

Ice Vision System



Consequences of ice accumulation on conductors can be catastrophic as learned from damages experienced by utilities during major ice storms over the past 10 to 15 years.

The Ice Vision System developed through collaboration between Manitoba Hydro International (MHI), Manitoba Hydro, and the University of Manitoba provides for automated early detection of ice accumulation, automated alarm notification, and the ability to acquire real time images from the field. The Ice Vision System is very useful for assessment and prioritization of ice mitigation resources. The Ice Vision System automatically measures ice profiles directly on overhead lines allowing for quick remediation.

Every year, North American power systems face at least one localized ice storm as well as frequent damaging ice storms. In order to alleviate ice damage since the 1980's, Manitoba Hydro has developed an ice storm mitigation strategy of melting ice accretion on overhead lines by selectively placing short circuits to heat the conductors until ice is released.

This new ice detection system utilizes a computer vision recognition technique to automatically measure ice profiles directly on conductors of overhead lines. The icing information, based on physical ice accumulation on the conductor, improves efficiency for making real-time ice storm management decisions.



Since 2005, Ice Vision Systems have been providing 24/7 monitoring and alarms for ice accumulation.

Vision Based Ice Detection System

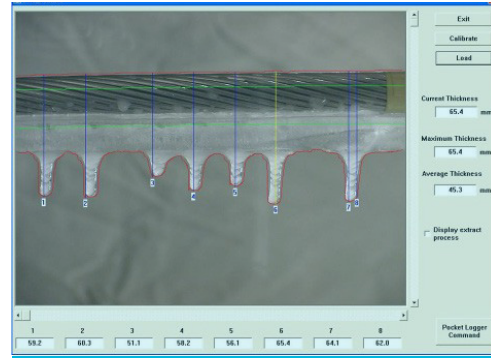
This system uses advanced vision recognition technology which allows for early detection of ice accretions directly on conductors. Cameras mounted on line structures take pictures of conductors. Image processing software calculates the accumulated ice profiles on the conductors automatically from a high-definition image. A wireless connection is used to send the icing information to a centrally located server.

For users located within the corporate utilities LAN, the system provides secured and authenticated users access to weather data, alarms, digital images and a real-time view of any of the cameras. One master server interfaces with the systems from each individual location.

Over the past four years, Manitoba Hydro has been implementing a network-based system that will be comprised of 23 early warning Ice Vision Systems. Once fully deployed, the Ice Storm Management staff can establish ice melting priorities ensuring an objective and consistent dispatch of resources to critical icing areas. This enhanced information system extends the lifespan of system infrastructure and minimize the impact of ice storm damage.

Software Highlights

- A master application controls and establishes the communication with each of the monitoring stations
- A SQL database and file management system which stores the data received from the individual monitoring stations
- Web-based graphical user interface allows the users to access the system information from within the authenticated corporate network. System users are within the utility corporate network
- A web-based system administration of each remote monitoring station is provided to users with elevated permission levels
- Customizable, multi-source alarm annunciation capabilities
- The Master ice application is configured to provide SMS or email messages to any number of users based on each individual monitoring station
- Capable of detecting ice within an accuracy of $\pm 2\text{mm}$
- Rugged design tested in harshest conditions (-40C to +40C)
- Automatic and accurate measurement of ice profiles directly on conductors (accuracy of 2 mm)
- Collection of weather data including temperature, wind speed and direction, relative humidity, precipitation levels, and atmospheric pressure
- Real time ice pictures
- Customizable user interface
- Wireless communication for remote access, control, and configuration of settings
- Central storage of information for web-based retrieval
- Graphing and trending of historical data



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