Steel Pole & Tower Assessment & Remediation

Turnkey Solutions for Aging Steel Infrastructure

an Osmose company

Logsys Power Services

Understanding and Addressing the Risks of Aging Steel T&D Assets

Once thought to be permanent structures free from maintenance and reliability concerns, steel towers and poles have demonstrated that they do indeed degrade over time as a result of corrosion and mechanical damage. Age alone is not an accurate predictor of which structures may be experiencing corrosion. There are a number of factors that can cause corrosion or affect the rate at which a structure corrodes.

Structure Characteristics

- Age
- Structure Type & Design
- Material Type
- Foundation Construction
- Existing Coatings

Environmental Conditions

- Terrain & Soil Conditions
- Moisture Content
- Stray Current
- Agricultural Activity
- Industrial Emissions

An **Asset Management Workshop**, covering both technical and financial considerations, can help asset owners determine the best assessment methodology, and how to optimize structural and financial performance of this asset class to effectively achieve service quality requirements and mitigate unsafe operating conditions. Logsys Power Services facilitates these no-cost workshops to help ensure customer's steel structure programs derive optimal value and risk mitigation, while leveraging industry best practices.

PILOT PROJECT

Low-Cost System Screening

The results of a pilot project can provide quick and valuable insight into the condition of key steel assets. Based on the results of a targeted pilot project, utilities can make informed decisions about next steps, including instituting a risk-based, cost-effective cyclical program that addresses the entire system over a period of years.

Pilot projects are typically inexpensive and help build the business case to fund a full program.

Turnkey Solutions from Logsys Power Services

As a turnkey solution provider, Logsys Power Services can assist utilities with every aspect of implementing a steel infrastructure maintenance program. We offer the industry expertise to develop effective corrosion and concrete programs, the engineering resources to design complex repairs, and the field labor to thoroughly assess structures and install repairs, cathodic protection, and protective coatings.

- Industry expertise in corrosion remediation
- Experienced Professional Engineers to design steel and concrete repairs
- Highly-trained field technicians and NACE-certified corrosion experts

Reinforced concrete encasement of a severely corroded tower section.

Repair of a severely deteriorated pile foundation on a 230 kV guyed mast transmission tower located in a protected wetland area.

Logsys Power Services is an Osmose company who is an active member, participant, and/or complies with the following organizations and their standards:

- ASCE (American Society of Civil Engineers)
- ACI (American Concrete Institute)
- AISC (American Institute of Steel Construction)
- NACE (National Association of Corrosion Engineers)
- IEEE (Institute of Electrical & Electronics Engineers)
- NESC (National Electric Safety Code)
- SSPC (Steel Structures Painting Council)
- ANSI (American National Standards Institute)
- ASTM (American Society for Testing and Materials)
- DOT/OPS (Department of Transportation/Office of Pipeline Safety)
- AWS (American Welding Society)

DETECT • PROTECT • CORRECT

Corrosion Assessment

Logsys Power Services corrosion investigation programs locate and assess deterioration on steel transmission structures and identify those in need of repair, helping utilities avoid costly replacements.

Comprehensive Inspections vs. Partial Predictive Inspections

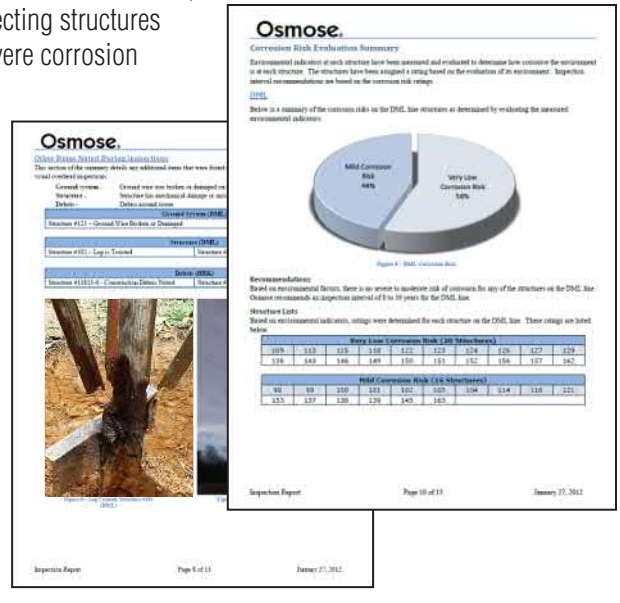
During a **comprehensive inspection**, each leg of the structure is excavated to a depth of 46 to 61 cm. This is the ideal inspection method for obtaining structural condition information in the critical transitional zone of the steel structure, and it allows for protective coatings to be applied. **Predictive inspections** provide an effective, less costly approach that targets "the worst of the worst" conditions on a structure. During a predictive inspection, one leg or section of the structure may be excavated. Based on the findings in that area (including structural condition and the presence of corrosion or the presence of corrosive factors), a prediction is made as to the condition of the tower or structure.

Structural Ratings & Corrosion Potential Assessment

The assessment process involves both a **structural assessment** and a **corrosion potential assessment**. During the structural assessment, each member of each tower is assessed and assigned a structural rating based on the extent of existing corrosion and its ability to support loads. During the corrosion potential assessment, each structure is evaluated and given a rating based on the likelihood of future corrosion. This comprehensive rating is indicative of its current corrosive condition and its potential for future deterioration based on environmental factors.

Non-Destructive Evaluation (NDE) Options

When non-destructive evaluation of an asset is necessary, skilled and experienced Logsys Power Services technicians utilize electromagnetic acoustic transducer (EMAT) technologies such as Intelli-Pole™ and Anchor-Inspector™ to help identify below-grade structural defects. These technologies are types of NDE designed to estimate the extent of defects in conductors, steel poles, stub angles and guy anchors. EMAT technologies are particularly useful for inspecting structures that cannot be excavated, or for structures that have been classified as having severe corrosion potential and require further evaluation without the risk of excavation.



Data Deliverables

All relevant data - both structural and environmental - collected during the assessment process is recorded and delivered to the utility. Customers receive raw data as well as project summary reports which summarize the findings and provide recommendations for logical and cost-effective next steps.

Accurate, comprehensive data removes the guess work, allowing customers to address priority concerns immediately and design a condition-based assessment and mitigation program for the second cycle. Most customers find that lifecycle costs diminish substantially in the second assessment cycle, while service life and reliability are enhanced.

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Corrosion Remediation

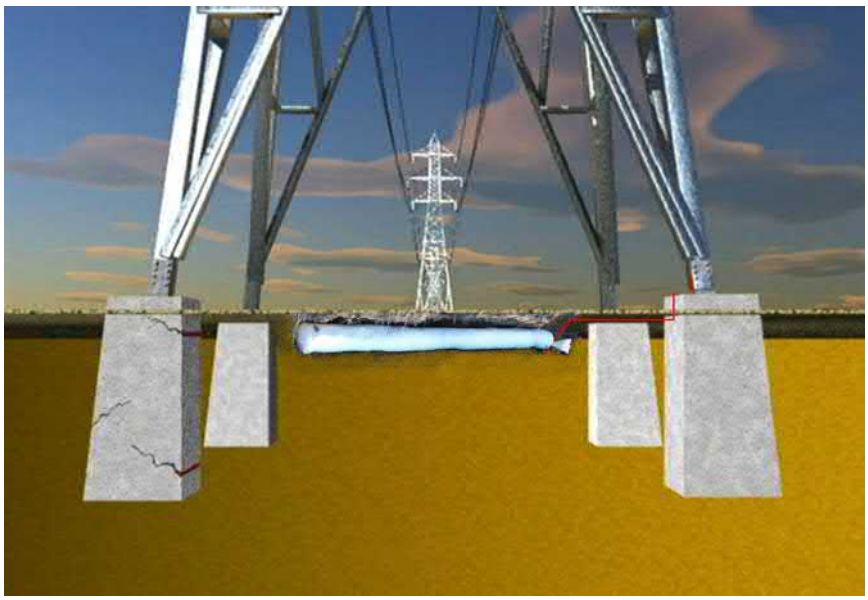
Application or installation of corrosion countermeasures such as specialized below-grade coatings or sacrificial anodes (cathodic protection) can help extend the useful life of steel poles and towers for many years. Logsys Power Services has the experience and skills to help utilities develop optimal corrosion remediation programs that provide long-term protection and life extension.

Coatings

Application of below-grade coatings adds an improved measure of protection and can help alleviate potential corrosion concerns, effectively extending the structure's useful service life.

Galvanic Cathodic Protection Systems

Cathodic protection is often used as a secondary mitigation method to target specific areas that require additional attention. Attaching sacrificial anodes to steel structures and placing them in the same soil profile provides an additional layer of corrosion mitigation. Cathodic protection does not eliminate corrosion activity, it simply transfers the corrosion activity from the steel structure to the anodes which "sacrifice" themselves to protect the asset.



RELIABILITY STANDARDS

Osmose steel asset management programs help utilities ensure the safety and reliability of high-value bulk transmission assets that fall under FERC and design oversight.

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Engineered Repairs

Whether secured by a concrete foundation or direct-buried in soil or water, Logsys Power Services provides engineered repair solutions for damaged steel towers and poles. At a fraction of the cost of replacement, these repair solutions restore original strength and can even increase capacity when greater strength is required.

- **Structural Steel Repair**
  (designed and implemented to AS 3995 specifications
  - Corrosion rehabilitation to restore original strength
  - Structure is temporarily supported; lines remain in service
  - Structural uprates
- **Concrete Foundation Repair**
  (designed and implemented to AS 3600 standards
  - Concrete repair or replacement
  - Capacity increases

Operational & Financial Benefits - Making Sense of the Investment

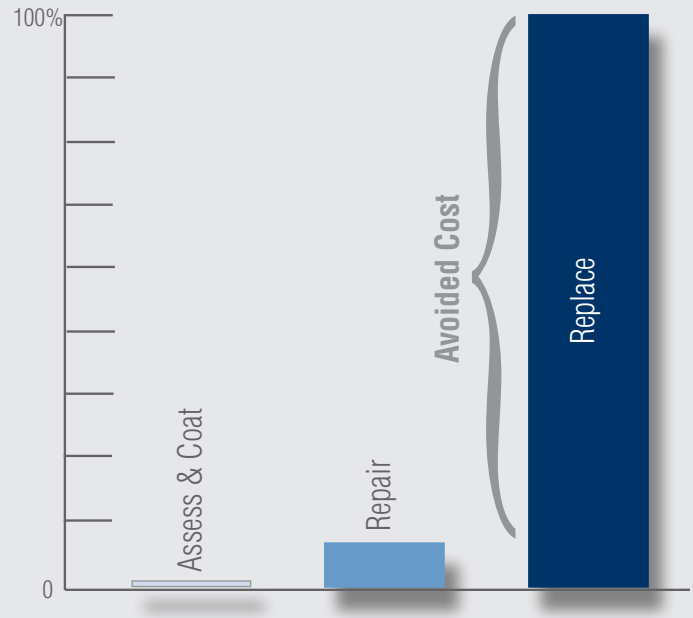
A steel structure asset management program has both operational and financial benefits. It adds years of reliable service life to the transmission system and provides a mechanism to continuously recapitalize steel tower assets and control replacement CAPEX requirements.

Cost avoidance is achieved by proactively remediating towers/poles versus reactively repairing and replacing them. For example, one utility's average cost to assess and coat the footings of one tower is approximately 15% of the cost to repair the tower. This same utility's average cost to repair one tower is approximately 7.5% of the cost to replace it.

Adding years of dependable service life to steel structures defers costly repairs and replacements, thereby reducing capital and O&M needs, facilitating investments in other key projects and programs. The net result of a well-executed program is effective regulatory compliance, safe and reliable operating conditions, and a consistent return on equity.

An Osmose **Asset Management Workshop** can help illustrate the compelling financial benefits for your system based upon our industry studies and analysis. Contact your Logsys Power Services representative for more information.

Proactive Remediation vs. Reactive Replacement



CAPITALIZING YOUR INVESTMENT

A Logsys Power Services Coating & Repair Program significantly extends the useful life of steel towers and poles. As a result, many utilities are presently capitalizing their programs. We can show you how.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