Wood Drying Australasia
Recent developments and future directions

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Introduction

Drying used to be the ‘wall flower’ of the wood processing chain. Resources were more readily poured into the more glamorous sawmilling and even remanufacturing rather than kilning. But increasingly the following inescapable facts are changing this perception:

- Most of the energy used for processing is consumed in drying - and energy costs are rising.
- Drying contributes significantly gaseous, liquid and visual pollution - and environmental impact requirements demanded by the community and eventually required by marketing pressures are increasing.
- Accurate and suitable moisture content is critical in stability in use.
- Quality requirements for wood products in an increasingly competitive market are becoming more demanding - and the relative contributions wood resource characteristics and drying (and their interaction) to product performance is not well understood.

These statements set the tone for the following observations about the recent past and the near future. They have been divided into commercial and research areas. These are set out in point form with comment where appropriate.

Recent developments
Commercial

- Forced reco-chambers – In softwood drying, steam reconditioning chambers with fans and water sprays have been introduced to reduce cooling time and improve stress relief – these emanated largely from ensis Multi-client drying group (MDG).
- Trend to low temperature dryers (<55°C) with higher air flow to diminish kiln brown stain (KBS) in radiata.
- Attention paid to fan costs during NZ electricity shortages - optimal fan re-pitching, VSD use- MDG schedule optimising project
- Increasing difficulty for resource consents for gaseous emissions. Introduction of Fogarty condensing kiln.
- Increasing use of green density sorting Fibre Gen, A-grader
- Re-drying of non-arsenic copper preservative treated timber. Appropriate schedule, colour issues and moisture meter corrections.
- Increasing use of geothermal energy source in NZ and natural gas in Australia.
- Installation of large hardwood LT pre-dryers in Australia.
- A reduction in the number of new dryer installations is noted due to slowing in the NZ export sector and Australian domestic sector
- Solar kilns in Australia for hardwoods and CC re-drying.
- Increasing use of in-kiln capacitance meters – Dryzone Hands off in UHT in Australia
- Vacuum drying of hardwoods – Vacudry, QFRI

**Research**

Drying research Australasia could be characterised by

- A recognition that limited progress can be made with the simple empirical approaches which gave good progress in the past.
- The way forward is focus on fundamental understanding of wood behaviour in a range of environments often where sensing technology is at its limits. Because wood is an anisotropic, naturally variable and complex material, progress will not be achieved without dedication and effort.
- Progress will not be made without understanding how wood resource characteristics interact with the drying process. Thus a holistic approach is required.
- Thus the 80/20 rule – In the past 80% progress with 20% effort. Now 20% progress with 80% effort. The low fruit has been picked, but the prize remains.

**Recent research developments**

- Ensis fundamental wood properties study – measurement of instantaneous stiffness, time creep and mechano-absorptive creep at high temperatures. This has major implications for the understanding of stress development and reduction, wood stability and long term behaviour. This has proved more difficult than anticipated due to limitations in available sensing technology, but is close to completion.
- Two out splitting study- factors effecting longitudinal stress
- MDG studies on drying/cooling /steaming, longitudinal stress.
- MDG /WQI joint studies on the effect of sawing on drying recovery, impact of future scanning technology on drying.
- Stress modelling – the realisation that a full 3D approach is required.
- MDG storage studies- documenting storage behaviour
- Progress in management of KBS – University of Canterbury (Mcurdie), ensis-KBS now quantitatively measured and a range of solutions available.
- Ensis Microwave probe re-activated. Ability to measure density and MC with physical model proven.
- Studies in high temperature treatment of radiata pine to improve stability and durability, with CHH.
- Acetylation of radiata to improve wood stability has required close involvement of Ensis drying personnel and their experience with high temperature drying. Technology now being commercialised in Europe.
- Hardwood and softwood moisture meter corrections and the use of capacitance meters - FWPRDC study.
• Supercritical Fluid dewatering process with no gaseous emissions, low energy and low environmental impact, and recovery of valuable extractives about to be patented by enosis.
• Miscellaneous work on ACQ schedules and MC meter corrections.
• Reported progress in the use of microwaves to enhance the drying of eucalypts CRC Wood Innovations

Future
• Current Ensis/WQI programs on scanning boards and logs that allocate “the best boards to the best use” and programs in the examining means of utilising lesser material will have impacts on how wood is dried in the future. Research programs are being planned in these areas.
• Green processing – it is perceived that the future marketing of wood products will be bound to its essential nature as a renewable resource with a positive impact on the environment. Wood processing and drying in particular must be in harmony with this and renounce its current perceived and actual ‘dirty’ ways. Thus appropriate drying may mean a move to:
  o tailored drying
  o continuous rather than batch processing – to be more energy efficient
  o emission free –could mean treating recalcitrant waste
• Continued effort study wood properties at severe conditions in order to understand further and thus optimise drying, steaming and storage operations.
• The key to improved quality is still the control MC and stress and its distribution. Thus work will continue in moisture and stress sensing, both for in process use and for research work 3D scanning.