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ACQ WOOD PRESERVATIVES – A BRIEF CANADIAN UPDATE

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Summary

ACQ wood preservatives have been commercially available in the United States, Europe and Japan for over 15 years. In Canada, an ammoniacal copper based formulation of ACQ has been conditionally registered for wood preservative uses with the PMRA since 1994. To date commercial development of that product in Canada has not occurred for a number of technical, business and regulatory reasons. However, the climate is changing. In 2002, several significant developments in the Canadian regulatory arena took place leading to the successful introduction of ACQ technology into the Canadian market place. This presentation attempts to provide a brief historical background and a current status report on ACQ in Canada from a technical and commercial perspective.

1. Background and Introduction

The purpose of this presentation is to provide a brief update on ACQ technology with a specific focus on the technical, commercial and regulatory issues relevant the Canadian marketplace.

ACQ wood preservative formulations contain alkaline copper and quaternary ammonium compounds. They provide a cost effective non-arsenic, non-chrome alternative to chromated copper arsenate (CCA) preservative systems. The technology is patented in a number of countries and the worldwide patent rights are owned by Chemical Specialties, Inc. based in Charlotte, NC, USA

ACQ has been a commercial success with proven performance in the United States, Europe and Japan for over 15 years. In 2001, fourteen US based treaters produced over 150 million board feet of ACQ treated lumber that was distributed through 400 retailers established in 30 individual states in the US. Worldwide ACQ production in 2001 exceeded 500 million board feet.

As of today, October 2002, the total number of ACQ wood treaters in the US and Canada has risen to 30 and is still growing. The total volume of ACQ production is expected to exceed 1 billion board feet world wide in 2002.

2. History

ACQ was first registered with the US Environmental Protection Agency in 1992 as an ammoniacal copper based formulation mixed with didecyl dimethyl ammonium chloride (DDAC) at wood preservative treatment plant sites. The American Wood Preserver's Association (AWPA) standardized two ACQ formulations in the fall of 1992. One formulation, designated ACQ Type A, contained ammoniacal copper and DDAC in a 1:1 CuO : DDAC ratio, the other designated ACQ Type B, contained ammoniacal copper and DDAC in a 2:1 CuO: DDAC ratio.

After its initial entry into the marketplace, the evolution of ACQ technology in the United States continued with the development of amine copper based systems in combination with DDAC. The amine copper plus DDAC formulations became known as ACQ Type D. More recently, amine or ammonia based copper systems in combination with alkyl dimethyl benzyl ammonium chloride (ADBAC) quat, designated ACQ Type C, have been developed.

At about the same time as the US regulatory activity Domtar submitted an ammoniacal copper based formulation (ACQ-1A) and the DDAC quat ACQ-2B to the Pest Management Regulatory Agency (PMRA) in Canada. Eventually, in 1994 both components were conditionally registered for wood preservative uses. In 2002, the Domtar ACQ-1A and ACQ-2B conditional registrations were transferred to Chemical Specialties, Inc. Two ACQ Type C formulations (ACQ-2102 – CSI and NW-100 – Timber Specialties) were given conditional registration by the PMRA in 2002.

3. ACQ formulation attributes

ACQ technology provides a two component wood preservative system with a broad spectrum of activity. Copper provides primary protection against decay fungi and secondary protection against wood destroying insects, in particular termites. The quat component provides secondary fungicidal protection against copper tolerant fungi and wood destroying insects.

Copper has a long history of safe use in agriculture as a broad spectrum fungicide. It is a naturally occurring element in all soil and water systems. Copper amine products are widely used in ponds, lakes, potable water reservoirs, fish farms, hatcheries and stock watering tanks to control algae.

Quat is an abbreviation and common name for quaternary ammonium compound. Quats are soluble in water and form true solutions. They are widely used in household and industrial disinfectants and cleaners as well as in fabric softeners. The toxicological profile of quats is relatively benign. Quats are not listed by the World Health Organization or by the US EPA as known or suspected carcinogens.

Several quaternary ammonium compounds have been evaluated for use in ACQ systems but the current commercially available products rely on either DDAC or ADBAC quats.

ACQ formulations are commercially available in several forms. Historically, ACQ was delivered to wood treatment facilities as two separate copper and quat components that were mixed on site. Many treaters continue to use the component form successfully. More recently, ACQ Type C has been made available as a fully formulated mixed copper plus quat concentrate.

The ratio of Copper to quat in ACQ Type C is 2:1 when expressed on an oxides basis.

4. Performance, Efficacy, Standardization

Extensive performance testing of ACQ under extreme decay and termite hazards (including Formosan termites) was initiated in the early 1980's using a wide array of standardized laboratory and field based test methodology. Field testing of ACQ has been particularly rigorous, tests having been conducted at established wood preservative sites around the world for example in Hilo, HI, Harrisburg, NC; Gainesville, FL, Dorman Lake and Saucier, MS, North Queensland, Australia and at multiple sites in New Zealand. Tests are currently being established with Forintek Canada Corporation at several Canadian sites.

The efficacy data generated from this comprehensive test program has been subjected to peer competitive review both in the US and Canada.

ACQ technology is approved and standardized by a wide range of industry standards and building code organizations worldwide for example, AWPA, ICBO, NES, CSA, JIS and Australian Standards to name a few. In Canada ACQ Type B is currently listed in CSA O80. Proposals for ACQ Type C will be presented to the CSA O80 committee in October of 2002.

A Technical Recommendations Document (TRD) for the design and operation of an ACQ treatment plant was submitted to Environment Canada in late 1999. The document is currently under review by the Agency but its present status is unknown. Best management practices (BMP's) for ACQ have been developed by WWPI and CITW. An ACQ BMP based on the WWPI/CITW document has been published by the state of Michigan.

The available data indicate equivalent performance of ACQ to CCA at matching retention levels. Thus recommended minimum ACQ retention levels for different exposure hazards are as follows:

Above ground	4.0 kg/m3
Ground contact	6.4 kg/m3
Fresh water	6.4 kg/m3

Marine splash zone	9.6 kg/m3
Permanent wood foundations	9.6 kg/m3

Technologically advanced water repellent emulsion additives have been developed for use with ACQ preservative systems. These emulsion systems are combined with treatment solutions at the plant to produce a stable formulation. Preservative penetration with ACQ + water repellent formulations in southern pine species is excellent but adequate penetration into refractory wood species presents a challenge. Building code approval for ACQ at a retention of 2.4 kg/m3 + water repellent for above ground decking applications was recently granted by the National Evaluation Service.

Constant solution agitation or close control of solution temperature is not necessary to keep ACQ treatment solutions or concentrates stable. Treatment cycles for ACQ are equivalent to those currently used with CCA. Preservative penetration in East coast species is equivalent to that seen with CCA but enhanced penetration with Douglas fir and Western hemlock can be achieved if heated treatment solutions are utilized. A recent paper by Forintek and CSI scientists published in the October, 2002 Forest Products Journal reported improved penetration and retention beyond that obtainable with CCA in Pacific Silver fir, Western Hemlock, white spruce and Douglas fir. Treatability data for red pine, Jack pine, spruce-pine-fir, Hem-fir and Douglas fir will be used to support an ACQ Type submission to the CSA O80 committee in October of 2002.

Current ACQ products are formulated for maximum corrosion protection in the treatment plant. Standardized tests with metal coupons have demonstrated that corrosion rates with mild steel are low (0.013 mil/year) - well within conventional engineering design parameters for pressure treatment vessels. Treatment plant conversions to ACQ require removal of all brass and bronze fittings. In addition, Buna rubber valve seals and gasket materials should be changed.

It is well established that preservative all treated lumber including CCA is more corrosive than untreated lumber to metal fastening systems and metal connectors. Industry and major building code recommendations of fasteners suitable for CCA treated lumber are appropriate for ACQ preservatives. Thus hot dip galvanized and stainless steel are the fasteners of choice. In addition, for a number of years, CSI has evaluated the suitability of some of the newer metal coating technologies in the marketplace for use with ACQ. The end result of these evaluations using accelerated corrosion tests has been the publication of a technical bulletin entitled “Metal Fasteners in Use with Preserve Treated Lumber” available at www.treatedwood.com. The work is on going and collaborative studies are under way with the major fastener and metal connector manufacturers in North America with the intent being to expand the current list when and where appropriate.

Environmental concerns about the potential toxicity of copper based wood preservatives to aquatic organisms have led to ACQ technology being subjected to intense scrutiny.

Standard leaching/depletion tests have shown that the total active ingredient losses from ACQ treated wood are similar in magnitude those observed with CCA.

A number of models have been developed in an attempt to understand the impact of leaching/depletion from treated wood on the environment. A recent landmark study by Brooks and Lebow evaluated the impact of preservative treated wood boardwalks on a sensitive wetlands area close to Portland, Oregon. Treated wood board walks were fabricated from CCA, ACZA, ACQ and CDDC treated lumber. The water column and sediments in and around the treated structures were sampled periodically and analyzed for the presence of preservative components. Components from all four preservative types were detected in the environment but the authors reported no significant impacts on the fauna and flora.

2002 was a difficult season for mold in the treated wood industry, particularly in the South East of the US. An isothiazolinone mold inhibitor is available for use with ACQ treatment solutions. CSI has developed minimum mold inhibitor use rates along with a comprehensive monitoring program for its customers. Based on experience from the marketplace, provided that recommended use levels for the mold inhibitor are employed, mold is not a significant issue with ACQ treated lumber.

5. Commercial issues

The retail price differential between ACQ and CCA in the US marketplace is in the 15-30% range dependent on white wood pricing, retention and whether or not the water repellent is used. Commercial experience has shown that this price differential is achievable for the full range of products in the marketplace. Even with the price differential the cost of ACQ treated lumber is approximately 30 % less than cedar and 50% less than redwood or wood/plastic composites.

Treated wood specifiers were identified as being key to the successful introduction of ACQ to the marketplace . Towards that end the focus has been on the education of contractors, architects, specifiers and government departments. The Internet has proved to be a valuable tool for the dissemination of ACQ information to those groups of individuals. CSI's corporate website www.treatedwood.com has served as an important driver for treated wood specification and use.

ACQ technology continues to advance to meet market needs and customer expectations. As it does, it preserves the future for treated wood.