TMG News

The Manufacturing Game®

July 15, 2009

"Sharing Information to Improve Reliability"

The Pinecone Strategy Revisited

by Winston P. Ledet

During a meeting in 1990, I articulated some ideas I had to several people, including Art Kleiner. Art asked if it was alright if they used the ideas in a book being written by Peter Senge, Art Kleiner, George Roth, etc. called "The Dance of Change"[1]. The section I contributed to became known as The Pinecone Strategy. The essence of that article was how I noticed that nature did not expect every pinecone to become a pine tree, instead nature produced a huge excess of pinecones to ensure that the pine forest sustained itself over very long periods of time. At that time I lamented the fact that to use this strategy in organizational change you had to keep 'under the radar' because there was always someone around to kill off good initiatives. The part that I missed back then was the reason that good initiatives get killed. They get killed because more urgent or more important tasks need to be done that cannot be ignored. This is true in nature as well. If too many pinecones become pine trees, then some have to die to avoid over stressing the resources needed to grow a forest. So how does nature handle this excess? Basically, the pinecones are scattered as far as the native processes can broadcast them including squirrels carrying them off and burying them for food later. In this way, wherever the conditions are right for a pine tree to grow, there is a high probability that there will be a pinecone there to grasp that opportunity.

In a recently developed new agent based computer model of the Lima refinery, we have been experimenting with various ways of implementing defect elimination to see if we can discover a better way to create a successful culture change at a site. What we rediscovered is the Pinecone Strategy. This time the form of the strategy is applied in time rather than space. A pine tree habitually puts out pinecones in a space so that the opportunity to grow is taken whenever the time is right. What we found in the model is that in manufacturing plants today, the time element is much more important than the space element. While the opportunity for a pinecone to germinate comes only part of the year, the opportunity to improve a facility is available most of the time but is very limited in the availability of the resources to implement the improvement. It is not that the resources don't have enough time to implement the improvement; they just don't have long stretches of time they can devote to the improvement. Therefore, we have

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All I Need Is the Air that I Breathe!

Sembcorp Utilities UK in the north of England used The Manufacturing Game® to engage all its employees in defect elimination practices. Facilitated and supported by reliability consultants, Reliable Manufacturing Ltd, Sembcorp is applying defect elimination to a recently commissioned Biomass Power Plant which uses wood chips for fuel. An Action Team emerged from a recent workshop which shows the value of pro-active bug elimination.

John Turner, a fuel handling operator, together with Chris Walker and Jay Jackson identified a problem on the Volvo loading shovels which are used to handle wood chip, the main fuel of the new unit. Two types of chips are

handled: dry recycled chip which is made from anything from a scrap pallet to an old wardrobe, and wet chip which is made from newly felled tree logs. Dry chip tends to hang in the air and gets sucked into the air filters of the big machines. Wet chip on the other hand falls to the ground quickly and causes no problem to the air filters.

After recently taking delivery of a load of dry chip John noticed

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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

Public Workshop

The Manufacturing Game® will be holding a Public Workshop at the System Dynamics Conference and the SMRP Conference for information see page 4.

Conferences of Interest

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 17th Annual Conference
October 19–22, 2009
St. Louis, MO
To register or for more information please visit: www.smrp.org

23nd Annual International Maintenance Conference (IMC)
Daytona Beach, Florida
November 17–19, 2009
To register or for more information please visit:
www.MaintenanceConference.com
or call (888) 575-1245

Mark Your Calendar!

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to produce an incredible number of improvement ideas in order to have one that is the right size to get done in the time available between other more pressing work. In a facility like Lima with about 500 people, they are dealing with something like 25,000 work orders a year to maintain the equipment needed to produce the product. Each of these work orders represents an opportunity to make an improvement with less time. In most work orders, there is a lot of time spent on getting permits, clearing up the equipment, tagging it out, locking power supplies, etc. If an improvement can be done at the same time as the repair, all of this prep work does not have to be repeated. However, the improvement idea must already exist and be available to the planner of the work order so that all of the resources to make the improvement are made available. This is what the Lima organization called "Don't just fix it, Improve it."

In past work with our original System Dynamics model, we clearly understood that it was better to start with small projects in order to clear up enough time to attack the larger problems just as Jack Welch insisted that the Work Out program had to be done before Six Sigma could be effective. We created a new agent based computer model for one of our clients who wanted to know why not all defect elimination initiatives result in a culture change like the one we achieved at the Lima refinery. In the agent based model we model the individual managers, mechanics, operators, equipment, and engineers as agents who do tasks, interact with each other, respond to events, create events, attend workshops, have meetings, sit idle, ignore instructions, do improvements, take initiative, be motivated, not care, have ideas, give instructions, not work, etc. Therefore, many behaviors can emerge that change the relationships between people and equipment. This allows the model to somewhat take on a life of its own.

What we are discovering in our agent based model of Lima is that the projects have to be even smaller than we thought. We can run experiments with the model by asking it to do various things with certain parameters. It will then tell us whether what we have asked it to do is possible or not. Once we had the model calibrated to fit the data from Lima, we experimented with ways to get even better results than they achieved at Lima or at least take less time to achieve it. What we found was somewhat amazing. We unintentionally asked the model to attempt to do improvements on half of the work orders executed. Much to our surprise, the model in fact was able to execute this request. At first we assumed that we made a mistake in the modeling, but as we dug deeper into the model, we recognized that there in fact was enough time in the schedule to do that many improvement attempts as long as the duration of those attempts were a few hours of work. In order to make this possible, the agents in the model had to come up with 10 times more ideas to work on than they actually did work on. Most organizations would consider this an "initiative overload" because they are only getting 10% of the projects that they could dream up done. This, however, is in fact the pinecone strategy. There has to be an improvement available when the opportunity arises that fits in the discretionary time they have to implement it.

The lesson we learned is that people have the time to do improvements if the system can keep track of a large excess of good ideas and attach them to the normal work management system so that the opportunity is recognized when the right equipment and resources are available. The excess of good

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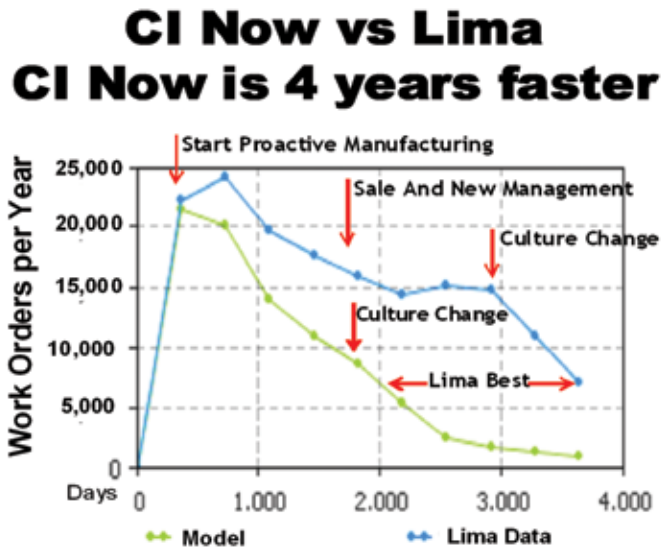
ideas have to be greater than the number of pieces of equipment in the facilities if you want to create a genuine culture change that sustains over time. This means keeping track of 20,000 to 40,000 ideas for improvement. Fortunately, in most of the places we work, people easily have that many ideas they would like to work on and a CMMS that can easily handle this volume of ideas. The model shows that this approach with very small projects can even out perform the amazing results that the Lima Refinery achieved as shown in the figure below. We call this approach Continuous Improvement Now or CI Now.



[1] The Pinecone Strategy articulated by Winston P. Ledet appears on page 174 of "The Dance of Change"written by Peter Senge, Art Kleiner, George Roth and others.

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a colleague struggling to push up a load with a Volvo. The machine lacked the power to do the job. He suggested to his supervisor that the problem could be the air filter. When it was removed it was found to be clogged with dry chip. The filter was cleaned and the machine returned to normal service.

John and the team realized that it was very likely that this problem would recur and asked themselves how this could be handled. Failure to act could have severe impact on fuel supplies to the unit or could possibly result in an engine failure.

John first suggested that a compressor and an air line could be provided and that someone be designated to regularly clean the filters. A spare set of filters could also be kept as a back up. However, Volvo who is contracted to maintain the machines, said that now that they were aware of the problem they would monitor it and service the filters as required. This seemed reasonable, but the team was concerned that this still left the solution in the hands of an outside body.

John's next thought was to vary the workload on the machines, and he discussed this with Mike Bonnard, Fuel Handling Manager. As well as wet and dry chips, the machines are also used to handle logs, using a grab in place of the bucket. This duty takes them away from dry chip and the dangers of air filter blockage. John worked out a rotation schedule to coordinate the duties of the Volvo machines. This will ensure that no machine works entirely on dry chip and will extend the time between air filter cleanings.

There is the possibility that the new system could eliminate the problem entirely if the rotation system is worked correctly. John also took time to involve not only his own shift but all the other shifts. This will ensure that if any of the staff moved around or left then the system would not be abandoned.

As this team discovered, it is a better solution to remove the cause of the air filter blockage than to spend time repeatedly cleaning them out. In many cases like this, when the first and most obvious solution doesn't work as well as expected, a second and better solution can often be found.

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

TMG News

What's Happening!

The Manufacturing Game® is holding a public workshop at the **System Dynamics Conference** July 26–31, 2009 in Albuquerque, NM this year. System dynamics is a methodology for studying and managing complex feedback systems, such as one finds in business and other social systems.

The Manufacturing Game® is based on system dynamics, and its effect on reliability in manufacturing and production. The workshop will be held Thursday, July 30, 2009.

The **SMRP Conference** in St. Louis, MO October 19–22, 2009 will be hosting a Manufacturing Game Public Workshop. The Manufacturing Game® is an all day workshop and will be held Thursday October 22nd from 8 a.m.–5 p.m. It is a thought provoking simulation encouraging all employees – managers, engineers, maintenance personnel, materials procurement, and front line operators

to get involved in reliability as part of their normal routine. The Manufacturing Game® facilitates organizational change by changing the way people think about the way they work through defect elimination and cross functional teams. This is an ideal opportunity to experience what a workshop can do for you and your company.

Changing Organizational Cultural Using Microworlds

Winston Ledet along with Michelle Henley will be presenting a workshop at the **International Maintenance Conference** (IMC Conference, Nov. 17–19, 2009) *Using Microworlds to Change Organizational Culture*. The workshop shows how a microworld like The Manufacturing Game®, can be used to change the culture at multiple industrial sites from the Reactive Domain to the Precision Domain. With the use of an agent based computer model they will demonstrate the emergent behavior that results in improvements and sustainability. Participants will receive an applet that they can use to decide the best strategy for their own site.

This workshop is open to Plant Mangers, Maintenance Managers, Operations Managers and their guests, who are interested in creating a successful organizational change to bring their facilities to peak performance.

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