TMG News

The Manufacturing Game®

April 15, 2009

"Sharing Information to Improve Reliability"

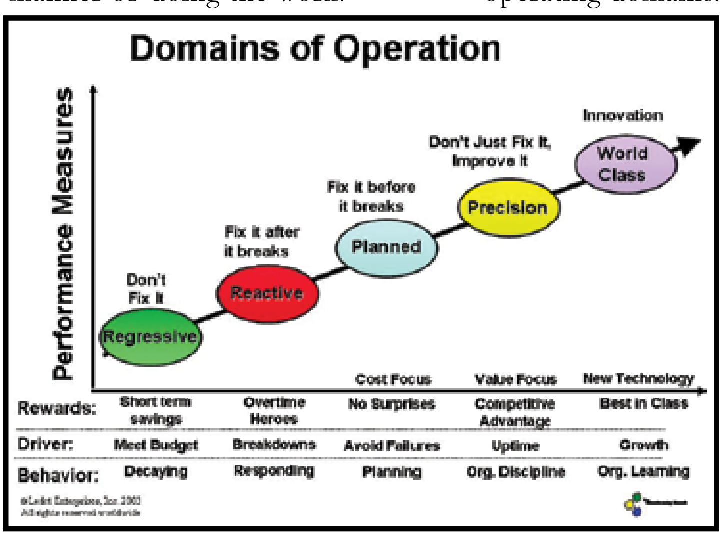
Escaping the Capability Trap in Different Domains

by Winston P. Ledet

In their publication "Nobody Ever Gets Credit for Fixing Problems that Never Happened"[1] Nelson Repenning and John Sterman, both professors at MIT, have defined the capability trap. Their article summarizes a long study of failed attempts to make process improvements at several facilities in different companies and industries. Essentially they find that people continue to drive themselves or are driven by their management to work harder rather than work smarter and eventually find themselves caught in the capability trap. The capability trap occurs when resources are continually allocated to working harder in their usual manner instead of allocating some resources to improve the manner of doing the work.

The authors also give reasons for the existence of the capability trap, several examples of companies in the capability trap, and a couple of examples of facilities that escaped this trap. One example of a facility that escaped the capability trap is the Lima Refinery where the organization was able to elevate the performance from the Reactive Domain to the Precision Domain in a 3 year period and continue improving for the next 8 years and beyond.

One reason that the success achieved by the Lima Refinery is the exception rather than the rule is that many organizations pursuing improvements misunderstand the nature of the capability trap in different operating domains. The five domains depicted in the figure: Regressive, Reactive, Planned, Precision and World Class are the ones identified through a worldwide benchmark study of process



Escaping ...continued on page 2

Gaining Control Over the Tank Vent Blower

Deno Lejeune and Bernie Beethe had just recently removed defects in the Incinerator 662 Turnaround Job Scope and then started looking for another defect to obliterate. This next defect may have marked itself for death when Deno had to deal with the mess the defect was leaving behind.

Vents from the process tanks are processed through a multi-stage centrifugal blower to a downstream treatment system. The tanks' vent compressors were getting a build up and plugging up causing blower mechanical failures. When the blowers failed, the spare blower was placed into service. This failure caused an interruption of other routine work and the removal of the blower for an overhaul at $20,000 to $25,000 each time it had to be rebuilt.

Not only was this defect causing a lot of work for the operators and potential environmental releases, it was also costing the site about $75K per year. Deno (Operator) and Bernie (Maintenance Manager) knew they would need some help, so they recruited Curtis Folks (Maintenance Foreman), Ron Carlin (Operator), and Dawson Fontenot (Maintenance Supervisor) to join their Action Team.

Originally, they would run to failure then change to the rebuilt one until the next failure.

Gaining ... continued on page 4

What's Inside?

SCHEDULE

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

For more information visit

www.mfg-game.com

Conferences of Interest

NPRA

Reliability & Maintenance Conference

Grapevine, TX

May 19–22, 2009

For more information or to register visit: www.npra.org

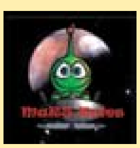
System Dynamics Society

The 27th International Conference of The System Dynamics Society

Albuquerque, NM

July 26–30, 2009

To register or for more information please visit: www.systemdynamics.org



Houston Chapter of SMRP Maintenance and Reliability Symposium

Moody Gardens Galveston, TX

August 27–28, 2009

For more information or to register visit: www.smrphouston.org

SMRP

SMRP 17th Annual Conference

St. Louis, MO

October 19–22, 2009

For more information or to register visit: www.smrp.org

Mark Your Calendar!

Escaping ...continued from page 1

manufacturing facilities conducted by DuPont in the late 1980's.

There are different manifestations of the capability trap in each of these domains.

- The **Regressive Domain** trap is that the workforce is not productive because they do not have enough skill and knowledge. This could be because their staffing levels are inadequate or their people lack sufficient skill and knowledge.
- In the **Reactive Domain** trap, the people have the necessary skills and knowledge but lack the system to use them productively.
- The **Planned Domain** trap occurs when the maintenance people have a system to enhance their productivity, but the operations and technical people do not. This domain is very unstable because two of the three key functions are still at low productivity.
- In the **Precision Domain** trap, the operations and maintenance people have systems to enhance their productivity but the technical people do not.
- When organizations are able to achieve the **World Class Domain**, they have escaped all of the capability traps along with the technical limitations of existing technology and are ready to start a new cycle of evolving upward with a new set of domains in a new technological era.

With the exception of the Regressive Domain, it may be more appropriate to think of the Capability Trap as a form of **"Productivity Trap"** since the deficiency is not in skills, knowledge, or tools but in their use. The number of people it takes to operate, maintain, and improve a facility in the Precision Domain is much lower than in the Reactive Domain. Therefore, since capability is defined as Hours Worked times Productivity in Repenning and Sterman's article, only the Regressive Domain is lacking in hours worked. Organizations struggle when they try to get out of the Capability Trap by training people on how to use new tools when the people don't have the **freedom** to use the tools they already have. In the vast majority of the facilities we have encountered, they are beyond the Regressive Domain so the skills and knowledge already exist to reach the **Precision Domain**. The solution is not in obtaining more skills and knowledge; it is in creating a system that expects and allows for consistent use of existing skills and knowledge.

Freedom Is Needed To Escape the "Productivity Trap"

The nature of the productivity trap is lack of freedom to apply the skills, knowledge, and tools that already exist in the organization. Therefore, the simple answer to how to escape the productivity trap is to create the freedom that is missing. Creating that freedom is not simple however. When we observe the constraints that are placed on people or that people place on themselves, we conclude that these constraints are there to prevent people who don't **understand** what they are doing from causing potentially catastrophic events. So the means to create freedom is to create understanding.

In many people's minds, you reach understanding through knowledge and skill. However, knowledge and skill are not enough. Creating understanding requires adequate experience to insure that the person will be able to handle any of the consequences of actions they take. John Bennett says that understanding is the **will** to

Escaping...continued on page 3

Escaping ...continued from page 2

live fully within the limits of our authentic experience and he defines will as the power to see "why" and "how" as the same question. When a person knows why and how to do something, then he/she is free to take action in any particular situation without unintended consequences. The safest way to create understanding is through simulation. In a good simulation the person experiences the authentic structure of the work he will be doing but in a situation where the unintended consequences are not hazardous to his/her well being.

The Manufacturing Game® provided this simulation experience at the Lima Refinery, and the people working there were able to apply that experience to their real work back in the refinery. They then applied that understanding by undertaking work process improvements through cross-functional action teams specifically directed to a particular source of defects, usually in some piece of equipment. This helped translate the game experience to the particulars of their normal work. This step is quite important because understanding is about the "will" aspect of getting things done. The nature of "will" is always in the particulars of the situation and therefore unique to that specific situation. People need to learn that the common processes they use to make their work more orderly must always be applied in a way that allows for the distinctiveness of their particular situation. That is why knowledge and skill alone are not enough.

[1.] To read the entire publication of "Nobody Ever Gets Credit for Fixing Problems That Never Happened" by Nelson Repenning and John Sterman go to: http://web.mit.edu/nelsonr/www/Repenning=Sterman_CMR_su01_.pdf)

The Right Attitude

A taxpayer looked nervous as he conversed with an IRS tax auditor, who was reviewing the taxpayer's records. "Uh huh," the auditor said to himself as he worked through the papers. The taxpayer shifted uncomfortably in his seat.

The auditor adjusted his glasses and said, "Mr. Smith, we at the IRS feel it's a great privilege to live and work in the United States. And as a U. S. citizen, you have an obligation to pay taxes—and we expect you to pay them eagerly with a smile."

"Oh, thank goodness," Mr. Smith said, wearing a giant grin on his face, "I thought you were going to want me to pay in cash."

DON'T FORGET TAX TIME!

Reactor 20 Fetterholfs

The Fetterholfs are two long valves that turn water on, causing a series of flushes to rinse out a reactor. The water sprays like a whirlybird down through the reactor rinsing out the walls so that it can be turned over quickly. When the switch is up the Fetterholfs are closed and when they are down the valve is open. The switch was not working on the valve. It was flushing through the cleaning cycle, but the operators had to force the signal to say that the valve was open so the computer knew that it was open otherwise it would just sit and wait for the signal.

DCS' are supposed to control, to reduce the demand on operator time by doing routine tasks more efficiently. What do we do when the system does not do its job? After two years of living with the problem, patience ran out. Stewart W. Ray (Process Control Engineer), Don Derosa (Production Operations "Superman—Bug Killer"), Anthony Ferdinand (Operator), and Glenn Thibodaux (I&E Tech) chose the Fetterholfs as their Action Team project after attending a Manufacturing Game workshop.

Losing a few minutes on reactor 20 did not seem like a big deal at first; however, the reactors are scheduled to switch, batches in specific sequence in order to meet customer demand. When Reactor 20 takes too long to switch the lost time can and has cascaded through other reactors causing lost time on more than just Reactor 20. Don said, "With as many batches as we run in a given month, it turns out to be noticeable in our monthly schedule performance."

The team knew that they had to have the limit switches repaired but they wanted to do more. The team then came up with a 'belt and suspenders' approach. They had the limit switches repaired and modified the software program to simulate the time required to clean the reactor. If the valve did not shutoff in a timely fashion, an alarm would sound to minimize lost time. Procedures are now in place to insure this problem does not happen again.

TMG News

The Manufacturing Game®

April 15, 2009

7702 FM 1960 East, Ste. 226
Humble, TX 77346
(281) 812-4148
(281) 812-4149 Fax
http://www.ManufacturingGame.com
email: *info@ManufacturingGame.com*

Until you try to do something beyond what you have already mastered you will never grow. —*Ralph Waldo Emerson*

Spring

TMG News

Gaining...continued from page 1

One suggestion was to look at the type of blowers at the Lake Charles plant and to change to the same type, but that would be at a high capital cost to the company.

Earlier in his career, Deno had worked with some smaller blowers, and he had some success with their improvement. One thing he did to begin the improvement in the current situation was clean the offline blower each week by washing it down with condensate and drying with nitrogen before use. In addition, he swapped the blowers out each week to be cleaned. Some people were skeptical that his ideas would work. Deno and Ron did the swapping with Curtis setting up to prepare the blower for clean out. Persistent attention to swapping and then clean out started to show results. Once he was able to implement his ideas and everyone saw they could work, they realized his ideas had some validity. However, they still had some build up problems at the check valves. It was suggested to include the check valves in the cleanout process. Both operations and maintenance agreed to run hard piping to make set up for wash out less work and ensure proper disposal of the cleanup water.

A recent seal leakage indicated additional blower problems causing many to say, "Here we go again, changing blowers out." The seal only needed to be retightened and some grease added to correct the issue. "We might still need to address a few other problems," said Deno, "like impulse lines, transmitters, and the automatic control system that controls operation of the automatic valves. We might possibly put in a PM system for swapping blowers and the impulse lines might still get plugged, but that leaves us some other defects to look into correcting."

Deno says, "The secret to success is to simply swap out blowers and wash them weekly. It is a lot less work, less risk to the environment, and it can be done when it is convenient for operators rather than the operators having to jump whenever the defect raises its ugly head – which it usually did at the worst possible times!"

If you would prefer your TMG News sent to you via email send your request to: cbraun@mfg-game.com