Exelon Improves Maintenance Prioritization and Capital Planning Using Bentley Software

AssetWise Ivara Performance Management Enables Asset Health Indexing for More Economical and Impactful Decisions

Project Summary

Organization:
Exelon

Solution:
Utilities

Location:
Chicago, Illinois, United States

Project Objectives:
- Enable better visibility into the current overall health of critical assets
- Establish a continuous fact-based capital planning cycle leveraging up-to-date health indices
- Optimize investments across maintenance, capital replacement, and overall risk mitigation

Product Used:
AssetWise Ivara Performance Management

Fast Facts

- Exelon is one of the largest electric companies in the United States, with operations and business activities in 47 states, the District of Columbia, and Canada.
- Exelon chose *AssetWise Ivara Performance Management* to provide accurate health assessments of critical assets on a more regular basis and with minimal effort.
- *AssetWise Ivara Performance Management* has enabled health assessments for 57,000 critical assets to be performed on a monthly or quarterly basis rather than every few years.

ROI

- Better informed capital planning decisions
- Better prioritization of maintenance work
- More planned costs – less reactive costs

The Situation

Exelon is one of America's largest electric companies with close to USD 19 billion in annual revenues and over USD 55 billion in assets. It has the largest market capitalization in the electric utility industry, and is ranked #1 in gas and electric utilities by *Fortune* magazine. The ComEd division delivers electricity to several million customers in northern Illinois.

Exelon needed a way to update the indices on a fairly regular basis with minimal effort so that it could make decisions based on the current health of their assets.

Several years ago ComEd commissioned Kinectrics Inc. to conduct a study of 31 different classes of substation and transmission assets. The study developed a score for each of the 57,000 assets, where zero represented an asset that had failed beyond repair and 100 represented a brand new asset. This "asset health index" score was initially used to drive capital replacement plans and help prioritize maintenance work for the following year.

The Challenge

The study itself was quite valuable, and ComEd envisioned many more potential uses for the asset health indices, but the study results were becoming out of date. ComEd tried to manually recalculate the indices, but found the data volume to be overwhelming for their small internal staff. ComEd needed a way to update the indices on a fairly regular basis with minimal effort so that they could make decisions based on the current health of their assets, not the health as it was assessed several years ago.

The Solution

ComEd was impressed with *AssetWise Ivara Performance Management*'s ability to gather data from multiple disparate process control, SCADA, CMMS, and homegrown systems and use the data to generate alarms for condition-based indicators. The next step was to leverage the software's data connectivity and flexible customization tools to develop complex health index calculations.

The Bentley team took a sample health index spreadsheet for one of the asset types and turned around a prototype in under two weeks for what the final health index system would look like. Based on this, they were given the task of developing a production system in under three months for generating health indices for all 31 asset types and 57,000 assets.

The developed solution defined and created a "Health Index Worksheet" for each of the 31 identified asset classes.

Asset health component data is normalized, weighted, and combined to determine the overall asset health index.

Individual "components" were then created for each Health Index Worksheet to define the desired calculation for that component. For example, one component might be to count the number of infrared measurement problems (on a circuit breaker) over the past year. Another might be to determine the most recent trip time measurement (on a circuit breaker). A third might be to find the maximum load peak readings over the past 60 months (on a transformer).

Each component data value is then normalized by referencing a factor table and deriving a factor, ranging from 4 (excellent

health), to 0 (very poor health). Each factor is then multiplied by a weighing factor to obtain a score for that component. Some asset classes could have as few as 14 uniquely calculated components, while others could have as many as 90+ components, depending on the complexity of the equipment. Next, each component score is then calculated in a health index calculation; the component score is divided by the maximum possible score to derive a health index expressed in percentage (0 to 100) for each component. Finally, all the component scores are combined and divided by the maximum possible scores to determine the overall asset health index in percentage (0 to 100).

Also a calculation is made on the data that was found during the component calculations to evaluate how complete the data was during the calculations. For example, if a health index for an asset was found to be 95 percent (quite good) while the data availability was only 65 percent (moderate) then the confidence of the health index might be somewhat suspect. Assets in a given class can then be ranked by their health index score and the poorest ones (lowest percentage) identified for further analysis.
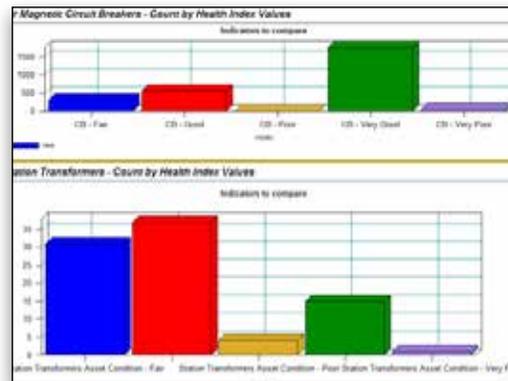
Asset health indices can be run on individual assets or by the entire asset class.

The data is provided by a number of automated daily interfaces to several legacy systems, providing:

- Updates to the assets
- Indicator readings (measurements) for all the measured parameters
- Work orders (created against the assets)
- Problems identified in the field for each asset

All factors, weightings, parameters, and components are maintainable and tailorable by Exelon personnel, allowing "what-if" scenarios to be run at will. Health indexes can be run on an asset or by the entire asset class. The developed framework and logic allows other asset classes and health indices to be easily added. Finally, the calculation programs

can be modified by Exelon IT personnel to provide a robust flexible solution into the future.

The Result

The inputs to the health index calculations are now collected automatically every night from the various source systems. On a monthly or quarterly basis this will be augmented with manual data from Excel spreadsheets and updated indices will be calculated.

ComEd plans to use the much more timely health index data for a variety of purposes, which may include:

- Putting in place a short term capital replacement plan for old assets with low health;
- Developing a five- or 10-year capital plan for replacing assets projected to deteriorate over the coming years;
- Considering the deferral of maintenance for assets soon to be replaced;
- Increasing the priority of maintenance work for lower health assets that are not scheduled for replacement;
- Performing root cause analysis for young assets with low heath to determine why they are problematic and if they are recoverable;
- Displaying the geographic dispersion of low heath assets to determine if there are economies of scale in grouping maintenance or replacement of assets in close proximity with one another;
- Using histogram and regression analysis to determine if there are key factors that are causing poor asset health;
- Using trend analysis to determine the rate of change of asset health over time for both individual assets and overall asset classes;
- Calculating the probability of asset failure in the near term based on current health;
- Combining probability of failure with an analysis of the criticality of failure to identify high risk assets that required urgent risk mitigation strategies.

Conclusion

By generating asset health indices in a much more timely and automated fashion, AssetWise Ivara Performance Management is providing ComEd with much better visibility into the overall health of their extensive physical plant. Health indexing is bridging the gap between short-term corrective work driven by condition-based maintenance, and longer term capital planning, which used to be driven by periodic one-time studies (or last year's budget and available capital). The foundation has been set for fact based decisions on how to find the right balance between ongoing maintenance, capital replacement, and overall risk mitigation.