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PLANT ENGINEERING & MAINTENANCE

Chair's Message

—DR. MEHERWAN P. BOYCE PE,
The Boyce Consultancy Group, LLC, Houston, USA

Welcome to the 2005 Plant Engineering & Maintenance Division Newsletter. I would like to wish all of our members and their families a Very Happy and Prosperous 2005. In 2004 we participated actively at various conferences such as the National Manufacturers Week in Chicago, and the ASME Power Conference in Baltimore. This year we are going to actively participate, in addition to our past conferences activity, in the IMECE 2005 in November in Orlando, with 11 papers from around the world. To be successful at these and other conferences we need your help in volunteering as a speaker, a panel member, or become a member of our existing technical committees.

The Plant Engineering & Maintenance Division has over 16,000 members of ASME, who have indicated interest in our Division, with over 7,100 members who consider this division to serve their primary or secondary areas of interest. The division has been very active in the areas of Petro-Chemical, Electric Power and Engineering Services. Presently the Division has Five Technical Committees serving our large and varied membership interest. Two of these Committees are new in the area of Plant Security, and Plant Operational Safety. The Chairs of all our Committees would be more than glad to welcome you to become part of these Technical Committees.

I would like to throw out a challenge to our 3,400 members who have indicated this division as their primary area of interest to help your executive Committee build new Technical Committees which are active and vibrant. If we could have twenty percent of our primary members pick up my challenge we would be one of ASME's most active Divisions.

On behalf of the Plant Engineering & Maintenance Division Executive Committee, I would like to congratulate the members of The South Texas Chapter who had formed a Plant Engineering and Maintenance Chapter, and have been active for the past years. This chapter meets monthly, and sponsors an Annual Conference, and should be a model for members of our division in other regional areas.

As members of the Plant Engineering and Maintenance Division our activities cover the traditional areas of manufacturing, processes and maintenance, so we have a wide area of interest that we can bring to these committees. Our Division is part of the Manufacturing Group.

Please do contact me or any member of your executive committee, and volunteer to advance our division and your professional development. I strongly believe that if this division is to succeed we need the very active participation of our members. Remember our Mission Statement:

The continuous improvement of manufacturing and facilities through global Plant Engineering and Maintenance excellence.

We would like to welcome you to send articles for our news letter and for posting on our Web Site. The division wants to be active in serving your needs, thus we need your active participation.

I look forward to working with all of you in 2005 to ensure the success of our Division.

INSIDE

Reliability Excellence

"The Wise Man's house is built upon the rocks…"This old Sunday school song had it right – a good foundation is critical to success. There are two 'rocks' that form the foundation of 'Powered by Reliability Excellence' – Leadership commitment and the establishment of an operations-led, proactive environment.

Leadership Commitment – The dreaded 'program of the month' syndrome is generally the result of executive leadership being inspired by a methodology, process, or success story. In their desire to make a difference and see results, a new program is launched with great enthusiasm. Generally, either the results do not appear as quickly or to the extent that is expected or the enthusiasm subsequently diminishes and finally fades away. A successful implementation of Reliability Excellence (Rx) requires executive sponsorship and also needs to sustain that sponsorship. 'Powered by Reliability Excellence' addresses this in three stages:

1) Engaging Corporate Sponsorship

'Powered by Rx' uses a structured site implementation methodology that begins with setting the proper expectations and introducing many of the core Rx philosophies. These expectations include presenting a basic business case to show the potential returns, introducing the philosophy of what is necessary to successfully implement and sustain the processes and methodologies that yield these returns, and a brief overview of the tools and metrics that will be used to execute Rx.

2) Setting Proper Expectations

When presenting to senior management, it is easy to slip into a 'sales' mode and create a potential 'Over-commit and Under-deliver' situation. To sustain corporate sponsorship, the proper expectations must be set as to both the expected returns and the rate of return. Efforts must be spent to obtain realistic return numbers and timeframes. One general guideline is to find out what the 'justifiable' return is and work towards that. For example, if management would support a program that costs $1,000,000 as long as it returns $10,000,000 within three years, and you have determined that $20,000,000 within three years is a realistic, conservative estimate, present the return numbers closer to the 10-12 million number, leaving the very real possibility of exceeding their expectations in the next three years (Remember to take full advantage of any opportunity to exceed expectations).

3) Creating Reporting Metrics

Once you have established the expectations, you must create a methodology to make the gains visible and understandable. One of the core tools of 'Powered by Rx' is the Benefits Tracking tool, which establishes a direct link between the Rx efforts and a specific budget line item. These Reporting Metrics allow all involved to see quantifiable improvements. These improvements are tracked against the projected returns to ensure that the program is "Keeping its Promise" and delivering as projected.

Without leadership commitment, you will be hard-pressed to get the support (both financial and political) necessary to succeed. If you do get the necessary sponsorship, ensure that you have created expectations that you will be able readily achieve and most likely exceed. After you have set the proper expectations, ensure that you have reporting tools that clearly show progress against your projected results. Next month, we will look at the other 'rock' in the foundation – establishing an operations-led, proactive culture.

ASME Plant Engineering, Inspection and Maintenance Trade Show

Pasadena Convention Center Pasadena, TX • April 28, 2005

The ASME Plant Engineering & Maintenance Technical Chapter invites you to display your products and services in the Third Annual Engineering, Inspection and Maintenance Trade Show at the Pasadena Convention Center in Pasadena, Texas. The show will be from 10:00 am until 6:00 pm on Thursday, April 28, 2005. Proceeds from this event will go toward ASME South Texas Section University Scholarships. We believe this show will attract many professionals from the plants along the Ship Channel and the Gulf Coast due to the uniqueness of offering a trade show geared towards all aspects of engineering, inspection and maintenance of refinery/petrochemical fixed and rotating equipment.

If you would like to participate, please call the Trade Show Committee Members below.

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Response Requested

The PEMD Executive Committee and Technical Committee Chair persons would very much like to direct our efforts to the needs and concerns of our membership. Therefore, all PEMD members will soon be receiving an invitation to complete an online survey to help identify those needs and concerns.

Please take a few minutes to complete this survey. Results will be shared with our membership when the information has been reviewed and correlated. Thank you in advance for your participation.

Three Waves to Reliability Excellence (Proven Process to Establish Reliability)

—TOM DABBS, Managing Principal, Life Cycle Engineering®

The ***Three Waves to Reliability Excellence*** is a proven methodology for effectively implementing a global reliability improvement strategy in large multinational manufacturing organizations. This process is an integrated strategy that consists of proven maintenance, reliability and manufacturing fundamentals planned and implemented by the local organization to provide the stability required to provide the stability required to allow sound lean manufacturing processes to succeed. It relies upon unwavering corporate sponsorship and a well planned and executed implementation strategy implemented by the local organization guided by qualified subject matter experts and coaches. The foundation of this methodology is a cooperative partnership between operations and maintenance. In this partnership, operations own reliability and maintenance is an equal partner dedicated to provide timely and effective methods, skills, expertise and support. Charles Bailey, V.P. Operations, Eastman Chemicals came to this conclusion in his quest to achieve reliability:

"Reliability cannot be driven by the maintenance organization. It must be driven by the operating units… and led from the top."

This proven methodology can be likened to three very powerful waves that have been proven to deliver unprecedented results. Do not attempt to implement this process unless you are convinced that the current system is broken and you are completely committed to change the processes and systems you currently employ. I think W. Edwards Deming was spot on when he said:

"Your system is perfectly designed to give you the results that you get."

Wave 1 – The methodology starts with development of a high level corporate or business unit financial business case for reliability improvement based upon achieving reasonable business and performance improvements and conducting *Reliability Excellence* education for all participants on the core reliability and manufacturing concepts and implementation strategies. The preliminary education consists of education and workshops for combined groups of executive level management, plant management and supervision, operators, maintenance personnel, engineering, and other support functions such as purchasing and finance. The workshops conducted during this phase of the initiative will result in identifying tactical improvement opportunities and creating cross functional teams that immediately engage in resolving these issues and capture short term gains that can be utilized to provide the funding for wave 2. This is the first step in creating awareness of new methodologies and alternative solutions, the value of creating cross functional teams focused on a single issue and the collective discovery of the solution begins the very important process of changing the existing culture.

Wave 1 has is actually performed in two parts: The first part is the business case creation and presentation to educate senior management of the compelling reasons and benefits to improve equipment reliability. The second part is the education at the plant level that includes both plant management and a mix of operators, maintenance personnel and engineering. This education is followed by a workshop to show how cross-functional teams consisting of operators and maintenance personnel can address and solve reliability issues.

The high-level business case must be prepared and communicated to executive management to gain sponsorship. Executive management must provide the sponsorship and demonstrated commitment required to move the initiative forward. *This executive sponsorship, and only this executive level sponsorship, will provide the entire organization a compelling reason to change.* This is especially effective when the business case stresses the competitive environment and external threats to the business. The business case must be supported by a reliability strategy that focuses the entire organization on the reliability and technological issues related to the business and communicating this strategy throughout the organization. The second step is to provide education on reliability principles throughout the organization making it clear that reliability, like safety, is everyone's responsibility and create the expectation everyone will participate in the process. Consideration must be given to existing initiatives that are currently underway, i.e., TPM, 5S, RCM, Lean Manufacturing, etc., and make the connections to these processes. It is critical that the reliability improvement initiative not be perceived necessarily as a stand-alone new initiative, but rather an enabler or foundation to the current improvement processes.

"It is critical that the reliability improvement initiative not be perceived as a new business improvement endeavor. Use the Three Waves to Reliability model to focus and fully realize the potential of any existing Lean, TPM, or Six Sigma improvement and change management infrastructure."

The entire process must be defined and communicated in Wave 1, making it clear that management is committed, has clear expectations, and intends to follow through. This will help dispel any false perceptions that this initiative is a *flavor of the month or program of the day.*

As a part of the education provided in *Wave 1*, it is imperative that workshops are conducted to identify obvious reliability issues and the financial impact they have on the operation. Cross-functional teams are then formed to resolve these issues and measure the progress and savings. These teams are tactical in nature and should not get involved in systemic or organizational issues. The strategic or systemic issues will be dealt with in Wave 2 and 3. The purpose of the *Wave 1* activities is to start the change process and to set the stage for the cultural change that must occur within the organization as we

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Three Ways to Reliability Excellence

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move further into the process. To foster real action, the leader of each tactical team must provide a written statement to the plant manager or his immediate supervisor outlining the issue the team will be addressing and the expected outcome within a few days of the conclusion of the workshop. Management must then follow up on these initiatives. If this Wave of the process is effectively carried out, the savings can potentially finance Wave 2 and possibly Wave 3.

Wave 2 – The next step in the process is an assessment of current conditions at a specific location, financial analysis that results in an estimate of the value in closing the gaps to *Reliability Excellence* compared to the cost of implementation presented as a return on investment (ROI) calculation and a preliminary master plan that outlines the processes and methodologies required to close the gaps. The gaps are simply current conditions and existing processes and practices compared to reasonable targets of best practices within a specific industry or in general industry. The assessment is a highly participative process that provides a high level of awareness and discovery that again contributes to the continuation of the cultural change that must take place to set the stage for Wave 3 or implementation.

Wave 2 begins with an overall assessment of the operation, measuring current status of twenty-one specific elements of reliability shown in Fig. 1 "The Reliability Arch" with scores for each element and a composite score that allows us to identify the gaps in the current processes and structure. These scores also give us a visual comparison with others either within our industry or from industry as a whole. With this information we can now develop a master plan.

An outline of the actions that, when completed, will close the gaps to excellent. The master plan at the completion of Wave 2 is not a completely detailed, but has enough detail to outline the elements that will be addressed and are fully detailed in Wave 3.

We can now develop a Return on Investment (ROI) by determining the financial impact that closing the gaps identified in the assessment will have on the operation compared to the cost of executing the plan. In most cases the ROI is in excess of 10:1 and in a few cases it has exceeded 30:1. Savings or cost avoidances generally come from similar areas in most plants, i.e., loss of product due to: availability, rate and quality; maintenance spending, overtime, inventory investment, work in process, etc. Typically gains from operating improvements range from 1.5 to 6 times more than gains from maintenance.

Wave 3 – Implementation is the final step in the process. Wave 3 is the implementation of the master plan and includes education/workshops on the proper techniques, coaching/mentoring on the correct execution and establishment of defined processes and effectiveness measures of progress. Again there is a focus on organizational change management through the use of a leadership team and implementation teams and education to ensure that all process and structural changes are sustainable.

The organization will only succeed in the implementation of meaningful change when management is fully committed to creating the environment to allow change to occur and dedicated to its successful completion. Leadership is the key and the prerequisite for sustained change.

Master Planning is the roadmap that keeps us on course as we implement the identified processes, systems and structures. Cross-functional participation is a key ingredient to successful implementation of the master plan. People tend to own what they create, so in this wave implementation teams will fully detail and implement the elements of the Master Plan. A *Leadership Team* must be established to provide the leadership structure for the overall change initiative and to ensure compliance with company policies and practices. Then create multiple *Implementation Teams*, with dedicated leaders; to develop detailed action plans for each specific element of the *Master Plan*. This approach has proven to be an excellent vehicle to foster participation and produce the desired results.

Coaches and subject matter experts must be made available to the implementation teams at appropriate times during the process to ensure that team members have technical resources available for consultation and effective technical transitions are made. Much care should be taken in selecting Focus Team leaders and members and ensure they have the proper training and coaching to carry out their missions. A *Reliability Excellence Facilitator* must be selected from the organization and dedicated to this initiative for the duration to ensure its success and keeps all activities on track.

The *Leadership Team* should be no more than three to five participants that represent a good cross section of the local management team. These Leadership Team members will define the mission of the Implementation Teams, reconcile the investment and return for the overall initiative and collectively have the authority to make decisions to eliminate any barriers identified during master planning and implementation. To ensure appropriate Sponsorship an Executive Sponsor should be identified to ensure participation and input from executive management.

Implementation Teams should also be a cross functional team with no more than three to five participants each with a dedicated leader that is responsible for all team activities. Detailed *action plans* for each element of the *Master Plan* will be developed and reviewed at specified intervals throughout the implementation phase with the *Leadership Team*. When the action plans are agreed upon with the *Leadership Team* and coordinated with all *Implementation Teams*, the execution of the master plan commences. Action plans will be identified, step by step, resources assigned to appropriate personnel (to include all plant personnel) and a completion time established for each step.

The creation of a *Support Team* is an effective way of providing resources to the *Implementation Teams* on an as required basis, i.e., external consultants and coaches, vendors, accounting, human relations, etc. These individuals are not full time participants, but are identified and available, when needed, for consultation and information to the

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Three Ways to Reliability Excellence

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Leadership and Implementation Teams.

The number of implementation teams depends upon the size of the local organization and will heavily influence the duration of the change initiative. The time requirements for Leadership and Implementation Team participants during plan development and implementation range from 10% to 15% for leadership team members, 20% to 25% for implementation team leaders, 15% to 20% for implementation team members and 100% for the Reliability Excellence Facilitator.

New Implementation Teams are commissioned as existing ones complete their missions until all elements of the master plan are fully implemented.

Some important thoughts to remember as you get underway are there are always two parts to any prescription:

1. ***Prescribe the right medicine***
2. ***Ensure it's proper and complete use or application***

While the medicine has the potential to cure, only it's proper and complete use will make it effective and produce the desired results. This is the core issue with *Flavor-of-the-Month* or *Program of the Day* improvement programs. Routinely the concepts are sound, however the implementation method and complete application is either premature, incomplete or shortsighted.

In most manufacturing environments, two rules hold true:

1. ***Production capacity of the plant and maintenance spending are the most significant controllable parameters in the success of the overall operation.***
2. ***Capacity is a function of equipment reliability and sustainability.***

Simply Summarized: when equipment is reliable, product is made. So how do we increase reliability? TPM? RCM? Six Sigma?

Yes and no, these methods and processes all have proven results, but ONLY WHEN PROPERLY AND COMPLETELY APPLIED! These concepts are very powerful when applied to a stable operation that has sustainable equipment reliability can produce tremendous results, but tend to fail miserably when applied in an operation where the fundamental work processes are not established or fully utilized and equipment reliability is not established.

In the physical world, momentum, equilibrium, and the force necessary to enact change heavily influence our daily lives. When dealing with organizations, teams and individuals; momentum and the force necessary to enact change are every bit as challenging. Resistance to change is a very powerful force and you are likely to hear these reactions when attempting to implement a change initiative of this magnitude:

- ***"I/We are comfortable where we are, why should we change?"***
- ***"We will do it your way for a little bit, but go back to the old way as soon as we can>"***
- ***"I've already got a full time job. This is just more work."***

In *The Three Waves to Reliability Excellence* process, prescribing the medicine and ensuring it's proper application are integrated. Just as importantly, outsiders do not develop the prescription; it is developed by the local organization in a participative discovery process with all the justification predetermined and communicated up and down the organization. Again Deming had it right:

"A system cannot know it self, it must be examined by outsiders, by invitation only"

The core foundation of *The Three Waves to Reliability Excellence* is in establishing the ownership of reliability. It is much like your automobile. Who owns the reliability of it? Is it your mechanic or dealer? No, ownership of its reliability must be with the driver or operator. Operators live with plant equipment day in and day out, much like the driver of a car, and good operators have an inherent feel for when their equipment performance begins to deteriorate or is in jeopardy. If a sense of ownership is created in operations for their equipment, the desire to fix it before it breaks or avoid failure increases. If maintenance is established as a true partner, then both operations and maintenance will have an increased desire to do what's best for the equipment/line/plant and "Fix it right or avoid the failure" will replace "Fix it quick or hurry up and get it back on line".

Sustaining these changes is again, a matter of leadership and dedication. When proven work processes are developed and in place, systems are in place to automate these work processes, leadership and dedication to always do it the same way is instilled and rewards have been reaped, real change has occurred and reliability will be evident and *Reliability Excellence* will be the basis of the way you conduct your business.

Paper Presentations at IMECE 2005

In support of ASME's International Mechanical Engineering Conference & Exposition, being held in Orlando, FL, November 5-11, 2005, PEMD is sponsoring two sessions. 11 abstracts have been presented for the two sessions. Next year we would like to add one more paper session and a panel session

Other PEMD Supported Conferences

The following are the primary conferences PEMD supports by engaging fellow PEMD Members as session chairs, presenters, panel participants, and other support activities. If you would like to participate in any of the conferences listed below, PEMD would be glad to support and promote your involvement. Please contact us should you like to get involved.

- **National Manufacturing Week (NMW)**
  March 7–9, 2005; Chicago, IL • March 21–23, 2006; Chicago, IL
- **International Mechanical Engineering Conference and Exposition (IMECE)**
  November 5–11, 2005; Orlando, FL • November 2006
- **ASME Power / Electric Power Conference**
  April 5–7, 2005; Chicago, IL • April 4–6, 2006, New Orleans-LA

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