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Determination of wood moisture properties using CT-scanner in a controlled environment



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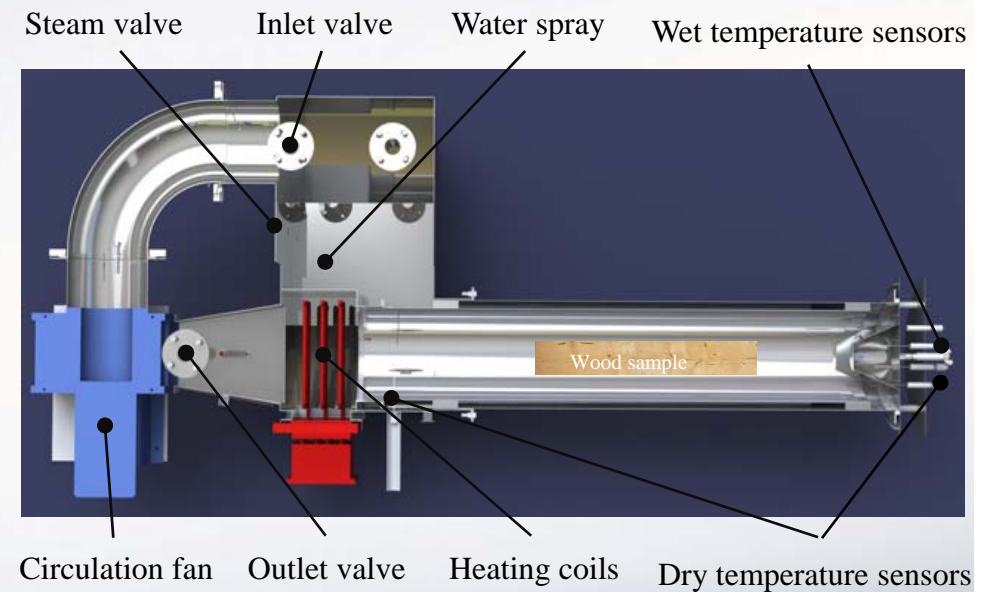
The aim of the project:

- To examine the existing algorithm for the moisture content calculation.
- To analyze and compare the moisture flow data for high and low temperature drying.



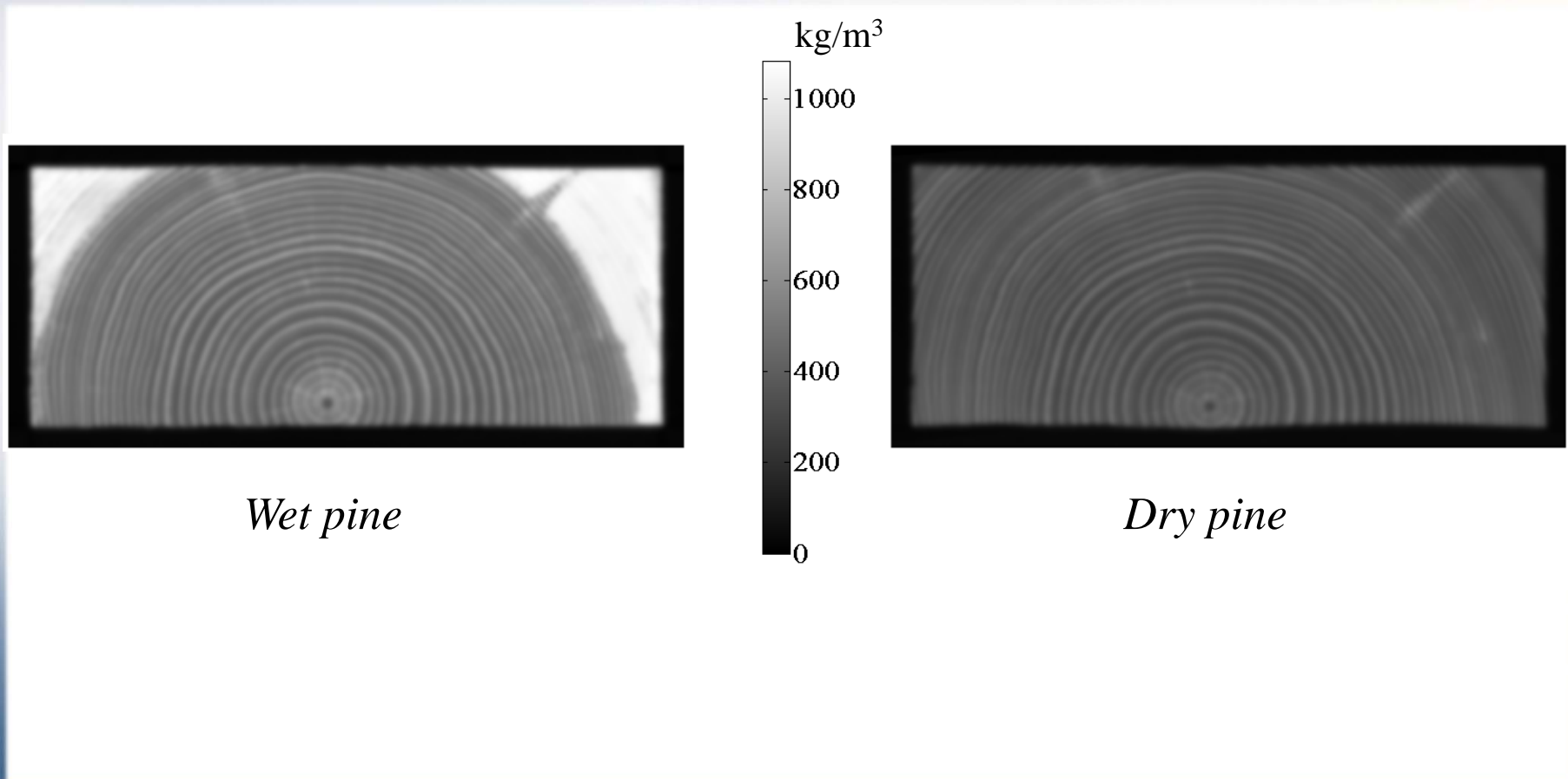


- CT- scanner
- Climate chamber



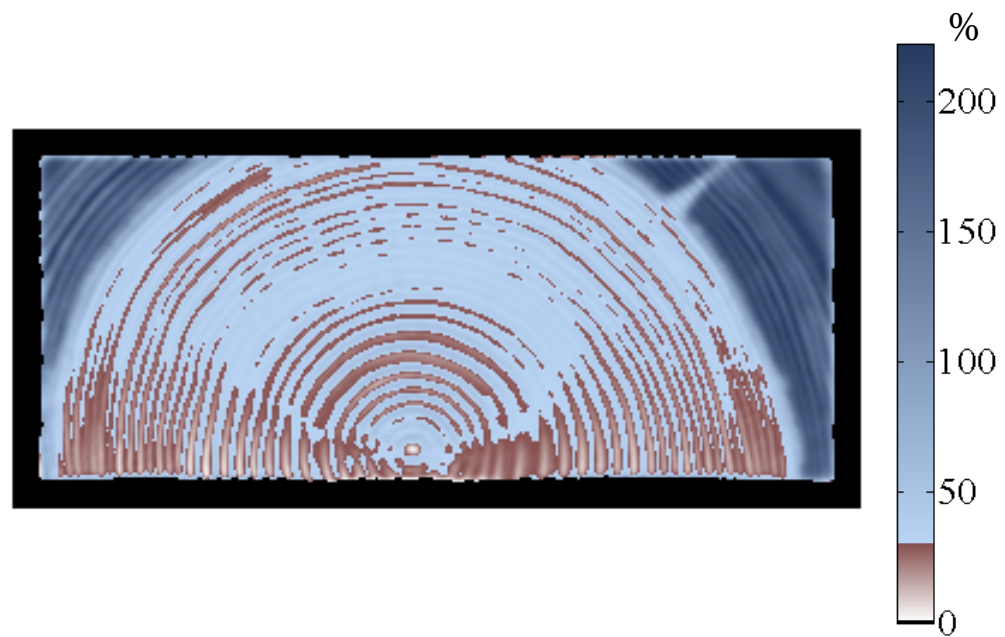


Algorithm for moisture content calculation



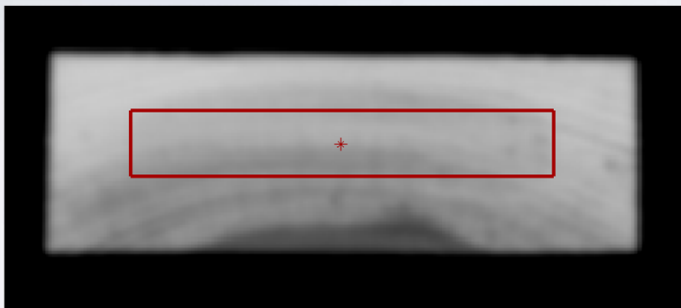


Moisture content profile

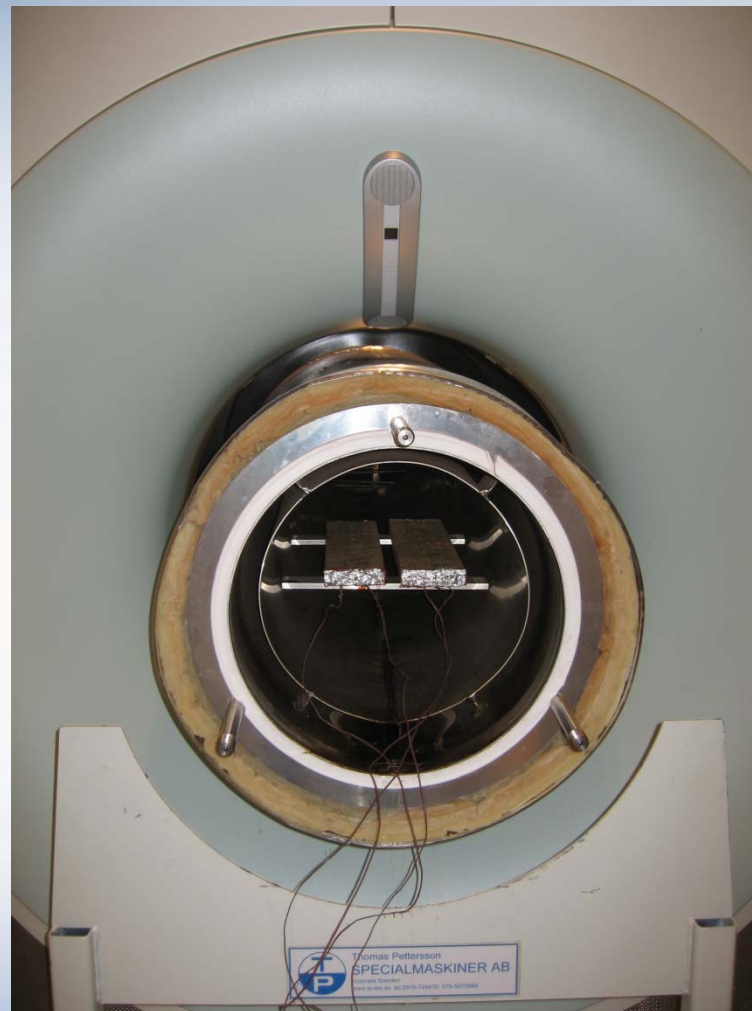




High temperature drying

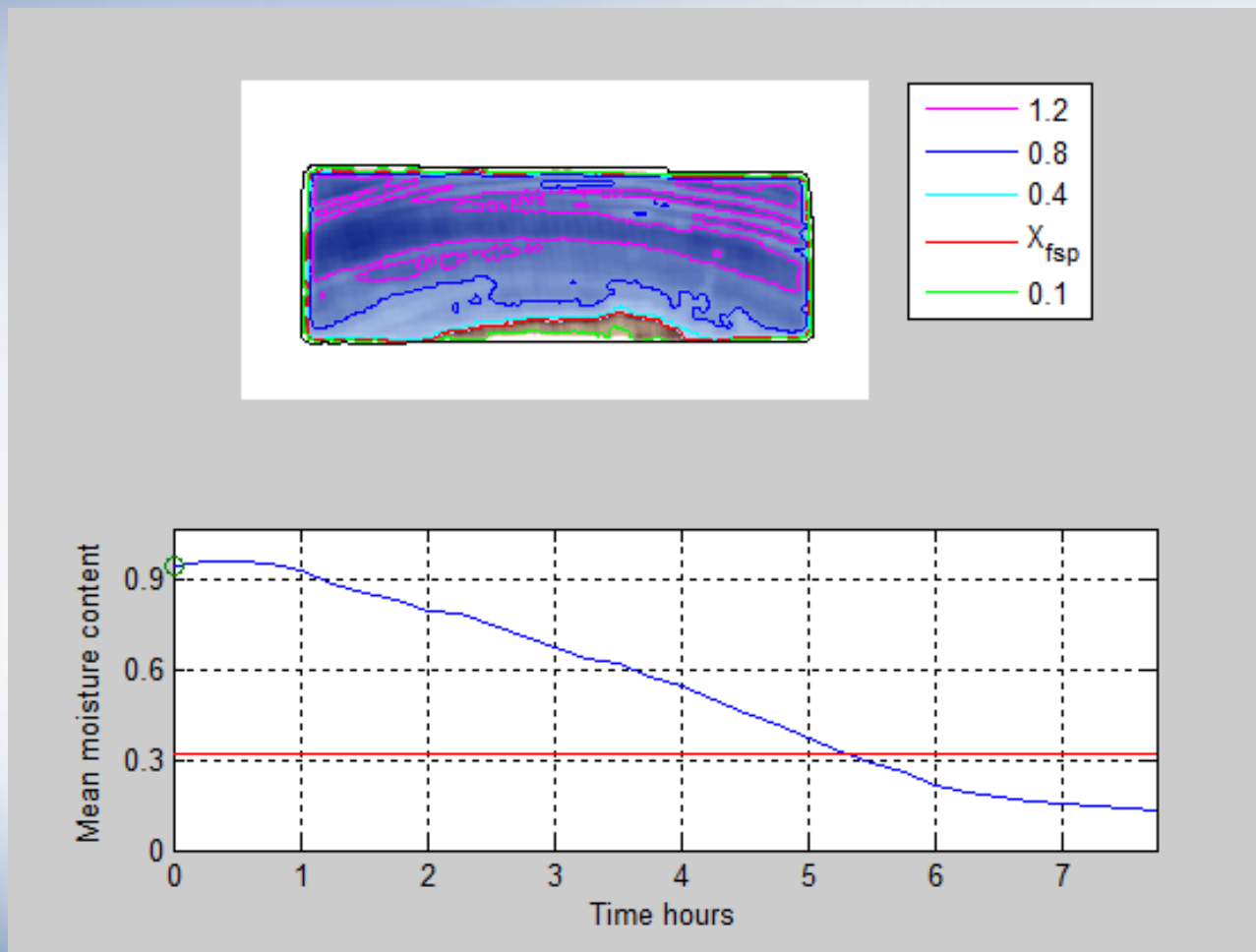


*A CT- image of wet pine sapwood
with dimensions 24x66 mm
 $T=90/110^{\circ}\text{C}$ (wet bulb/ dry bulb)*

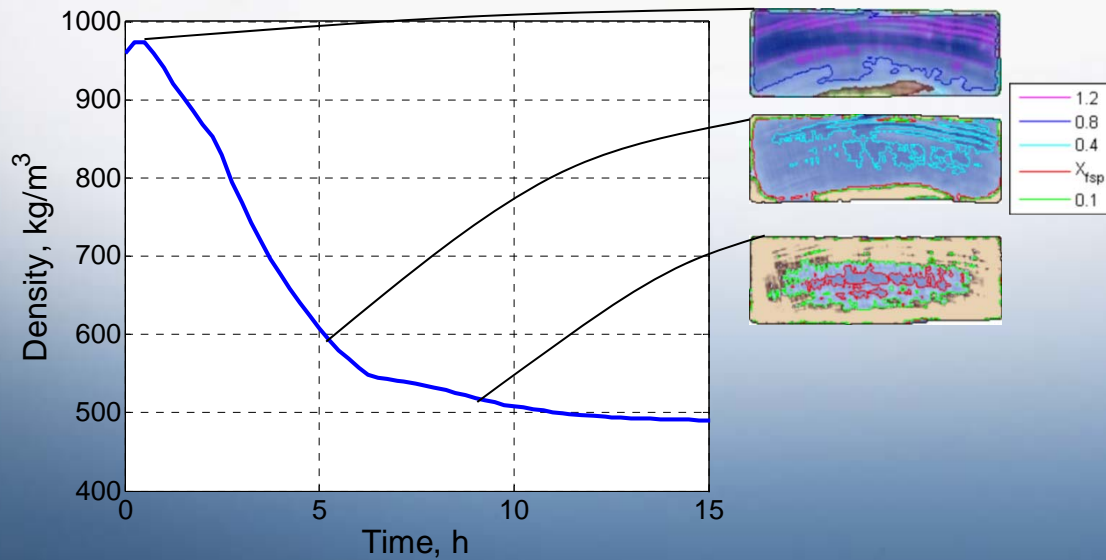
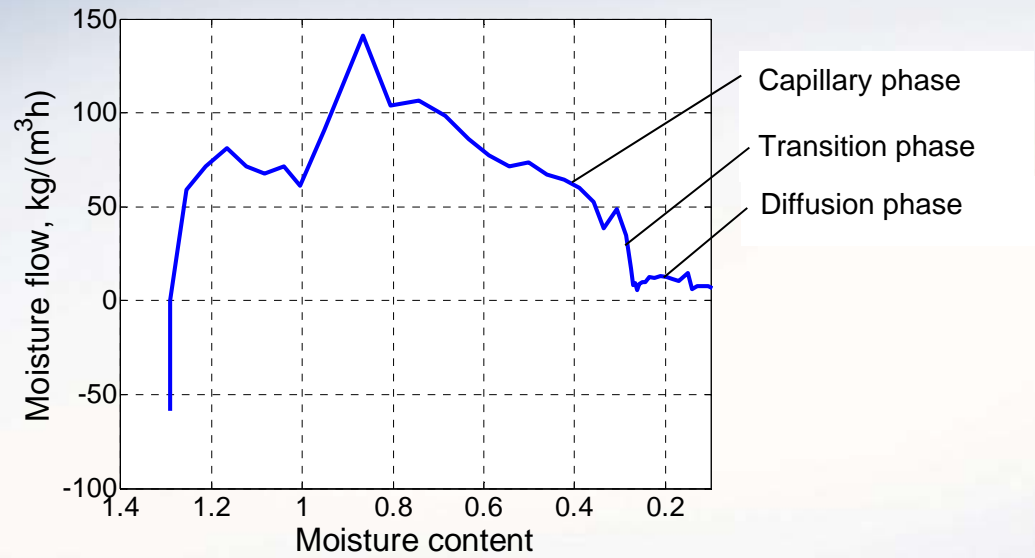
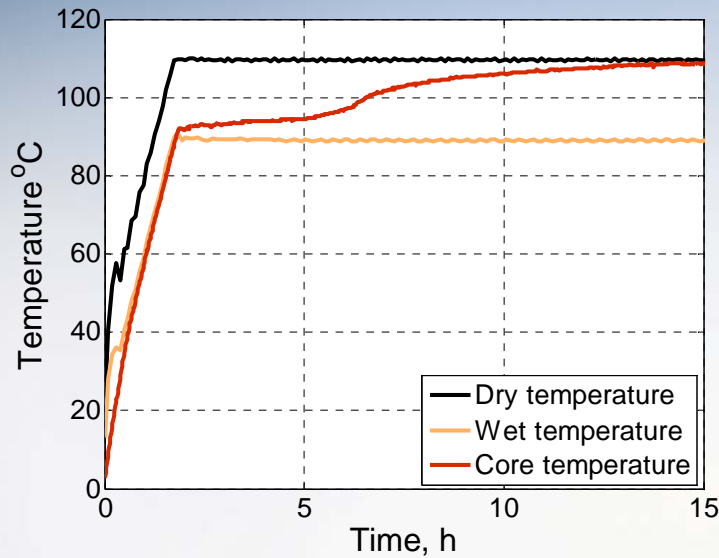




High temperature drying

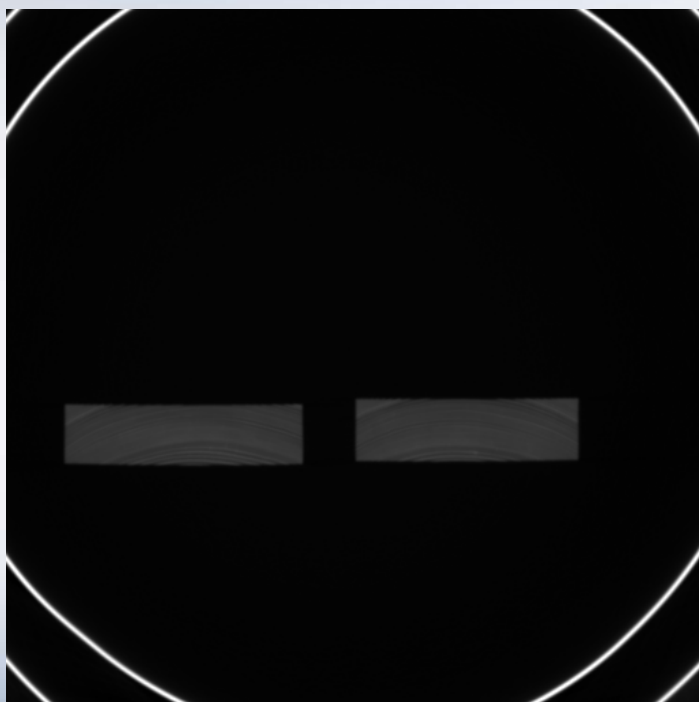


High temperature drying

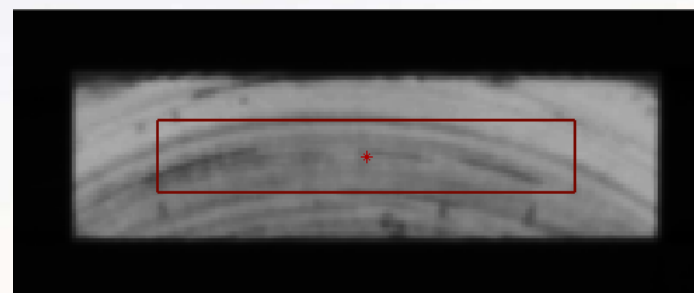




Low temperature drying



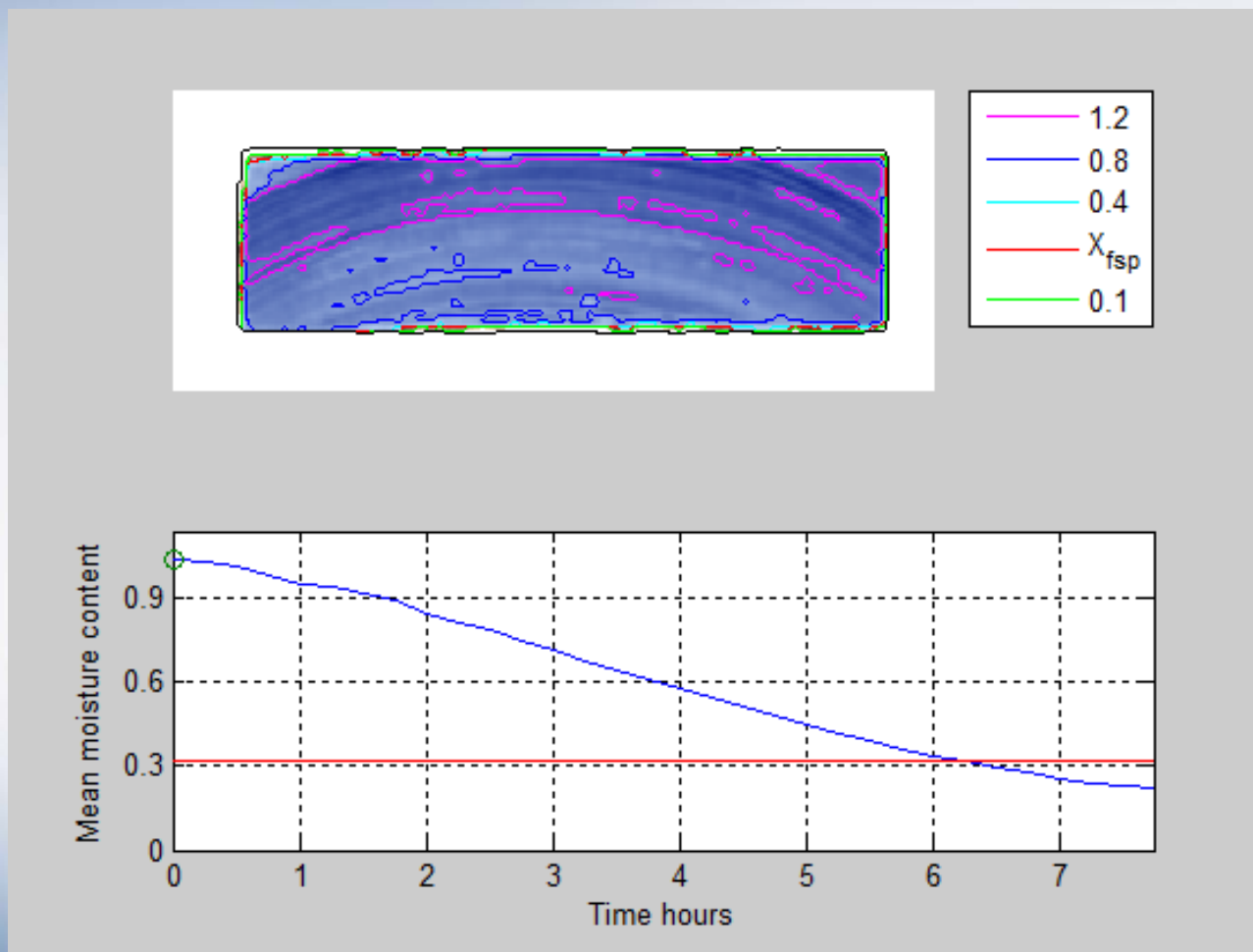
Boards inside the climate chamber



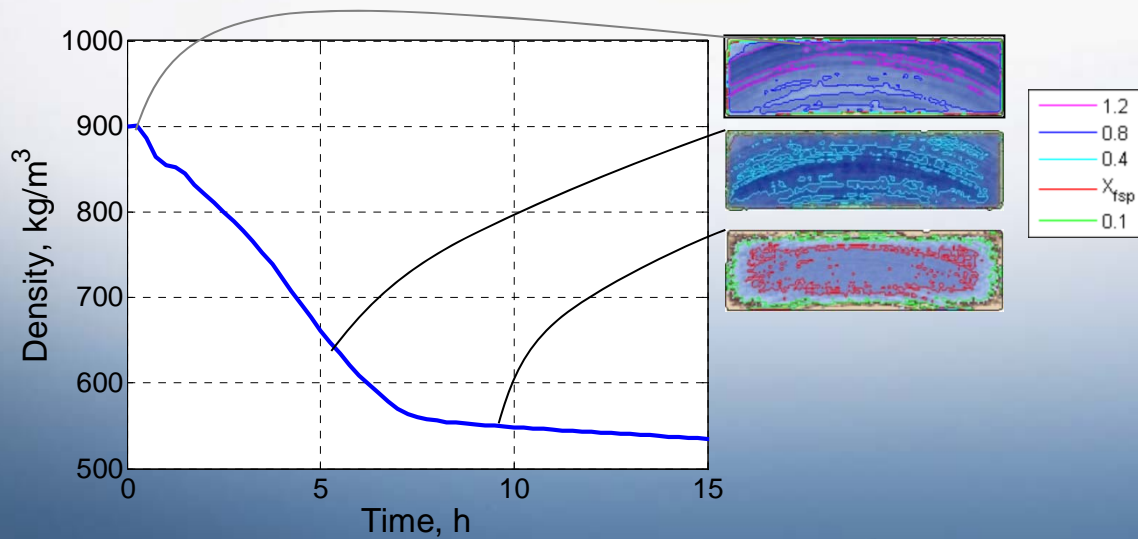
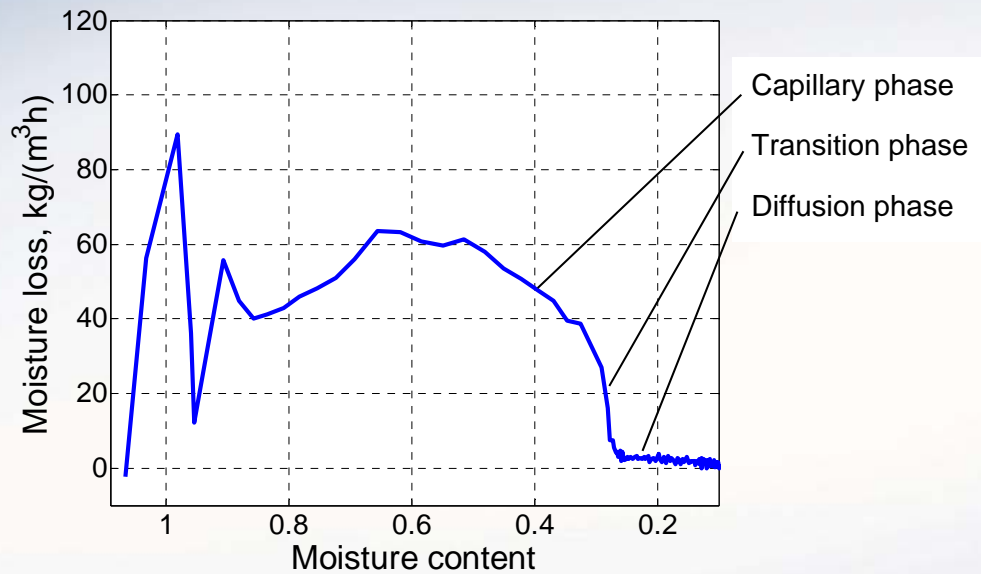
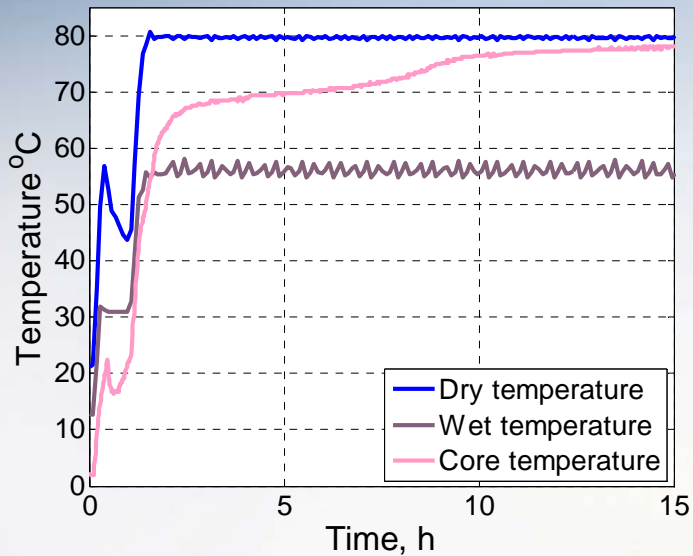
*A CT- image of wet pine sapwood
with dimensions 26x92 mm
 $T=56/80^{\circ}$ C (wet bulb/ dry bulb)*



Low temperature drying



Low temperature drying



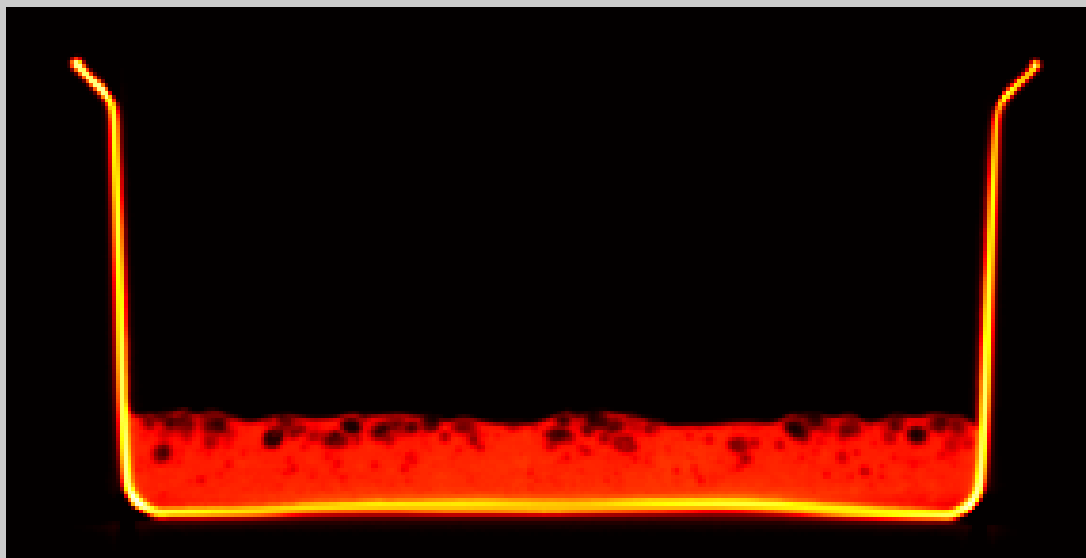


Conclusions:

- The existing algorithm, showed that this method is a powerful tool for analyzing the moisture flow within the wood piece.
- The new CT-scanner together with the climate chamber gives unique results, as it has not been possible to study high temperature drying with this method before.



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Chaired Professor in Wood Physics

Today, Luleå University of Technology is one of the world's leading research platforms in wood technology. At the Division of Wood Technology based in Skellefteå, the research fields include Wood Physics, Wood Technology and Wood Products Engineering.

Our present Professor in Wood Physics is approaching retirement and we now wish to recruit a chaired professor whose task it will be to lead the continuing development of research, graduate training and undergraduate education in the subject.

Wood Physics is part of the Department of Engineering Sciences and Mathematics, within which research in close cooperation with industry plays an important role. The Department offers a broad range of subjects with many successful research groups and widely recognised educational programmes. Research fields include the materials sciences metal, wood and composites; energy engineering process issues, flow phenomena, product and production development, etc. The versatility of the Department means that together we have strong corpus of theoretical skills across our entire area of operations.

Wood physics as a subject is characterised by experimentally based research closely linked to the needs of industry. The research is based on fundamental skills in the multivariable physical properties of wood as a material and its reactions during industrial processes in the wood industry production chain from forest to end products. Our research into modification of wood through different methods means that the subject also includes the chemical and biological properties of wood. Process control, property control, and the development in close collaboration with industry of industrial processes such as wood drying, heat treatment, impregnation and chemical modification are fundamental to the subject. Our overriding goal is for our renewable raw material wood to be used in more durable products than today, particularly in the perspective of long-term sustainability.

At Luleå University of Technology in Skellefteå there is a wide range of experimental facilities in the form of building, equipment and technical personnel. Within the subject we have today access to a new CAT scanner with a world unique climate facility tailored for material technological wood research. This equipment

is particularly suited to in situ studies of moisture dynamics processes such as drying and heat treatment, but can also be used for studies of other phenomena of interest to the subject.

Subject description

This research subject area comprises characterization, determination of properties and modification of solid wood and wood based materials. This includes properties and responses to industrial processes such as drying, impregnation, thermal and chemical modification. Process development and process control strategies for drying and thermal modification is therefore included in the subject.

Responsibilities

As professor and programme representative you will be responsible for leading research for the future development of the subject, and will be responsible for education in the subject at all levels by tutoring students and research students. You are expected to participate in the development of the new Masters program in Wood Technology which is being planned at the Division of Wood Technology.

As programme representative you will be working actively with external financing of research and research education, and contributing to the development of the Division, the Department and the University. The position as professor is a permanent post, while the programme representative appointment is limited to six years with the possibility of extension.

In building a strong research environment, a particularly important factor is collaboration with other subjects within wood technology research at Luleå University of Technology in Skellefteå, as well as with other subjects in Luleå University of Technology. Another area involves further developing today's close collaboration with the wood industry and its representatives, among other things through WoodCentre North. A further important factor is collaboration with institutions, national and international research environments and the surrounding community. The ability to lead, collaborate and to develop operations is therefore something to which we attach considerable importance.

Required Skills and Qualifications

The applicant qualified for appointment as professor is a person with demonstrated scientific and teaching proficiency. Equal attention will be given to the assessment of teaching proficiency as to the assessment of scientific expertise. Applicants must be able to demonstrate leadership within their discipline and show original and innovative scientific work of an excellent international standard. This is typically documented in the form of a series of articles published in recognised peer-reviewed journals with international distribution.

Teaching proficiency includes competence in planning, conducting and evaluating tuition. A professor must have undergone supervisor training and, in normal cases, must have been the principal supervisor for at least one postgraduate student who received a PhD.

Assessment criteria

- These assessment criteria apply to the position:
- Documentation demonstrating scientific expertise
- Documentation demonstrating advanced teaching proficiency
- Documented experience with advanced supervision
- Other selection criteria (in no particular order):

Leadership abilities as well as competence in organisational development

Demonstrated ability to obtain research grants in national and international competition

Demonstrated ability to lead and develop research in collaboration with industry, institute and public Sector

Interest in and experience with experimental work

The appointee must be able to teach in Swedish and/or English

Information

For further information please contact:

Head of Division, Gunnar Landsell, phone +46 910 58 53 89, gunnar.landsell@ltu.se

Application

Send your application written in English marked with reference number 1104-11 to Luleå University of Technology, Registrar, SE-971 87 Luleå, Sweden. Attach any scientific work to be used primarily in support of the application. In particular, the applicant's educational merits should be documented. Submit the application in triplicate. Please use the application template when you apply for this position.

Deadline for application: 1 December 2011

Reference no: 1104-11