

LOW DOSE ACTIVE INGREDIENTS FOR DECAY AND INSECT PROTECTION OF WOOD AND WOOD PRODUCTS

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In the past 20 years low dose active ingredients have been developed for agricultural use in the United States. These pest control substances offer several distinct advantages over their predecessors. A high degree of specific activity against the target pests results in fewer effects on the non-target species. Lower doses reduce the load on the environment. Since most of these compounds are relatively new, their safety data is current and conforms to recent guidelines. The net effect is reduced pressure by the regulatory officials.

The volume of agricultural pesticides used in the US annually has steadily declined over the period from 1980 to 1999 (Fig. 1), in part as a result of the increased use of the low dose active ingredients (2). During this same time period, the total volume of wood preservatives used per year has steadily increased (3). From the viewpoint of the regulators, wood preservatives are good candidates for further scrutiny and regulation.

The primary cause for the increase in total wood preservative volume is the consistent increase in the use of waterborne preservatives (Fig. 2) (3). The search for alternative chemistry for preserving wood has resulted in the development of several compounds from the agricultural sector. While complete replacement of the existing waterborne preservatives is a formidable challenge, by segmenting the product uses into ground contact and aboveground, it is possible to use some of these low dose alternatives and thereby reduce the total volumes of wood preservatives used annually in the US.

In other parts of the world, for example Europe and Japan, these regulatory changes are already taking place. Globalization is occurring within the regulating authorities just as it is in industry. Regional differences continue, but the major policy trends are global.

Salts of copper, chromium and arsenic (CCA) are the primary treatment for wood exposed outdoors in the US. The American Wood-Preservers' Association (AWPA) has established standards for CCA at retentions of 6400 g/m³ for ground contact uses and 4000 g/m³ for aboveground exposed (non-ground contact) uses (1).

Alternative products combining copper and quaternary ammonium compounds have been developed and AWPA standards established (1). These products can be used in ground contact, but there is not a reduction in the amount of active ingredient in the wood. Copper-borate-azole systems are effective and reduce the active ingredient requirement slightly. A copper-azole product without the borate has been proposed for AWPA

standard establishment. A significant reduction in the amount of active ingredient achieved.

In order to take full advantage of new low dose active ingredients, the market must recognize aboveground versus ground contact lumber. Once this is achieved, significant reductions in the volumes of preservatives can be achieved.

High doses of quaternary ammonium compounds are needed for ground contact decay protection, whereas carbamates like IPBC and the azoles offer substantial reductions in the amounts of active ingredients needed. WOCOSIN brand propiconazole initially achieved acceptable decay control in laboratory studies at 400 g/m³. In Hilo, HI field studies, improved WOCOSIN formulations at retentions of approximately 200 g/m³ prevented decay for 10 years. Tebuconazole, another azole, has activity in the same range as WOCOSIN. The newest member of the azole class registered for wood preservation is EVIPOL brand cyproconazole. This compound offers equivalent activity in the lab at 100 g/m³. Field trials are in progress to determine if activity levels can be further reduced by formulation as they were with WOCOSIN.

As in the agricultural sector, using the range of new active ingredients in combinations as co-biocides offers the opportunity for additional reduction of total active ingredient required for effective control. EVIPOL plus quaternary ammonium compounds has been registered for above ground wood treatment at 300 g/m³. WOCOSIN combined with IPBC shows potential for decay control at 200 g/m³ and tebuconazole plus WOCOSIN is effective down to 120 g/m³. The synergistic effect of this combination is patented. The three-way, WOCOSIN-tebuconazole-IPBC combination is giving outstanding decay protection in lab tests at less than 100 g/m³.

Termite protection is necessary for ground contact and aboveground wood in the US. The copper and borates are effective termiticides at rates commonly used in wood protection. As the shift to metal free systems for aboveground uses occurs, organic termiticides become necessary. Chlorpyrifos has been an effective preservative, but has recently come under scrutiny if the EPA. Pyrethroids are effective at protecting wood from insect attack. Most recently neo-nicotinoids including imidacloprid and XAMOX are being developed for protecting wood from termites. In no choice lab tests, XAMOX provided 100% termite mortality at levels less than 50 g/m³. By combining several low dose decay compounds and one of the new insecticides it is feasible to protect wood from decay and insects with total chemical retentions less than 200 g/m³.

The volume of active ingredients used to protect wood in aboveground exposures could be significantly reduced if full advantage is taken of the new low dose active ingredients. In particular, combinations of active ingredients in optimized formulations could reduce by 20 to 30 times the preservative levels presently used in the US.

Bibliography

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Figure 1. Annual volumes of active ingredients used in agriculture compared to wood preservation.

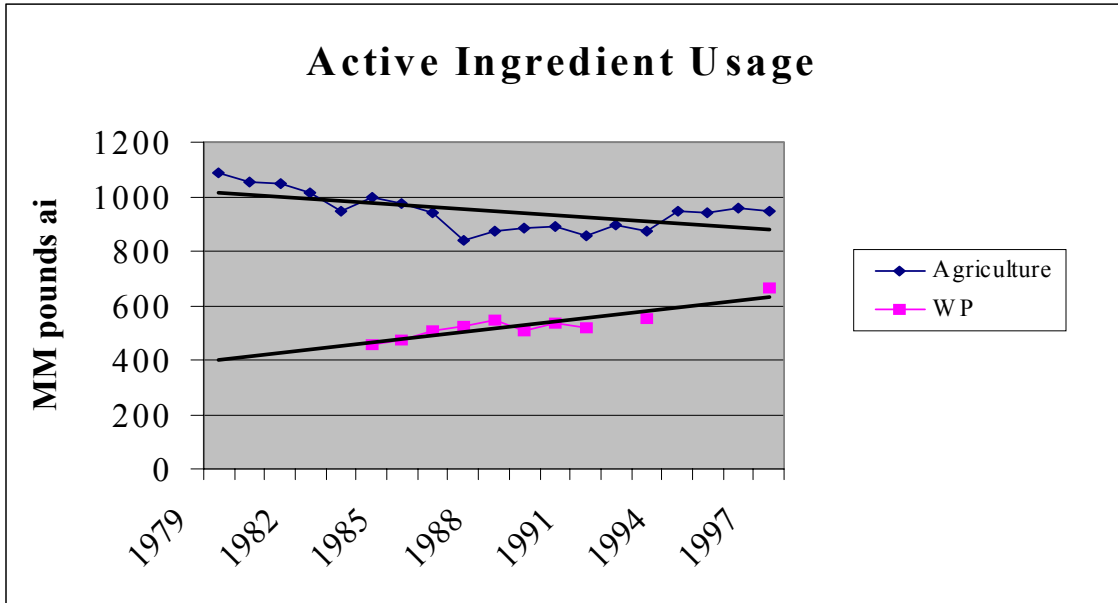


Figure 2. Comparison of annual volumes of active ingredients used in different wood preservative types .

