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SOME OBSERVATIONS ON WOOD PRESERVATION IN EUROPE

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Introduction

I recently had the opportunity to spend 10 months in various research labs and institutes in Europe and to observe how wood preservation issues of concern in Canada are addressed within the European Union. The observations that I found of most interest relate to the following:

- Availability of wood preservative alternatives at this time and expected changes with introduction of the Biocides Products directive (BPD);
- Approach to certification of wood preservative plants and products;
- Integrated approaches to control decay
- Value-added components for preservative treatment;
- Openness and interest in non-preservative alternatives;
- Significance of renewable materials and openness to energy recovery from organic based wastes;
- Collaboration in research and development.

1. Wood Preservatives

Wood preservative registration and re-registration has followed a very different path in current EU member countries compared to North America. Restrictions on or withdrawal of historically important preservatives such as CCA, creosote and pentachlorophenol has not been uniform within member countries of the EU, with restrictions on use of arsenic, chromium and PCP containing preservatives in place for many years in countries such as Germany and only recently and variously introduced in others such as the UK, France and the Nordic countries. As a consequence of this variable withdrawal of these highly effective and broadly applicable preservatives, a broad suite of specific preservative formulations have been introduced with specific use niches corresponding to the defined Use Hazard Classes.

Examples of numbers and types of formulations are summarised in Table 1 (Sweden) and Table 2 (France). While the number of preservative formulations that are registered at present in some countries is mind-boggling, it must be understood that some of the formulations are similar (different manufacturers) or differ only in concentration of the formulated product (same manufacturer).

Table 1: Preservative systems registered for different hazard class applications – Sweden/Nordic Wood Preservation Council

Hazard Class	5 (M)	4 (A)	3 (AB)	2 (B)
Number of formulations	7	17	29	17
Examples of formulations	CCA-C CCB CCP ACC creosote	CCA CCB CCP ACC CuQuat Cu, B, TCZ Cu, B, TCZ, PCZ Cu, CuHDO, B creosote	CCA CCB CCP ACC ACQ Cu, B, TCZ Cu, B, TCZ, PCZ Cu, B, PCZ Cu, CuHDO, B Cu, CuHDO Cu, CuHDO, B, PCZ ADBAC Cu, ADBAC PCZ, TCZ, IPBC Cu, B, polymeric Betaine creosote	

Table 2: Preservative systems registered for different hazard class applications – France (CTBA 2004. Produits destines aux industries de traitement preventif)

Hazard Class	4	3a/3b	2
Number of formulations	29	86/37	86
Examples of formulations	CCA-C CCB ACQ ACC Cu, B, TCZ Cu, B, TCZ, PCZ Cu, CuHDO, B creosote	CCA-C CCB ACC ACQ Cu, B, TCZ Cu, B, TCZ, PCZ Cu, CuHDO, B Cypermethrine, DCBAC, DDAC, Cypermethrine, PCZ Cypermethrine, TCZ Cypermethrine, PCZ , TCZ Cypermethrine, PCZ , TCZ , IPBC Cypermethrine, PCZ , TCZ , BAC Cypermethrine, TBTN , TCZ , IPBC ADBAC, B DDAC, B Permethrine, PCZ Permethrine, BAC Permethrine, PCZ, fenpropimorph, B	Same as 3a

Bis N Cyclohexyldiazeniumdioxy copper (CuHDO)
The European method of specifying retention for a given formulation is different from that in North America, which may cause confusion. The required retention is defined relative to the formulation, not to pure preservative or preservative content. For example, where we specify 6.4 kg/m^3 for ground contact application of ACQ based on total "dry" CuO and Quat equivalence, if the concentrate was 50% CuO + Quat, in Europe the specified retention would be 12.8 kg/m^3, "based on formulated product". As a result, different manufacturers of the same product (such as CCA-C) would have different treatment retention requirements depending on how they formulated the concentrate. Also, the specified retentions, even when converted to the same basis, may differ from the North American norms. An example of this is shown for CCA retention requirements in France vs those in North America (CTBA 1997 Retentions, recommended concentrations. Conversion units between USA/France. EH:P 31 Jan. 1997).

Table 3: Correspondence of CCA-C retention requirements and specifications between France and the USA (CTBA 1997).

Concentrate	Specified Retention HC3 kg/m^3		Specified Retention HC4 kg/m^3	
	USA	France	USA	France
100% oxides	4.0	4.4	6.4	9.0
60% oxides	4.0	7.3	6.4	15.0
50% oxides	4.0	8.8	6.4	18.0

Because of the rigorous data requirements under the Biocide Products Directive (BPD), it is unlikely that this high number of biocidal actives and corresponding formulations will be available once the BPD is implemented in EU member states (2006). In principle, actives will be excluded from the Annexes if equally effective alternatives that pose a lower risk to health and the environment are available.

2. Certification of plants and products

I observed a strong third party certification program in all countries I visited. In most cases, this involved two unannounced visits to treating plants where equipment, processes and practices were extensively checked and audited and periodic analysis of randomly sampled product for penetration and retention confirmation at the QC lab. In most cases the certifying and auditing organization was the federally supported technical research institute such as Centre Technique du Bois (France), Traetek-SP (Sweden and Holzforschung (Austria). This would be analogous to having Forintek as the third party agency in Canada.

These agencies have their own defined certification schemes (Bois-Plus etc.). In my experience the audit was very thorough and professional. Most often the advice given as a result of the audit visit was helpful to the company. Of course, the whole process is aided by realistic penetration standards used for most species and products, such as requiring full sapwood penetration of pines (Photo 1) making it very feasible for plants to meet these specifications as long as the wood was sufficiently dried and process conditions are appropriate. With many Canadian species, penetration and assay retention requirements cannot be realistically or economically reached making such a certification program difficult to introduce or enforce here except for industrial products and products specified under “process” standards such as CSA 080-36 for “light duty above ground residential uses”.

Photo 1: Scots pine treated with copper HDO

3. Integrated approaches to protect wood structures and value-added components for preservative treatment

It was evident, especially is Sweden that a great deal of attention is paid to design and construction to minimize decay risk. I believe that this can be partially attributed to the lessons learned over centuries of use of wood in homes, churches and other structures in the Nordic countries. Photo 2 shows the application of such principles to the design of a modern wood sound barrier with a wood cap and wood wedges to restrict water uptake in joints and a rubber seal between the bottom board in ground contact and the remaining boards to prevent moisture movement from the ground. Several formulators of preservative systems in Europe depend on integrated systems including (usually a low impact wood preservative with a coating system such as the Royale treatment (Photo 2) utilizing ACQ treatment followed by linseed oil treatment and ScanImp utilizing an organic fungicide and a high performance factory-applied paint that has stood up remarkably well after 8 years in this sound barrier, even in components in full ground contact (Photo 3).

Photo 2: Noise barrier near Stockholm Sweden after 8 years in service (Royale treatment)

Photo 3: Noise barrier near Stockholm Sweden after 8 years in service (ScanImp treatment)

However, it is possible to get this wrong as well in which case the combination of poor design and moisture trapping paint leads to accelerated decay (Photo 4).

Photo 4: Painted fence near Stockholm Sweden

4. Value-added components for preservative treatment

I was struck by the much lower utilization of treated wood in general in Europe compared to North America and the tendency to treat more highly processed and valuable wood products. For example, the fence systems shown in Photo 5, common in Northern Germany consist of micro-lam and other components that provide attractive architectural features and variation in construction while ensuring that weathering deterioration will be minimal and a long service life of an attractive product is possible. Virtually all deck and boardwalk structures I saw had the grooved profile which is described in detail in the paper by Shane McFarling and Paul Morris in these proceedings. Also, most sound or noise barriers in northern Europe are made with treated wood. While the added cost of such systems may be significant, the benefits of beauty and uniqueness and longevity (reduced disposal problems) provide benefits to the consumer that make the costs justified. The industry can benefit from an added value niche product that should remain in service for a significant period.

Photo 5: Value added treated products

Photo 6: Value added treated products

5. Acceptance of and interest in non-preservative alternatives

There is a great openness and tremendous drive in Europe to identify suitable alternatives to conventional pesticides to protect wood. In contrast to North America, natural fibre/ plastic composites have not made great inroads for decks and other residential uses, there is a great interest in such products and I expect this to change in the future.

Significant research resources have been directed to optimizing thermal heat treatments to protect wood and a number of commercial treatments (Thermowood, Bois perdure, Plato, Oil heat treatment etc.) have been developed, although the volumes treated are still quite low. An example of a school building in Montpellier France is shown in Photo 7. Part of the slow development can be attributed to differing opinions and results on their efficacy and lack of consensus on which product hazard classes would be appropriate for such treatments. Also, there is no universally agreed upon quality control procedure to validate the quality of treatment.

Similarly there has been great interest in chemical modification, with most emphasis on acetylation and fufurylation processes. For wood species that can be penetrated adequately, these treatments are highly effective when the required high loadings are applied (typically to 100 kg/m^3 or more. However, the very high chemical and process cost and some processing difficulties have slowed the introduction of these treatments, although chemically modified commercial cladding products have recently been introduced. The main limitation of these treatments for many Canadian species is the poor penetrability by liquid treatments.

Photo 7: Thermal heat treated structure, Montpelier France

There is a lot of interest in untreated larch as a possible alternative to preservative treated wood (Photo 8). While the idea is attractive, rigorous scientific testing and field experience indicates that improvements in performance over the untreated heartwood of other softwood species is modest at best and the potential applications where a reasonable service life can be assured are limited.

Photo 8: Untreated larch heartwood structure

6. Significance of renewable materials and openness to energy recovery from organic based wastes

There is a highly positive attitude within the EU towards the benefits of renewable materials such as wood as a building material and carbon neutral fuel. Many EU initiatives and research support programs appear to support increased use of renewable materials in the economy.

Of course the biggest difference between EU and Canada is the attitude towards incineration of and energy recovery from organic wastes, including preservative treated wood. This has driven the movement away from chromium and arsenic based preservatives towards organic and copper based systems. Waste wood products are credited as a carbon neutral fuel source, providing positive value to spent wood products and eliminating landfill disposal problems.

Photo 8: Biomass fuel for power plant near Borås Sweden

7. Collaboration in research and development.

There are many research initiatives within the EU that can support research in wood preservation at institutions in member countries. Such projects must be strongly collaborative in nature, with partners from several other countries and particular involvement of researchers from countries with less well established research or that are more recent entries to the EU.

One program in particular that does not support research operating costs but promotes collaborative research is COST (Collaboration in Science and Technology). There have been and continue to be several COST "Actions" relevant to wood preservation including COST Action E37 "Sustainability through new technologies for enhanced wood durability" (http://www.bfafh.de/cost37.htm) and COST Action E31 "Management of Recovered Wood" 2002 to 2006 (http://www.ctib-tchn.be/coste31). The programs and technical presentations of COST E37 including state of the art of wood preservation reports for 22 participating countries can be checked by viewing the technical presentations on their web site.

These actions support targeted areas of research such which are promoted by providing funding for periodic conferences, training working groups and funding for travel by young researchers to other research facilities.

In my experience, this concept is extremely valuable to foster the interchange of ideas and the development of collaborative research. North American research in this area could benefit greatly from a similar program.