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A Case Study in Effectively Implementing Corporate Change Initiatives

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In today's world, more and more corporations are developing an integrated set of best practices to implement corporate wide. Implementing these best practices in a way that provides the desired results is proving to be far more difficult than developing the set of best practices.

Motiva's Convent Refinery has been a leader in implementing Shell Manufacturing's Global Asset Management Excellence (GAME), a suite of manufacturing work processes and supporting tools based on Shell and industry best practices that target industry-leading performance in safety, reliability, environment, and cost. After using traditional implementation approaches with limited success, we have discovered and are continuing to discover a set of implementation best practices for corporate initiatives.

This paper will be broken into three sections:

- Frameworks that help explain the current situation.
- History of GAME-ME and it's implementation at Convent
- Results of the pilot in one area of the plant.

Background

GAME – Global Asset Management Excellence

GAME is a global program. It is based largely on successful Process Safety Initiatives (PSI) undertaken by Shell/Motiva US refineries. PSI was credited with significantly improving safety performance in Shell/Motiva's six US refineries. It is a comprehensive set of best practices and metrics for the efficient operation of Shell and Motiva's refineries and chemical plants. GAME consists of the following modules:

1. Equipment Integrity
2. Instrumented Protective Functions
3. Ensure Safe Production
4. Reliability-centered Maintenance
5. Maintenance Execution
6. Turnaround

GAME is built on work processes and how these work processes interact – not merely a collection of disjointed best practices. Thus, GAME was designed using process methodology including process maps, work flow diagrams, and work process descriptions and definitions. Much of GAME's documentation includes process maps.

Sites identify gaps in their performance against the global process and develop a gap closure plan. Sites assign process owners who are responsible for closing one or more gaps in performance. Process owners are given comprehensive training and resources – time, money, and support from management. Sites were also provided with training materials to use as a basis for training their site.

Motiva's Convent Refinery is fortunate to have supportive top management that were very knowledgeable about the work processes that GAME laid out and

approached the implementation with much more than a “check the box” approach.

The site-specific documentation which included clear process diagrams and roles and responsibilities reflects a sincere and significant effort to ensure that everyone would know how they were to work under the GAME umbrella.

The site had spent considerable effort over a two year period to turn GAME into a reflection of the way work is performed at the site. To be clear, progress has been made but not at nearly the pace that everyone involved would like.

Many companies and sites are taking similar approaches with visible progress being made but still general dissatisfaction on the pace.

The question we will explore is why after years of effort and lots of money, are sites still struggling to get where they want to be? Why were other sites such as the Lima and Port Arthur refineries able to make the significant shift in 18 months?

For more information about these successful sites, see:

- “Proactive Manufacturing: accelerating step change breakthroughs in performance” – NPRA Maintenance Conference MC-98-92 by
  - Paul A. Monus, Senior Project Manager
  - Donovan J. Kuenzli, Refinery Manager
  - James D. Griffith, Plant Availability Manager
- “A New American TPM: Leadership requirements for breakthrough change” – NPRA Maintenance Conference MC-99-95 by
  - Paul A. Monus, Sr. Project Engineer - BP Amoco Chemicals
  - James D. Griffith, Manufacturing Manager - BP Amoco Chemicals
  - Donovan J. Kuenzli, Refining General Manager - Clark Oil
- Achieving Proactive Manufacturing: Learnings in leadership on our journey to become a world-class refinery by
  - James D. Griffith, Manager of Maintenance, Premcor Refinery - Port Arthur, TX

  These papers can be viewed at http://www.manufacturinggame.com/articles.html

Motiva's Convent Refinery

The Convent Refinery was originally built and operated by Texaco in 1967 and went through a major expansion in 1979 when a hydrotreater, sulfur complex, three crude oil storage tanks and an additional dock were added. The plant capacity was approximately doubled with an upgrade in 1984. The site's current capacity is approximately 235,000 barrels/day. It became a Saudi Aramco partner in 1989 as part of Star Enterprise. The plant became a part of Motiva Enterprises LLC in 1998 adding Shell as a family partner.

The major refining process units include Atmospheric and Vacuum Crude Distillation, Fluid Catalytic Cracking, Resid Hydrocracking, Catalytic Reforming, Alkylation, Hydrotreating, Hydrogen Generation, and Sulfur Recovery.

The refinery employs approximately 550 Motiva employees. Convent also has approximately 200 full time equivalent contract employees on site at any point in time.

Relevant Frameworks

The following frameworks will serve as foundation for the new material being presented. Since these concepts have been presented several times in the past, we'll only include a synopsis of each with references that can be obtained at http://www.manufacturinggame.com/articles.html

Dynamic Benchmarking Model

The data used to develop DuPont's original Dynamic Benchmarking Model was collected in DuPont's "Best of the Best" Benchmarking Study administered by A. T. Kearny in the mid to late 80's. The purpose of the survey was to discover the characteristics of the very best maintenance organizations. A total of 140 sites were surveyed from a broad spectrum of industries. About half the sites surveyed were non-DuPont sites.

Conventional analysis of the flood of data did not result in any useful insights into how to elevate the performance of organizations. Winston Ledet initiated and led a team of three DuPonters and one consultant to analyze the data using Systems Dynamics modeling. Tony Cardella was one of the team members. A Systems Dynamics model, which is the basis for our Dynamic Benchmarking Model, Maintenance Stable Domains and Defect Elimination, were developed for the first time by this team during this effort. These frameworks have become the prevailing paradigms of most maintenance experts. However, in 1991, these same frameworks seemed strange by most and "heretical" by some. The Manufacturing Game® was developed to help communicate these concepts more effectively and efficiently than written/oral documentation.

For a more comprehensive academic description of the background, contact the authors for a copy of "Learning a Stitch in Time: Building a

Proactive Maintenance Culture at E. I. DuPont de Nemours and Co." by John D. Sterman, Ellen Banaghan, and Elizabeth Gorman, MIT

For a practical view of the implementation of these frameworks, see "Executive Summary of Lima Refinery experience", by Paul A. Monus, Sr. Project Engineer - BP Amoco Chemicals, James D. Griffith, Manufacturing Manager - BP Amoco Chemicals, Donovan J. Kuenzli, Refining General Manager - Clark Oil

Systems Dynamics Modeling

DuPont's first Systems Dynamics model was completed in 1989. A Systems Dynamics model is basically a cause and effect approach put to mathematics, which is then verified against actual real world experience. This results in a model that is structurally equivalent to the area of study. This then provides the researchers a "practice field" to determine the key leverage points in the system.

For a more detailed explanation of how the computer simulation can be used, see "The Manufacturing Game" by Winston Ledet and Mark Paich.

The original Systems Dynamics model was updated to include more organizational capability and readiness structure in 2002. The basis for the upgrade was the experience gathered after working with over 168 companies at multiple sites around the world and over 30,000 participants in The Manufacturing Game Workshop.

Defect Elimination

At the time of the "Best of the Best" Maintenance benchmarking study in the late 1980's, the goals of maintenance organizations were thought to be centered on maintenance costs. As a result, conventional benchmarking attempted to find effective means of achieving low cost by focusing on resources such as the number of planners or craftsmen, or stores levels, etc. and technologies such as planning and scheduling, predictive maintenance, etc.

The Systems Dynamics model helped us recognize the goal is defect management. This led us to looking at how numbers of resources and technologies were employed to eliminate defects. Furthermore, it led us to conclude that costs were a consequences of how these resources and technologies were applied toward defect elimination.

For a more comprehensive explanation of Defect Elimination, see "The Value of Defect Elimination" by Tony Cardella, Mark Downing, Winston Ledet, and Mark Paich.

Goals, Means and Consequences

Also discovered was the importance of understanding the significance of the distinctions of Goals, Means and Consequences. Attempts to control or manage any system by attempting to control the consequences of the system inevitably lead to poorer systems performance. For example,

attempting to control a maintenance system by focusing on cost control as the driver will lead people to do less maintenance, which will increase maintenance costs in the future. Another example of driving cost control is that predictive maintenance (a means) may find that a piece of equipment is about to fail but the organization allows it to fail because it is "cost effective".

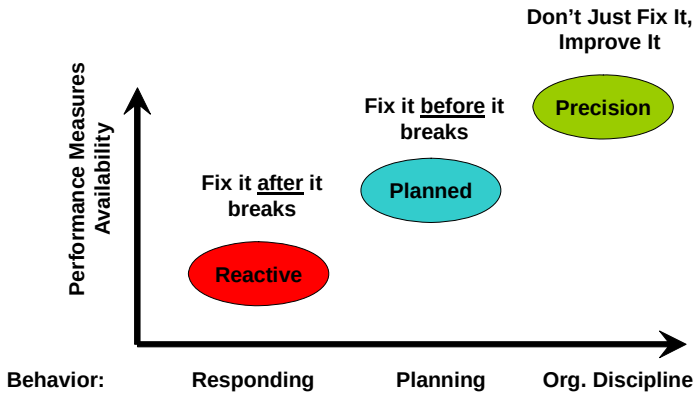
System control gets much better when decisions are made based on the impact on the goal. For example, by using defect elimination as a goal, a means such as predictive maintenance may find a piece of equipment about to fail and will take appropriate actions to prevent failure because this will eliminate the defects created by the failure event. This action would be taken even if this one situation isn't "cost effective" because, if you don't take the action, it may lead to misunderstanding by the workforce who could lead to applying the same logic to a situation that may not be "cost effective".

For a more detailed explanation about how various maintenance technologies/functions would operate when applied with a goal of defect elimination, see "Creating Proactive Maintenance Behavior" by Tony Cardella, Mark Downing, Winston Ledet, and Mark Paich.

For a view of how the Goals, Means, and Consequences Framework is used in Organizational Change, see "A Successful Client's Approach to Organizational Change" by Winston P. Ledet.

Stable Domains

In the "Best of the Best" Maintenance Benchmarking study, we could clearly see that site performance for the 140 sites in the "Best of the Best" benchmarking study aggregated into three stable domains – Reactive, Planned, and Precision. Furthermore, we knew from Prigogine's theory of dissipative structures, these sites were stable due to overlapping control mechanisms that kept the system stable within limits. The Systems Dynamics model helped us understand those control mechanisms.



Heroic Change

In order to achieve functional performance at the level of the Precision Domain, a transformation from the Reactive Stable Domain to the Precision Stable domain has to occur. Our experience with two such transformations supports the framework of Kurt Lewin that says that the transformation takes place in three stages. First, the organization has to be unfrozen so that it can change. Second, the change must take place and third, the organization must be refrozen in the new structure.

For a more complete description of this framework see Heroic Change by Winston P. Ledet

Requirements for successful implementation

To replicate the success described earlier in a reasonable period of time 18 months to 2 years, organizations must be able to meet the functional requirements, must have the will to implement the change, and must have the energy required to make the change. The following is meant only as an overview of a coalescence of several other frameworks based on works by J. G. Bennett.

Functional Requirements

In order to put in place new work processes such as GAME, organizations must be capable of meeting the functional requirements of the change. Approaches to improve functioning capability includes “How to” efforts and addressing organizational issues and a budget to cover the cost of change.

These are all “How to” efforts which include:

- Training
- Coaching
- Documentation including:
    - Manuals
    - “cheat sheets”
    - Handouts
    - Diagrams

Its organizational dimension would include:

- Roles and Responsibilities
- Organizational issues such as:
    - Reporting structures, i.e.,
        - Central vs. decentralized maintenance
    - Budget ownership
    - Contracting strategy
    - Numbers of people, i.e.,
        - Numbers of planners
        - Numbers of mechanics per first line supervisors

Finally, the organization must have a budget to implement the change.

Will to Change

The will is the sum total of the situation in which the site finds itself which sets the limit of what is possible regardless of the site's current functioning capability and energy. By sum total, we mean that you have to consider the will of:

- Shareholders who are seeking good returns on their investments
- Customers that want good value for the money they spend on your products.
- Society who are seeking safe and clean facilities
- Employees who are seeking meaningful work

It's important to note that will exists – we don't create it. For example, for most petrochemical plants, we don't get to choose who will be our shareholders. Shareholders have invested their money based on their expectations of future financial return for the risk they are taking through their investments. However, we can tap into the will. We have all heard of organizations that when faced with closing (losing their shareholders), find a way to improve.

Will is also connected to values that people hold which are sometimes difficult to assess. Therefore, it is important to not be too quick to judge what the will is. Many times, the will is hidden behind satisfied values. For example, the marketplace may be demanding low cost gasoline – until there is an oil embargo, which makes quantity more important than costs. Or, we may confuse behavior and will. For example, the workforce at the plant may appear to be very "anti-improvement" of anything, which may manifest itself as a lot of complaining and whining. However, this may be an indication of placing high value on making a difference in the quality of their work, which has been squashed by overemphasis on cost control or inappropriate leadership styles or boundaries.

There is a certain tension between these various groups that makes finding a way to tap into the will difficult. As a result, we see organizations try to tap into the will to reduce costs that results in unsafe facilities or polluted environments. This can also happen when an organization gets too focused on meeting customer demand – mechanics and operators are pushed to hurry their work which can result in future failures and more lost opportunities.

The nature of "will" is uncertainty embedded in the concreteness of the situation, which complicates any planning process. In general, "will" is embedded in everything that exists in the form of "striving to continue to be what it already is." When we do capital project work, the new thing we are creating does not yet exist so does not yet strive to be what it is. In this case, we can plan much better because we are not fighting what already exists. So when we are dealing with an existing organization, it is difficult to create a plan that reconciles all the "strivings to be" needs of what already exists. Therefore, project planning tools are not the best tools to use for managing organizational change.

Energy to Change

Albert Einstein stated *"No problem can be solved from the same level of consciousness that created it."* Therefore, if we wish to change the organization, we must bring a different level of consciousness to bear on the problems that are preventing the organization from achieving its goal. Consciousness is a particular quality of energy that is difficult to experience.

Let's look at the pertinent levels or qualities of energy that have to exist for an organization to change.

Automatic Energy

Automatic energy is easily obtained when we add bodies to any effort. It is what we get when we simply use someone's hands, habits, or routines. An example might be that we start braking when we see the upcoming traffic light turn red. Another example of automatic energy is when someone is given a very explicit set of instructions and told to follow them without fail.

An indication of utilizing the automatic energy of the workforce is when people talk about "checking your brain at the gate".

Automatic energy is extremely useful but perhaps the most useful in organizational change is when we are trying to make things more efficient.

Sensitive Energy

Sensitive energy is a bit more difficult to obtain. We can no longer simply add bodies to the effort. The people we do have will have to notice problems or defects in processes and practices. An example might be when we see an upcoming traffic light has no power. Now, we must stop or slow down to notice if any other cars are arriving at the intersection. Another example might be when we ask mechanics to replace a leaking seal and at the same time look for the cause of the leak and take appropriate action.

Sensitive energy is very useful when solving known problems with known causes – like bad bearings causing a seal to leak. "Back to basics" types of organizational improvement efforts are attempting to raise the quality of energy in the workforce to this level.

"Back to basics" improvement efforts assume 1) performance was good enough in the past, and 2) the performance has degraded and is no longer good enough. Thus, successful "Back to Basics" efforts are likely to show results in the short term and then degrade over time which will require re-solving the organizational performance issues over and over. If the will of the situation is driving an organization to improve, it is likely to not be satisfied in the future when performance starts to degrade. Thus, automatic energy and sensitive energy alone are not sufficient for solving problems with unknown causes. Organizations that are limited to this level of energy, typically find themselves swamped with initiatives that are all competing for attention (sensitive energy) and people's time (automatic energy).

Conscious Energy

Conscious energy is much more difficult to obtain than sensitive energy. However, a little conscious energy can result in a lot of action/activity. This is evident during an emergency or after some major disaster – people do some pretty incredible things – like 10-year old lifting a big four wheeler off of his severely injured father or working 36 hours straight. Conscious energy is not created, it is tapped into based on our receptivity. Organizations that are truly afraid of being shut down unless performance improves dramatically are usually very receptive and thus tap into conscious energy in a big way. However, for most organizations, this is not true. The workforce has become skeptical over the years after many unsuccessful initiatives thrust upon them. Thus they have difficulty being open to one more thing.

When someone can clearly see the impact of their personal decisions over time, they become much more receptive to conscious energy. Unfortunately, this is very difficult to see in the real world due to the complexity of the situation and the long time delays before the true impact could be known. Thus, the most effective means to creating receptivity is to have people participate in a simulation that mimics how their world works. This is the basis of why simulators and authentic drills have been proven to be much more effective than mere talking about how something works.

Creative Energy

Without creative energy, all of the activity that results from tapping into conscious energy is more of what was done in the past which is likely to have the same type of impact as a "back to basics" approach – a quick hit but short lived.

Creative energy comes about when various initiatives are seen to be one single integrated whole and implemented as a single integrated change effort. Organizations that are able to tap into creative energy find ways to apply many new initiatives in one focused area. For example, rather than break GAME into 12 separate initiatives with 12 different champions, 12 different training programs, etc., they find ways to apply all 12 in a small way in a single integrated effort.

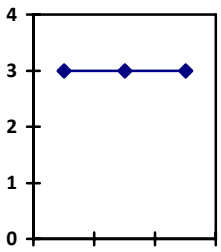
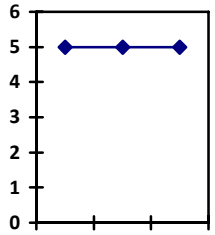
This integration of initiatives is what Don Kuenzli means when he says "*the only way to make this transformation is make defect elimination your way of doing business."* Don is a retired plant manager who has taken two refineries through complete transformations to the Precision Domain. These two refineries have remained in the Precision Domain after multiple changes in ownership and management over the last 8 to 12 years.

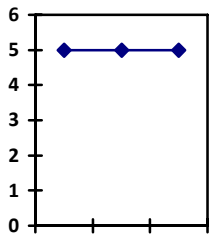
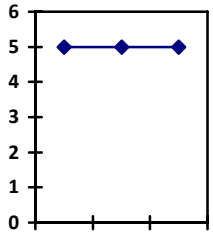
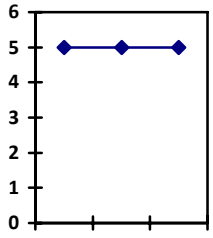
This is the level of consciousness that Albert Einstein meant in his statement.

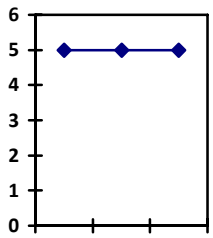
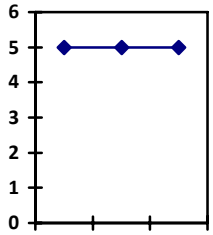
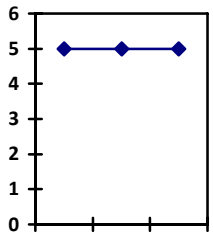
GAME-ME Implementation History at Convent

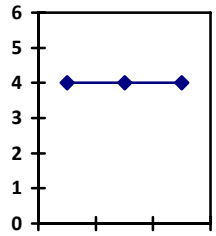
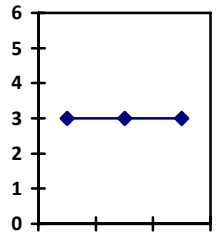
Requirements for achieving the Precision Domain

Based on the frameworks, we have found the following requirements to be necessary to achieve sustainable change to the Precision Domain. The blue lines indicate the requirement for each category and the bar charts in the later sections will show the progress made by Convent in each of three initiatives to pursue higher performance. This first section only shows the requirements and the description of the requirement in the right column. The value set on the left of the graph is a subjective evaluation of the level being achieved. Later sections will show the progress for the Ramp program, the GAME-ME program, and The Manufacturing Game pilot.

Framework	Requirement	Description
Stable Domains		Sites in the Reactive Domain have the highest costs, lowest reliability, highest lost opportunity value, and most safety and environmental incidents Sites in the Planned Domain backslide to the Reactive Domain after a few years of improved performance. Sites in the Precision Domain have the lowest costs, highest reliability, lowest lost opportunity value, and fewest safety and environmental incidentals. The scale is 1 = Reactive, 2 = Planned, and 3 = Precision The Convent Refinery has a goal of reaching the Precision Domain.
Defect Elimination		In order to reach the Precision Domain, a site in the Reactive Domain must make a significant reduction in the defect generation rate and/or increase in defect removal rate. Sites that write 6,500 work orders/year must deal with 20,000 defects in their equipment. Sites in the Reactive Domain must launch on-the-job action teams at a rate of 0.5 teams/worker over an 18 month period. Sites can also expect to see 1 team/worker form spontaneously. Worker includes company employees plus embedded contractors. The scale is 1 =.1 teams/worker and 5 = 0.5 teams per worker in 18 months

Goals, Means, Consequences		Reflects how metrics are used. The only way to achieve the Precision Domain is to eliminate work which is caused by defects. Thus good goal metrics should include defects removed or work eliminated. Metrics that reflect the means being used are the actions a site is taking that eliminates defects in the equipment or processes, i.e., number of On-the-Job Action Teams. Metrics that reflect consequences are the result of the means used. The most common consequences metrics are costs, head count, wrench time, etc. Sites should have their metrics clearly identified as goals, means, or consequences. Furthermore, metrics should also be used appropriately – i.e., short term decisions should be made based on Goal and Means metrics. Long term corrections should be made based on consequences metrics. The scale is 1 to 5 and is based on the fraction of metrics properly categorized as a goal, means, or consequences.
Functional Improvements		Organizations in the Reactive Domain usually have most of the functioning capability they need to achieve the Precision Domain. More frequently the problem lies with not fully utilizing the functioning capability that they do have. Thus the need to improve functional capability is not very high. Organizations must guard against wasting time and energy on learning what will not be used. The scale is 1 to 5 and is based on having the skills needed do all work perfectly.
Automatic Energy		As stated under defect elimination, organizations must eliminate significant numbers of defects over a 12 to 18 month time frame – far exceeding the capacity of any part of the organization – such as engineering or reliability. Thus organizations must engage everyone in the organization who performs work that affects equipment, processes, or parts. The scale is 1= 10% engaged and 5= 80% engaged.

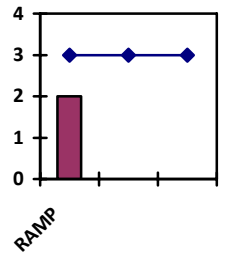
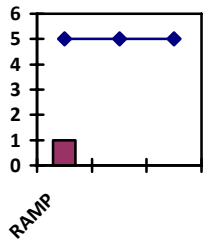
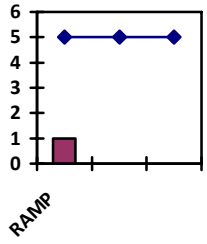
Sensitive Energy		Changing stable domains requires changing work habits and routines. Before anyone can change their habits or routines, they must become aware of the defects in those habits and routines. As stated earlier, it requires everyone performing work, thus everyone performing work must be sensitive to how their work is adding or removing defects. The scale is 1= 10% aware of defects in habits and 5= 80% aware
Conscious Energy		Noticing is not enough. Those same people have to be disciplined enough to resist slipping into old habits and routines once they have noticed they are a source of defects. This requires conscious energy. An indication of conscious energy is the quantity and quality of disciplined work with a defect elimination focus. The scale is 1 = 10% disciplined and 5 = 50% disciplined.
Creative Energy		As stated earlier, stable domains are stable because of overlapping or redundant control systems that exist. Changing these control systems cannot be taken by breaking them down one at a time. The nature of these overlapping control systems is that stopping one at a time usually results in another becoming active to maintain the status quo. Breaking out of a stable domains requires creating/discovering new control systems that are implemented as an integrated whole rather than one at a time. Receptivity to creative energy requires space and time and cannot be scheduled. The scale is 1 = 1% receptive to creativity and 5 = 30% receptive.

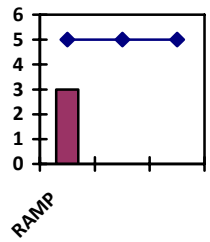
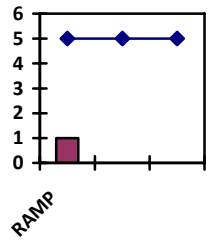
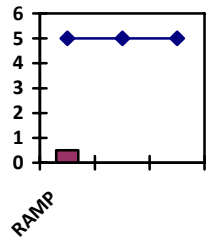
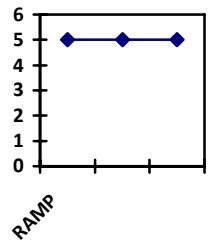
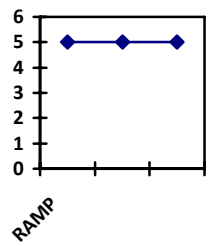
Urgency		Urgency is used as a means of evaluating the Will to change. Organizations faced with "improve or die" have a very high level of urgency. Organizations that are led by forward thinking leaders are able to see how the current path of an organization may lead to closure years in the future and take action in the present to avoid that fate. The scale is 1= things are fine and 5= they are going to shut us down if we don't do something.
Heroic Change		Heroic change has three stages 1) unfreezing of the organization, 2) making changes necessary to achieve the Precision Domain, 3) refreezing the organization. The scale on the graph indicates the stage required to obtain the Precision Domain.

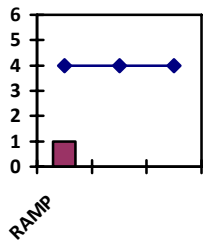
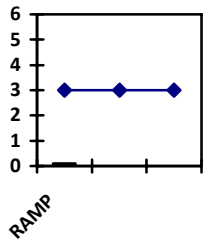
RAMP Implementation

Convent's journey towards Maintenance Excellence actually began prior to GAME or GAME-ME. In 2001, the site initiated a program entitled RAMP – Reliability and Maintenance Practices. The primary focus of RAMP was to establish good PM programs through the use of RCM. RCM was primarily a technical effort driven by a few part time engineers. RAMP also worked to ensure PM's were completed as scheduled by having dedicated PM crews.

The site was in the reactive stable domain at the start of the program. Emergency and Break-in work orders made up about 45% of the total work orders written in 2000.

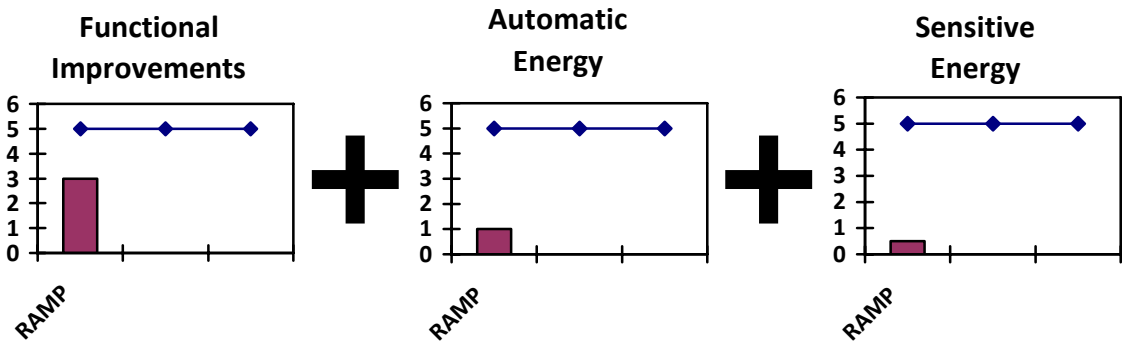
Framework	Ranking	Comments
Stable Domains		The goal of the effort was to improve efficiency or move from the Reactive Domain to the Planned Domain The scale is 1 = Reactive, 2 = Planned, and 3 = Precision
Defect Elimination		Although there was some emphasis on reliability through better PMs, it was focused on a few technical resources which would not come close to the roughly 375 equivalent On-the-Job Action Teams needed to reach the Precision Domain. The scale is 1 =.1 teams/worker and 5 = 0.5 teams per worker in 18 months
Goals, Means, Consequences		This implementation utilized common metrics that would utilize consequences-type metrics such as cost or manpower, to drive short term measures. The scale is 1 to 5 and is based on the fraction of metrics properly categorized as a goal, means, or consequences.

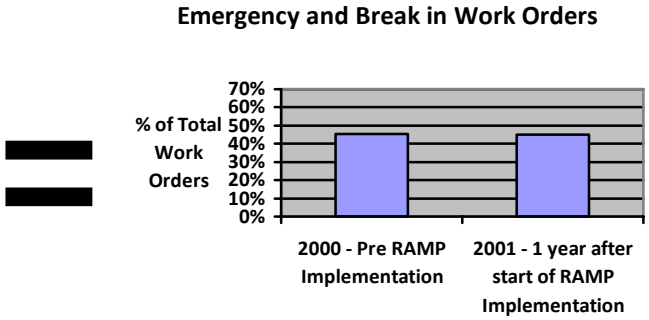
Functional Improvements		The site had reasonably good skills at the time of the RAMP implementation. The scale is 1 to 5 and is based on having the skills needed do all work perfectly.
Automatic Energy		Engagement was limited to very few people and most of them were in engineering. The scale is 1= 10% engaged and 5= 80% engaged.
Sensitive Energy		The primary focus was to get a better, more consistent PM program established rather than awareness of defects in work habits. The scale is 1= 10% aware of defects in habits and 5= 80% aware
Conscious Energy		There were no significant changes in habit or routines. The scale is 1 = 10% disciplined and 5 = 50% disciplined.
Creative Energy		RAMP represented the conventional wisdom of the time which reflected little or no creative energy. The scale is 1 = 1% receptive to creativity and 5 = 30% receptive.

Urgency		The will to change was actually pretty high however the organization was insensitive to it. The scale is 1= things are fine and 5= they are going to shut us down if we don't do something.
Heroic Change		The low quantity and quality of energy put into this effort had little or no impact on unfreezing the organization. The scale on the graph indicates the stage required to obtain the Precision Domain.

Impact of RAMP Implementation

Even though RAMP represented a functional improvement over the practices at the time, the low quality and quantity of energy resulted in no significant improvement. At the end of 2001, emergency and break-in work orders still remained about 45% of the total – the site was still in the Reactive Domain.

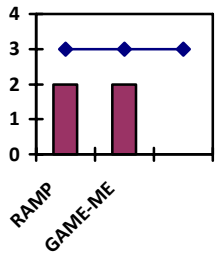
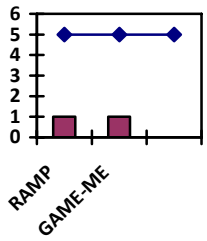
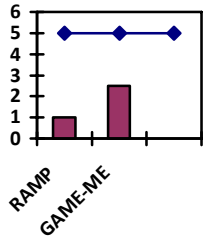


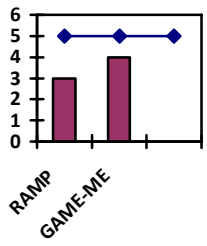
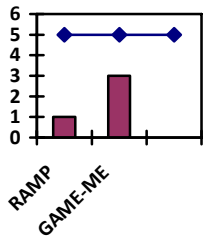
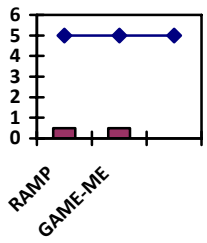
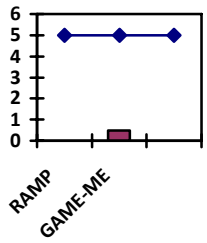


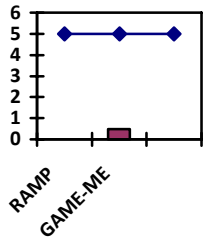
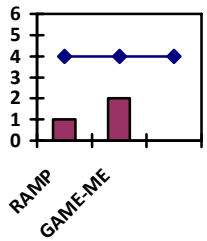
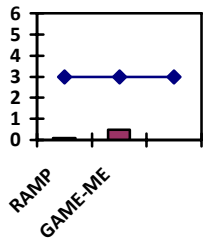
GAME-ME Implementation

In the fourth quarter of 2004, a significant part of the four Engineering Excellence engineers' time was assigned to work on implementing GAME-ME. Additionally the site began initiating several other improvement efforts associated with the total GAME work processes.

A large cross functional team was formed to implement GAME-ME. The team spent significant effort in carefully defining roles and responsibilities, process handoffs, and objectives. Management made the entire workforce available for training in the new work processes.

Framework	Ranking	Comments
Stable Domains		The goal of the effort was to improve efficiency or move from the Reactive Domain to the Planned Domain, which was no different than RAMP. The scale is 1 = Reactive, 2 = Planned, and 3 = Precision
Defect Elimination		GAME-ME did not significantly increase attention on defect elimination. The scale is 1 =.1 teams/worker and 5 = 0.5 teams per worker in 18 months
Goals, Means, Consequences		The emphasis on metrics increased in the GAME-ME effort with more metrics being identified as meaningful. Furthermore, the metrics were used to drive more decisions. However, some metrics were still not used or used without consideration of Goals, Means, or Consequences. The scale is 1 to 5 and is based on the fraction of metrics properly categorized as a goal, means, or consequences.

Functional Improvements		Documentation and training programs were of high quality. The scale is 1 to 5 and is based on having the skills needed do all work perfectly.
Automatic Energy		The site engaged a much larger population in this effort. There was a large cross functional team of full time or near full time people working on the implementation team. Management ensured that training existed for most people within the site and the training was well attended. Most people were only expected to spend a small amount of their time working on making GAME-ME work. The scale is 1= 10% engaged and 5= 80% engaged.
Sensitive Energy		GAME-ME did not address defect elimination in work habits any more than RAMP The scale is 1= 10% aware of defects in habits and 5= 80% aware
Conscious Energy		The training did not include participation/interaction with any sort of simulator that would raise receptivity to conscious energy. There were no significant changes in habit or routines. The scale is 1 = 10% disciplined and 5 = 50% disciplined.

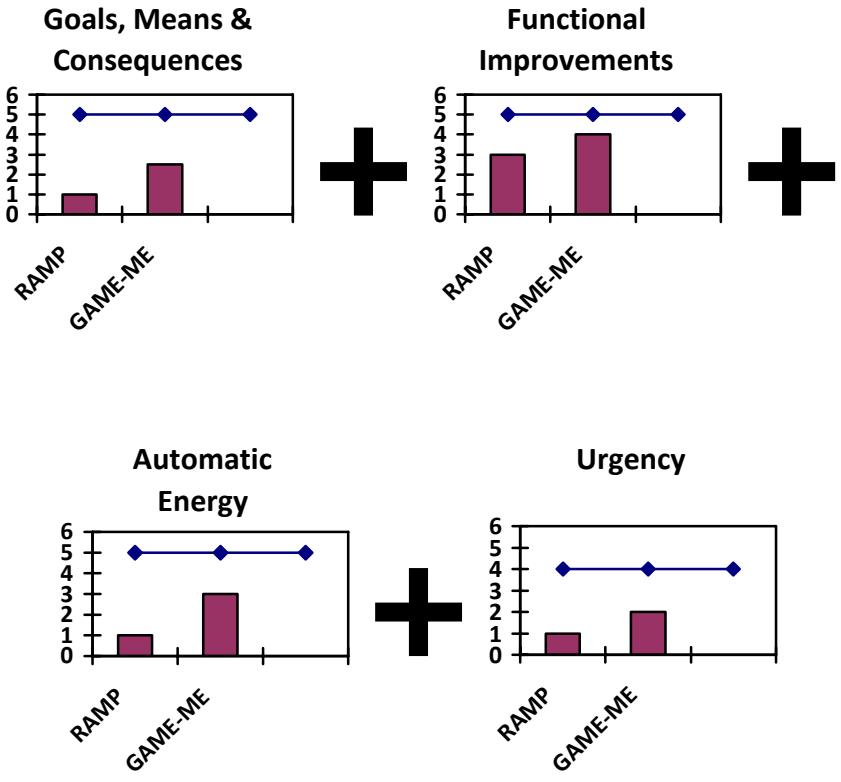
Creative Energy		The implementation team did access some creative energy in the way they approached documentation and training. However, there was little creativity applied to changing the nature of the work that GAME-ME is supposed to manage. Furthermore, the space and time given for creativity was only given to the implementation team. An indication of the lack of creative energy was that the various initiatives competed for resources which is an indication of lack of integration. The scale is 1 = 1% receptive to creativity and 5 = 30% receptive.
Urgency		The corporate push helped raise the urgency. The scale is 1= things are fine and 5= they are going to shut us down if we don't do something.
Heroic Change		The low quantity and quality of energy put into this effort had little or no impact on unfreezing the organization. The scale on the graph indicates the stage required to obtain the Precision Domain.

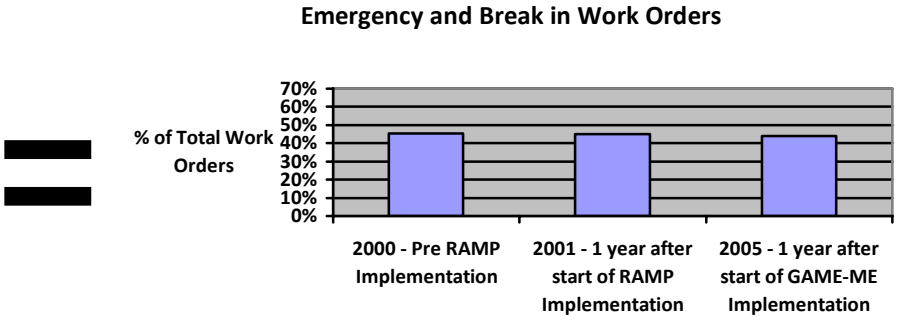
Results of GAME-ME Implementation

The GAME-ME implementation should have been very successful based on conventional wisdom around implementations.

- The site made better use of better metrics as indicated by the rankings of Goals, Means, and Consequences ranking.
- There was more effort spent on functional improvements,
- The effort had a much higher quantity of energy put into it by engaging the entire workforce – see Automatic Energy ranking. And,
- The extra corporate push increased urgency.

Unfortunately, bottom line results were still difficult to identify. For example, emergency and break-in work order rate remained virtually unchanged – the site was still in the reactive domain after a solid 1 year effort.





The Manufacturing Game Pilot -- Raising the Quality of Energy

Ledet Enterprises was asked to conduct an organizational readiness assessment to assess the organization's will and energy to change. The assessment as conducted using the dynamic Benchmarking Model as the guiding framework. The assessment determined that the will to reach the precision stable domain was strong – 100% of those interviewed (about 25% of the employees) stated this. However, most believed that given the initiatives that were being pursued they would fall short of the Precision Domain.

A detailed review of GAME-ME showed that functionally it was well designed for the Planned Domain.

The site underestimated the energy required to achieve the Precision Domain. A limited defect elimination effort was in place through Reliability-centered Maintenance and small groups of reliability-focused personnel. Site leadership was shown that achieving the Precision Domain requires every employee to both increase the defects removed and reduce the defects being put into equipment and processes.

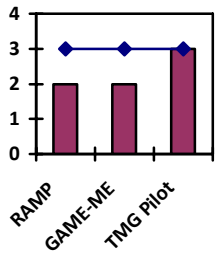
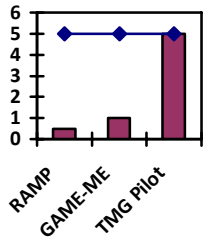
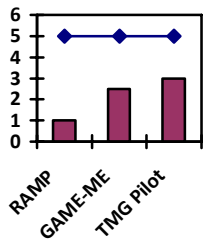
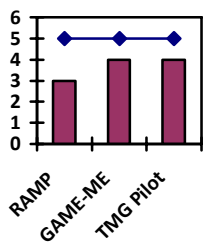
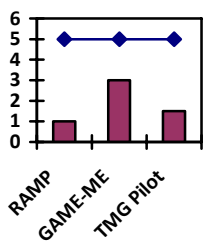
Leadership was made aware of the Heroic Change Process. Unfreezing the organization represented a risk that they believed had to be evaluated – a potential negative side effect of unfreezing the organization is a backward slide in performance with which they may not be able to cope.

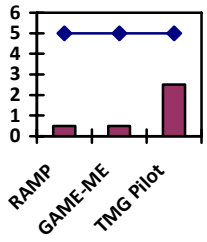
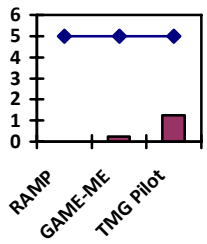
The organization also recognized that they were suffering from the tragedy of the commons or initiative overload and was reluctant to risk making the situation worse by adding another initiative.

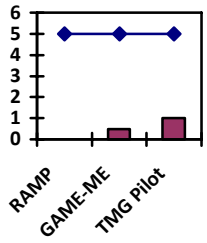
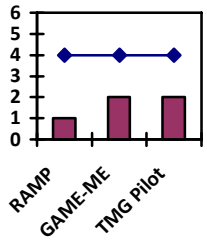
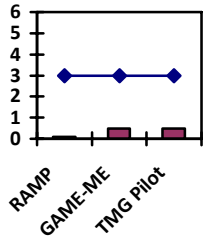
However, the potential impact of reaching the Precision Domain was estimated to be about $60 to $70 million dollars if we replicated improvements at the Lima and Port Arthur Refineries. Therefore, even though implementing a pilot held some risk to the site as stated above, leadership believed it would be a prudent risk.

With this in mind, the leadership team decided to pilot the concept in one area of the plant to test the concepts in their organization. The pilot

consisted of launching about 7% of the action teams that would be needed across the entire site to achieve the Precision Domain. Since they already had considerable efforts in place working on site leadership, they elected to not fully engage the leadership in a single integrated defect elimination focus.

Framework	Ranking	Comments
Stable Domains		The goal of the effort was clearly to achieve the Precision Domain which is what 100% of those interviewed as part of the assessment thought should be the goal. The scale is 1 = Reactive, 2 = Planned, and 3 = Precision
Defect Elimination		The pilot focused on using The Manufacturing Game workshops to engage the workforce in the pilot area. The Manufacturing Game Workshop is 100% designed to help participants focus on defect elimination. The scale is 1 =.1 teams/worker and 5 = 0.5 teams per worker in 18 months
Goals, Means, Consequences		There was some effort expended on metrics. However, little progress was made because most of the site was still in a GAME-ME type mindset re: metrics. The need for consistency largely negated these efforts. The scale is 1 to 5 and is based on the fraction of metrics properly categorized as a goal, means, or consequences.
Functional Improvements		There was no significant effort put into additional functional training. The scale is 1 to 5 and is based on having the skills needed do all work perfectly.
Automatic Energy		The pilot focused on just 15% of workforce rather than the 100% of the workforce targeted by the GAME-ME effort. Rather than a large team being involved in the implementation like GAME-ME, only six were trained in some of the principles of reducing the chaos that was overwhelming the work processes.

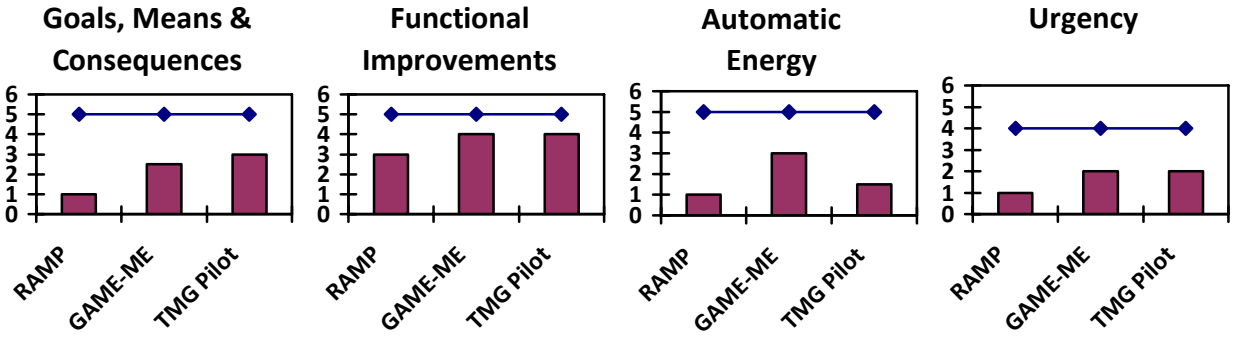
		The scale is 1= 10% engaged and 5= 80% engaged.
Sensitive Energy		The pilot engaged 15% of the workforce in The Manufacturing Game Workshops and On-the-Job Action Teams designed to raise awareness of defects. ***Senior leadership on site recognized the lack of sensitive energy and implemented a policy to have all emergency and break-in work orders approved at a higher level. This resulted in additional sensitive energy within the entire site. The scale is 1= 10% aware of defects in habits and 5= 80% aware
Conscious Energy		The 15% of the workforce that participated in The Manufacturing Game Workshops had an opportunity to operate a simulator of how manufacturing works at a structural level in the workshop. As stated earlier, participation in lifelike simulators is a good way to help become more receptive to conscious energy. The leadership process was not implemented which kept the number of On-the-Job Action Teams to about 7% of the recommended number as a result of The Manufacturing Game Workshops. The engineering and reliability efforts that had been initiated in the GAME-ME implementation continued. The scale is 1 = 10% disciplined and 5 = 50% disciplined.

Creative Energy		The 15% of the workforce that participated in The Manufacturing Game workshops and On-the-Job Action Teams learned to integrate several processes/initiatives as part of their participation in The Manufacturing Game Workshop On-the-Job Action Teams. Furthermore, those attending the workshop were given the space and time to access creative energy through participation in On-the-Job Action Teams Since this was a pilot and the leadership process was not engaged, there was little creative energy accessed to integrate the various initiatives the site was pursuing. The scale is 1 = 1% receptive to creativity and 5 = 30% receptive.
Urgency		Urgency was unchanged from the GAME-ME effort. The scale is 1= things are fine and 5= they are going to shut us down if we don't do something.
Heroic Change		The limited scope of the pilot and not actively engaging the leadership process resulted in low Conscious and Creative energy which limited the effectiveness in unfreezing the organization. The scale on the graph indicates the stage required to obtain the Precision Domain.

Results of The Manufacturing Game® Pilot

The Manufacturing Game® pilot should not have succeeded based on conventional wisdom...

- There was little effort put into metrics or the use of metrics as shown in Goals, Means, and Consequences ranking.
- There was no significant effort put into functional improvements,
- The effort had a much lower quantity of energy put into it because it only engaged 15% of the workforce – see Automatic Energy ranking. And,
- There was no additional urgency.



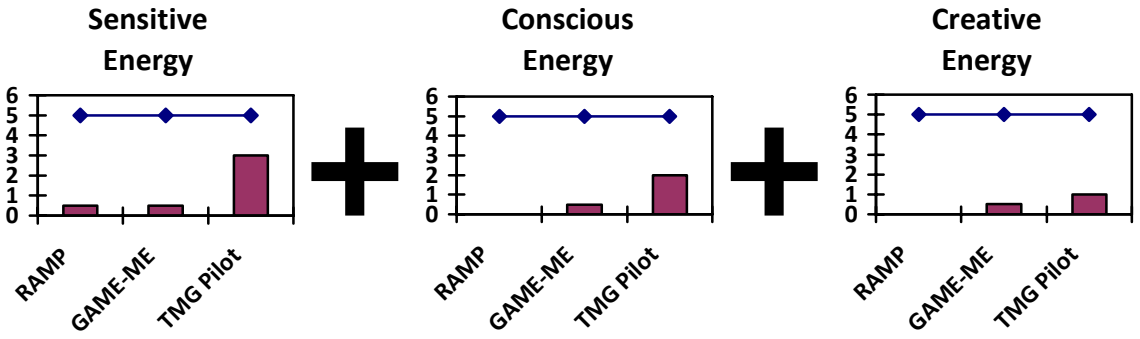
However, by tapping into more higher qualities of energy:

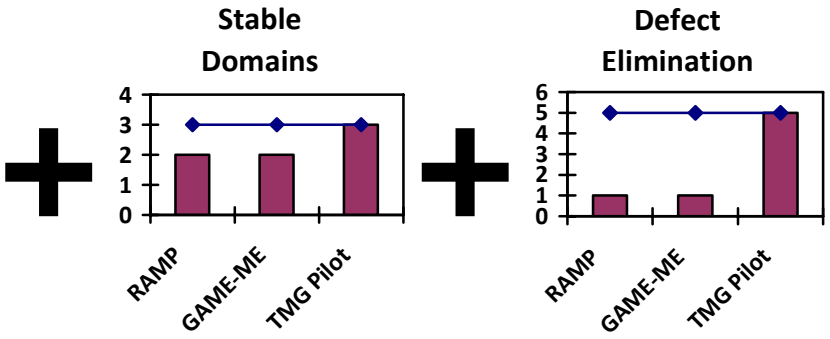
- Sensitive energy
- Conscious energy, and
- Creative energy

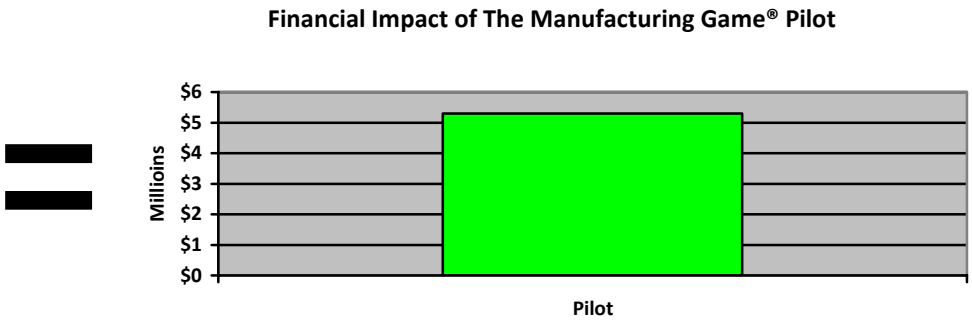
and focusing the available energy on:

- The Precision Stable Domain rather than the Planned Domain, and
- Defect Elimination

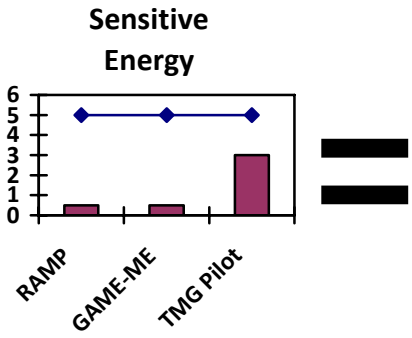
The Manufacturing Game® pilot generated $5.3 million in benefits over the GAME-ME implementation effort.

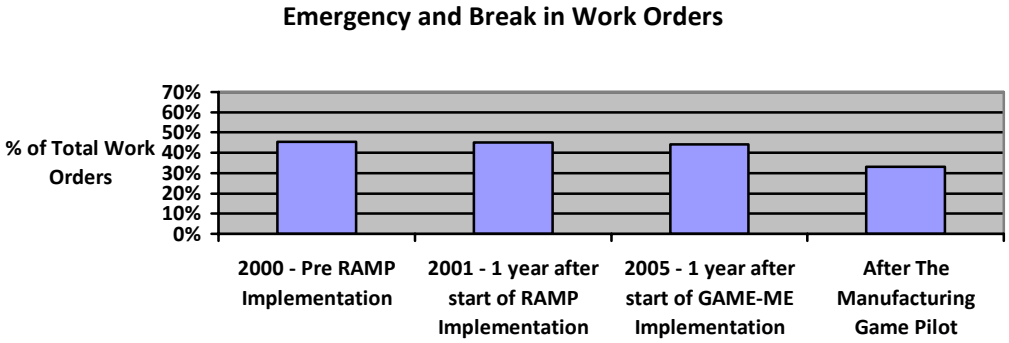






Furthermore, since the authorization level change for emergency and breakdown work orders occurred after most of the successful On The Job Action Teams were completed, we can conclude that the increase in sensitive energy brought about by the change in authorization levels for emergency and break-in work orders beyond the GAME-ME implementation had a clear impact on reducing the emergency and break-in work orders by 26%.





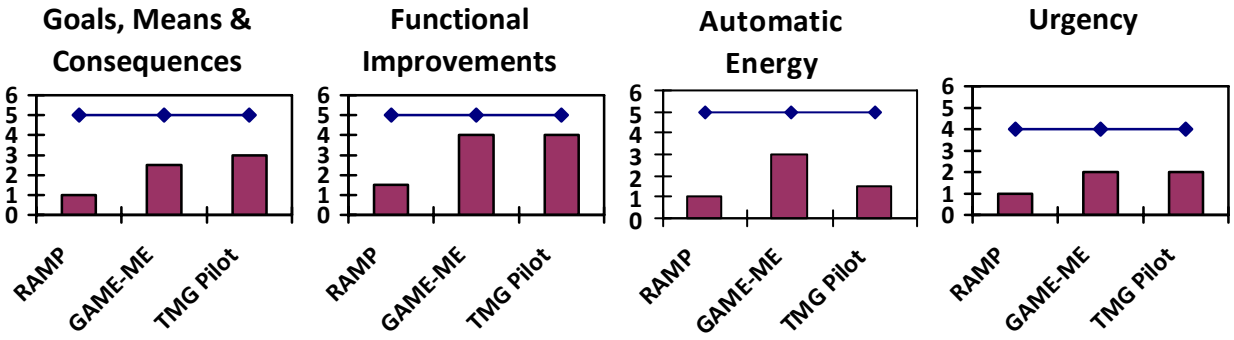
Conclusion

The pilot clearly showed that successful implementation of corporate initiatives such as GAME requires much more attention be given to the quantity and quality of energy being utilized. Engagement processes that are limited to:

- Lectures, even those containing good graphics, flow diagrams, and high levels of detail
- Discussions,
- Paper-type testing,
- Computer-based training,

do not access the quantity or quality of energy necessary for successful implementation. However, we don't mean to imply that these efforts are not important. We classify these as:

Necessary but NOT Sufficient

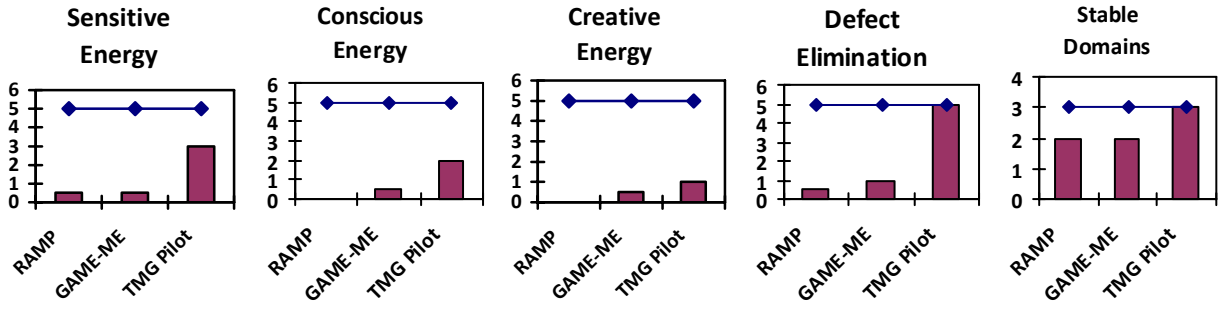


Furthermore, the engagement process must be designed to help the entire workforce become more receptive to conscious and creative energy. At a minimum, conscious energy requires participation in a life-like simulator. Creative Energy requires the freedom and space in the real world.

And, finally, the engagement process should be focused on achieving the Precision Stable Domain through Defect Elimination.

Thus, we classify the following as:

High Leverage



What would the expected impact be if the pilot were expanded to the entire site just as Don Kuenzli did in the Lima and Port Arthur Refineries?

The Lima Refinery documented $43 million in benefits. However, the Convent Refinery is much larger. If we scaled up the Lima results based on site capacity, the benefits would be approximately $70 million. However, since we know that the Pilot On-the-Job Action Team success rate is running higher (56% vs. 40%) than 6,400 On-the-Job action teams launched at many other sites through The Manufacturing Game Workshops, the anticipated benefits would be closer to $79 million.