



Phytosanitary treatment during kiln drying

Pre-conditions and advantages

Johannes Welling, Gerda Lambertz



Content



- **Background**
- **Kiln Drying and Heat Treatment**
- **Drying Process *Pre-Conditions***
 - *Temperature Measurement Methods*
 - *Dry bulb temperature measurement*
 - *Wood core temperature measurement*
- **Conclusion**

- Pine wood nematode, *Bursaphelenchus xylophilus*, a microscopic nematode worm, causes the pine wilt disease
- It is distributed by its vector-host, the Longhorn Beetle (*Monochamus*)
- Native to North America
- Major threat to Asian and European pine forests
- Presence of the nematode in the Setubal region south of Lisbon) since 1999
- Quarantine area is more than 1 million ha
- Wood packaging material is considered to be responsible for the introduction



- Portuguese Plant Health Authorities, with EU funding, have implemented a national eradication program to restore the EU's pest free status with respect to this forestry pest
- Eradication program has not been successful up to now
- New outbreaks of the pest have been confirmed in a number of other locations
- Single infestations are reported from Spain in 2008
- To safeguard other territories against Pine Wood Nematode, all export of coniferous wood and bark from all parts of Portugal to other EU member states and third countries must receive a phytosanitary treatment in conformity ISPM 15



Background



- Methyl-bromide (MB) is not allowed anymore
- Heat-treatment (HT) is currently the only possible method to meet ISPM-requirement
- HT means warming up the wood to a core temperature of 56 C for at least 30 minutes
- This leads to elimination of all development stages of wood inherent insects and nematodes by denaturizing their protein
- Because technical drying is not mandatory for packaging material it is often not carried out for economical reasons (energy saving and time reduction)
- Un-dried HT timber shows high affinity towards mould and blue stain



Kiln Drying and Heat Treatment



- Kiln drying (KD) does not necessarily implicate a phytosanitary treatment
- Drying processes are designed to reduce moisture content to a desired level and not to eliminate pests
- Nowadays there is a trend towards using low temperature waste heat for kiln drying operations
- This will lead to drying temperatures well below the temperature limits set by ISPM 15
- The same is true for most dehumidification drying



National ISPM 15 Requirements



- ISPM 15 is an international standard
- But nevertheless, the interpretation and implementation may differ from country to country
- National authorities are responsibility for implementing certification schemes.
- In Germany, the responsibility is with the Plant Health Services of the Bundesländer
- Requirements may differ somehow from Bundesland to Bundesland
- Julius-Kühn-Institute (JKI) has recently issued a comprehensive guideline to overcome this problem

COST E53 Conference in Lisbon 10/2009

Welling/Lambertz 7



German ISPM 15 certification



- Company must be registered
- Dry kiln including measuring devices must be certified
- Printout of the process parameters (time log of temperature) is needed
- HT-treated timber has to be kept separate from not HT treated material
- HT-treated material has to be marked with ISPM 15 sign immediately after treatment
- Records of treatment in conjunction with charge number and dates of treatment have to be filed so that, in case of complaint, evidence can be given that a HT conform to ISPM 15 was carried out

COST E53 Conference in Lisbon 10/2009

Welling/Lambertz 8



Temperature Measurement Methods



- Two methods are appropriated to validate that the ISPM 15 temperature requirements (56°C over 30 min) have been met during the kiln drying process
 - Measurement of the dry bulb temperature of the circulating air
 - Measurement of the wood core temperature



Dry bulb temperature



- Normal kilns are equipped with at least two dry bulb thermometers, one on each side of the stack
- In early stages of the drying process, not the dry bulb temperature has to be considered estimating the core temperature of the wood
- As long as the surface MC is above fibre saturation the wood behaves like a wet bulb
- Therefore, drying conditions have to be taken into account



- ALEON, D. (2004) carried out tests and derived tables which were published by the French Plant Protection Organization
- Tables contain the following parameters
 - initial temperature of the wood
 - dry bulb temperature in the chamber
 - thickness of the sawn timber
 - final moisture content
- Tables inform about minimum time span of the temperature treatment during the drying to meet ISPM 15 compliance



- In normal kiln drying operations, which aim at reducing MC to low levels,
 - 8 +/-2% (flooring) 10 +/-2% (joinery)
 - 14 +/-2% (windows) 15 +/-3% (construction)the time span at elevated temperature (>56C) is normally long enough to meet the ISPM requirement
- Achieving low final MS automatically implies that surface MC is well below FSP and, therefore, the wet bulb effect is not relevant anymore.
- When timber for packaging application is kiln dried, the final MC requirements may be quite weak, e.g. below FSP or 20 +/-5%
- In a kiln load of Pine initial MC may range from MC 120% to 40%.
- With target MC of 25% some pieces at the end of the kiln run may still be above FSP. Here the wet bulb effect may still be relevant.
- Packaging material and pallets requires special consideration
- The minimum "treatment" time starts when the air temperature has reached target dry bulb temperature



Wood core temperature measurement



- Temperature probes are placed in the centre of the thickest pieces
- Temperature at the coldest probe must exceed 57°C for at least 30 minutes
- Temperature records have to be kept and stored for each and every kiln load
- A very safe but rather expensive and time-consuming way to meet ISPM 15 requirements

COST E53 Conference in Lisbon 10/2009

Welling/Lambertz 13

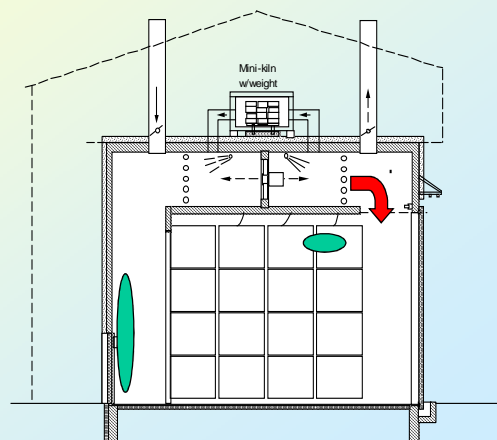


Where is the coldest place in a kiln?



The German guideline postulates that measurement of air and core temperature has to be determined in the coldest regions in the kiln

→ Where is the coldest place in a kiln?



COST E53 Conference in Lisbon 10/2009

Welling/Lambertz 14



Advantages



Combining ISPM 15 and drying means:

- Securing pest free status of sawn timber
- Saving energy as compared to separate ISPM 15 and drying
- Preventing mould grows on packaging material without any further chemical treatment



Conclusions



- ISPM 15 requirements are **not** met during low temperature kiln drying
- Kiln drying (KD) alone is not sufficient to eliminate pest
- Only strict control of ISPM 15 treatment will prevent the spreading of the Pine Wood Nematode to other European regions
- If this should happen a lot of damage is done to European forests and to the wood sector
- Therefore ISPM 15 treatment is not a type of a nuisance of Plant health services but rather a necessary step towards save guarding European forests



Thank You for listening

COST E53 Conference in Lisbon 10/2009

Welling/Lambertz 17