



Federal University of Viçosa



UFV Head Office

LCP

Lab Location

Brasil Map



Viçosa



Minas Gerais State (Southeast of Brazil)

Federal University of Viçosa



- Total Land : 473.423.666 m²
- 34 Departaments
- Staff: 2371
- Teachers: 822
- 61 Undergraduate Programs
- 34 Master Programs
- 20 Doctorate Programs

Source: UFV

Department of Forest Engineering



Teachers (32)

Undergraduate Program (350 students)

Master Program (62 students)

Ph.D. Program (47 students)

Pulp and Paper Laboratory (LCP)



www.lcp.ufv.br

LCP numbers

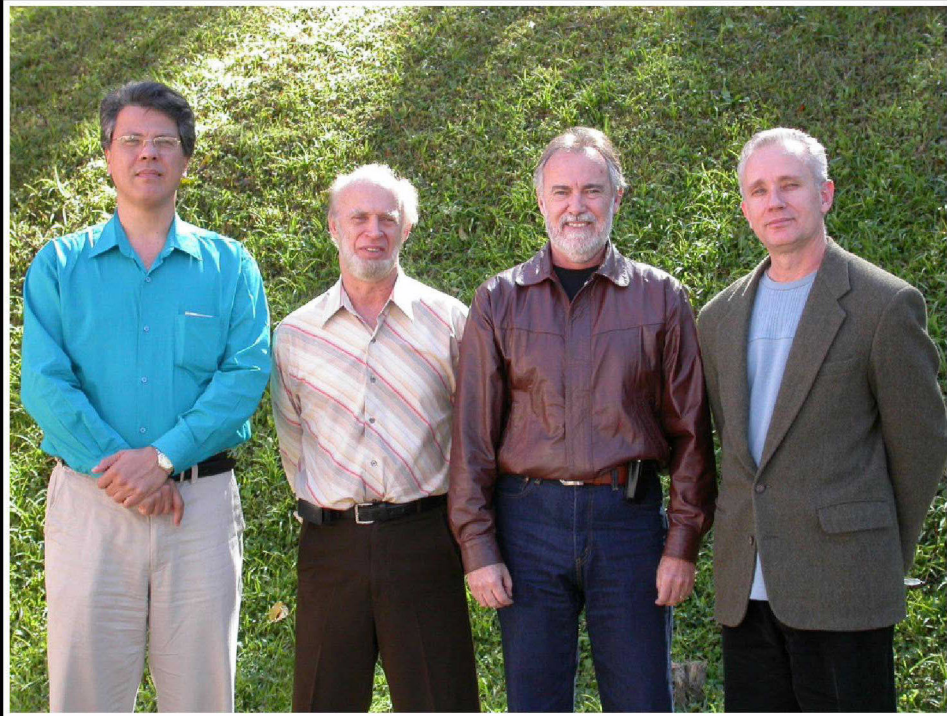
- ✓ Foundation: December, 2^{sd} 1970.
- ✓ In 35 years:
 - 51 M.S. dissertations
 - 10 Ph.D. thesis
 - 212 Specialization monographs (2002-2005)
 - 129 Specialization monographs (2007)
- ✓ In 1998, Pulp and Paper Laboratory was recognized as Excellence Center by the Brazilian Science and Technology Ministry.

LCP numbers

Funding:

- ✓ Federal University of Viçosa: 30%
- ✓ Central government agencies: 15%
(FINEP, CNPq, PRONEX, CAPES, etc.)
- ✓ State government agency: 15%
(FAPEMIG)
- ✓ Pulp and paper industries and suppliers: 40%

Professors



Prof. José Lívio Gomide

Pulping Technology

Prof. Jorge Luiz Colodette

Wood Chemistry and Bleaching
Technology

Prof. Rubens Chaves de Oliveira

Paper Technology

Prof. Cláudio Mudado Silva

Environmental Control

Prof. Ann H. Mounteer

Biotechnology

Prof. Alfredo Mokfienski

Chemical Recovery (Adjunct)

Laboratory Staff



26 employees

LCP objectives

✓ Teaching

Undergraduate Courses: 3

Graduate Courses: 10

Specialization courses: 12

✓ Research

✓ Technical services

✓ Consulting



Undergraduate courses*

- Pulping Technology
- Wood Chemistry
- Paper Technology

* Taught to Forest Engineering, Chemical Engineering and Chemistry Students

Graduate courses

- Wood Anatomy and Morphology
- Wood Chemistry
- Pulping Chemistry and Technology
- Bleaching Chemistry and Technology
- Paper Technology
- Paper Properties
- Environmental Control
- Kraft Recovery Cycle
- Biotechnology in Pulp & Paper Industry
- Special Topics
- Special Problems

Graduate program

Strictu Sensu

Degree	Hours	Months	Students
M.S.	360	24	7
P.M.	360	24	21
Ph.D	720	48	7

The Professional Master Program in Pulp and Paper Technology started in August, 2008 and has 21 students enrolled.

Lato Sensu

Degree: Specialist in Pulp & Paper Technology

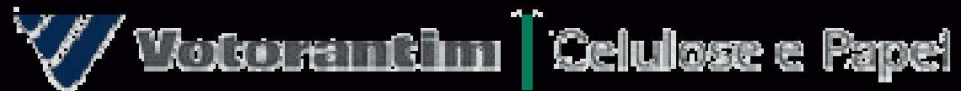
2001/2002 - 117 students

2003/2004 - 102 students

2004/2005 - 92 students

2005/2006 - 135 students

2006/2007 - 74 students



Laboratories

- Wood Preparation Room
- Wood Chemistry
- Pulping Chemistry
- Pulping Technology
- Bleaching Chemistry
- Bleaching Technology



Fields of Research

Wood Chemistry

✓ **Wood quality** - Eucalyptus clone selection focused on wood quality

- **Wood chemistry**

Lignin: Syringyl / guaiacyl ratios, free phenolics

Xylans: structure, uronic acids, acetyl groups, MW distribution

Celulose: MW distribution & cristalinity

Extractives: characterization for pitch problems and pulping hindrance

Wood Chemistry

- ✓ **Wood quality** - Eucalyptus clone selection focused on wood quality
- **NIRS Spectroscopy**
 - Sampling issues
 - Sample preparation
 - Prediction of important traits such as: wood density, lignin content, lignin S/G ratios.

Wood Chemistry



HPLC chromatographer

UV-Visible spectrophotometer



Pulping

- ✓ Non-wood pulping
- ✓ Wood behavior during pulping
- ✓ Pulp yield improvements
- ✓ Chip leaching
- ✓ Dissolving solids vs pulping yield
- ✓ NIRS spectroscopy



Pulping



Pilot scale
wood chipper,
30 inches disc,
3 knives,
2 screens



Pulping



Laboratory digesters
20L



Pulping



Lab plant for simulation
of modified cooking



Pulping



Laboratory
digesters
dual vessel high-
pressure cooker

Near infrared
spectroscopy (NIRS)
analyzer



Bleaching

- ✓ Pulp chemistry vs bleachability
- ✓ Pulping operation vs bleachability
- ✓ Bleaching vs pulp quality & ultra structure
- ✓ Hot acid and hot chlorine dioxide bleaching
- ✓ Color reversion
- ✓ Bleach plant closure
- ✓ ECF-light bleaching
- ✓ Catalyzed peroxide bleaching
- ✓ Enzymatic bleaching
- ✓ Mechanical pulp bleaching
- ✓ Secondary fiber bleaching

Bleaching



High intensity
mixer/reactor

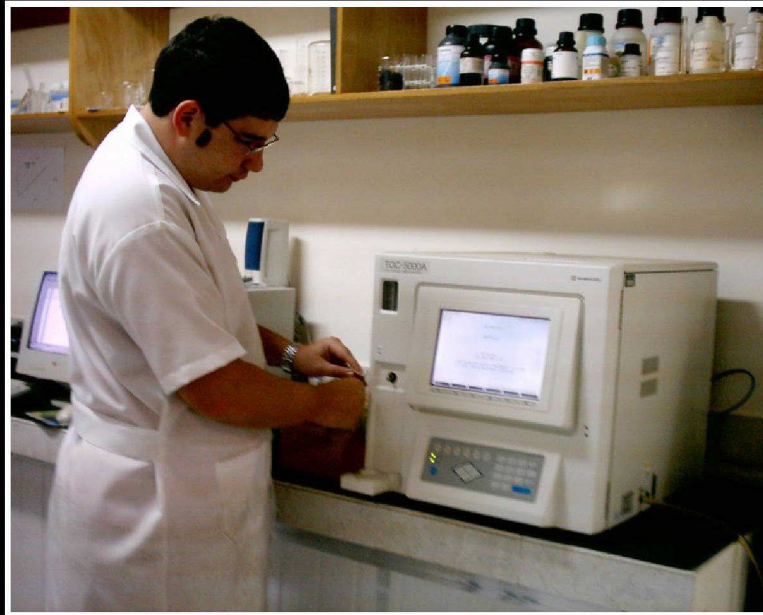
Ozone generator and
analyzer

+

High intensity
mixer/reactor



Bleaching



Total organic carbon (TOC) analyzer

Adsorbed organic halogen (AOX) analyzer



Bleaching



Atomic absorption
spectrophotometer

Paper

- ✓ Vessel picking
- ✓ Tailoring the pulp fiber in the forest
- ✓ Fiber recycling
- ✓ Novel alkaline paper sizes
- ✓ Novel techniques for strength evaluation
- ✓ Tissue paper properties
- ✓ Stick control in secondary fiber production
- ✓ Web strength improvement
- ✓ Natural colorant development
- ✓ Novel refining and drying techniques
- ✓ Fibers ionization by plasm techniques

Paper



PFI beater

Handsheet machine



Paper



Universal testing machine
is a computer controlled
electro-mechanical testing
system (tension and
compression tests)



Paper



Bursting strength tester,
laboratory fluter,
densometer type Gurley
(air permeance)

Color control
spectrophotometer



Paper



Sediment analyzer for
particle size and shape

Environmental control

- ✓ Membrane filtration and membrane biological reactors
- ✓ Water use minimization
- ✓ Utilization of effluents for forest irrigation
- ✓ Understanding activated sludge systems

Environmental control



Ultrafiltration plant

Activated sludge plant

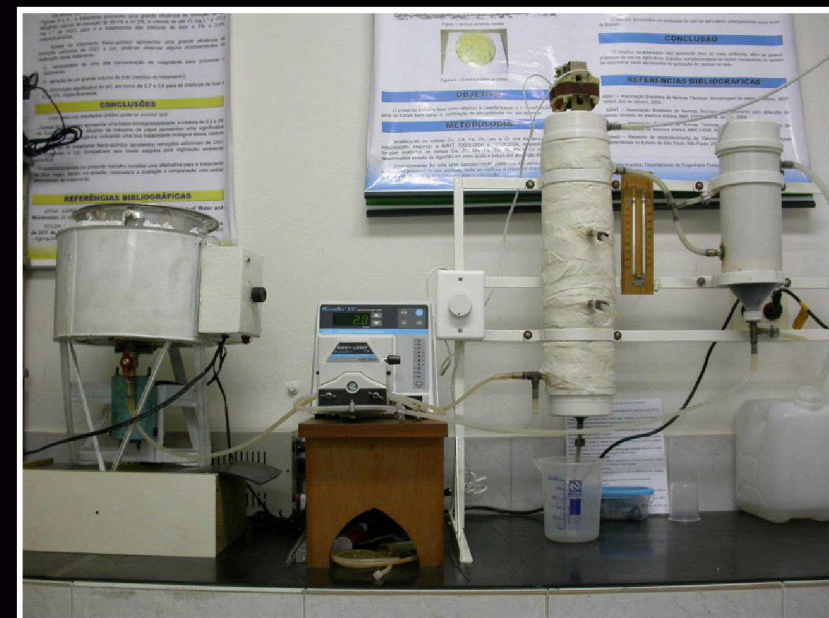


Environmental control



Aerobic membrane bioreactor

Anaerobic membrane bioreactor



TECHNOLOGY TRANSFER

- ✓ **Consulting:** Specific Problem Solving
- ✓ **Technology development:** Focused on New Ideas
- ✓ **Technical support:** Execution and/or Technical Advisory of Long Term Projects
- ✓ **Technical services:** Continuously per Request
- ✓ **Technical courses:** Continuously per Request
- ✓ **Publications**
- ✓ **Patents :** Licensing

COUNTRIES WHERE LCP HAS BEEN ACTIVE

- Courses, Publications, Conferences -

- USA
- Canada
- Finland
- Sweden
- Colombia
- Venezuela
- Uruguay
- Mexico
- Spain
- Chile
- Australia
- Portugal
- Argentina
- China
- India
- New Zealand

THE BRAZILIAN PULP & PAPER INDUSTRY

Brazil has a Pulp and Paper Vocation:

- ✓ Large Available Area for Reforestation
- ✓ The Highest Forest Annual Growth in the globe

INVESTMENTS: PULP & PAPER

2003/2006

US\$ 3.5 billions

2007

US\$ 3.0 billions

2008/2012

US\$ 7.9 billions

Total (2003/2012)

US\$ 14.4 billions

Source: BRACELPA