements in manpower and material costs and reliability as a result of introducing automation.

So why is it that we hear all the painful stories about getting automation in place because of hidden costs, schedule overruns, and wasted capabilities? Worst of all, we have even heard of the entire effort being abandoned after millions have already been spent.

Our experience is that the technical design of systems has nothing to do with success or failure. It is not the "what" of the system, it is the "how" of the system. How is the organization prepared for and guided through implementation?

Over the years, we have seen the organizational mistakes companies make when pursuing the bright promise of automation. Here are some of the most common:

- Executives enter into the change because "it's the right thing to do" and never identify, measure, realize, or prove the proposed gains in efficiency.
- Existing work processes are not well defined, even undocumented. Off-the-shelf processes often cannot cater to unique company needs. Detailed process design occurs during programming, which increases the cost and sets up unpleasant surprises during implementation.
- The reasons for proposed changes are not articulated, not aligned in the organization, or the working levels do not relate to them. The new process does not arrive in front of the work force until the first day of implementation training.
- Line management and union leadership learn about the changes at the same time as the general employee population. Line management starts asking the same questions as their employees rather than being part of the support group answering the questions.
- The IT trainers cannot answer questions related to specific issues in the work environment of the end users.
- Directives from top management and one-time training sessions do not assure understanding, learning, and compliance in the work place.

Lessons Learned
We have learned from our experience. We've developed an implementation process that reduces organizational trauma and assures realization of the promised financial benefits. Grounded in the change management theories of gurus such as John Kotter and Jeffrey Hiatt, our recommended approach has six major stages.

Define the purpose. Clearly identify what top executives need to achieve, their objectives. Define how to measure the achievement of the objective. How will they know it when they see it? And begin measuring performance.
**Formulate the team.** Identify a sponsor and charter a knowledgeable and credible team to lead the effort. Free the team from current responsibilities to concentrate on the new objectives. Make this their fulltime job through implementation.

**Define the process and automation needs.** Document the current process. Bring in subject matter experts, whether formal or informal, and the user population to identify current work flow. Work at a fair level of detail describing roles and responsibilities as well as approval levels and routings.

This is the time to establish "best practice" changes. Fix any points in the process that are known to cause problems. Establish necessary consistency between divisions, regions, and locations.

Develop a list of functional requirements for the software based on your process. These will form the basis of your user-driven and IT-based specification and selection criteria in the next phase.

**Select the software and partner with the vendor.** All CMMS and EAMS are not created equal. They have different capabilities. The tasks can be as amazingly simple as routing requests for authorization. Some do it well, and others do not.

Review the full list of requirements with the technical people from several vendors. Select the best fit, understanding that any system may not perfectly meet all criteria.

**Train the organization.** In our experience, "Train the Trainers" is the most effective approach to implementation training. Use company people who know the company and have lived in the work environment to deliver the training. This has the highest credibility with the organization and provides trainers who can answer department-unique questions outside the system.

While training the trainers, also prepare line management. Position them to actually lead implementation in their areas. Train them system ahead of their employees. Get answer questions as implementation with the structure and tools to supervise implementation.

**Coach the organization.** True learning does not happen in the classroom. The critical time for learning is the live situation.

The "trained trainers" become implementation coaches. They proactively work with each individual in their work area and check that the trainees can do the task as trained. Was the training clear? Did the trainee miss something? Does each individual have the tools to perform the task?

We have seen situations in which individuals are not provided with what they need to get their jobs done. They might have no access to a computer, or the wrong job classification, and errors in reference tables. Line management leads the implementation coaching teams to correct these conditions, preventing minor blips from becoming showstoppers.

**Summary**

The largest gap we see in implementing automation is in implementation training. The most common model is classroom training supported by help desks. Given that true learning happens from live experience, a large portion of the employee population risks not learning in the classroom model. These are the people who do not learn well in the classroom and may not be inclined to ask for help.
Implementation coaching is the only way to ensure that the necessary learning occurs. Line management leads the effort with temporary assistance from the coaching team, accelerating the learning curve.

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