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## Expert Systems for Characterizing the Corrosivity of Pipe Environments

### Objectives

To develop expert systems that can help decision makers identify the environments in which the corrosion of ductile and cast iron pipes is most likely to occur.

### Background

Corrosion is one of the major causes of structural failure of ductile and cast iron water mains. Such failures can be prevented to a significant extent by using externally coated pipes for new installations and by providing cathodic protection for new and existing pipes. However, such measures are costly and should be applied selectively where most needed. Municipal engineers are therefore in need of software tools to help them identify highly corrosive environments and select an appropriate level of protection for the pipes.

### Statement of Work

- Surveyed experts and augment their findings with information found in the literature.
- Collected data from pipe samples.
- Built a knowledge base incorporating this information.
- Developed the algorithms and inference engines for each expert system.
- Developed a software tool that can encompass multiple expert systems.

### Outcomes

A fuzzy expert system and a pipe deterioration fuzzy model have been developed to predict the deterioration rate of metallic pipes based on soil properties.

### Start/Expected Completion dates

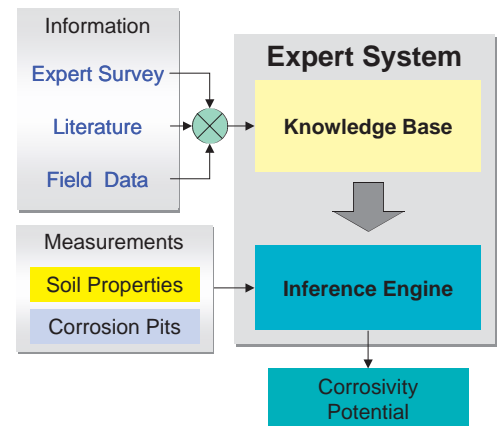
This project began in April 2003 and was completed in 2006.

### Project Manager

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For more information, see [http://irc.nrc-cnrc.gc.ca/ui/bu/corrosivity\\_e.html](http://irc.nrc-cnrc.gc.ca/ui/bu/corrosivity_e.html)

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Each expert system consists of

- A knowledge base built on field data and expert knowledge
- An inference engine driven by a soft-computing technique such as fuzzy logic, neural networks or probabilistic reasoning.

Measurements such as soil properties and corrosion pit depth are processed by the Expert System, which determines the corrosivity potential of a specific installation.