



# Development of an infra-red spectroscopy tool for ISPM 15 compliance test



MINISTÈRE  
DE L'AGRICULTURE  
DE L'AGROALIMENTAIRE  
ET DE LA FORÊT

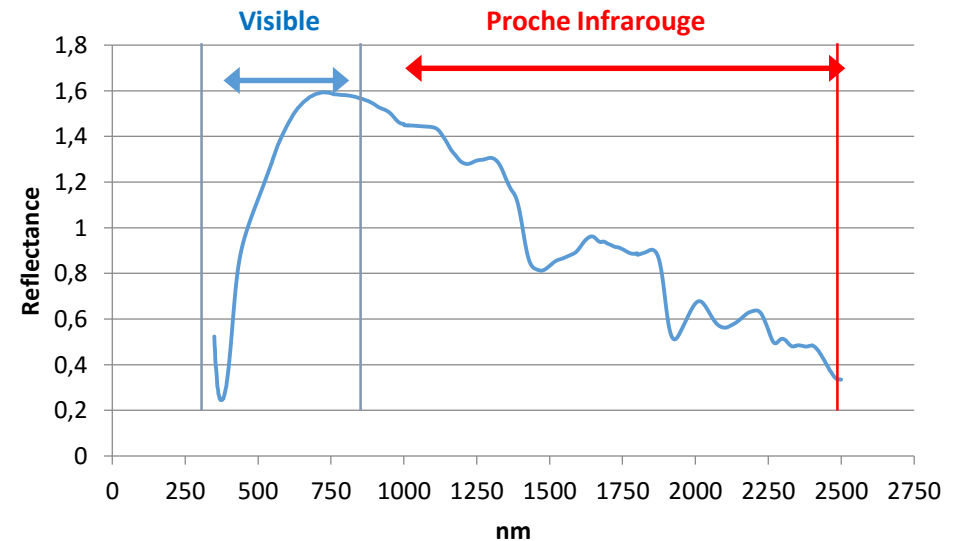
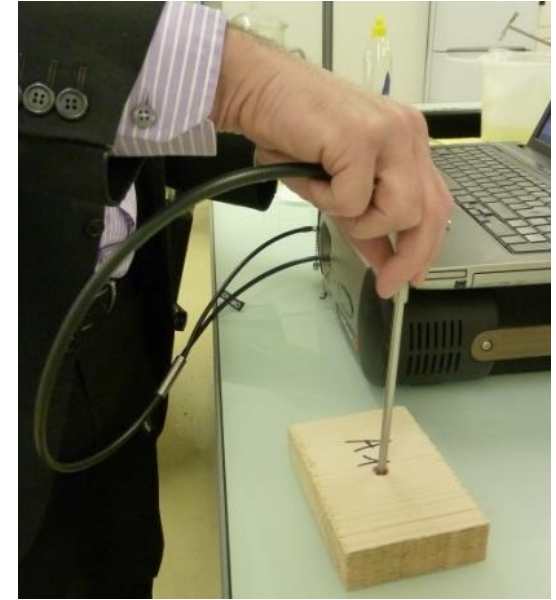
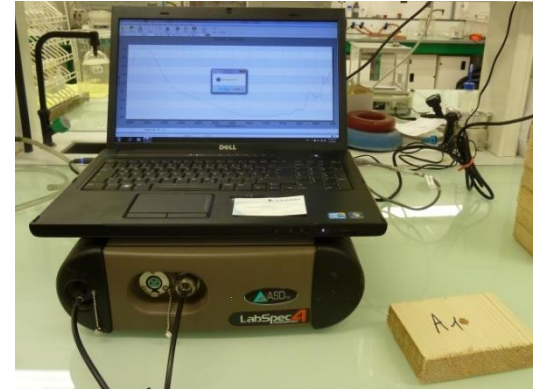
Workshop for Inspectors on tools available for inspections  
National Agri-Food innovation Campus, Sand Hutton, York



2017-12-13/15

# Context

- ✓ The French Agriculture and Forestry Department ask FCBA (French Institute of Technology for Forest-based and Furniture sectors) to develop a portable control tool for wood packaging was mark ISPM15 (HT).
- ✓ Based on the Near Infra-Red Spectroscopy (NIRS) technology FCBA work on the development of prediction model based on NIR analysis spectrum to determine if the wood was correctly treated.

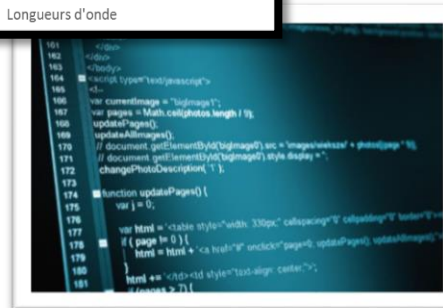
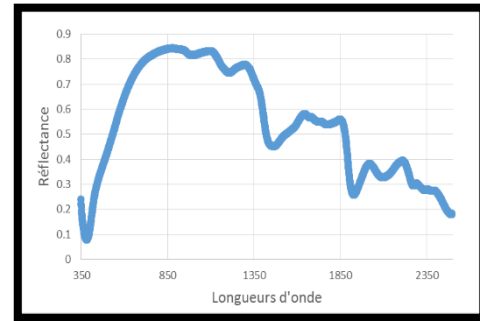


# Global approach adopted to validate the feasibility

Constitution of a near infra-red spectrum database thanks to a laboratory heat treatment on pine and poplar



Development of a prediction model based on the statistical analysis of this database

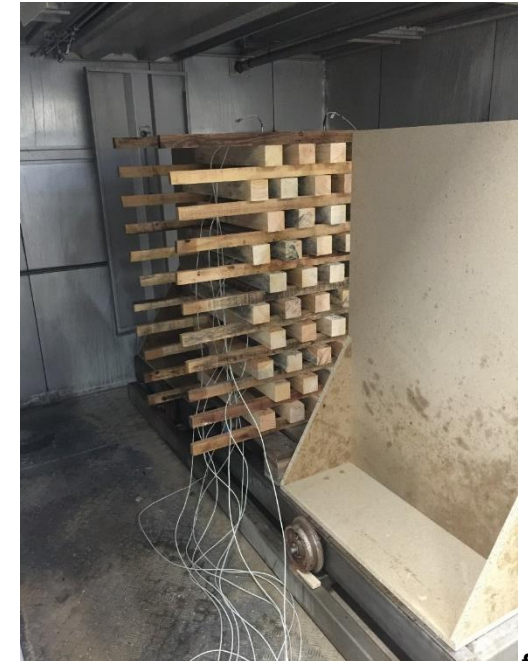


Test of the prediction model on industrial pallets treated in compliance, or not, with ISPM15



# Materiels and methods

- ✓ **2 groups of wood species**
  - Softwood with Maritime pine, Radiata pine and scots pine
  - Poplar with 2 different clones (light and heavy)
- ✓ **3300 samples (6 x 6 x 60 cm) for 66 different heat treatments (50 samples per treatment)**
- ✓ **3 variables for the treatment**
  - Treatment temperature (55, 60 and 70 °C)
  - Treatment time (15, 30, 60 and 120 min)
  - Gradient temperature rise (5, 7.5 and 10 °C/h)



# Materiels and methods

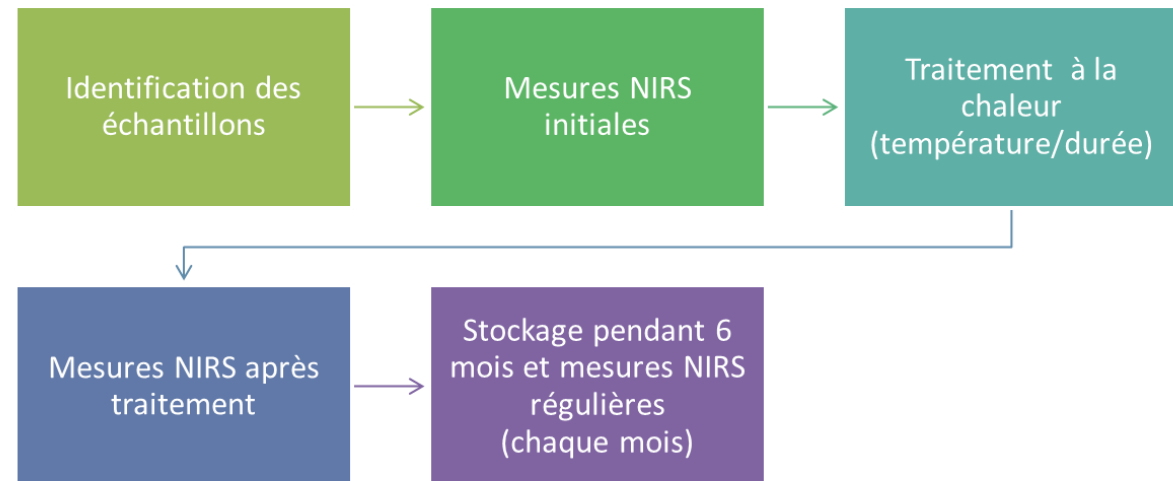
## ✓ For each sample,

- 1 measure before heat treatment and 1 just after treatment
- 1 measure each month during half year with 3 different storages conditions (interior, outdoor, outdoor under cover)

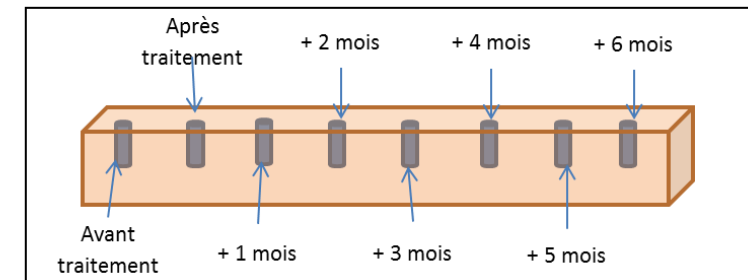
→ 8 measurement points per sample with 3 repetitions

for each point

→ 39600 spectrums per group



Taille des échantillons  
6 x 6 x 60 cm



# Materials and methods

## Storage conditions

interior



outdoor under cover



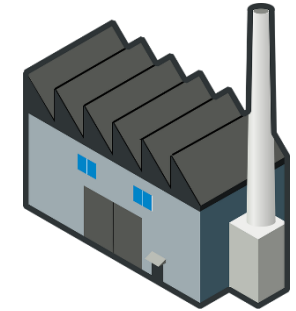
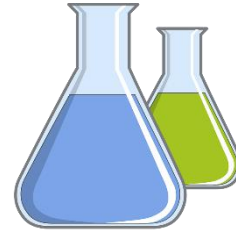
outdoor



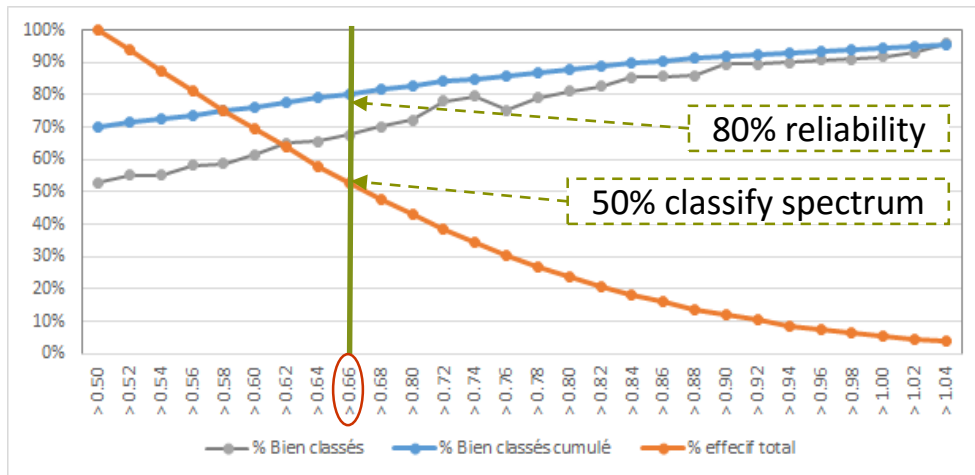
# Results

## Laboratory results

		Pine	Poplar
By spectrum	Reliability	70%	80%
	% classify spectrum	50%	62%
With filter	Reliability	80%	90%



## Filter value



## Industrial results with laboratory model

		Pine	Poplar
By spectrum	Reliability	68%	63%
	% classify pallet	100%	50%
By pallet with filter	Reliability	72%	78%

# Conclusion

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**Feasibility ?**

**YES**

**One prediction model for all species?**

**NO: one model for each species (or group, like pine)**

**Transferability from a laboratory model to an industrial use?**

**NO: not reliable enough to enable an effective control**



# Next step: development of a usable tool for ISPM15 compliance test

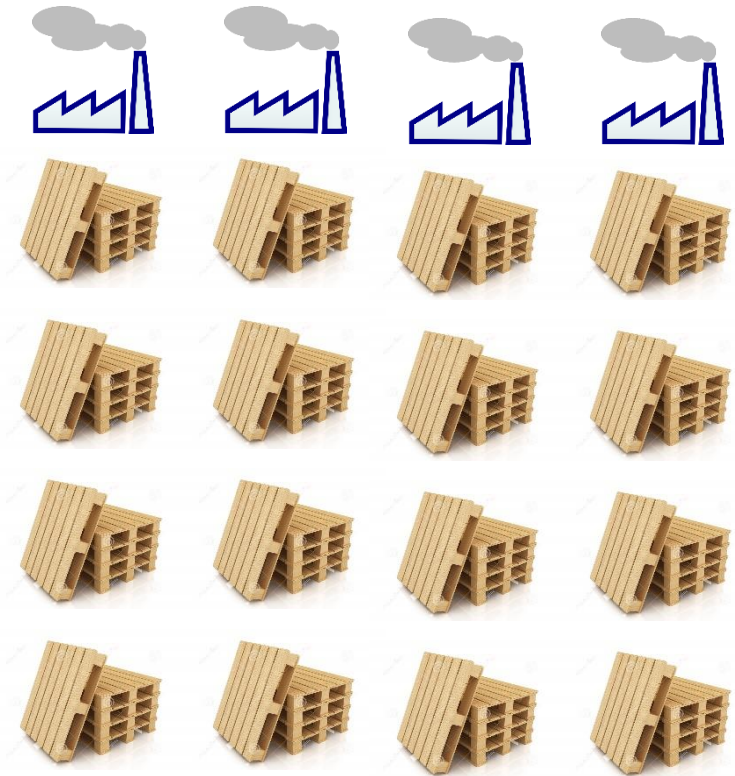
- ✓ Constitution of a spectrum database with industrially treated pallets
- ✓ Development of a prediction model based on this database
- ✓ Integration of prediction models into a software for instantaneous responses



What species?

		Sitka		Fir		Radiata pine
		Black pine				Poplar
Ash			Spruce			
Eucalyptus		Beech				Larch
			Douglas			
		Oak				
		Alep pine				
						Maritime pine

What is needed to validate the prediction model for each species?



# Next step: development of a usable tool

- ✓ This project can become a European project
  - If European wood packaging producer support it through the National and European federations
  - If the NPPO and EPPO support it to the European commission





# Thank you

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