

Research - What is being done and what needs to be done!

Three different perspectives

- Government
 - Michael Kennedy
 - Ed Suttie
- Academia
 - Jeff Morrell
 - Holger Militz
- Industry
 - Ramsay Smith
 - Peter Hayward

A government perspective

The Forestry & Forest Products research agenda
in the State of Queensland, Australia

Michael J Kennedy
Leader, Forestry Science

A Government Perspective – the State of Queensland in Australia

Primary influences on the research agenda:

1. Government policy objectives for the industry
2. Institution or Government imposed business model

A Government Perspective – the State of Queensland

Evolution of the research agenda:

Era	Forestry R&D Agenda	Forest Products R&D Agenda
1920s to 1950s	Domestication and improvement of the native <i>Araucaria cunninghamii</i> [now 50,000 ha sustained rotation]	Processing and utilisation of native-forest sourced rainforest and hardwood timbers
1950s to 1970s	Improvement of exotic sub/tropical softwoods from North and Central America (<i>Pinus elliottii</i> , <i>P. caribaea</i>) [now 200,000 ha sustained]	As above, plus processing and utilisation of plantation-grown <i>Araucaria</i>
1970s to 1990s		Processing and utilisation of plantation-grown exotic <i>Pinus</i>
1990s to 2000s	Domestication and improvement of native hardwoods [~25,000 ha and growing]	Processing and utilisation of plantation-grown hardwoods

A Government Perspective – the State of Queensland

Evolution of the business model:

Era	R&D	Testing
1920s to 1980s	100% State funded Mostly researcher initiated	Mostly regulatory testing done
1990	External income targets introduced; no restrictions on externally funded content	
1990 to 2003	State funding of R&D reducing from 90% to 60% Increasingly industry initiated	Increasing amounts of fee-for-service testing (analytical & performance) Increasing % of unit's testing overheads to be recouped in FFS charges
2004	R&D priority areas identified; co-funding targets for each area; Testing discouraged	
2004 to 2008	State funding of R&D averages 50% of project cost Only State-relevant R&D done	Massive reduction in testing activities Researchers previously involved in FFS testing now generating R&D work
2009	FFS testing must now bear its share of entire Department's overheads	

A Government Perspective – the State of Queensland

Current Forest Products R&D priorities:

Support increased private investment in hardwood timber-producing plantations:

- Wood properties assessment – feedback to breeding and silviculture R&D
- Processing research – particularly of thinnings from young hardwood plantations
 - major focus on processing of composites from this low quality resource
 - improved drying and protection processes
- Product development - integrated with processing research
 - new timber products from hardwood thinnings
 - structural panels
 - structural beams
 - composite poles
 - new protective products to complement eco-credentials of plantation-grown wood

A Government Perspective – the State of Queensland

Summary:

- Increasing scrutiny of State R&D expenditure for value to the State economy
- Increasing demand for industry co-investment in R&D work
- Decreasing willingness to provide testing services – seen as industry responsibility
- Decreasing commitment to research institutions – they will only continue to exist if they are seen to be providing:
 - good outcomes against current policy
 - good value for the State investment

A government perspective

A Government Department for Sustainability,
Innovation and Construction

Ed Suttie

Sustainable construction

- Low impact buildings
- Diverse and vibrant innovation based economy
- High standards of social responsibility
- Green technology revolution

Consumer protection

- Healthy buildings
- Safe buildings
- Building codes and regulations
- Quality Assurance

Priorities

- Affordable housing
- Efficient use of resources
- Low impact Green buildings
- Tackling climate change
- Land use and planning
- Flood resilience
- Recycling and reuse
- Security (energy, resources)
- Employment and skills
- Robust ethics (Responsible Sourcing, Chain of Custody)

Timber in construction

- Good feeling about timber
- Renewable resource
- Sequesters carbon dioxide
- Is this enough?
- Deliver service life
- Complete life cycle studies
- Understand and address impacts

Concrete in construction

- 5% annual anthropogenic CO₂
- Widely used 2bn tonnes per annum and rising

Cement Sustainability Initiative

- Environmental problem recognised
- Focus for industry and research
- LCA to understand environmental impacts
- Address high impacts
- Integrating innovations
 - Energy consumption down
 - Water reuse up
 - Emissions down
 - Recycled aggregates and clinkers
 - Advance admixtures
- Reduce CO₂ by an estimated 40% per tonne
- Net CO₂ absorption as innovative concrete cures

Steel in construction

- 10-15% CO₂ emissions in China, Brazil, South Africa, India
- 30-50% of primary energy is targeted to be saved
- 20% CO₂ emission reduction by 2020 compared with 1990
- Ultimate recyclable construction material
- New structural steel has 60% recycled content
- 97% steel in demolished buildings is recovered
- Industry and research united around a sustainability charter

Observations

- Laboratory research
- Material performance
- Uncoordinated
- Limited integration with the rest of the wood product chain and end users
- Difficult to connect to our priority - Sustainable Construction

Comments on research to take forward...

- Performance of systems (windows, houses)
- Tools to support quality control
- Service life – how long will your products last?
- Prediction tools – build confidence with insurers, lenders, approvals bodies
- How will you contribute in the Carbon economy?
- Minimising emissions to indoor air
- Increase added value to national resources
- Innovative or new uses for wood
- Enabling no compromise end of life options
- Integration into codes and regulations

- There is a need to demonstrate the sustainable benefits of treated wood products in an unequivocal, impartial and credible format thus “providing the sound case for Government support of timber”
- Reliable wood protection is pivotal - a sustainability essential

An academic perspective

Jeff Morrell
Oregon State University

Institutions

- 10 university programs
- 14 faculties
- 2 government programs
- 8 -10 scientists

Federal Research Support

- Formula funds
- Competitive Grants (1/15)
- Wood Utilization Research

Other Support

- Foundations
- Contract Research
- State Government

Category	1983	1993	2009
State	20	20	15
Industry	30	40	50
Federal	40	20	-
Contract	10	20	35

Future Support

- More contract
- Less publication
- Shorter research horizon

Issues

- Proprietary work
- Student preparation
- Lack of basic research
- Limited ability to explore

An Academic perspective

Future for research in wood protection?

Holger Miltz,
University Göttingen, Germany

Education in wood science and technology

- Wood Science programmes guaranteed in several countries in Europe
 - Germany: Hamburg, Göttingen, Dresden (60-80 MSc students/year)
 - France
 - Sweden
 - Poland, Hungaria, Slovenia, Slovak Rep.
 - Totally: some hundred students per year (MSc), even more on BSc

Wood protection research

- Where goes wood protection research?
- Research Institutes
 - Depending on long term visions of politicians
 - ...certain threat!
 - Trend downwards?
- Universities
 - Depending on interests of professors/ researchers

Wood protection research

- What type of research is needed?
- What is financed?

Performance Testing (stake farming)

- Wood destructing basidiomycetes (EN 113, 350)
 - Sterile cultures of white rot fungi (hardwood) & brown rot fungi (softwood)
- Soft rot (ENv 807, EN 252)
 - Fungi in soil contact (non-sterile)
- Blue stain and mould

Important?

- Testing:
 - Good contact to industry
 - Exchange of knowledge by close contact
 - Service life prediction
 - Project duration: weeks to months
 - New ideas for fundamental/ applied projects

Applied research/ process development

- Applied research:
 - Understanding needs from stake holders
 - Use fundamental knowledge for society
 - Educate younger people
 - Project duration often 6 months – 3 years
 - Pressure from industry „mid“

Fundamental research

- Fundamental research:
 - new insights
 - fundamentals
 - Educate young people
 - Less daily pressure!
 - No pressure from industry!

Fundamental work

- Protection mechanisms of new chemicals and modified wood
- Degradation patterns
- Reaction parameters of chemicals
- Material research on wood properties
 - Moisture related
 - Strength
 - Biological

Is there need for research?

- Society
 - Wood is seen to be the material of the future
 - renewable
 - Environmentally acceptable (CO₂..)
 - Traditional....but modern
 - But: the „society“ does not sponsor research

But...

- Because of society visions...
- Politicians react...
- Research programmes are initiated...
 - Research money for fundamental research and process development is available....if:

- Research is innovative
- Environmental impact is low (low toxicity)
 - New chemicals
 - New processes
 - New products

Conclusions:

- Yes, research in wood protection is needed
- Good mix of fundamental, applied research and testing crucial!
- Performance of a product on long term is central issue
 - Wood preservation
 - Paint/ coating
 - Exposure situation
 - New techniques (wood modification)

- ...and IRG can/ will play a role in this!

An Industry perspective

W. Ramsay Smith
Global Research Director
Arch Treatment Technologies

Great Opportunities for new wood preservatives

- Voluntary removal of CCA from residential markets
- Chance to increase our vision and horizons
- Higher cost of substitutes allows wider range in product development
- Chance to introduce new products
- Chance to differentiate companies

R&D From a “Supplier’s” View

- Evaluation of potential candidates
 - Actives
 - Technologies
- Formulation of new/modified systems
 - Physical properties , chemical properties, efficacy, treating attributes, environmental and regulatory acceptance, market acceptance, code and industry association criteria, etc.
- Continued development and improvement of current products

Emerging Technologies

- Improvement of current products
 - Dissolved copper systems
 - Dispersed technologies
 - Wood modification
- New organic and inorganic actives
- “Natural” biocides, i.e. extractives from wood, plants, etc.
- Metal free, carbon-based wood treatments
- Better fire retardants, moldicides, water repellents, antisapstains

What Needs To Be Done?

- Work to re-claim lost markets and gain new market share i.e. wood plastic composites
 - Appearance
 - Weathering enhancement
 - Dimensional stability
- Change our objective from 50 years that look bad in 2 years, to look good for 15 years and replace in 18 years
- Not an objective of “lowest cost treatment” but being better than alternative materials

What Needs To Be Done?

- Environmental issues and education
 - Reclaim metals from treated wood – long term sustainability
 - Better fixation technologies – coatings?
- Better understanding of particulate mechanisms
- Better understanding of potential health hazards from nano-based materials
- Better understanding of changes in fungi global issues – are they spreading more with more global commerce?

What Needs To Be Done?

- Metal free, carbon-based wood treatments for ground contact
- More efficient testing methods to reduce time for effective preservative analyses
- Mobility of actives after treatment
- Increase penetration from surface applications
- New carriers
- EWP preservation

So,
what will we find at the end of our wood
protection rainbow?

An Industry perspective

Dr Peter Hayward
Zelam

Historical (some years ago)

- Institutes FRI / CSIRO, State
 - Government - Public Funding
 - Data available to public
 - Some Industry input
- Universities
 - Some research - teaching focused
- Other Institutions
- Industry

Current

- Same groups but:
 - Down sizing of many Institutes
 - Government money more tied
 - Encourage Industry participation
 - so contractual
 - data not public
 - Advent of “Commercial Managers” in many Institutions

Institutions/Universities

- Trying to do basic research but
 - because of funding it is very difficult and
 - often funding availability skews this research - politically?
- So emphasis on natural products and processes
- Experienced Scientists and growing older
- Government funding geared to natural products and this is where our younger scientists are going
- But the cost of commercialisation?

Industry

- Guys the world has changed!
 - It costs over \$US500 million to develop a new active
 - What Institution or Timber Preservative Company has that money?
 - Future is in Post Patent Proprietaries – IP
 - Some work in this area and need to be supported as it costs
 - Institutions – natural so safe?
 - Industry - lost

Fundamental Research

- Fundamental Discovery Chemistry Research mainly by AgChem & Pharmaceutical Companies – None by Timber Industry
- Timber Industry Research mostly technical and enhancing known chemistry
 - Quicker payback especially when buy from Institutions or Academia
 - Long term focus not popular with CFO's - expensive
 - Working mainly with existing actives
 - I ask you – is'nt the cupboard bare!
 - Use Institutes to carry out our work

Industry vis a vis Institutions - Aus/NZ

- What the are we on about
 - We get most of our work done by Institutions who:
 - Don't really trust us
 - Are both the generator and arbiter of the Information
 - Are also the Regulator or assist them
 - But they want our money and Co operation to get matching Public money! - Conflict of interest?

Institutions and Industry

- One scientist - many Industry clients
- Pay for learning that is shared
- Demote Industry work as suspect because there is that “dirty” commercialism? Therefore biased
- But is Institution Research less biased?
 - Its commercial - sensitive
 - Selling a product
 - So who's kidding who?

Zelam's perspective

- Do our own research
 - Very uneasy with the potential for bias and unprofessionalism in Institutions
 - Take the whole commercial risk
 - Own the IP
 - Knowledge stays within house
 - Strive for very high professionalism
 - Can innovate

Down side to Zelam Strategy

- Lack of capital and resources
- Lack of International reach
- Must make a buck so not able to open up about our research
- Protection of IP
- Off side with Institutions who are the final arbitors on Registration

Pet Frustrations

- Dealing with a multitude of Institutions for product development
- Industry are Commercial and therefore ethically suspect
- Vexatious patents often from Institutions protecting their money tree

What we do we do well!

- ❖ Innovative development
- ❖ Micro Capsules must not be confused with Nano Particles.
- ❖ Nano particles are particles finely ground down to nanometres.
- ❖ Micro capsules are capsules formed around solutions of molecules