Asset Optimization —

How the Good Get Better & The Best

Remain Champions

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Asset Optimization — How the Good Get Better & The Best Remain Champions

by: John S. Mitchell

Two decades of involvement in asset optimization have proved enlightening to this author. Indeed, asset management workshops and discussions with course participants from top performing companies have always been revealing to most unbiased reliability-focused observers. It seems that best-of-class performers have in common an acute awareness of the necessity to become and remain the best of the best in all aspects of asset utilization and effectiveness. On their journey towards reaching 96 percent and higher availability, they have come to share many of the requisite management strategies, physical work processes and methods. The approaches used by best performers are thus virtually identical across a broad range of industries and companies. In essence, they all recognize the need for continuing improvement and cite similar areas in which additional improvements are feasible to solidify and extend gains made on the road to becoming top performers and to stay at the top.

For our part, we plan to look at some common elements implemented by companies that have attained industry best asset utilization and effectiveness. Likewise, we wish to explore areas where even these top performers see opportunities for further improvement. But why is this detailed examination of superior performance so important? Perhaps a simple analogy would help us to get at least a partial answer to our question.

Would you purchase a home or automobile knowing that it had 96% availability and wouldn't be available for use two weeks per year? Perhaps that would be acceptable if the time could be scheduled to coincide with a flying vacation---but suppose best case warning of an unavailability was only a couple of minutes or perhaps days? Further, suppose that unavailability could vary from several hours to many days? Or how about unexpected failures to major appliances or your car? Think of the added cost and chaos in your life that would result. Now to the point: Some engineers and managers have a tendency to accept much worse performance at their respective plants.

ESSENTIALS FOR SUCCESS

In Asset Optimization Workshops participants are given the opportunity to identify organizational strengths as well as learn about opportunities for further improvement. Listening to open discourse among best performers and those striving to join the club results in amazingly consistent conclusions. There is consensus that global competition for products and capital is driving requirements to increase asset reliability, effectiveness and performance. Increasing demand, combined with the difficulty (impossibility) of permitting new hydrocarbon processing facilities in North America are placing extreme pressure on existing facilities to boost manufacturing productivity, utilization and throughput while simultaneously reducing costs.

The drive towards optimization and sustained top performance leads to three essentials being recognized. Putting it another way, to gain and maintain the level of asset performance necessary for industry-best manufacturing productivity and profitability, three conditions must be met:

- System and equipment production availability must be close to or match industry best
- Unavailability---both timing and duration---must be predictable. There must be no surprises
- Cost per production unit (bbl, pound, etc.) must approach or match industry best

Industry Best Availability

As was stated before, companies with world-class ambitions recognize that asset availability and utilization must be close to industry best benchmarks. However, few may realize that asset availability and utilization below existing industry-best benchmarks means they are actually operating a smaller than nameplate facility. Under these conditions, benchmarks such as cost per unit (pound, barrel, etc.) must be adjusted downward. As an example, if you are operating at 63% availability compared to a world-class benchmark of 88% (actual numbers from a batch chemical facility), your plant is effectively 25% smaller than the nameplate throughput. To join the few top performers, either availability must be increased to the world-class value or costs must be reduced 25% below metrics based on nameplate to gain competitive performance. Anything else would appear to be wishful thinking and reaching for the impossible. And it should be noted that this simplified example doesn't consider additional cost reductions necessitated by underperforming availability such as scheduling disruptions, missed deliveries and diminished capital effectiveness.

As a bit of an aside it must be mentioned that industry, process and equipment effectiveness benchmarks to compare current performance to industry best and identify areas where improvement is necessary are published and readily available for nearly every activity. These include production availability, maintenance cost, origin of maintenance requirements, work schedule compliance and equipment reliability expressed as MTBF (Mean Time Between Failure). One caution: many petrochemical industry metrics are based on Replacement Asset Value (RAV) or Estimated Replacement Value (ERV). Both depend on estimated current cost to replace a given production output. Calculations are often inconsistent between companies and even similar plants within the same company. RAV and ERV are good measures for tracking a plant's progress but should be used with caution when comparing performance between facilities and companies.

Contradictory claims are made by at least some providers of benchmarking data. They contend that the parameters RAV or ERV are independent of currency and date. Accordingly, they list these independencies as the main reason why they use them largely in their comparative studies among plant all over the world. But again, not all asset management experts agree with this contention and some find these parameters highly unstable and varying wildly even within the same country. These opposing experts have expressed the view that RAV and ERV are either misleading or totally meaningless for purposes of comparison.

Predictable Unavailability—No Surprises

Everyone who has been involved with making a product knows well the chaos and inefficiencies associated with surprises, which is to say unanticipated failures and unscheduled outages. Both carry significant cost and production penalties. Here is an actual example.

> *A large facility in Southeast Asia had been struggling for over a half a year to maintain compliance to ambi tious cost and availability objectives. A single unexpected outage, experienced on a Friday evening, elim inated all chances of compliance for the year—and performance based bonuses. It goes without saying that minimal variation and predictability are essential elements of world-class asset utilization and effec tiveness.*

Workshop conveners, typically senior plant management, typically point to "surprises" as a primary performance deficiency within their organizations. Industry best organizations strive to achieve 100% predictability. One company established an objective of less than one unplanned event occurring over a two-year period to be achieved within three years. Suffice it to state that
maximizing predictability requires the deployment and effective use of technology such as condition monitoring along with processes for effective notification and follow-up in the event of abnormal changes in condition.

Competition for capital and the resulting demand for increased return drive the necessity for additional reductions in areas such as production inventory and stocked spare parts. These drivers constitute further incentives for maximizing predictability, hence, minimizing variation.

Staffing Issues and Reliability Improvements

Continuing in business while faced with competition from low wage areas of the world demands reducing costs to levels that would have been considered impossible a few years ago. Understandably, then, and even among industry best, management is constantly looking to reduce costs by reducing personnel. An asset optimizing process most often has to occur simultaneously with a staff reduction. Very seldom are personnel additions allowed.

Most companies in North America have gone a long way in terms of reducing numbers of personnel. Outsourcing labor may gain further cost reductions; however, outsourcing has other complications and quickly reaches a floor. Where else to go? The answer is to provide the means for additional cost reductions through improved reliability—improved reliability that reduces the need for work. In many cases, cost objectives can be met by attrition, provided solid plans are in place to reduce work requirements.

Industry best companies determine a final staffing plan based on cost objectives, labor costs and the split between labor and materials for the local area (approximately 50%-50% in North America). With a typical optimum objective of 60% work originated by Preventive (PM) and Condition Based Maintenance (CBM), 25% to 30% Planned Corrective and 10% to 15% Unplanned, it is relatively easy to determine the necessity for additional improvements (work reduction) in order to meet cost and staffing objectives. As one example, it is not atypical for a top performing facility to learn that current PM requirements can't be accomplished within the constraints of staffing levels required to meet profit objectives. When that occurs PM tasks and intervals have to be reviewed and optimized. Better yet, the organization has to understand where component upgrade measures could reduce or even eliminate the type and frequency of maintenance effort typically expended. Not many benchmarkers have the expertise to guide these efforts with tangible specifics. Yet, without tangible specifics, upgrading and the attendant reduction in failure events remain elusive goals at best, and risky experimentation at worst.

In all too many instances, cost and headcount objectives have dramatically reduced professional staffing. Where even a modest-size facility used to have technical experts in a variety of disciplines, these people--if present at all today--are typically overcommitted. There is little time for professional study and advancement or even contemplation of risk and opportunity as precursors to the development of well thought-out upgrading, i.e. permanent improvement initiatives. Many facilities and companies that profess a commitment to becoming industry best will not allow technical professionals to attend conferences and seminars. Conference participation, "networking," the learning opportunities gained through the exchange of ideas and successes combined with the enthusiasm and heightened motivation that always results from peer discussions, far outweigh the cost and "loss" of time—definitely a solid value opportunity in the asset optimization culture.

Production Superintendents have been observed to complain about a lack of maintenance support when cost-competitive staffing levels no longer permit the slack that had mechanics and technicians readily available for immediate attention to unplanned, emergency work. In this environment, the real question is how much maintenance is affordable for a given business and level of production. If affordable maintenance is less than what might seem necessary, a plan must be developed and placed into effect to reduce maintenance requirements. As will be discussed in more detail later, the arrow points to an imperative for increasing reliability.

Returning to our automobile analogy, the success of this concept can be observed in modern vehicles where maintenance requirements have been designed out. As a result, today's automobiles are far more reliable with maintenance a fraction of what was required only fifteen or twenty years ago.

INDUSTRY BEST ORGANIZATIONAL CHARACTERISTICS

A number of essential characteristics are shared by industry best production facilities. Although everyone believes they can and must get better, the following characteristics emerge again and again within workshops and discussions as essentials for attaining industry best performance:

- Engaged senior executives and management driving the improvement process
- Organizational culture of honesty, trust, reliability and quality
- Solid, committed reliability-oriented management and leadership
- Good at the basics—robust processes, practices and technology in place, effective and fully utilized
- Ready availability of data and information
- Reliability improvement teams actively driving improvement initiatives
- Accountability at all levels, but enforced with impeccable justice

Engaged Senior Executives

Within industry best companies the necessity to improve is driven from the top. Industry leaders recognize that continuous organizational, process and cultural improvement is essential to keep pace in a competitive environment. This requires constant effort—and takes time. Leaders take an active role communicating and promoting the necessity to achieve the highest level of excellence in order to gain the motivation and commitment needed for success.

> *The manager of a world-class refinery stated his objective of attaining a cultural and organizational com mitment to asset performance equal to the excellence they had achieved in Safety, Health and Environmental areas.*

Management realization that improvement is a result and not a command may be another significant differentiator between the best and everyone else. Many Asset Optimization Workshop participants mention a lack of recognition that improvement can't be ordered as management fiat. They clearly see this lack of recognition as a significant barrier to progress within their organization.

Industry best executives and managers continuously demonstrate their total commitment to the improvement process by word and deed. It is astonishing to see how a plant manager's show of interest in the improvement process by occasional active participation in meetings energizes the people and process. In other organizations, a strong and motivated Steering Committee of mid-level managers listens to brief, semi-formal weekly presentations by lower level staff, giving them well-deserved visibility and, quite frankly, educating themselves in the process. Another company asks its technical staff to present "shirt-sleeve seminars" at the end of each safety meeting. The young engineer organizes his thoughts and makes a presentation that elevates the knowledge base of every listener, himself included.

Culture Of Honesty, Trust, Reliability And Quality

In case the forgoing factual observations didn't make the point: Optimization Workshops throughout the world typically arrive at very similar conclusions—the greatest opportunities for improvement are not process, practice or technology but rather organizational and cultural. Participants see the wisdom in moving to an empowered ownership, value, trust and results- oriented culture where all employees are focused on quality and continuous improvement. Rather than accomplishing repairs that simply lead to restoration of service, mechanics, technicians and engineers are encouraged to think and act in terms of problem elimination where deficiencies and problems are viewed as opportunities for improvement. To the extent that their thinking needs tactful and competent guidance, an enlightened management sees to it that such guidance is provided by in-house or outside consultant talent that will start by absolutely impartial and highly competent root cause failure analysis, or RCFA. A plant that doesn't perform RCFA is condemned to experiencing repeat failures that drain its resources and deprive it of reaching high availability and profitability.

Committed Operating Leadership And Management

Appointing operating leadership is a vital function of senior management. A successful leader of the Asset Optimization program must have the personal attributes of a champion and chief advocate for the program. The program leader must have prestige and visibility throughout the organization and occupy a position of authority—able to remove barriers by fiat if necessary. Most important, the leader must dedicate the time necessary for success in this vital position. Leading an Asset Optimization program is not a collateral duty to be addressed during spare time. There must be real accountability for results, including time for achievement and solid incentives for success. Generally speaking, successful Asset Optimization programs are led by an individual at the Superintendent level or above.

Effective and Robust Management Processes, Practices And Technology

Industry best facilities are skilled in all the basics. Quality metrics such as rework are industry best. Effective processes and practices are in place and followed for Work Planning and Scheduling, Spares Management, Preventive and Condition Based Maintenance and Root Cause Failure Analysis (RCFA). Industry best will be aware of best practice benchmarks in all aspects of performance and consistently track compliance to key objectives for improved results.

Solid processes for proactive equipment management such as Condition Based Maintenance (CBM) are in-place at industry best facilities. While every effort is made to eliminate problems prior to the appearance of symptoms, effectiveness is monitored with methods such as vibration, fluid (lubrication oil) and electrical current analysis and thermography. When one of these methods indicates an abnormal change in operating condition, the organization goes on alert to prevent an unscheduled interruption in production. Also, the organization views the event as a learning experience and will do its utmost to prevent a repetitive event from recurring.

Ready Availability Of Data And Information

Improvement initiatives depend on data. Within the best of the best, data are readily available. Although data access is not always easy, smart organizations find ways to circumvent access problems. Smart organizations even find ways, in some cases, to outflank less than responsive IT Departments with inexpensive data transfers to readily available commercial databases. From there, bright professionals can spend time most productively quickly analyzing cost and availability history to identify improvement opportunities with commercial software tools such as Microsoft Excel®.

> *As stated by the Maintenance Superintendent in a world class refinery: "The road to solutions begins with identifying issues—and that requires accurate data."*

In line with this valid observation, the best of the best will have reliability improvement action teams on the move and producing results. This core characteristic merits attention and will be examined in great detail later.

NECESSITY FOR A RELIABILITY CULTURE

As stated earlier, participants in virtually every Asset Optimization Workshop conclude that organizational culture is the most important element of achieving industry best performance. Organizations that have the right culture are successful and continually improving performance. Within struggling organizations, a strongly embedded culture that is resistant to improvement is often the principal barrier preventing the transformation needed to gain results essential for competitive success.

It should be noted that some asset optimization processes are promoted for their ability to manage failures. The prime objective of a reliability driven asset optimization initiative is not to manage failures but to minimize failures by identifying and eliminating the defects that cause failures.

Industry best performers typically have a reliability-oriented culture with several readily identifiable attributes:

- Efforts across the entire organization directed to creating value and improving business performance
- Trust, empowered ownership and accountability established at the craft, supervisory and support levels
- A proactive failure identification and elimination mindset—shifting focus from "doing maintenance" to problem and work elimination
- Utilizing problems and failures positively as opportunities for improvement
- Consistent quality, performing tasks correctly—the first time—stressed throughout
- Prioritized risk/threat identification and minimization actively pursued
- Constant training and improvement—the good learning organization gets better

When facilities are under pressure to reduce cost—and who isn't—there is a second major benefit to be gained by a reliability-oriented culture.

Surveys indicate that improved work management, better Planning and Scheduling along with implementing/refining CMMS, may yield a cost improvement of 15% to 25% (primarily by increased labor utilization—Wrench Time). Improved Materials/Stores procurement, storage and issue may yield another 10% or so reduction in costs. Neither really addresses the need to improve availability or eliminate surprises. So where do improved availability and the additional 5% to 20% cost reduction needed by industries facing stiff international competition come from? Some may assert that time based Preventive Maintenance (PM) or Condition Based Maintenance (CBM) will fill the gap. While both are essential to maximize asset and work effectiveness, there are many other factors that must be considered. As one consideration, unoptimized Preventive Maintenance (PM) may require more time than is available with an affordable maintenance staff. Furthermore, increased Preventive Maintenance may actually add work and downtime without a commensurate increase in availability. The best evaluate PM on the basis of value added. It is often possible to increase value by altering PM tasks, substituting condition tasks and / or extending task intervals. A good program of Condition Based Maintenance (CBM) will provide warning of failures in time to limit damage. However, without drive to eliminate cause, CBM can't eliminate the problems that limit MTBF and produce failures.

Again the answer is improved reliability. Improved reliability that simultaneously reduces requirements for labor and parts and increases availability. Increasing reliability directed to improving availability and driving down costs is the only way to gain a sustainable improvement in asset performance and effectiveness. This is the path being followed by the best of the best!

PRINCIPAL ELEMENTS OF A RELIABILITY ORIENTED CULTURE

Of all the process elements of a reliability-oriented culture four deserve additional discourse:

- Risk / threat assessment
- Root Cause Failure Analysis (RCFA)
- Optimized lifetime cost
- Reliability improvement teams

Risk / Threat Assessment

Risk/threat assessment and mitigation is particularly important to prevent “surprises”. In many cases there is recognition of a problem just waiting to happen. Many facilities wait until a problem occurs to take action. The best will identify and prioritize threats, even though nothing may have happened—yet—and take corrective action.

> As an example, a refinery recognized that the lubrication and seal oil system on a vital compressor did not meet current design standards or practice. Controls were antiquated and many felt that the automatic start system for the spare lubricating oil pump was unreliable. Although there had never been a failure or out age attributed to this vital system, most with knowledge considered it a ticking time bomb. Eventually the decision was made to replace the entire system. The task was thoroughly planned, a replacement was engineered, procured and installed successfully during a scheduled turnaround.

It is important to utilize risk ranking to identify threats and prioritize improvement opportunities. Equally important, risk is not simply consequences, but probability times consequences. Thus, systems and equipment where any failure may immediately interrupt production that have proven highly reliable over time may have a lower risk rank compared to equipment and systems with lesser consequences of failure and a history of unreliability.

Lesson—waiting for failure symptoms to appear then taking corrective action is not enough. The best identify risk and take corrective action before any failure symptoms are present.

The risk ranking process must be formulated such that only about 10% to 15% of total equipment and system assets are in the highest risk category. This will assure that attention and effort are focused on the greatest threats / opportunities.

> I*n one case a “criticality” assessment, identified approximately 1,600 systems out of a total of about 2,200 as critical first priority for maintenance optimization (Reliability Centered Maintenance—RCM). After about a year of effort by a dozen or so reliability engineers, optimized programs had been developed and imple mented for approximately 200 systems—13% of the total considered most critical. At that point the pro gram was more or less abandoned due to priorities, demotivated participants, resource availability and uncertain return. Did the 200 analyses that had been completed cover the highest priority systems or address the most threatening potential problems with greatest value recovery? No one knew—that step hadn’t been accomplished.*

Root Cause Failure Analysis (RCFA) Within a Continuous Improvement Culture

Root Cause Failure Analysis is the core of the failure cause identification and elimination process that is at the heart of a reliability-oriented culture nurtured by industry best performers. To accomplish the cultural transformation to industry best, prime responsibility for Root Cause Failure Analysis (RCFA) and corrective action move down in the organization to the working level. Everyone is challenged to eliminate the cause of defects and failures.

> *As a simple example, a general-purpose steam turbine bearing pedestal cooling jacket had cracked. The repair was reasonably straightforward, however, what caused the failure in the first place—and how can repetition be eliminated? A cursory examination revealed that the relatively thin wall cooling jacket was in close proximity to the turbine nozzle block and clearly subject to strong radiant heating. In operation, the cooling jacket probably experienced a several hundred degree (F) differential temperature across the thin wall. This led to excessive stress and ultimately cracking. The solution, install a heat shield to eliminate radiant heating.*

The preceding is a relatively simple example of a culture of problem elimination and continuous improvement that characterizes industry best performance. Craft mechanics are encouraged to be curious and continually ask why did that failure occur? At a higher-level within the continuous improvement culture, reliability engineers search out opportunities for increasing value. Typically, an effort to identify least reliable systems and equipment, those with highest repair costs and those responsible for the greatest number of emergency, unplanned Work Orders, will provide a clear picture of where efforts should be directed to gain greatest value. For facilities lacking application specific software capable of performing this type search, Microsoft Excel® pivot tables already resident on every professional's desktop are a very powerful, inexpensive method for identifying and prioritizing anomalous cost and availability. Excel Pivot tables are being used very effectively by many of the best and most clever reliability professionals.

Using this method a reliability professional leading an improvement team tasked with very ambitious objectives for improved availability and reduced cost recognized linked failures that hadn't been apparent to technicians, supervisors or even management. When viewed from a larger perspective, the opportuni ties were readily apparent. While a solution has not been developed as this is written, the path ahead is clear.

These observations lead to a cultural imperative—for maximum value and return, improvement initiatives must be reliability and value driven. The prime goal is not to perform work faster or more effectively but to eliminate the need for the work altogether by improving reliability (Mean Time Between Failure—MTBF).

Optimized Lifetime Cost

Another key element of a reliability culture is the recognition that a large portion of lifetime cost and availability are determined during design, procurement and installation (approximately 20% of total maintenance costs due to design in one study as much as 65%, probably including operating efficiency, in another). Additional effects often occur due to changes in operation. The reliability driven organization recognizes that defects due to faulty design and installation, including those brought about by off-design operation, must be eliminated. In some cases materials must be upgraded. Occasionally components, perhaps even entire equipment, will have to be replaced.

As an example, deep well centrifugal pumps were originally installed on the outlet from a large atmospher ic storage tank. The deep well pumps proved very unreliable. Failures typically occurred after approxi mately 6 months service and were costly to repair. A design review disclosed that the deep well design was deemed necessary in the event the tank, filled with a gas-saturated liquid, had to be pumped empty. In practice, neither condition occurred. Looking at realistic operating requirements the solution was evi dent—replace the deep well pumps with far more reliable in-line pumps. Although the in-line pumps weren't capable of meeting the original design specifications, they proved more than adequate for the service, far more reliable and much less costly under actual conditions.

A second example: Variable speed DC motors were unreliable and costly to maintain. Replacing the DC motors with variable frequency AC motors essentially eliminated the problems. The AC motors proved orders of magnitude more reliable, far less costly to maintain and paid back the investment for replace ment by increased production and reduced costs in less than a year.

In both the cases cited, would a conventional maintenance improvement program have led to a conclusion to replace assets that had proven unreliable or would it have concocted more extensive and costly monitoring and maintenance actions to mitigate design deficiencies? The best of the best consider design and material improvements as well as outright replacement in terms of value gained compared to more extensive maintenance.

Operating errors, including missing or incorrect procedures and inadequate training, are another significant source of excessive cost and degraded availability. There have been numerous cases where an investigation of failures occurring at startup revealed a design that was fine for operation but lacked critical provisions for startup. Post failure analyses conducted on equipment operating at high temperatures occasionally find no provisions for warming. Unanticipated pressure imbalances at startup were responsible for thrust bearing failures and total destruction of two centrifugal compressors. Similarly, some positive displacement machines lack provisions for starting at less than full system pressure. Proper venting is another commonly encountered deficiency on fluid machinery. Again, the solution is a failure analysis and correction culture that constantly asks why did this occur and what can be done to prevent reoccurrence plant wide.

Reliability Improvement Teams

Small, multi discipline reliability improvement teams are the heart and soul of an asset productivity optimization program utilized by industry best. Within action teams good intentions are converted to solid results. Teams evaluate risk, identify and prioritize opportunities using availability and cost benchmarks and implement improvement initiatives.

Teams are typically composed of four to six permanent members. Additional personnel with complementary knowledge and talent are brought in when required. The leader or a designated member will identify opportunities for improvement based on factors such as excessive cost, emergency Work Orders and / or downtime. It is often the case that "bad actor" systems and equipment will have the dubious honor of appearing high in all three categories. Team members collectively develop improvement initiatives along with metrics (objectives) in terms of both results and time to achieve results.

Opportunities for improvement are selected for implementation based on value and time (return). The team lists strengths to build on, barriers to success and a desired end state (objective).

> *One team in a large chemical plant committed to reducing unscheduled downtime by 50%, improving cost performance by the same percentage within a year.*

Once action plans are developed and agreed upon, responsibility is assigned for implementation. The individual responsible for implementation also reports results along with any problems back to the team – typically at monthly intervals.

Some considerations that will improve team results:

- Teams benefit from facilitation to help remain on objective. In a large facility, multiple teams may have totally different personalities depending on the individuals involved.

  In one plant, one team was run by an area Production Superintendent (very helpful to gain buy-in), three were run by Reliability Engineers with strong support from Production and Maintenance Superintendents. A fifth team was run by a Production Coordinator. Each team had a totally different personality that was largely the personality of the leader. With facilitation, the processes could be kept consistent and ideas developed in one team quickly communicated to the others.

- The number of improvement initiatives must be limited to avoid diluting efforts. A typical action team should have no more than five or six improvement initiatives active at any one time. Further, to assure meeting expectations, results from all initiatives should total about 120% of the overall improvement objective.That way if one or more initiatives fall short of objective others will hopefully make up the difference.
- Teams must direct their activities toward objective results that include a time schedule. With so many things going on simultaneously in a processing facility it is very easy to allow improvement initiatives to slide until the day of reckoning arrives and harsh reality shows that progress to results are either minor or invisible.Industry best drive relentlessly to objectives.

CONCLUSIONS

In every industry there is a group of best performers. While not every organization will or can be a best performer, all participants must endeavor to reach or approach industry best benchmark performance. Anything less in the current competitive environment may initiate severe cost reductions (job losses) or even going out of business.

Over the past several years it has become apparent that industry best performers share many characteristics. Workshops and discussions reveal that all are skilled and proficient in every aspect of their operations, aware of best practice and at or near the top of industry benchmarks for results in every category: Safety, Health, Environmental performance, operating, maintenance and business. All are learning organizations, always improving, never satisfied with current performance. They are also the happiest and most profitable.

Workshops reveal that organization, cultural and communications issues are nearly always the greatest barriers to achieving industry best performance. Further, mid level managers and technical staff state unequivocally that a culture of trust, empowered ownership and understanding is essential to gain best performance. They will go on to state that dictating improvement by arbitrary reductions or other measures is largely ineffectual. Real improvements in operating and business results are achieved by identifying gaps to best practice, implementing the improvements to culture and process necessary to close the gap. Within the industry best organization everyone must become aware of the impacts of "surprise" failures and endeavor to eliminate defects before they become failures.

As one Production Vice President commented, "You can't starve into prosperity".

The solution—followed by many industry leaders is to become reliability oriented, push responsibility for improvement down into the organization where real institutional knowledge and ownership can produce solid results and value. Utilize people most effectively, they have brains and are excited to participate in activities that are challenging and make their jobs easier, more enjoyable and secure. All who have followed this path recognize that improvement isn't utopia; resistance can be expected from people who are uncomfortable with change. If you are part of leadership recognize that leadership is quite different from management. People are hungry for leaders who show them how to do the right things and encourage success. In this case the right thing is inspiration to attain excellence in every activity.

About the author:

John Mitchell recently retired from Fluor Corporation upon completion of an assignment as Site Manager responsible for an asset productivity improvement initiative in a large petrochemical complex. Prior positions included Vice President Maintenance Operations and Engineering with ABB, Inc.; industry consultant; founder and president of MIMOSA, the Machinery Information Management Open Systems Alliance; Manager, Condition Monitoring Systems, Brüel & Kjær, AS and President and CEO, Palomar Technology International. He is the author of The Physical Asset Management Handbook, currently in third addition.

Improvement Team Sidebar

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Vital characteristics of action teams include:

- Approximately four to six participants
- Collaborative, multi-discipline composition capable of addressing cross functional opportunities / defects
    - Maintenance, production and reliability
    - Operators and crafts (maximize use of institutional knowledge)
    - Engineering / technical, finance, stores
- Led by committed champions
- Focused on manageable scope, e.g., unit, area availability, cost improvements
- Driven by defined objectives: increase MTBF, reduce lost production, cost, emergency Work Orders
    - Gaps – “Should Be” benchmarks compared to “As Is” metrics
- Personalities defined by individual participants—teams adhere to identical principles
- Develop solid and practical improvement initiatives and corrective action plans
    - Eliminate fundamental defects and the need for maintenance

      – not simply mitigate problems, restore to service
- Clearly stated objectives in terms of increased availability, reduced cost, time to achieve
- Multiple improvement initiatives, no more than four to six per team, optimized in terms of number and balance
- Directed toward quick results – gain support and momentum
    - Identify top opportunities for improvement—“low hanging fruit”
- Gain organizational and individual commitment to the improvement effort
    - Communicate necessity for improvement—“respond quickly to concerns, avoid rumors
    - Define specific responsibility, accountability
    - Establish and build ownership
    - Drive results
    - Promote teamwork, learning, development of new skills
- Identify and establish short and long-term metrics to measure progress and results
    - Demonstrate contribution to business objectives and value
- Implement for results, create visibility, gain support
- Facilitation and coaching provided to keep on track
- Monitor and publicize gains

Heinz P. Bloch is a Consulting Engineer with offices in West Des Moines, Iowa. Before retiring from Exxon in 1986 after over two decades of service, Mr. Bloch's professional career included long-term assignments as Exxon Chemical's Regional Machinery Specialist for the United States. He has also held machinery-oriented staff and line positions with Exxon affiliates in the United States, Italy, Spain, England, The Netherlands and Japan. Troubleshooting and reliability improvement missions have taken him to process plants and manufacturing facilities in 30 or more countries on all six continents. He has conducted hundreds of public and in-plant courses internationally.

Mr. Bloch is the author of over 300 technical papers or similar publications. His 14 comprehensive books and a searchable CD-ROM on practical machinery management include texts on failure analysis, failure avoidance, compressors, steam turbines, oil mist lubrication and practical lubrication for industrial facilities. These groundbreaking books have been used for reliability improvement lectures and maintenance cost reduction consulting worldwide. In addition, Mr. Bloch holds five U.S. and many international patents relating to high-speed machinery improvements.

Mr. Bloch graduated from the New Jersey Institute of Technology with B.S. and M.S. degrees (Cum Laude) in Mechanical Engineering. He was elected to three National Honor Societies, is an ASME Fellow, and maintains registration as a Professional Engineer in New Jersey and Texas. Mr. Bloch is the Reliability/ Equipment Editor of the monthly publication Hydrocarbon Processing.