Improving electrical distribution reliability and cost

By Jose Sanchez

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ackground
The company analyzed it's competitive position relative to the other large investor owned utilities in the US. It became clear to survive in a deregulated environment that significant change was needed in 3 key areas.
Reduce operating and maintenance expenditures to be at or near the best companies in cost per kWh.
Improve generating efficiencies and implement load control programs so that no new generating plants would be needed to meet forecasted demand through the end of the century.
Maintain overall system reliability, and focus on improving the reliability for the largest commercial and industrial "at risk"customers, and fund this effort by redeploying cost reductions.
Develop a sense of competition on its people
Developing Customer requirements
An effort was undertaken to obtain the reliability expectations of all customer segments. Of primary concern were the large commercial/industrial (C/I) customers. This effort yielded a clear picture of customer expectations and the recognition that significant improvement was necessary for a portion of large C/I customers if the company was to retain them in a deregulated environment.
Other pertinent information was collected during this phase that would provide the basis for new product and service offerings geared to customers who required "premium power quality".

Systematic process improvement
The existing methodologies were not dynamic enough to focus resources on the most significant problems and target specific customer segments. Past improvement efforts were directed at system−wide projects that resulted in slight reliability gains. A more focused approach was needed in this new environment of cost reduction.
This process assessed the relative revenue contribution to company margins of specific customers, and the current level of reliability they were experiencing. In addition, their individual expectations, or reliability thresholds which were obtained in the surveys, were used in developing a scoring index. All large commercial customers were evaluated in this way. This resulted in a ranked scoring, or prioritized list of all C/I customers and enable the company to focus improvement efforts.

Implementing reliability improvements

After the C/I customers were ranked in order of needed improvement, a field analysis was conducted at the feeder level for each high priority account to identify needed corrective actions. This analysis resulted in a number of system improvements that were scheduled as part of the operation and maintenance work to be completed. A deployment strategy was developed based on sound PDCA principals. These projects were included in the budget allocation process and were integrated as priorities in the local business plans. Total expenditures in the improvements were tracked to assess the benefit of the investment These projects were worked before the heavy outage season and early enough in the year to see reliability improvement gains by year end.

Results

Operations and maintenance expenditures in the distribution area were reduced by 34% from 1992

through 1996 in terms of cost per kWh.

Capital expenditures were reduced by 32% during the same time frame.

Overall reliability degraded slightly during this time frame.

While reliability was slightly worse, overall customer satisfaction with reliability improved by 9%. This seems counterintuitive however, the focus on eliminating extreme reliability problems actually shifted customer satisfaction. In terms of price per kWh the company improved from one of the high price energy producers in the region to one of the lowest.

Recommendations

The approach this organization has taken to reduce operating expenses while improving reliability for the most significant customers, is a real success story. It is not unique however and with commitment on the part of any electric utility, is replicable.

The following were some of the recommendations to embark on this approach to improve reliability and competitive position:

The initial step is to assess the organizations relative position with its natural competitors, and develop a sound strategic plan to improve operations and reliability while reducing costs.

Determine customer requirements for all segments and understand their reliability expectations using QFD techniques. Develop strategies to address significant reliability problems and focus improvement on the most important customers.

Benchmark with best in class companies to understand the basis for their performance and analyze their processes for improvement ideas

Be prepared to change the management structure of the business unit based on the most effective way to achieve customer satisfaction and low cost. This will involve downsizing or elimination unproductive work processes, flattening management layers, and realigning functions to get closer to the customer and provide seamless service delivery.

Manage customer relationships based on a sincere commitment to meet their requirements. Develop sound statistical measures of customer satisfaction and initiate actions to reduce and eliminate dissatisfaction.

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Transducers − The Remarkable Changers

By Thomas Yoon

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Complex control systems all make use of signals that can be easily measured and altered remotely. Automatically operated machines or actuators need to be powered either by electrical motors, pneumatic or hydraulic cylinders.

The most common signals sent out from a transducer are electrical current or voltage and pneumatic pressure. These signals are easily translated by controllers. Visual measuring devices like liquid bulb thermometers are not able to be used in automatic control systems because there are no electrical or pneumatic signals.

However, when some other component is added to it to enable it to give a corresponding signal, then the measuring unit becomes a transducer.

A transducer is a device to convert a signal (representing a physical quantity) of one form into a corresponding signal of another form, retaining the amplitude variations of energy being converted.

Just as an example, a microphone is a sound transducer (acoustic to electrical) and a loudspeaker is an electrical transducer (electrical to acoustic). A transducer may be an integral part of the measuring unit, for example pressure to displacement in a Bourdon pressure gauge. It may also be a separate unit converter especially suitable to change the signal to a better form for remote transmission, e.g. displacement to electrical in a differential transformer.

How do these transducers work?

To convert physical movement to electrical signals, some devices make use of variable resistors. Any movement will cause a slider contact to change position against a resistance wire causing a change in electrical current or voltage. Other devices may make use of the movement to alter the position of an induction coil relative to the magnetic core, causing a change in the induced current in the circuit. Others may make use of the movement to change the air gap between two capacitance plates, causing a

change in the current in the circuit.

In the case of the loudspeaker, the opposite effect takes place. Electrical signals are converted to movement.

Some pneumatic transducers make use of changing air signals to cause a corresponding mechanical movement in the flapper and linkages. This movement is then converted to electrical signals by the methods above. So it takes 3 steps of conversion before we can get the electrical signal.

Once the electrical signal is obtained, it can be used to compare to the set value in the controller, and a whole control system can be designed from it.

Well folks, get your signals and be in control!

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