TMG News

The Manufacturing Game®

April 15, 2008

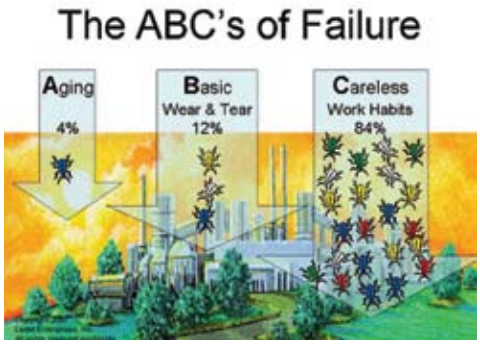
"Sharing Information to Improve Reliability"

The ABC's of Failure – Getting the Noise Out of Your System

by Winston P. Ledet

For years we have observed companies pursue planned maintenance with the standard tools: inspections, planning, scheduling, materials procurement, CMMS systems, etc. and obtaining the same results. They succeed for a while and get their percent of planned and scheduled maintenance up to the 80+% only to see that drop back to 60%. Our conclusion is that only 60% of the work of maintenance is plannable. The rest of the work is created by random acts that we are now calling care-lessness. The sites that we see achieve 92% to 96% planned maintenance for the long term without regressing, are the ones who eliminate the unplannable work. Of course, this cannot be done by maintenance alone. Everyone who works at a site contributes to the defects that create the unplannable work, and therefore must participate in eliminating the defects that create the 40% of the work that is unplannable.

Let's more clearly articulate the true significance of Defect Elimination. Failures happen because things that exist are not perfect. To reduce failures one must eliminate as many imperfections as possible. One of the classes of imperfections is "defects". Our studies have concluded that all failures of equipment and processes can be traced back to defects. Therefore, defects are the basic cause of all failures and can be classified into three sources: **A**, **B**, and **C**.



A. Stands for Aging, which generates about 4% of the defects that become failures over long periods of time (25-50 years). These defects are generated even if the equipment is not operated at all.

B. Stands for Basic Wear and Tear of the equipment. When one operates the equipment, that typically generates about 12% of the defects that become failures over shorter periods of time (1 month to 7 years).

C. Stands for Care-less Work Habits, which contributes the remaining 84% of the defects that become failures over random periods of time. Care-less is not the same as irresponsible. By care-less we mean, not providing the

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A Puzzling Problem at Georgia Gulf

After a Manufacturing Game Workshop at the Georgia Gulf facility in Plaquemine, Louisiana the Action Team of Lawrence Pierce, Oscar Dabney, Ron Barnihizer, Thomas Williams, Eric Prettelt, and Randy Polk set out to solve a problem that had been puzzling them for quite a while. Why were the 3-way valves constantly failing, and how could they make them more reliable so it would be easier to PM the relief valves? According to our data, valves result in 17% of the failures in most facilities, second only to pumps at 25%.

It is no wonder these valves had been flagged as an important problem to solve. At times, the valves would leak through which led to several small piping and tubing leaks. The leaking valves were also causing a lot of wasted time. Operators were spending time trying to clear the relief valves. Work had to be rescheduled due to failures, which consumed schedulers and supervisors time. Mechanic time was wasted gearing up to pull the valves, waiting as the operators tried to make it safe to pull the valves, and then finally changing direction to work on something else. There were also times when these failures lengthened shutdowns.

The entire team pitched

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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*

Conferences of Interest

NPRA

Reliability & Maintenance Conference
San Antonio, TX
May 20–23, 2008
For more information or to register visit:
www.npra.org/meetings/maintenance.com

MinExpo 2008
Las Vegas, NV
September 22–24, 2008
To register or for more information please visit: www.MinExpo.com

SMRP 17th Annual Conference
Cleveland, OH
October 20–23, 2008
For more information or to register visit::
www.smrp.org

Mark Your Calendar!

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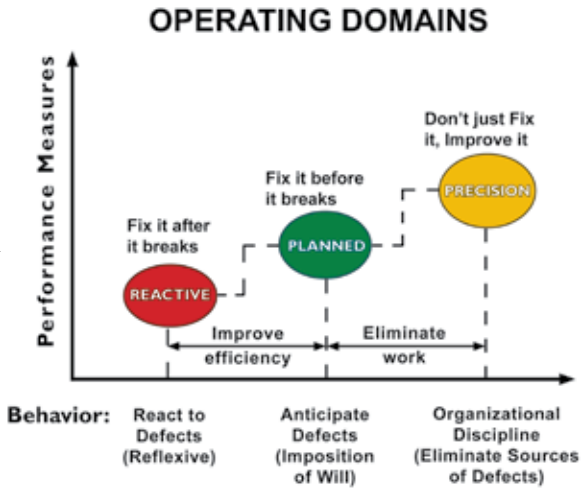
"care" that the equipment needs to run perfectly.

Most people do not realize that the vast majority of defects are created by Care-less Work Habits and underestimate the significant impact that defects can have. People waste much of their time and energy on trying to prioritize a long list of failure repairs that should not have happened at all. People refuse to accept that they have Care-less Work Habits because they equate carelessness with irresponsibility. Most people fail to understand this way of looking at defect generation because it is hard to accept that we could operate that poorly and still survive. This is well documented by Total Productive Maintenance (TPM) award winners in Japan that eliminated 90% to 98% of their failures as far back as 1991. The BP Lima refinery eliminated 87% of their pump failures when they implemented defect elimination. One assumption that blinds us is that the failures are avoided by doing a repair early as a preventive task. At the TPM award sites, the defects that cause the failures are removed without need for repair or the defects are never generated in the first place.

Three modes of behavior create performance in three different Stable Domains. The domains are Reactive, Planned, and Precision. There are three potential modes of action that an organization can take when dealing with defects:

- **React** to the difficulties it faces without growing capability,
- **Plan**, seeking to impose its will on anticipated future circumstances,
- Choose to create a culturally based system of **purposeful action** that embeds new ways of working into the everyday actions of workers.

The Planned Domain is a step above the Reactive Domain, but it is actually unstable. It creates the need for a parallel organization to plan improvement activities like equipment maintenance and personnel training. Now we look at Stable Domains in a different manner from just a few years ago. We do not believe that it is necessary to go through the Planned Domain to achieve the Precision Domain. We now understand better that a bifurcation exists where it is necessary to choose which path you intend to follow. Do you intend to try to plan unplannable work or do you intend to eliminate unplannable work? We recommend achieving the third domain through a program of eliminating unplannable work by defect elimination, with a core logic at every level of the company such as "Don't just fix it, improve it." How can such a change be led without becoming yet another initiative? This is a topic for creative thinking on all our parts, and such change is sufficiently rare that there are no pat answers. One thing we are sure of is that it is necessary to pursue a higher purpose to achieve the Precision Domain. So we ask, "Can every employee at a site answer



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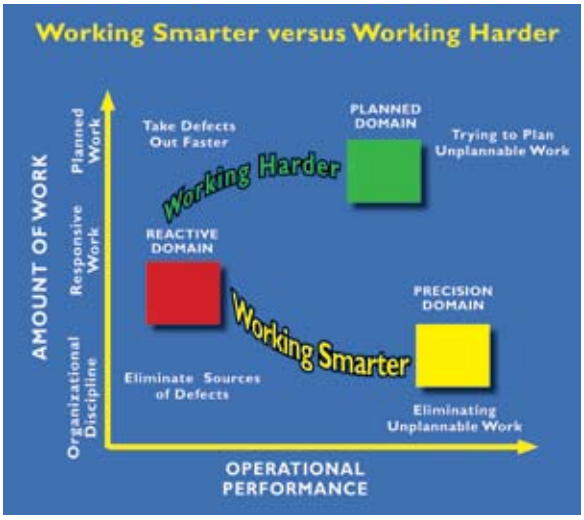
the question, "How do I personally contribute to the company's vision?"



Every employee who cannot answer that question is unwittingly contributing to the carelessness category of defects. There is no way companies can achieve inspirational visions unless they become great in their core business. So how can we advance up the Stable Domains — through Careful Work Habits.

Careful Work Habits can be defined as noticing defects when they are very small and removing them before they generate other defects or cause failure events. This is the essence of Total Productive Maintenance.

Three things are required to get your organization to make a culture change of this type.

- **An urgent business need**. If your site needs to improve safety by at least 40%, reduce maintenance costs by 30% to 60%, and improve earnings while improving the quality of life for everyone on site, then perhaps you have the urgent business need.
- **An empowered work force** to make decisions in their work. See the NPRA paper "A case study in effectively implementing corporate change initiatives" in the 2007 NPRA Maintenance and Reliability Conference proceedings to learn more about how this is done. (See Publications at www.mfg-game.com)
- **A strong leadership process** to guide the change. Since initiative overload is common today, the first step leaders should consider is rationalizing all initiatives into one with defect elimination as the key principle.

Winston and June Ledet on Local Television Show

The HoustonManufacturers' Show hosted Winston and June Ledet of The Manufacturing Game®. To view the program log on to www.HoustonManufacturers.com and click on to the Archive of Shows, February 5, 2008 Show.

Lighting Up The Shower

Barry Dean and Dewey Stuart decided to look into replacing the lighting in the safety showers after participating in a Manufacturing Game workshop at the Motiva Refinery in Port Arthur, TX. The standard for the lights has been incandescent and high pressure sodium bulbs. The incandescent bulbs lasted less than one year and the high-pressure sodium bulbs lasted less than 2 years. Neither was very cost efficient. When you consider the time notifying maintenance, ordering parts, receiving, planning and scheduling the work, the site was spending approximately 400 man-hours per year in addition to the cost of the bulbs. The bulbs also put out a lot of heat and when they were hit by the cold water of the shower they tended to burst and present another safety hazard–that of broken glass. This caused far too many safety work orders, a lot of hassle and poor vision in the showers.

As Barry said, "If you have something hazardous on your person all you want is to be able to see that all-important green light, and get to the shower as soon as possible". In the past they had tried replacing the old incandescent bulbs with fluorescent but that only extended the life of the bulbs from one to two years. Any benefits gained were lost when you consider that fluorescent lights should be disposed of as hazardous waste.

Barry decided to try an LED light when he found that the manufacturer claimed LED lights last up to 10 years. The electrical supply representative said he couldn't confirm the 10 year lifespan since they haven't been widely used for that long. He did, however, have data that showed they would last over 5 years which is about how long they have been in wide use. The LED lights burn brighter, last longer, give out less heat (causing less breakage), and therefore are safer. They do not require any special waste disposal and are vibration resistant. One more benefit with LED lights is that they show signs of failure long before the light "burns out". This makes maintaining the lights much more efficient. This small change in lighting reduced the man-hours, improved energy efficiency and most importantly safety for both the company and its employees. Barry said, "Vendors need to present new technology to the plants". Had he been told about the LED lights, he would have requested them earlier. What he would like to see is all the lighting changed out in the plant–first in all the safety showers, then the exit signs, increasing their life to approximately 10 years and eventually throughout the refinery. Barry said "If everyone made small changes to save energy and time, imagine the energy and work hours that would be saved." Barry thought it would be great if other departments and refineries could be aware of the added safety and lifespan of the LED bulbs. By sharing his story with all the TMG News readers, his wish could come true.

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"We cause people to reconsider their limits, to see what looks like a wall may really just be an obstacle in the mind."
—Lance Armstrong

Spring

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in to help. Lawrence contacted the manufacturer to see if others had experienced the same problem and if so should they upgrade to a newer, better valve? Someone contacted the Georgia Gulf plant in Lake Charles, LA along with other vinyl chloride monomer plants to get a copy of the relief valve design to determine if they could find an alternate solution. Eric sent the valve to the valve repair company to see if they could determine the reason for the recent failures.

One suggestion that was presented during their follow-up meeting was that three single block valves be used, one at each end of the Y and an additional valve at the bottom of the Y, instead of one three way valve. Someone noted then they would have three valves failing instead of just one. That would not solve their dilemma.

Eric Prettelt, the new kid on the block, had only been with the Plaquemine facility for a few weeks. He sent the valve to the repair company to see if they could determine the reason for the recent failures and discover the cause. And they did. The culprit turned out to be a policy of running valves to failure, when they could not be repaired without shutting down. It's no wonder that nothing was done to the valve till it failed. The solution was to set up the 3-way valves on a time based/ conditioned based maintenance PM to recondition the valves prior to failure. The best time to do so was during a turnaround window, so no additional downtime would be necessary. Eric is the planner for the area, and his job is to plan what happens during the turnarounds, so he made it his job to overhaul the valves. In order to avoid having this problem in the future they needed to know the right frequency of PM and how often to go between overhauls. In the end Eric added a task to the PM standards for the furnace, to pull the 3-way valves to check and overhaul as needed. He plans to use the information gathered to determine the correct frequency.

Not only did the team get the satisfaction of eliminating a defect that created problems for both maintenance and operations, but also they learned a lesson they would like to share with everyone, Oscar spoke up and said "If you don't want things to fail, don't follow a policy of run to failure". A simple solution to a puzzling problem.