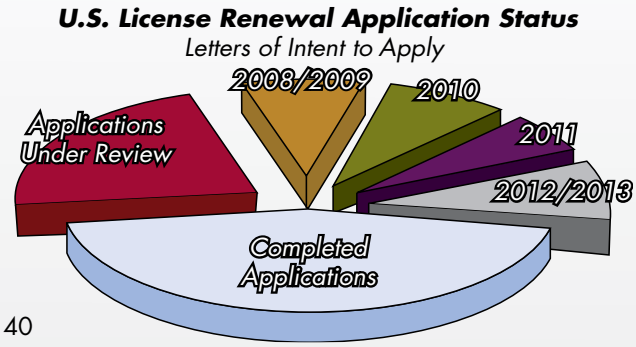
Managing Buried Assets

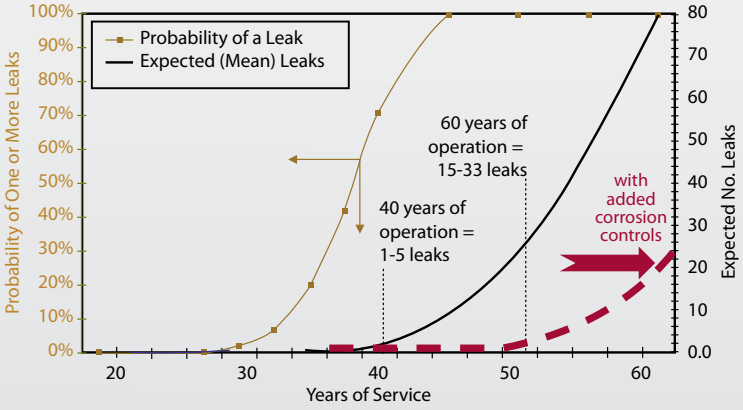
Programs for Nuclear Plants

Issue

By 2013, all nuclear power plants in the United States will have applied for license renewal. Original design specifications for buried assets were intended to achieve safe, reliable operation for a minimum of 40 years. Corrosion protection was designed through: material selection, coatings and linings, or other supplementary internal and external corrosion control practices such as biocides, inhibitors and cathodic protection.



Accumulation of degradation over time, which is the driver for essentially all aging phenomena, results in typical "leak evolution" predictions as shown below. Achieving a trouble-free 40 year life is possible with these typical corrosion prevention measures. However, the effects of an additional 20 years of service can produce significantly degraded plant performance unless actions to remediate or mitigate the degradation are defined and executed.



Specific corrosion threats challenging plant life extension include:

- external coatings deteriorating and losing adhesion
- internal linings cracking
- soil corrosion potential changing over time

Supplementing corrosion controls (e.g., adding cathodic protection) has the potential to extend life (red curve).

An increasing trend for plant License Renewals, supported by INPO, is to commit and improve upon inspection and maintenance plans for buried pipelines and other underground assets.

Solution

Structural Integrity Associates has extensive experience with the assessment of buried piping systems in nuclear power plants, as well as in other regulated energy industries, allowing us to bring multiple industry best practices to your plant.

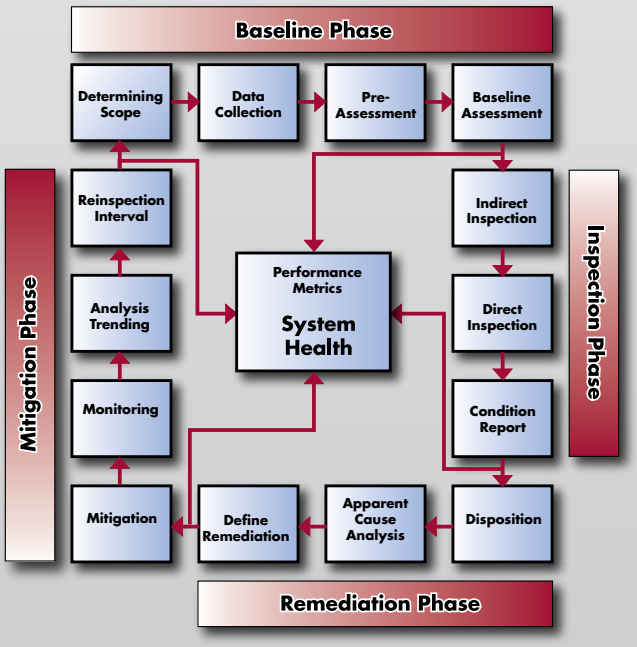
Structural Integrity's experience with life cycle management, risk assessment and defect disposition provides the basis for an in-depth understanding of the challenges that nuclear power plants face in managing their buried piping systems. Structural Integrity staff are leaders in the pipeline industry dealing with the data integration and unique inspection methodologies required to assess buried components. Structural Integrity has applied this understanding in the development of the **Managing Aging Piping (MAP)** program for buried assets.

MAP Program Strategy

Structural Integrity has developed an underground piping and tank assessment methodology for power plants. The cornerstone of Structural Integrity's approach is a written program that addresses the complete cycle of necessary activities:

- Determining scope
- Risk ranking systems
- Developing an inspection strategy with necessary decision criteria
- Resolving findings
- Mitigating future degradation
- Identifying timely future actions to insure continued reliable operation

Independent of ongoing corrosion prevention actions, MAP provides the road map necessary to plan, document and maintain buried systems using a consistent, analytical decision making process.



MAPPro™ Database

A key to successfully implementing a program is the management of critical data necessary to support subsequent decision making and reporting requirements. As part of Structural Integrity's expert database application, **MAP**Pro (Managing Aging Piping), critical data is categorized into several classes:

- **Asset information**: physical features of the pipe/tank, its environment (soil and fluid side), as well as operating, repair and historical performance statistics from the Baseline Phase.

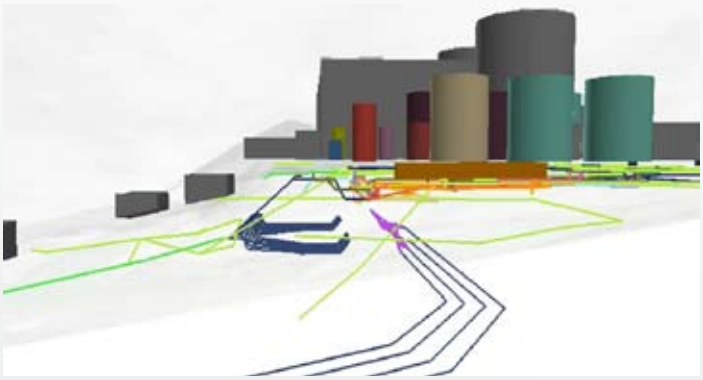
MAP process manages the logical flow of information

- **Inspection Data**: system measurements that describe conditions at a specific location that indicate the health of the system at a specific point in time from the Inspection Phase.
- **Analysis Data**: post processed engineering risk calculations, risk algorithms, and assessment criteria applied to Asset and Inspection data to reveal patterns and trends in system behavior that proactively lead to the discovery of adverse conditions before they result in extensive degradation from the Remediation and Mitigation Phases.

A buried piping program cannot evaluate a system based on a single set of parameters. Design parameters change, the environments change, and corrosion control performance changes. **MAP**Pro utilizes dynamic data segmentation to direct inspection efforts at the highest risk locations and minimize the potential for costly excavations in low value areas.

MAPProView™

MAPProView is an integrated companion tool to **MAP**Pro that allows system engineers to analyze and visualize data. This tool instantly puts all buried piping design, inspection and risk assessment data at an engineer's fingertips. The interactive interface allows the display of aerial imagery, plant drawings, written inspection reports, spreadsheets, photographs, key plant health indicators and other information in one place. Using **MAP**ProView does not require the maintenance of two systems. Simply maintaining data in **MAP**Pro



***MAP**ProView allows analysis and visualization of information*

will seamlessly allow information to appear in **MAP**ProView. As projects proceed, additional data can be appended into this tool for instant information retrieval. The **MAP**Pro suite can be used over a network or linked to other existing plant databases.

When digitized from isometric information, 3-dimensional renderings of the plant systems can be visualized for: optimizing the inspection benefit from opportunity digs, reducing the risk of accidental damage to other lines during excavations, as well as dispersion modeling for the likely release paths into groundwater or surface water bodies.

MAP Training

Structural Integrity offers industry leading training on:

- principles of establishing an underground piping program
- Use of the **MAP** process and supporting **MAP**Pro and **MAP**ProView tools
- G-Scan™ (Guided Wave Ultrasonic Testing)
- Cathodic Protection in Nuclear Power plants – Application & Testing

Why Structural Integrity

The cornerstone of Structural Integrity's approach to assessments and development of asset management programs is the integration of expertise in degradation, structural mechanics, advanced inspection technologies, regulation and organizational performance.

Expertise: Structural Integrity has industry leading engineers, data analysts, inspectors and inspection equipment that allows us to rapidly respond to your needs. We maintain internal expertise in all areas of the MAP program including: database development, GIS visualization, corrosion threat modeling/assessment, risk analysis, inspection planning, cathodic protection, soil analysis, guided wave ultrasonic testing (G-Scan), standard ASNT test methods, defect disposition / flaw handbooks, water treatment & analysis, repair recommendations, root cause analysis, remaining life and reinspection planning.

Leverage: The principles involved in MAP are not new; they are simply the logical integration of industry proven activities in a systematic manner. The staff at Structural Integrity will bring to your project experience from multiple industries to insure that your unique conditions receive the benefit of our state-of-the-art knowledge.

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