Reliability Centered Maintenance

Electric Distribution Utility

In this case study the customer is one of the largest urban electric distribution utilities in North America serving nearly 800,000 rate paying customers in a city of 2.7 million people.

Situation

The current utility was formed by the amalgamation of distribution utilities serving 6 different municipalities, already a large metropolitan area, into a single political entity. There was a wide range of assets from different manufacturers in similar application and, in some cases, different configurations. The city center has a large underground network with redundancy, outlying areas had either grid or radial system designs, some underground but largely overhead. Two of the original municipalities had tried Reliability Centered Maintenance (RCM), one gave up early, while the other carried out various studies before giving it up as being too cumbersome. Despite those early failures, there was a sense that they may not have applied the method optimally. After all, RCM had been applied successfully elsewhere in the same industry. There was a desire to determine just what caused those early program failures and to determine a new approach.

Solution

An initial study was carried out into the early studies. The one municipality that had given up left little to examine, but the other had both studies, and the initial consultant evaluation that led to the effort. Following amalgamation of the municipalities, the program was resurrected, albeit cautiously. That early documentation was examined. Indeed, had that one utility continued with the approach that had been recommended, they would be producing sound results, but also doing a lot of repetitious work that could be avoided. They were right to have stopped when they did. A different approach was recommended.

RCM works on any physical asset, but different approaches are called for to suit the situation. RCM is normally applied to systems, and that's the approach the utility had taken. Each "feeder" was treated as a system. After examining a few they realized that they were repeating work on the various pieces of equipment that made up those feeders.

In situations where there is a large fleet of assets performing essentially the same function, it makes sense to treat each asset separately and allow the program for any given system to be developed from its component assets' programs. We had used that approach in vehicle fleets in mining and transportation sectors successfully. In fact RCM was developed in the airline industry where it is applied

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to a single asset (an aircraft) comprising multiple systems all performing the same functions in nearly identical operating contexts.

We began a new initiative for the combined utility using the equipment asset classes as the object for our studies. If there were exceptions to the “most common” operating context, we could account for those in modified studies that started from the common case analysis work.

It had been several years since the earlier studies so we began the engagement with training for RCM analysts, the individuals who would participate in the studies. During the several classes that were taught, there were several individuals who emerged as having the necessary attributes to be capable of facilitating RCM analyses. A few of them self-identified as potential facilitators, others were chosen after a screening process and confirming interviews. It is important that the facilitators want to do the work – they all did.

We then ran a facilitator competency development program comprising training, classroom case studies and mentored pilot projects. We provided the training, rated the case studies and mentored the newly trained facilitator candidates through nearly a dozen pilot studies.

The pilot studies were chosen because they were obvious problem assets that were responsible to excessive downtime and repair costs.

Depending on the complexity of the asset being analyzed the analyses lasted from one to two weeks, most being roughly a week in duration. Each facilitator was evaluated during their pilot studies. One was clearly a “natural” at this work and required very little mentoring. Others took two analyses and one who was a weaker candidate required three. They all succeeded.

The results of those analyses are described below.

There was one major glitch along the way, during the pilot studies. As the results of the studies became known, they raised worries among the unionized shop workers. RCM usually produces a program that is heavy on condition monitoring and lighter on preventive activities (e.g.: overhauls) than traditional programs based on manufacturer recommendations. This utility was no exception and the shops’ personnel began to realize that work they had done for years would no longer be required.

There was suspicion about management motivation and what the program was “really” intended for. That suspicion was misplaced, but had been earned given some past and unrelated events. Rather than prove the motives of management (which is never truly possible), we trained the leadership of the union and other skeptics in the RCM method.

By the end of the training their eyes were opened to why things were coming out the way they were. Even the union’s president remarked that he could now see why certain decisions had been made. He also went on to say that he could see where they were erroneous decisions and where they were correct. He was using the method rather than fighting it. The result of that was growth in the available pool of manpower for the analyses and excellent feedback that helped the analysis teams make more informed decisions.

After the initial 9 months of work, the utility continued on its own for the next two years, analyzing all assets in their care.

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Results

The initial pilot studies produced some remarkable results in terms of cost savings. Average budget savings were on the order of 32% for those specific asset classes. Much of that came from the elimination of excessive overhaul work and introduction of condition monitoring. In several cases we found that the overhauls had actually been leading to extra work as a result of infant mortality after the overhauls. Those savings on those initial projects had then paid for the program roughly 4 times over. The program wasn't even a year old at that point. There are indeed quick wins in RCM – something many believe to be difficult to achieve. We don't agree.

In addition to the changes in maintenance program composition, there were changes in operating practices, and work standards. The utility already had an excellent track record of compliance to its proactive maintenance program, so there were no worries about the studies resulting in no change. Asset performance tracked by asset did indeed show early signs of improvement. They were getting longer asset "run" times and fewer failures, therefore fewer expensive repairs and less customer disruption.

The condition monitoring that was put into place enabled the early identification of assets that were beginning to fail. In turn that enabled early action performed, in many cases, in a way that avoided customer outage time.

Roughly two years later the utility's manager who had been responsible for the program worked with us to present their results at a utility conference. Further data he had gathered since the initial studies revealed an across the utility budget saving of 22%.

At that time it was too early to have enough data to accurately estimate reliability gains, but tracking of performance using utility metrics was showing a distinct improvement.

To learn more

If you are considering Reliability Centered Maintenance, you will want to talk to us. We've been doing it since before our company was formed. In fact our principal has been doing it since the 1980's – before the first books and standards were even written. We know what works and what doesn't. There is more to RCM than meets the eye and we are happy to share out insights.

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