CWPA Proceedings, 2005, pp 32-46

Protecting Millwork

An overview of Canadian practice

Ron Bobker,
Everdry Forest Products Ltd

Material to be covered:

- **Significance of wood as a window frame material**
  - **Some statistics**
- **Typical window construction**
  - **All wood, vinyl clad**
- **Wood species used in Canada**
- **The need to protect wood windows & doors**
- **Decay mechanisms**
- **Wood preservative formulations**
  - **Water repellents**
  - **Biologically active ingredients (fungicides)**
- **Application methods**
  - **Dip, spray, double vacuum (pressure) impregnation**
- **Future developments**
  - **Solvents vs. water based preservatives**
- **Conclusions**

CWPA Proceedings, 2005, pp 32-46

Significance of wood as a window frame material

- **Total value of all windows and doors produced in 2002: B$4.5 – 5**
- **Total value of wood windows and doors produced in 2002: B$1.8 (source: Statistics Canada)**
- **Units manufactured by a major Canadian manufacturer of windows for the residential market:**
  - **Vinyl 90%**
  - **Wood 10%**

(implies that wood windows are more expensive than plastic windows)

- **Wood is regarded as the material of choice for up-market windows!**

Wood species used in Canada:

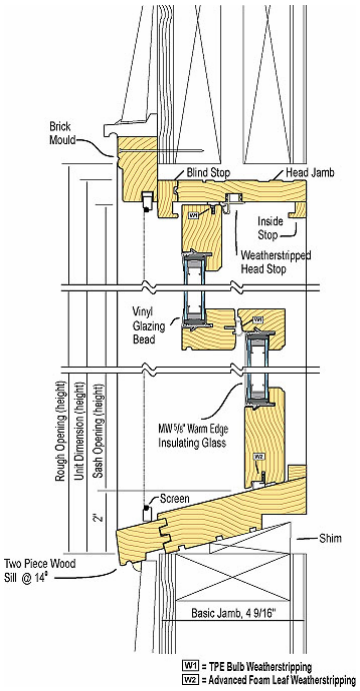
Western Canada

- **Mostly hemlock**
- **One large manufacturer uses Douglas Fir**
- **Some Ponderosa Pine**

Eastern Canada

- **Mostly Eastern White Pine**
- **Some Ponderosa Pine**
- **Some companies are experimenting with Radiata Pine from Chile**

CWPA Proceedings, 2005, pp 32-46



Wood Window construction details

Note the complexity of the profiles. Precision milling is needed to ensure the entire assembly fits together correctly.

Source: MW Windows web site

Vinyl clad wood frame window

Source: Pollard Windows

CWPA Proceedings, 2005, pp 32-46

Why protect wood windows & doors?

- If wood is kept dry and sheltered it does not decay or deteriorate, and:-
- a good paint film keeps rain and u.v off wood surface

This portion of a bow window was installed in 1999. Minimal exposure so paint film on wood is still intact.

Effects of weathering

- **Bow window on 2nd and 3rd floors of same house**
- **Previous photo is of window on lower level, behind tree.**
- **Paint film deterioration can be seen on upper and lower left window panels.**

CWPA Proceedings, 2005, pp 32-46

Close up of weathered sill

Weathered paint film has failed allowing rain water to contact wood surface: untreated wood liable to rapid decay.

Basic reasons for wood decay

- Wood rots after it has been infested by fungus.
- Fungus spores are ubiquitous – highly impractical to consider isolation as an option.
- Fungal attack proceeds only when the moisture content of the wood is > 25%
- Fungal decay requires oxygen.

CWPA Proceedings, 2005, pp 32-46

Methods to prevent wood decay

- **Keep wood dry.**
- **Treat the wood with water repellent chemicals.**
- **Treat the wood with chemicals that inhibit fungus grown.**

Water repellents

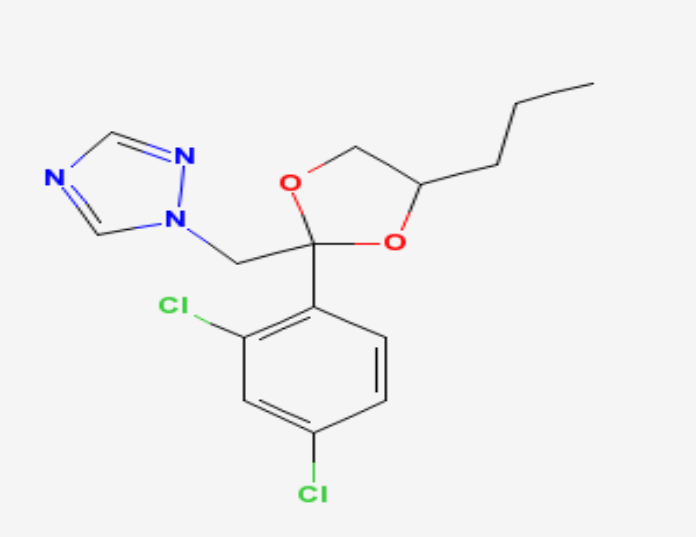
- **Typically blends of resins and waxes:**
- **Should have a water repellency efficiency of > 55% when tested according to WDMA protocol:**
- **Must not detract from paint adhesion – particularly of latex paints:**

CWPA Proceedings, 2005, pp 32-46

Anti fungus chemicals

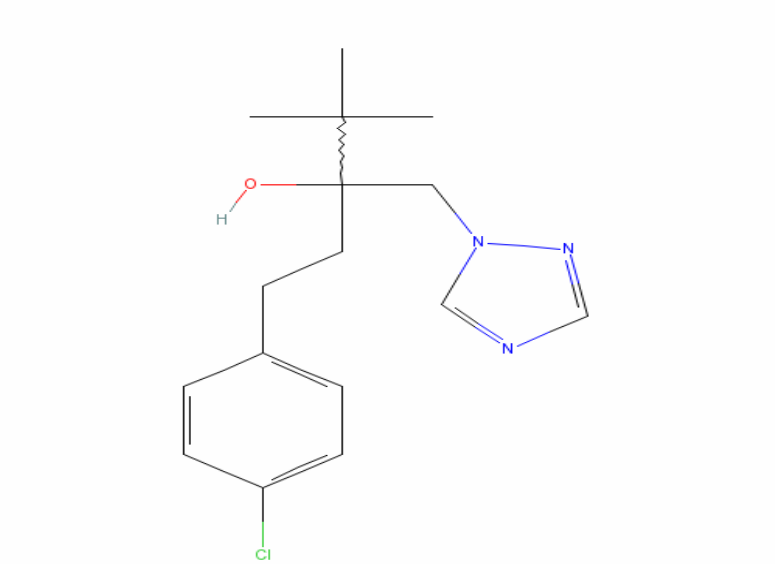
- **Formerly**:
  - **pentachlorophenol (penta)**
  - **phenyl mercury oleate (PMO)**
  - **tributyl tin oxide (TBTO).**
- **Today: mostly organic chemicals, of which the most important are:-**
  - **Propiconazole**
  - **Tebuconazole**
  - **IPBC (3-iodo-2-propynyl N-butyl carbamate)**
- **Preservative formulation must be approved by PMRA for sale in Canada**

Propiconazole: structure

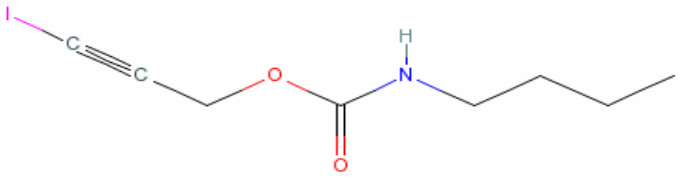


CWPA Proceedings, 2005, pp 32-46

Tebuconazole: structure



IPBC (3-iodo-2-propynyl N-butyl carbamate)



CWPA Proceedings, 2005, pp 32-46

Performance standards for water repellent millwork preservatives

- **The Canadian standard is CSA A440-00 (windows)**
- **Most of the CSA Standards are based on the US WDMA standards.**
- **Standards include:**
  - **Efficacy in preventing fungus growth:**
  - **Penetration of active ingredient into wood:**
  - **Water repellency:**

Other tests

- L-joint test – a long term test which involves observing deterioration in L-joints over a period of time: treated L-joints are compared with untreated and can compare different treatment processes.
- The L-joint test most closely conforms with actual service life, but is spread over a period of years: not suitable for screening purposes.

CWPA Proceedings, 2005, pp 32-46

Application methods

There are 3 application methods used in Canada:

Dip

Spray

Double vacuum (pressure) impregnation

Dip – advantages & disadvantages

Advantages:

- **Mechanically very simple.**
- **A 3 min dip usually results in good end grain penetration:**

Disadvantages

- **Dipping is a batch process, so extra handling is required:**
- **Potential leakage/pollution problem with in-ground tanks:**
- **Treated lifts have to be located near the tank to allow surplus liquid to drain off: this takes up space:**
- **A dip tank requires mechanical handling equipment to immerse the lifts into, and to remove them from the tank:**
- **Conveying treated lifts in the plant results in drips of preservative fluid spread over the plant floor.**

CWPA Proceedings, 2005, pp 32-46

Spray – Advantages & Disadvantages

Advantages:

- **In-line, final stage after treatment:**
- **Fast, very little extra handling required.**

Disadvantages:

•Very little penetration – little more than a surface wash:

•Wood surface is damp after treatment:

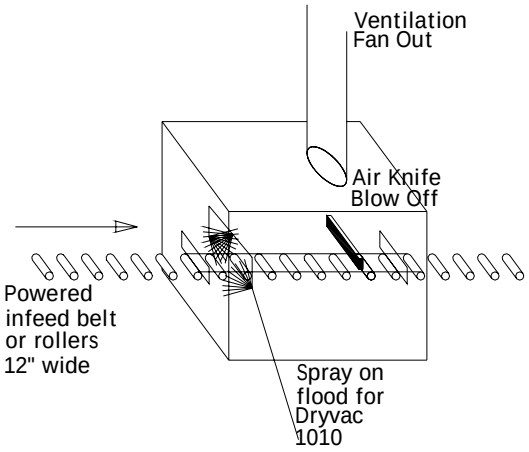
•Inefficient use of fluid – a lot of droplets expelled into the atmosphere.

Typical millwork spray equipment

Spray chamber: located at the end of the milling line.

CWPA Proceedings, 2005, pp 32-46

Millwork spray equipment - schematic



Double vacuum impregnation

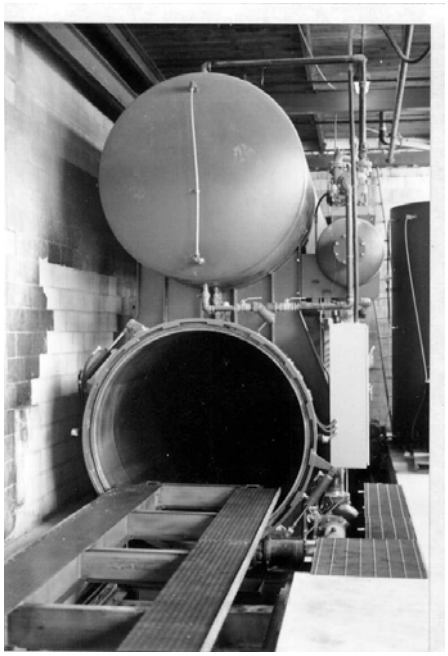
Advantages

- **Degree of penetration can be controlled**
- **Treatment conditions can be tailored to wood species**
- **Wood is dry to touch when it leaves the autoclave.**
- **More efficient use of preservative than either spray or dip**

Disadvantages

- **High capital cost**
- **Batch process so double handling required(to pack & unpack lifts for treatment)**

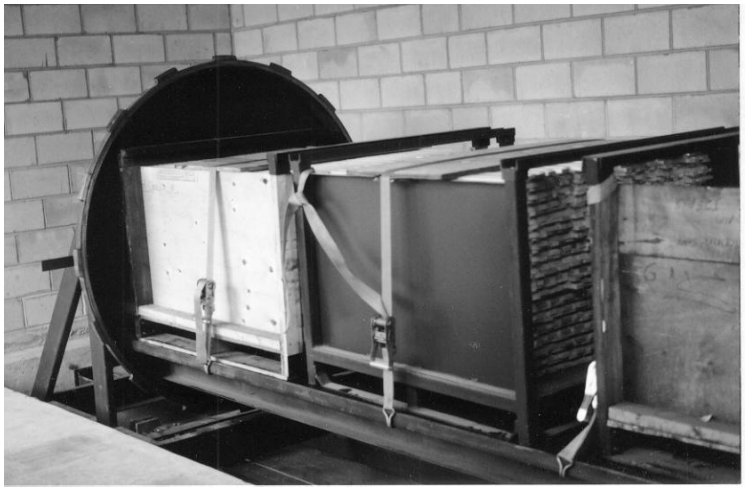
CWPA Proceedings, 2005, pp 32-46



Double vacuum millwork treatment machine

- **Lower tank: autoclave where treatment takes place.**
- **Upper tank: fluid reservoir**

Typical load for treatment



CWPA Proceedings, 2005, pp 32-46

Future developments

- **Environmental pressures against use of VOCs leading to control or phase out of solvent based preservatives.**
- **More use of water based preservatives e.g. as in the Jeld-Wen "AuraLast" series.**
- **Possible improvements in vapour phase solvent recovery.**
- **Increased usage of after burners to prevent emissions of VOCs**

Water based preservatives

Much reduced VOC emissions, but:

- **More expensive and less stable than solvent based formulations:**
- **Causes grain raise which deters from appearance, and can interfere with milled finish.**

Jeld Wen "Aura Last" overcomes grain raise by 100% penetration by double vacuum treatment prior to milling. This results in:

- **Much higher preservative application costs**
- **Wood cuttings subject to Haz. Mat. Regs.**

CWPA Proceedings, 2005, pp 32-46

Jeld Wen "AuraLast " Wood Windows

- **Water based treatment:**
- **100% penetration**

Source: Jeld Wen web site

Conclusions

- **Wood windows are regarded in Canada as an up-market architectural feature.**
- **Reliable durability is necessary to maintain this market position.**
- **Effective preservation is essential to make wood durable.**
- **Use of water based preservatives likely to increase in the future.**