



“Sharing Information to Improve Reliability”



## THE (NEW AND IMPROVED) MANUFACTURING GAME®

### Improving core lessons and incorporating 9 years of experience

The Manufacturing Game® which has for years helped manufacturers and operators of assets improve their reliability and profitability has gone through an upgrade to better drive home the core lessons and incorporate the learnings that we have had with over 16,000 participants in the last 9 years. How could the success our clients experienced with the original version be improved upon? And after 9 years why would we want to change what already works so well? As a learning organization we not only advocate continuous improvement, we practice it ourselves.

As we have documented in this newsletter, The Manufacturing Game® has been a successful tool for improvement in a wide variety of industries. Through our successes and failures it had become apparent that there were several key issues that we were not addressing.

- Many of our biggest successes had included substantial improvements in Health, Safety and Environmental performance yet the game barely addressed these.
- More and more our clients are operating in an environment where resources are constrained. The people have been eliminated but the work has not. The old version of TMG did not adequately deal with this reality.
- Over the years it has become increasingly clear to us that wide spread engagement of the workforce is the common denominator for success. The game did not adequately represent the approach and the difficulties in managing this type of engagement, and it did not clearly show management the need to change their approach. While we were extremely successful in launching defect elimination activities when we could get teams together at workshops, we still were having difficulty convincing management that this was the right approach. The redesigned TMG simulation deals with these high-priority factors.

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## GAS GRINS EXXONMOBIL REFINERY IN BEAUMONT, TEXAS

ExxonMobil's commitment to defect elimination and improving reliability has led to the formation of 201 action teams at the Beaumont refinery since 1998. 106 of the teams are still active, 37 have closed and 58 completed their projects. 46 of the teams that successfully accomplished their goals are recipients of ExxonMobil awards for their outstanding efforts.

ExxonMobil's Action Team Coordinator wears an ear-to-ear grin as he recalls how the Beaumont refinery is deriving annual savings of \$381,000 since the completion of just one of these action team projects.

After a Manufacturing Game® workshop, an action team formed in February 1999, consisting of eight people including unit operators, engineering and console control supervisors. This team decided to tackle an improvement effort to reduce the flow of off-gas to the low-pressure flare.

Through the workshop, the group

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## Public Workshop Calendar

Throughout the year, The Manufacturing Game® holds workshops for the general public at various universities and/or professional organizations across the country.

January 25-26, 2001  
**The Manufacturing Game®**  
**Atlanta, GA**  
 For registration information call  
 (281) 812-4148

February 22-23, 2001  
**University of Dayton**  
**Dayton, OH**  
 For registration information call  
 (937) 229-4632  
 or register online at  
<http://ud.udri.udayton.edu/cc/>

May 25, 2001  
**NPRA Conference**  
**New Orleans, LA**  
 For registration information call  
 (281) 812-4148



### Integrating Health, Safety and Environmental

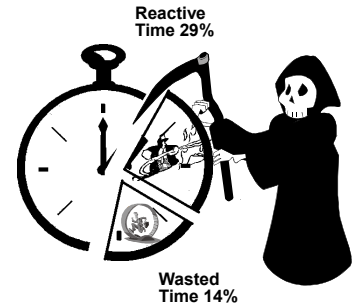
We researched best practices in Health, Safety and Environmental and modeled the connection between manufacturing effectiveness and the affect on safety and the environment and a company's license to operate. The key additions to the simulation in this area include:

- illustrating how equipment design and operational defects can lead to impacts on the environment
- expanding awareness of incident-causing defects which need to be identified and eliminated, and
- revealing how at-risk behaviors and defects are connected to worker safety.

### Dealing with Constrained Resources

When TMG was originally developed in DuPont beginning in the late 1980's, monetary constraints were a key limiting factor. Now after years of downsizing, mergers, an aging workforce and low unemployment rates, there are less people available and the workload has expanded. The new version of TMG requires participants to juggle their limited staffing to handle all of the activities of the asset. Operations must staff the equipment to keep it running, clean up broken equipment so it can be repaired, do basic PM's and inspections, and take equipment out of service for planned maintenance. Maintenance has to staff planning functions like inspections, planning and scheduling while also manning the breakdown work. Business Services orders, stocks and delivers parts for all work orders. All three functions must work together to staff cross-functional improvement teams to eliminate the sources of defects. The three functions also must work together where there are safety or

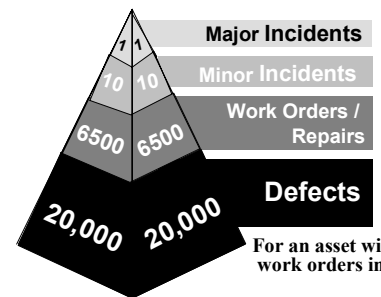
environmental incidents to deal with the regulatory compliance and to investigate the incident. Participants get first-hand experience balancing these seemingly competing draws on time. They discover that if they can eliminate the defects that lead to wasted and reactive time they can find what we have termed at one client – a "Phantom Workforce".



### Building and Approach for Wide Spread Engagement

We have believed for some time that wide spread engagement of the front-line workforce is the key element to reliability improvement. Our research into behavioral safety for this game reinforced that idea. Data from years of research in manufacturing shows that major incidents indicate a dozen or so minor incidents and hundreds of

Every incident implies thousands of defects



10,000 defects must be eliminated to reduce the incident rate by 50%



near misses. We took this safety analysis and numbers from several clients to "guestimate" how many defects a manufacturing site with 100 personnel might have. The number seems staggering, but it's obvious that every work order indicates at least one defect. Root cause analysis tells us that there are on average at least 3 defects per work order. If a site is going to eliminate thousands of defects, the task must involve almost everyone. The notion of action teams, cross-functional teams that work on specific non-capital defects that can

**TEAMWORK RULES!**

be eliminated in a short period of time, is an integral part of the new version of TMG. It truly takes people's time and creative energy in the game to improve plant performance, just as it does in real life.

**Other Improvements**

Some other distinct differences between the old and new TMG workshop highlight the keen advantages of the new game.

- **ENERGY**—Because the game and most of the talks have now been integrated we have found that participants stay much more engaged. The game play now continues on the second day to take advantage of insights occurring to participants as they "sleep on it" after Day 1 and to allow intervals during the simulation for participants and the facilitators to discuss the new behavior being learned on an ongoing basis. This new format means that Day 2 is now as interactive and stimulating as Day 1 has always been. Then, at noon on the second day, a debrief focuses on what defects were eliminated during the game that can be duplicated by taking action in real life.

- **CLIENT SPECIFIC FOCUS**—In addition to the standard talk on the second day from the leadership group, we can customize the performance measurements that participants use to gauge performance throughout the simulation, which reinforces the direction and goals of the client organization.

- **CLEARER VIEW OF PLANNED MAINTENANCE**—Planned maintenance has always been an integral part of The Manufacturing Game® but with the improvements that we have made it is clearer how all of the pieces fit together and the consequences of a partial solution.

- **EASY TO LEARN**—While the new version of TMG incorporates an array of true-life factors, it is actually easier to learn than the original version. Participants sometimes became too busy trying to learn the game, instead of concentrating on a way to improve problematic situations. Now eliminating costly defects through cross functional action teams receives more emphasis in the simulation and people walk out with a clearer view of what they can do in the real world also.

- **EASY TO FACILITATE**—For this reason, the new version is also easier to facilitate. The players now need less help with the maneuvers of the game and their minds are freer to grasp the important results of participating in the process.

**Where Are We With The New Version?**

We progressed through beta testing in fourth quarter 2000 with pilot workshops in Texas, Illinois and Indiana. We received substantial positive feedback regarding the new version and we are in the process of making the final design changes. Premcor Refining Group, Inc. participated in the beta testing and is now beginning to use the

updated TMG workshop format for its new employees and some employees and contractors who had not yet had an opportunity to experience a Manufacturing Game® workshop. Keith Mullins of Premcor Refining Group, Inc. has facilitated dozens of TMG workshops at the Port Arthur, Texas site. Keith says, "The new game helps you to see closer to the real world what we do in the refining industry."

Training materials for new TMG facilitators are now in development and scheduled for rollout in February 2001. If you are currently using internal facilitators and the original version of TMG, you can choose to stay with that version or convert to the new version. We will be holding a facilitator "re-train" session sometime in the Spring. We will notify all current facilitators when that date has been set.

*"Gas Grins" continued from page 1*

learned that defects in equipment systems can often lead to operational losses and waste. They speculated that by enlarging the flare gas recovery compressor recycle regulator to control the minimum flow and minimize fuel gas to the flare, they could maximize the fuel gas recovery from the flare gas recovery unit.

The proposed project received approval and proceeded. By November 1999, the installation had been completed at a total implementation cost of \$3,000 for materials, \$1,000 for employee labor and \$6,000 for contract labor.

Enlarging the regulator improved the system and increased the compressor flow so they could pull in more gas. In fact, the rate increased by 20,000 more scf/h (units of gas) going out of the gas regulator to the compressor system than before the regulator was changed. The gas now consistently recovered had previously been burned off as waste. Now it's recycled and productively used as fuel gas.



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TMG News

## PREMCO REFINING PIPE CLEANOUT

Premcor Refining Group, Inc. in Port Arthur, Texas, reports that as the result of one recent Manufacturing Game® workshop, a cross-functional action team was formed to get to the bottom of an on-going, very perplexing problem with a marine vapor combustion unit (MVCU).

The MVCU continually shut down every time they loaded barges. The shutdowns resulted in high demurrage cost penalties (incurred for delaying a vessel carrying freight) and created high levels of frustration as maintenance personnel were constantly pulled off other jobs to keep the MVCU

running.

After careful inspection, the action team discovered that piping was rusting due to the sour naphtha's high corrosion rate. This rust was falling down in the pipe and plugging up the lines.

The action team's first preventive maintenance steps were to clean out the pipes and coat the inside to prevent further rusting. The team is in the process of actively implementing additional measures to preclude any future MVCU shutdowns.

Their successful identification and elimination of this expensive problem has been accomplished at minimal cost, yet in just the first six

loads since the team coated the pipe, the company has saved \$34,000 in demurrage costs. Estimated savings for the first year once the team's measures have been fully implemented are \$150,000. Savings in frustration? Priceless!

