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CARE - Electricity Sector

The major factor reducing the operational life of steel lattice towers is degradation of the steel work through the reaction of the assets with the environment causing corrosion. The impact of these corrosion mechanisms is compounded by the operational stress placed on the assets through changes in load (thermal, mechanical, etc) and the interaction of the steel with the environment.

Corrosive action varies seasonally and is impacted by proximity to coastlines and trunk roads with their salt-laden air and to industrial centres with their heavy pollution. These effects have been long understood, however, they are generally poorly correlated and modelled on anything other than a generic basis; therefore, this knowledge is of little value in determining asset life.

Babcock Networks, Capcis and C3 have developed a computer model and database system, CARE, which enables that the condition of steel lattice structures be determined based on the interaction of tower steel with the environment.

CARE combines environmental parameters (weather and pollution data) with the tower's construction and maintenance history (e.g. painting) to calculate the likely materials degradation year on year since construction. CARE allows, for each tower, the historic and current condition of the tower steel work to be determined via a prediction of the loss of steel section.

In addition, informed extrapolation of the environmental conditions enables that the future condition of the steelwork can be predicted based upon a user defined maintenance schedule. This has clear implications for predicting the future life of a structure and ascertaining the optimum maintenance schedule for an asset.

The value of the model is further increased by the inclusion of a risk module, which defines the consequence of a tower failure and the loading factors that increase the risk of failure. This, in combination with the degradation assessment, enables a risk-based approach to maintenance planning to be carried out.

babcock

C3 AMULET

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MODEL BENEFITS

CARE offers most benefit when applied to a large number of geographically distributed galvanized steel structures. In this instance, CARE would enable users to ascertain the current and future condition of each asset, suggesting that:

- High level spend can be defined and targeted
- Model utilised defines the condition of assets relative to one another highlighting geographical variation
- Proactive maintenance scheduling be utilised
- Painting programmes could be implemented across the country based upon the when an asset requires protection. Hence, avoiding high spend/ resource in one period and extending the life of only the towers for which it is required
- Target inspection
- Physical tower inspection could be targeted to assets in poorest condition
- Inspection categories could be defined based upon the remaining life of an asset.

MODEL OUTPUTS

Figure 1 shows the gradual loss of section caused by degradation of the galvanizing layer. This will continue until the layer is completely degraded, after which the underlying steel will begin to degrade and eventually compromise the structural integrity of the asset.

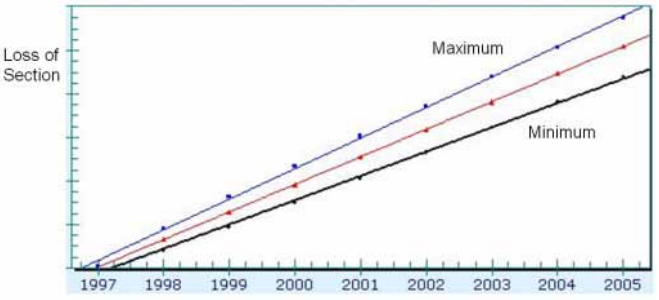

Figure 1: The minimum, maximum and average loss of section for a single asset

Prediction of the degradation process enables that an appropriate painting program be implemented prior to loss of the galvanizing layer.

Assets are color coded in accordance with their loss of section and assigned their geospatial reference so that they can be plotted on a map. Results can be viewed at various resolutions, enabling an overview of the whole country or details of local variations. An example is provided in Figure 2.

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Figure 2: Geospatial references identify structures location and condition

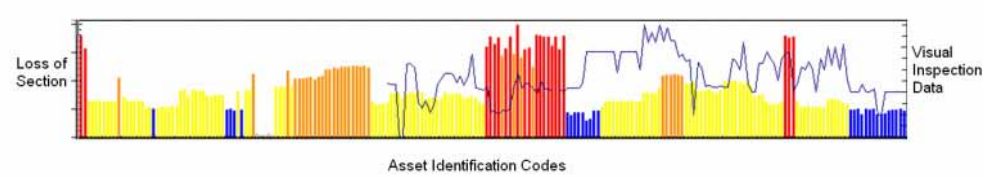

Figure 3: Asset current or future condition and visual inspection data for a large selection of assets

In summary, CARE is a sophisticated analysis tool, which by interrogation of multiple data sources can predict the degradation of steel lattice structures on a tower-by-tower basis. The output generated by CARE is an assessment of current tower steel condition and prediction of future degradation based on varied maintenance scenarios. This enables operators to:

- Manage and target spend on their network
- Understand the risks attached on decision-making
- Enable proactive approach to maintenance and inspection
- Assess future maintenance and operation options with respect to steelwork life
- Extend asset life
- Extend depreciation period
- Improve bottom line Profit and Loss

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