

Maintenance, Reliability, Profit, & Loss

A massive power outage in south Florida on Feb. 26, 2008, plunged millions of people into darkness.

Businesses depend on processes performing properly to generate desired results and revenues to sustain the business, leading to a return on an investment or a profit. These “processes” can include human work methods and procedures, transformation stages during product flow, or equipment-driven systems that produce a useable output. When these processes stop, when they momentarily stall, or when they run inefficiently, the business is negatively impacted. More commonly when equipment breaks down or human errors happen in business, costs increase, revenues decline and profits turn into losses. Maintaining equipment and processes for optimum reliability is essential for our nation’s competitive success. The more we ignore the value of maintenance and reliability, the greater the economic losses.

As I have said in prior columns: The maintenance department alone cannot make equipment and processes reliable. Other people and departments have a direct or indirect effect on reliability. Senior management, corporate executives, operations management and staff, equipment operators, spare parts store rooms, spare parts purchasing, spare parts suppliers, training, engineering, procedure writers, product and process quality, and outside utilities are just a few examples.

However, when equipment fails, it is typically the maintenance (repair) organization that springs into action to address the problem and restore equipment and process operation. Meanwhile, all of the other people and groups, if not directly involved in the problem-resolution efforts, are employed in overhead activities while the process is *not* generating revenues. Briefly stated, during the process downtime, the business is *not* generating revenues or profits. But even worse, the business is also *losing* money because of the unplanned costs (labor, parts and supplies) and the extra efforts that interrupt the normal jobs and work processes, and all of the people who cannot do their work because of the unplanned downtime. Unscheduled downtime is a financial drain, and the time that is lost can never be recovered. Sure they can work harder, faster, and longer to make up production, but that originally planned time is lost forever. Unscheduled downtime steals planned, scheduled, productive time, never to be returned. Time is money. Lost time is lost money.

Think of unrecoverable time this way: While leading at Daytona, the first race of the season, by a 10-second margin, a NASCAR team (let’s call them the “Car 54” team) experiences “unscheduled downtime” when their car hits the wall coming out of turn two. A caution flag is waved, and the other racecars slow down. The damaged racecar limps back to pit road for unscheduled repairs. While all the other cars make laps around the track, the damaged car is not moving: It is being repaired. After the officials clean up the debris on the track (unscheduled cleanup), the race returns to “green flag” conditions and all of the cars quickly reach track speed. Meanwhile, Car 54 is still on pit road with the team beating, banging, pulling, and duct-taping the car back together. After the race continues for 20 more laps, Car 54 is finally rolling down pit road and getting back on the track—not a pretty picture, but it’s running. The time that Car 54 was in the pits is lost time (track position) that can *never* be made up. Sure, Car 54 is running again, and it finishes the race. But they were still behind the rest of the field by more than 20 laps. Oh, and their costs skyrocketed because

of the damage to the \$300,000 racecar and the time and money required to make it race-worthy for the next race.

What did the Car 54 Team really lose? For starters, they lost the race. They also lost top-ten prize money. Sponsors were sorely disappointed, and the damages amounted to \$150,000 in repair costs. The repairs set their planned shop schedule back about a week, so the team worked huge amounts of overtime to catch up. A few of the team members were injured during the pit road repairs and required medical attention and a day or two recovery time off work.

What should the Car 54 Team do? They realized that this problem at Daytona could quite likely happen again at another race. They had four choices:

- 1) Suck it up, prepare for the inevitable wrecks, and ask for a bigger maintenance and repair budget.
- 2) Determine the cause(s) of the problem and develop a countermeasure to prevent it from ever happening again.
- 3) Improve the efficiency and effectiveness of their pit road and shop repairs.
- 4) Blend the three options.

The Car 54 Team determined that the root cause of hitting the wall had nothing to do with the car itself or the driver's actions (other than being in the wrong place at the wrong time). They determined that the slower, soon-to-be-lapped Car 13 had a right front tire blow out, causing the car to violently swerve to the right just as Car 54 was passing on the right. Car 13 barely clipped the rear bumper of Car 54, causing it to pitch to the left. The Car 54 driver overcorrected from the Car 13 hit and grazed the wall with his car's entire right side. *Ouch!*

Given those causal conditions, the Car 54 Team realized:

- 1) They operated with a fixed budget. Neither the owners nor the sponsors had any additional money to put into maintenance and repairs, and the wreck already impacted the budget.
- 2) "Stuff happens" that cannot be easily prevented, but in this case, the driver has to avoid passing slower cars on the outside in the turns.
- 3) They had to find ways to make racecar damages more efficient and effective while at the race track. Sure, they could have fired the driver of Car 54 and had the Car 13 driver banned from racing. But these actions would not have addressed the causes of the problem and the business losses that were incurred. Organizationally, they had to find ways to be more resource efficient and effective.

On Feb. 26, 2008, at 1:09 p.m., a power failure slammed south Florida. Two nuclear power plants at Turkey Point (units 3 and 4) and a natural gas power plant shut down, and up to 15 other power plants were affected. More than 900,000 customers of three power companies in Florida—the equivalent of nearly 2 million people—were without power for several hours. Electricity was not produced and delivered over 26 transmission lines to nearly 38 sub stations. A total of about 2,700 megawatts (MW) of electricity and 4,000 MW of load were impacted. Turkey Point Unit 4 was down for five days and Unit 3 was down for seven days. These 12 days of power plant downtime coupled with the widespread power outage, the costs of repairs, the lost electricity generating capacity, the purchased electricity from other suppliers, the lost customer revenues, the cost of damages incurred, and the lost profits can never be recovered. They are lost forever.

This outage had a huge business impact on the power company: Utility revenues dropped, daily profits turned into losses; stock prices declined by 3.7 percent. State, municipal, and federal tax receipts declined. Repair costs increased, and overhead costs continued without the supporting revenue. Consumer damages have yet to be determined. Early damage reports included high volume of traffic accidents because of inoperable traffic signals; businesses had to shut down and send employees home; restaurants closed and food spoiled; grocery stores suffered food damage and losses; and other business, industrial, and residential customers had numerous losses and damage. One power company in Texas had to import power from the Mexican grid during the power outage in Florida.

The power experts also explained that the electric distribution grid automatic safeguards worked as they were supposed to work and prevented power plant damage and wide-spread power outage as the U.S. and Canada experienced in August 2003 when the entire northeast went black. That's the good news. But the bad news—the multi-million dollar cost of the Feb. 26 Florida power outage—has yet to be determined. The Florida Reliability Coordinating Council will take months to analyze the events.

The reported cause of this massive power outage was human error: An employee with “significant tenure” disabled two levels of relay protection during the diagnosis of a malfunctioning disconnect switch at a substation in west Miami. While making the required measurements, a circuit shorted that cascaded to other parts of the system. The power company said that the “simultaneous removal of two levels of protection was contrary to its standard procedures and practices.”

The Florida power outage opportunities are much like the Car 54 race team:

- 1) Suck it up, prepare for the inevitable wrecks, and ask for a bigger maintenance and repair budget.
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- 3) Improve the efficiency and effectiveness of their pit road and shop repairs.
- 4) Blend the three options.

The media and public have called for firing the employee. The company has put the employee on administrative leave. But hold on! This employee has enough knowledge to contribute to not only the true causes of the problem but also to the countermeasures that would prevent these causes from ever happening again. This employee was closer to the causes of the problem than anyone else in the world. The worse reaction would be to fire this employee. The best action would be to learn from “mistakes”... learn not only as an individual employee but learn as an organization trying to improve performance.

Some of the questions that must be asked are:

- 1) Were the standard procedures and practices accurate and up to date?
- 2) Was the employee trained and qualified in the specific procedures?
- 3) Was the employee assigned to perform a task based on his “significant tenure” (experience) without regard to the proper procedures?
- 4) Was it truly a maintenance-induced failure?

- 5) Could a system be devised to allow the type of switch inspection and still offer the required level system of protection?

Sure, they could fire the employee. But what would that solve? Not a thing. The causes of multi-million dollar business losses would still exist... lurking just below the surface, only to happen again when least expected. In other words, the racecar will hit the wall again and the new driver might not be the cause. If you can't eliminate all of the causes of the problem, what can you do to minimize the damages? Maintenance and training budgets might be in jeopardy once the damage has occurred and downtime losses turn into revenue losses, and in turn budgets get cut. Oh no! Now we have to do more with less, or do less with less. *Car 54, where are you?*

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Resources used in the preparation of this column include:

- Florida Power & Light news releases
- Platts.com: Electric Power News
- Energy Assurance Daily: U.S. Department of Energy
- Associated Press reports, various publications
- Nuclear Energy Institute press releases
- Miami Herald (Knight-Ridder/Tribune Business News) reports

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