

# \ RESEARCH PROGRAMME 2009



\ InTechFibres  
research in fibres

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a partnership with



# *INTRODUCTION*

## InTechFibres

### 2009 Programme

**InTechFibres**, is an excellent example of an efficiently functioning network. Scientists with complementary skills in subjects related to lignocellulosic materials work together, through the partnership of ...

**CTP** Scientific and Technological Unit: Process-Pulps & Functional Fibres;

**FCBA** New Materials Division;

**Grenoble INP-Pagora** Departement of Pulping Chemistry.

This Research Programme, which bears the name of the partnership, is further reinforced by collaboration with **CNRS-CERMAV** and **INRA** laboratories.

The **InTechFibres** Research Programme will help the industries of the wood, forestry chains to take better advantage of lignocellulosic material diversity in their processes and products, now and in the future. The laboratories above ensure fundamental to applied research, giving project participants the potential of industrial implementation.

The objective of this Programme is to innovate in the production of mechanical and/or chemical pulps, to reduce production costs and environmental impact in a sustainable manner, while designing new processes and products. This objective is founded on increasingly better understanding of the lignocellulosic raw material properties and variability, and of pulping and bleaching mechanisms.

To design new products from lignocellulosic materials and to improve the quality of existing products, **InTechFibres** research seeks more highly valued uses for wood resources and fibres, and better characterisation of the fibres and their derivatives. Wood derivatives and fibres are incorporated into raw materials and products for many industrial sectors.

The **InTechFibres** Research Programme is organised in three main themes:

- Greener pulp for the future
- Biorefinery and fibre functionalisation
- New fibre technologies

# CTP PROJECT SELECTION

CTP's Research Programmes are run in collaborative deliberation with the Pulp and Paper Industry.

**CTP's Research Strategy** embodies 4 themes prevailing in the Industry today and around which more and more inventive and creative projects will continue to be developed:

## 1. Sustainable raw materials

CTP contributes in developing new raw materials, improving existing raw materials and in managing recycled pulp and paper raw materials. Focus is presently on the development of wood-based raw materials, on recycling and on green chemistry.

## 2. Eco-production concept

To efficiently manage raw materials, waters, energy and rejects, research is progressing with new production concepts which are more efficient, more economical and more environmentally friendly.

## 3. Bio-sourced materials, functionalising and new uses





Reinforced by the bio-refinery concept, new bio-sourced, high-added-value materials are being produced. By integrating nanotechnologies and functionalising these lignocellulosic compounds, CTP's Research Programme is generating newly developed fibres for paper and board destined to new markets and/or to packaging and communicative papers.

## 4. Product Performance

Projects are concentrating on product performances as our processes and products must be continuously adapted and improved to maintain and to advance in quality and in productivity.

### What is Innovation at CTP?

Innovation is when a project starts to produce results which are different from present industrial results. The originality and creativity of our projects are qualified from *Continuous-enhancement* to *Idea*.

Project level of innovation		2009 number of projects	2009 % of projects
Continuous Enhancement		23	39
Innovative		17	61
Highly innovative		15	
Idea		4	

More than 60% of the 2009 projects have been qualified as Innovative or better, the goal is 70% in 2011.

Great projects	Sustainable Ressources			Eco-Concept of Production				Bio-Sourced Materials			Prod. Perf .	Innova tion
	Wood&Agro-Ressources	Recycling	Green Chemistry	Recycled Raw Material	Water Management	Energy Management	Rejects Upgrading	New Uses of Lignocellulosic Materials	New uses of Paper&Board	New uses of Paper&Board	Product Performance	Innova tion
									Pack	TIC		
<b>InTechFibres Projects</b>												
Hemicell												★ ★ ★
PulpControl												★ ★ ★
ChipSensor												★ ★ ★
EcoBleach												★ ★ ★
Biorenew												★ ★ ★
EucaRef												★ ★ ★
BioKraftPulp												★ ★ ★
OptHYP												★ ★ ★
FunFibres												★ ★ ★
CellOLED												★ ★ ★
GreenBoard												★ ★ ★
Tissue+												★ ★ ★
O3 Paper												★ ★ ★
Optissue												★ ★ ★
<b>Environnement Projects</b>												
Scale												★ ★ ★
AddiStep												★ ★ ★
BioFime												★ ★ ★
EcoEnergie												★ ★ ★
HeatRec												★ ★ ★
Agri-Elec												★ ★ ★
OptiSludge												★ ★ ★
Resorbox												★ ★ ★
Accepto												★ ★ ★
Oxindus												★ ★ ★
<b>Recycled Fibres Projects</b>												
Celine												★ ★ ★
Digdeink												★ ★ ★
Flexo												★ ★ ★
SortMix												★ ★ ★
Monitor 2												★ ★ ★
BoardinDIP												★ ★ ★
DIP Impact												★ ★ ★
Colloids												★ ★ ★
MacroStic												★ ★ ★
MiniStic												★ ★ ★
OCC Stic												★ ★ ★
ValOBA												★ ★ ★
Biolmpact												★ ★ ★
InnoDIP												★ ★ ★
Enzyrec												★ ★ ★
BioreFR												★ ★ ★
OptiSludge												★ ★ ★
MecaFlot												★ ★ ★
RecyFun												★ ★ ★
<b>Product Quality &amp; Development Projects</b>												
Curwe												★ ★ ★
Transnews												★ ★ ★
DIP Impact												★ ★ ★
OptiRef												★ ★ ★
MatBar												★ ★ ★
Nanograft												★ ★ ★
NanoMat												★ ★ ★
Fijet												★ ★ ★
Decarte												★ ★ ★
FunInk												★ ★ ★
Méta Papier												★ ★ ★
Fluting												★ ★ ★
Dust												★ ★ ★
Curtain II												★ ★ ★
Amar-FCCA												★ ★ ★
Braille												★ ★ ★
Fite												★ ★ ★
Moca												★ ★ ★
Tissue+												★ ★ ★

## Research Programme 2009

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# CTP's ITF Network

<b>ADEME</b>	Agence de l'Environnement et de la Maîtrise de l'Energie <i>Agency for Environment and Energy Management</i>
<b>AGRICE</b>	Agriculture pour la Chimie et l'Energie / <i>Agriculture for Chemistry and Energy</i>
<b>AXELERA</b>	Pôle Rhône Alpes de Chimie Environnement <i>Rhône Alpine Cluster for Chemistry and Environment</i>
<b>CERMAV</b>	CNRS Centre de Recherche sur les Macromolécules Végétales <i>CNRS Research Centre for Vegetal Macromolecules</i>
<b>CIMV</b>	Compagnie Industrielle de la Matière Végétale <i>Industrial Company for Vegetal Material</i>
<b>CNRS</b>	Centre National de la Recherche Scientifique / <i>National Scientific Research Centre</i>
<b>CTP</b>	Centre Technique de l'Industrie des Papiers, Cartons et Celluloses <i>French Pulp and Paper Research &amp; Technical Centre</i>
<b>ESIL</b>	Ecole Supérieure des Ingénieurs de Luminy / <i>Luminy Engineering School</i>
<b>EU</b>	Union Européenne / <i>European Union</i>
<b>FCBA</b>	Institut Technologique des Forêts, Cellulose, Bois-construction et Ameublement <i>The French Institute of Technology for Forest-based and Furniture Sectors</i>
<b>Grenoble INP</b>	Grenoble Institut National Polytechnique / <i>National Polytechnical Institute of Grenoble</i>
<b>Grenoble INP-Pagora</b>	Grenoble Ecole internationale du papier, de la communication imprimée et des biomatériaux <i>Grenoble International School for Paper, Printed Communication and Biomaterials</i>
<b>INRA</b>	Institut National de Recherche Agronomique <i>French National Agronomy Research Institute</i>
<b>LBCF</b>	INRA Laboratoire de Biotechnologie des Champignons Filamenteux <i>INRA Biotechnology Laboratory for Filamentous Fungi</i>
<b>LERMAB</b>	Laboratoire d'Etudes et de Recherche sur les Matériaux Bois de l'Université Henri Poincaré de Nancy <i>Laboratory for Wood Research and Studies of Nancy Henri Poincaré University</i>
<b>TECHPAP</b>	Filiale du CTP qui vend des appareils issus de la recherche du CTP <i>CTP subsidiary sells products developed by CTP research (www.techpap.com)</i>
<b>TECKNOMETRIX</b>	Société de conception et création de logiciels pour datamining et analyses <i>Company for conception and creation of software for datamining and analyses</i>

# GREENER PULP FOR THE FUTURE

For sustainable development, paper pulping and bleaching processes need to become more environmentally friendly. It is particularly important to enhance these processes in order to economise energy in line with future fossil fuel shortages and to limit their impact on the environment (fixing carbon, limiting air and water pollution...), thus providing the pulp and paper industry with new means of producing greener pulps.

Among the different possibilities for environmental impact reduction, biotechnological techniques are enabling the pulping and bleaching processes to become eco-designed. Introduction of life sciences to the wood-based industries are offering many new and promising alternatives to lower production costs and energy consumption while decreasing production impact on environment.

Finally, enhancing existing processes by modifying running conditions and/or implementing new technologies is a viable alternative for protecting fibres and developing their properties.

**InTechFibres** is therefore focusing on work to produce greener pulps, through the following projects:

- Reduction of the environmental impact of mechanical pulp bleaching (**EcoBleach 1 and 2**), to determine the impact of wood resources and pulping conditions on the bleaching effluent load; how to optimise the bleaching conditions and how to use new alkali sources or additives to limit the resulting pollution, especially the recalcitrant COD;
- Mechanical and chemical pulp ozonation influence on the physico-chemistry of paper manufacture (**O3Paper**) for removing the pitch problems encountered by pulp mills and the detrimental effects of certain substances on paper sheet manufacture.
- White biotechnology for added value products from renewable plant polymers: design of tailor-made biocatalysts and new industrial bioprocesses (**European Biorenew project**) to evaluate the potential of oxidoreductases in functionalising fibres and in pulping processes.
- Development of bio-mechanical-chemical chip treatment for kraft production (**BioKraftPulp**) to improve the enzyme pre-treatment efficiency on wood chips in order to facilitate the delignification and to save chemicals in kraft pulping
- Optimisation of high-yield pulp refining for conventional TMP, CTMP and bio-HYPs to reduce production costs (**OpHYP**) for better development of fibre properties and electrical energy savings.

# BIOREFINERY AND FIBRE FUNCTIONALISATION

Global trends towards sustainable development have brought an increase in the use of lignocellulosic fibres and wood chemical components not only for the pulp and paper industry but also for other industrial sectors such as composite materials, pharmaceuticals, cosmetics, agro-foods, plastics, ... For all of these and for future uses, technical demands become more and more exacting.

Wood is a very abundant, renewable source of molecules and fibres to be upgraded for new applications in different industries.

These upgraded molecules are becoming attractive as substitutes for the fossil chemical molecules used today. Pulp producers wishing to maintain expertise and production in developed countries take the biorefinery concept more and more seriously. It is important to create new applications for lignocellulosic materials by manufacturing molecules of interest for different industrial sectors. Green chemistry seems to be entering a new era and will assist pulp producers by diversifying their markets.

Fibres are renewable, low-cost, and of low density. They are available in great quantity, are recyclable and present interesting properties which depend on the lignocellulosic materials they are extracted from. Modified, these fibres are suitable for introducing specially designed properties into new manufactured products. Providing lignocellulosic fibres with new functionalities can open the way to improving existing processes based on this raw material, or to generating new products.

Lignocellulosic fibre modification and the production of molecules from lignocellulosic materials will play key roles in the future growth of many industries calling for sustainable development.

For all of these reasons, **InTechFibres** is strengthening its efforts in this area, through the following projects:

- Functionalised fibres (**FunFibres**), will develop grafting techniques to be used at industrial scale in a water environment.
- Wood derivative materials, flexible supports for organic printed electronics (**CellOLED**), will expedite the use of lignocellulosics compounds in new applications such as conductive and light supports.
- To upgrade wood wastes from pulp mills, (**BioExtra**) will determine the potential of different wood residues from different wood species to produce bio-active substances for application in different industries.
- Hemicelluloses extracted from wood chips (**Hemicell**), will enhance paper properties by using these wood components as starch substitutes in paper manufacture.
- Micro/Nano fibrillated cellulose pulps (**NanoFibres**), will produce micro- and nano-fibrils from different cellulosic pulps in association with enzymatic treatment and/or refining.
- Glues from renewable resources (**Greenboard**), will be developed for the production of fibre/particleboards with low impact on health and the environment.

# NEW FIBRE TECHNOLOGIES

Lignocellulosic fibre characterisation is well known to provide increased knowledge of fibre properties, compositions, structures and ultrastructures. This knowledge is essential for using fibres in the manufacture of papers, boards and other wood-based materials such as composites. With better understanding of the impact of pulping processes on the fibre structure, it will be possible to analyse the potential of each fibre grade to be employed in existing and in future end-products.

Increased knowledge of the fibre potential will be obtained by developing specific treatments for fibres, sensors to characterise raw materials and their fibre components and by studying how fibres can be modified in existing processes for the development of new properties or new possible uses.

For these reasons, **InTechFibres** is studying different approaches and/or technologies, through the following projects:

- Nano-scale analysis of the bio-polymers of the plant cell walls (**Nanolysis**), in which different fibres, at different stages of the fibre separation process, will be analysed to understand the modifications of their characteristics while striving to optimise the processes so as to maintain the properties required.
- Real-time analysis of pulp flow will control pulp refining and mixtures composition (**PulpControl**) using fast measurements, to optimise the development of fibre characteristics and pulp properties and to reduce production costs.
- A tool enabling pulpmakers to take advantage of chips quality variations (**Chipsensor**), concerns the development of a new sensor to evaluate the quality of wood chips quality entering the process in order to better control the process variations.
- Technico-economical optimisation of tissue production (**OpTissue**) to improve tissue softness by studying the different fibre and process parameters.
- Development of eucalyptus chemical pulp potential by optimised refining (**EucaRef**), will include enzyme treatment and/or specific refining conditions.
- Use of new emerging technologies such as biotreatment, grafting or impregnation; and new components such as micro&nano fibrils or new raw materials; to get tissue softer and softer (**Tissue+**)

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# TO PARTICIPATE IN CTP RESEARCH

For *ideas which will make the difference in 2009*, contract possibilities are...

A **CTP *Innovation*** Contract will give papermaking groups, suppliers and end-users access to an entire Programme

It offers ...

- Active steering of the projects which most complement your work
- Results which may be transferred to all of your installations
- Access to all the results of the Programme
- Implication in project creation for each year's new Programme
- Participation in the annual Forum during which the year's results are presented by the scientists

A **CTP *OpenProject*** Contract is limited to active steering of the project

When included in a Programme, these projects are accessible independently to parties who have not signed a CTPi Contract

Original, **Private Projects** adapted to specific situations with individual priorities are possible for single parties or groups.

CTP and its network are a **research reserve** at your service.



The **contact list** provides the names of persons who will welcome your call and assist you in using...

CTP's expertise

to consolidate the present

to create the future