WOOD POLE PRESERVATION IN CANADA

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Like many other countries in the world Canada relies on wood poles to support almost all of its overhead electrical distribution systems and some of its transmission systems too. It is not expected that this situation will change in the foreseeable future, even though other materials, for example concrete, are being used in very small quantities. It is doubtful that substitute materials will make any significant inroads into the wood pole market in Canada due to our enviable supply of wood.

There are about nine million wood poles in service in Canada representing a capital investment at today's values of about $4 billion or roughly $400 per installed pole. At present about 250,000 new poles are installed by Canadian electrical utilities each year. By the turn of the century this number is expected to reach 330,000.

However, I would issue a word of warning to those suppliers and preservers who are now looking a little complacent; unless the industry, and that includes users as well as suppliers, are prepared to work together in developing the use of species that are currently considered undesirable, we shall find that poles manufactured of substitute materials will become competitive and take a larger slice of the market.

The first treatment plant in Canada was established in 1911 at Transcona, Manitoba followed by one at North Vancouver, British Columbia in 1916. Ontario Hydro installed its first full length treated poles in 1919; these were coal tar treated southern yellow pine and I believe that some are still in service.

The early treatment plants were built to cater to the production of railroad ties and the majority of the poles installed in the twenties and thirties were untreated or hand treated. The thermal butt treatment of poles has been common for about 40 years and some western red cedar butt treated poles are still produced today, but quantities are falling as more users specify full length treatment. Although full length treated poles have been available for more than 60 years, it was not until the late 50's that they started to penetrate the market.

Following the Second World War, rural electrification caused a tremendous surge in the use of wood poles and there was insufficient treating capacity available to meet the demand, so during the decade between 1945 — 1955 many untreated poles were installed. In British Columbia 22% of our total existing pole population falls into this untreated or hand treated category. Many of these poles have exceeded the predicted 30 — 35 years in-service life, and since typical replacements range from $500 to $3,000 per pole there are considerable benefits from increasing the average service life by reducing the incidence of decay.

The utility industry is therefore faced with two distinct problem areas. The first concerns how to extend the life of existing wood poles; the second concerns the purchase of new poles. Both of these areas concern wood preservation: one dealing with the remedial treatment of wood; the other with the preservation treatment of poles, before they are placed in service, to ensure a long in-service life.

REMEDIAL TREATMENT

Ontario Hydro has been active in many aspects of the preservation of wood poles for more than sixty years and has carried out extensive work in the remedial treatment field. Others, even though they have been installing commercially treated poles for a number of years, have not realized the economic importance of an in-service inspection and treatment program. Without such a program it is only a matter of time before Mother Nature in the form of groundline decay deals the fatal blow. The saving grace for these utilities is our northern location, which limits the number of days that decay can actually occur.

There are two inspection and remedial treatment methods in general use in Canada:

1. Bandage Method

The Bandage Method involves the following steps:

(a) Visually inspecting above ground for signs of external decay or insect damage.

(b) Checking for internal decay at the groundline, by sounding the pole with a hammer or using a sonic meter.

(c) Drilling the pole to identify internal rot.

(d) Excavating a hole about 600 mm deep and the removal of any external decay from the pole.

(e) Taking measurements of below groundline pole circumference and estimating its suitability to remain in service.

(f) Applying a preservative grease, containing pentachlorophenol, creosote and other chemicals, to the pole, covering the preservative with a kraft paper cover and back-filling the hole.

2. Injection Spade Method

The Injection Spade Method involves above ground inspection of the pole, but no excavation is required. Preservative grease is pumped under pressure between the pole and ground using a spade that penetrates about 350 mm below the groundline. The spade is moved around the pole until the entire circumference has been covered.

Our company recently introduced a crash inspection, treatment, stubbing and replacement program. The cost of this panic program would have been substantially less if the inspection program had been introduced ten years ago. It is recommended that utilities which are not inspecting and applying a groundline remedial treatment to their existing wood poles, should initiate a program before the consequences become catastrophic.

The preservatives most commonly used are pentachlorophenol and creosote which are mixed with petroleum-based greases to allow easy application to pole surfaces. Other chemicals such as sodium borate and sodium fluoride are often added to the mixture. These water soluble chemicals move with moisture in the pole and penetrate much deeper than the pentachlorophenol and creosote which protect the pole surface and cracks.

Treatments are repeated every 8 to 12 years. Some utilities are into the second treatment cycle and are reporting poles that have been in service for 40 years that are still in satisfactory condition.

Since pentachlorophenol is under scrutiny by several environmental agencies in Canada, the Canadian Electrical Association is sponsoring a research program to develop an environmentally acceptable wood-pole groundline preservative formulation that will be at least as effective as the present formulations. The program is being carried out by Ontario Hydro. Five groundline preservatives based on copper naphthenate, copper-8-quinolinolate and tributyltin oxide are under test, and it is expected that recommendations for a preservative that combines performance, economy and environmental acceptability will be presented in the not too distant future.

Perhaps the greatest problem that we face in remedial treatment is the early detection of internal decay. Many instruments have been developed to assist in this detection but none appear to be consistently accurate. B.C. Hydro, in partnership with CEA, is funding a research project using acoustic techniques in the detection of internal decay. Forintek Canada Corp. is responsible for the project; stage one is now completed and application for funding has been made for stage two.

The effective way to deal with internal decay once it has been detected is to inject chemicals into the decayed area and arrest further decay. The pesticides most commonly used are Vapam and chloropicrin; these are fumigants which are poured into holes in poles from which they diffuse as gases and control decay.

I expect to see an expansion of the use of fumigants and other preservatives in the future as more utilities become aware of their use in combating internal decay in wood poles.

TREATMENT OF NEW POLES

The commonly used wood species for poles are western red cedar, red pine, jack pine and lodgepole pine. Douglas-fir is used for longer lengths and some southern yellow pine and Scots pine are also important. The majority of these poles are full length pressure or thermally-treated although butt-treated western red cedar poles are still used in some provinces. The main preservatives used are pentachlorophenol, chromated copper arsenate (CCA) and ammoniacal copper arsenate (ACA).

Pentachlorophenol is the predominant preservative, although, since the price of oil has escalated, the use of water-borne chemicals has increased. Two problems with water-borne chemicals are causing some concern to utilities.

The first concerns the shell hardness of poles after treatment with CCA; the second the corrosion of hardware on ACA treated poles.

Tests carried out in Ontario and Quebec indicate that the shells of pine poles treated with CCA harden, with the southern yellow pine being rated almost unclimbable. This problem appears unique to Canada, as I have not heard of similar problems in the United States. The outcome could be that certain CCA treated species will be rated as unclimbable and some utilities may refuse to use them.

B.C. Hydro is probably the largest user of ACA treated poles in Canada. While surface-mounted hardware is unaffected, there is evidence of corrosion occurring on galvanized throughbolts. This attack on throughbolts appears to slow dramatically once the galvanizing has been removed from the active area. This corrosion problem raises doubts concerning the long term reliability of the ACA treatment and could cause a change from ACA to CCA.

Although the supply of wood in Canada seems limitless, there is evidence that unless new wood species are used we will be faced with a pole shortage within twenty years.

Several species are being considered for use as poles; the main candidates are eastern and western white spruce, western hemlock and ambilis fir.

White spruce, even with its drawbacks of thin sapwood, non-durable heartwood, susceptibility to checking and poor heartwood treatability, is probably the favoured species at present.

With such a list of negative points I believe our confidence in the ability of Canadian research and development to find solutions is well illustrated. White spruce is not completely without advantage: it grows in most parts of Canada in large quantities.

In 1977 a project was started by Domtar Ltd. and Forintek Canada Corp. to assess the suitability of white spruce for use as a pole. Ontario Hydro, Hydro-Quebec and Nova Scotia Power have each purchased and installed 200 ACA treated poles, and in-service data is being accumulated.

In western Canada, Forintek has been working with western white spruce, which was found to be more difficult to treat than the eastern species. ACA treated poles, including kerfed samples, are at present installed at the Westham Island test site near Vancouver. After three years of exposure, results indicate that the worst check penetrates much deeper in the unkerfed pole than in the kerfed pole. It remains to be shown that kerfing can prevent the checks from penetrating beyond the outer shell of treated wood.

If these projects produce a viable alternative to the existing species, Canada will be assured of an adequate supply of distribution poles in the future.

The development of alternate heavy duty wood preservatives appears to be less positive. Some work with alkyl-ammonium compounds (AACs) is being carried out, but I believe more emphasis is needed in this area in the near future.

QUALITY CONTROL

I have spoken about the cost of replacing decayed poles and the value to the user of remedial treatment. One route available to the user, to reduce these non-productive costs, is to ensure that a quality product is purchased in the first place.

The quality of the product is affected by:

1. The quality of the basic material.
2. The elements of the processing
3. The control of the process.
4. The storage and final delivery to the customer.

Pretreatment decay, that is, decay that occurs within a pole before treatment, is considered by many to be a major factor in the production of a quality pole. Air seasoning is the traditional method used to dry wood and it is certainly energy efficient, although in these days of high interest rates the benefits of cheap energy may be questionable.

Incipient decay, which can develop in the air seasoning process or before a tree is cut, is difficult to detect, and therefore it is possible for partially decayed poles to be treated and installed in the field. If incipient decay is a problem, then heat sterilization of a pole during the treatment process becomes an important factor in the quality of the finished product. To limit this risk, poles should be cut, artificially dried, sterilized and treated as quickly as possible.

Further questions arise concerning the effect of kiln drying, steaming or Boultonizing on the strength, checking patterns and treatability of the wood.

It is apparent, therefore, that it is the customers' responsibility to decide on the specifications they want a producer to follow.

Industry specifications are normally written to ensure that a customer gets an average product. If customers want a high quality product they must become more involved with specification-writing, and confer with suppliers to arrive at attainable specifications.

A specification that meets a customer's requirements, coupled with complete in-plant inspection, will guarantee that the customer receives the desired product. However, I feel that some utilities are not fully aware of some of the problems facing the wood preservation industry today and I hope that the CWPA will be able to provide a link between the suppliers and users that will help to improve the flow of information to a broader cross-section of utility personnel.

SUMMARY

Wood will continue to be the main source of poles in Canada in the foreseeable future, provided that it is fully and effectively treated to ensure a long in-service life. I believe that we can confidently expect a service life of 60 years.

Chemicals used for pole preservation are under review by government agencies, and as an industry it is our responsibility to ensure that our use of chemicals has a minimum impact on the environment and the health of our employees.

It is also our responsibility to ensure that accurate and factual rebuttals are prepared to defend our use of chemicals. Without our constructive participation, it is difficult for government to assess properly a set of circumstances and fully consider all the risks and benefits involved.

Also, as an industry we must be prepared to deal with the problems that arise after a chemical is proven to be unacceptable.

The unavailability of effective treatment chemicals would certainly lead utilities to use poles manufactured from alternate materials. Canadian electrical utilities, through the Canadian Electrical Association, fund research projects carried out by private and public research organizations. Several projects investigating alternatives to wood poles are currently in progress.

The electrical utility industry depends on wood to supply its consumers. We are therefore vitally interested in wood preservation and we will continue to support projects to ensure that a continuous supply of treated wood poles is available for our use.

Finally, I believe that since wood is one of Canada's greatest renewable resources, Canadian producers should be able to supply the utility industry with a quality pole. It should undersell any manufactured product, ensuring healthy competition in your industry that will benefit users and suppliers alike.