

Energy efficiency in the pulp and paper industry

OFATE Conference – Sept. 30th 2020

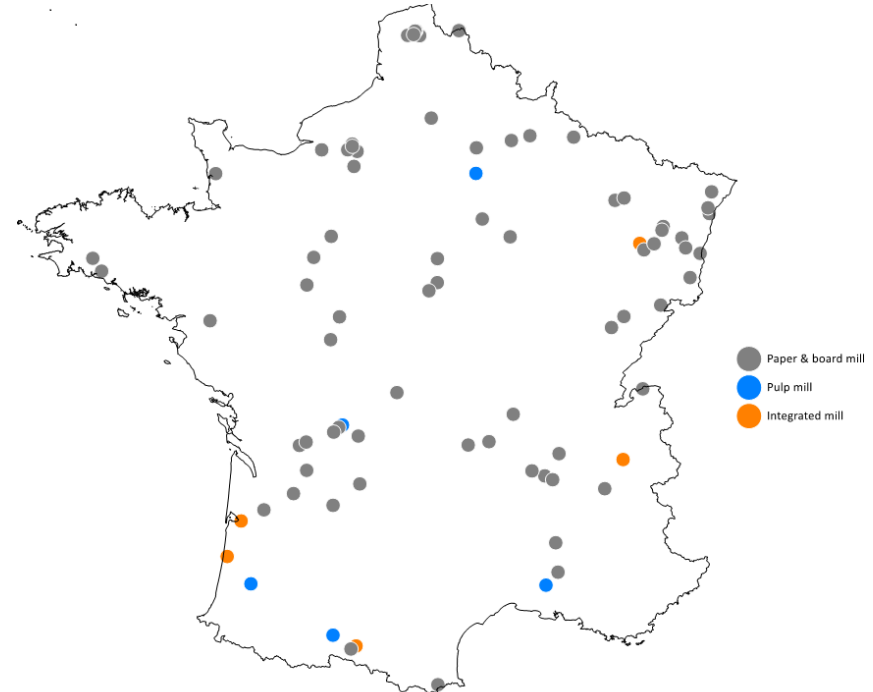
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□ COPACEL is a trade-union representing companies producing pulp, paper and cardboard, located in France

- 74 pulp and paper companies
- 83 industrial sites
- 130 paper machines
- 11 000 employees
- Turn over = 5,7 billions €
- Pulp and paper production in 2019 : 7.3 Mt

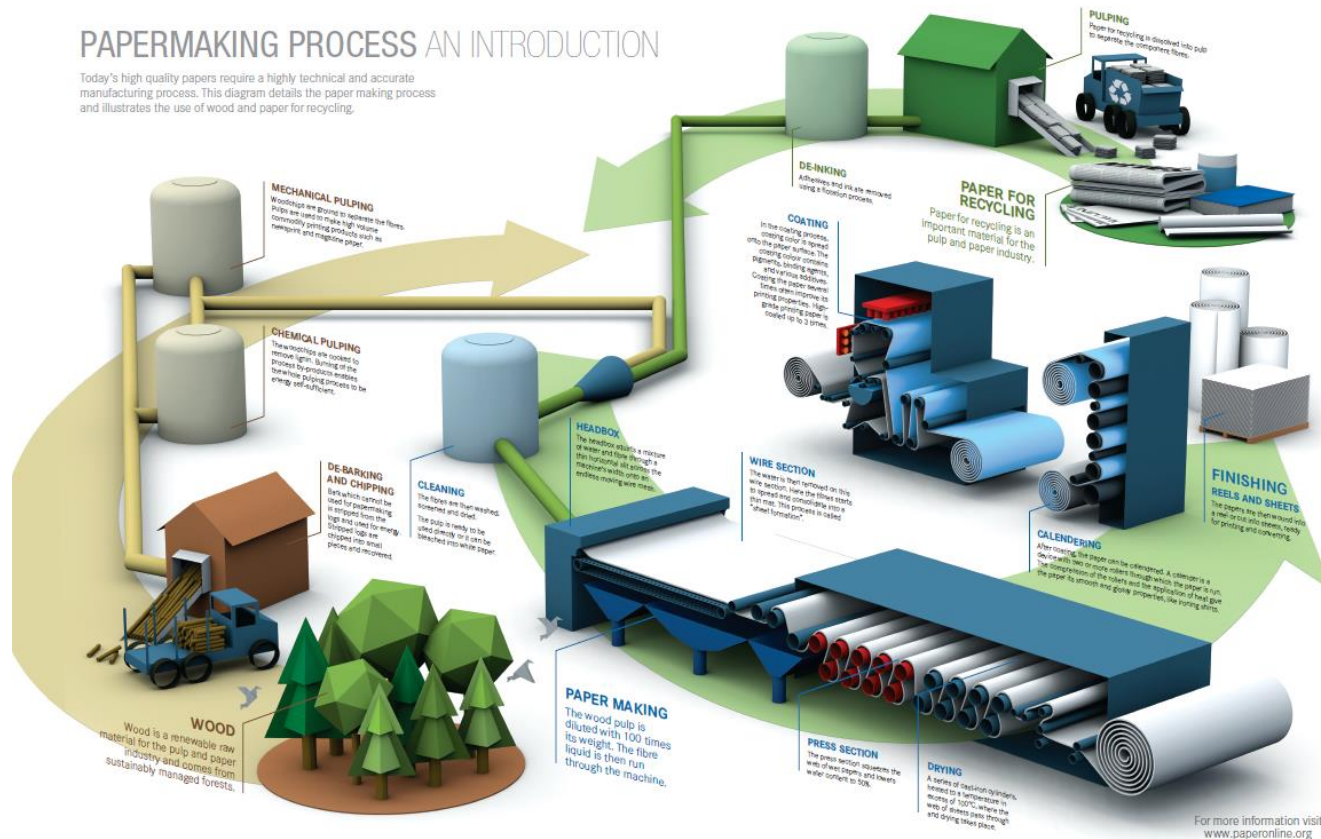


□ COPACEL missions

- Represents the pulp and paper industry vis a vis public authorities, regulators, etc.
- Supporting paper companies by providing them services such as statistics, regulatory affairs, information, etc.
- Promote good practices between paper companies, particularly in the field of safety, energy and environment

The pulp and paper industry is an energy-intensive sector

□ Main steps in the paper making process



Source : <http://www.paperonline.org>

- Electricity is mainly consumed by rotating machines for wood defibering, pumping, vacuum, paper making
- Heat is used for wood cooking, pulping or paper drying
- Overall, energy consumption represents from 15 % to 30 % of operating costs in pulp and paper processes

□ Paper machine



□ Paper rolls

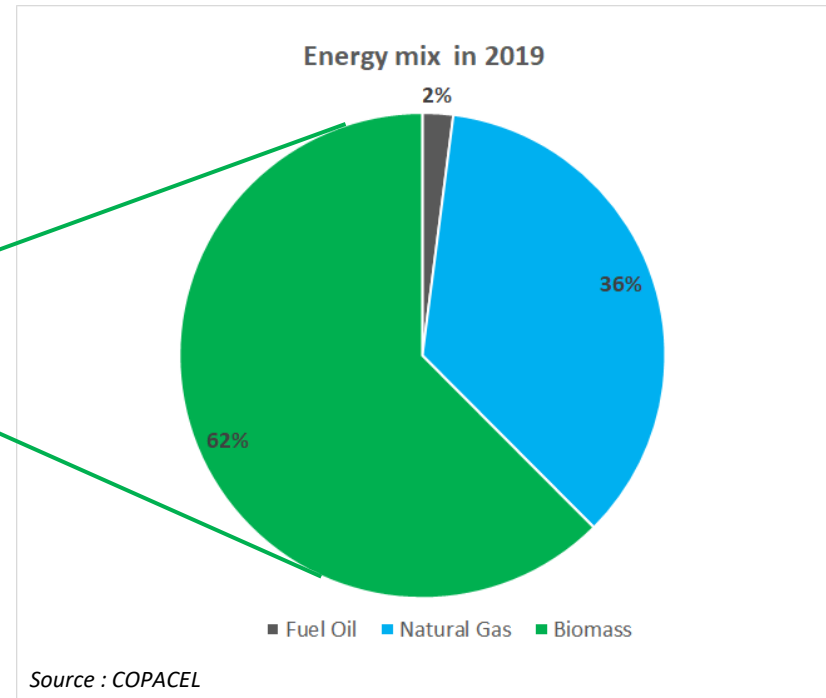


□ Energy mix in the pulp and paper industry

| COPACEL statistics | 2019 |
|----------------------------------|--------|
| # of sites | 83 |
| Heat consumption (GWh/yr) | 19 065 |
| Electricity consumption (GWh/yr) | 6 354 |
| Electricity production* (GWh/yr) | 1 417 |

* Electricity may be injected into the grid or self-consumed

Source : COPACEL



- Pulp and paper industry is largely decarbonized : heat is produced at mill sites mainly from biomass (62%), natural gas (36%) or fuel oil (<2%)
- Pulp and paper industry is a net consumer of electricity, largely purchased on the wholesale markets
- As a energy intensive industry, pulp and paper companies have continuously worked at improving process efficiency

How pulp and paper industry addresses energy efficiency issue ?

☐ CHP technology is a natural solution to improve energy efficiency

- It meets both electricity and heat needs in pulp and paper mills ;
- It exhibits efficient process integration with regard separate production of electricity and heat ;
- It allows primary energy savings of at least 10% ;
- Two types of CHP unit have been implemented : some use natural gas and other valorize biomass.

☐ CHP technology using biomass is widely spread in pulp and paper mills

- In the frame of the renewable energy policy, authorities set up calls for tenders (so called “CRE”) to subsidize high efficiency CHP projects through feed-in tariffs for renewable electricity production ;

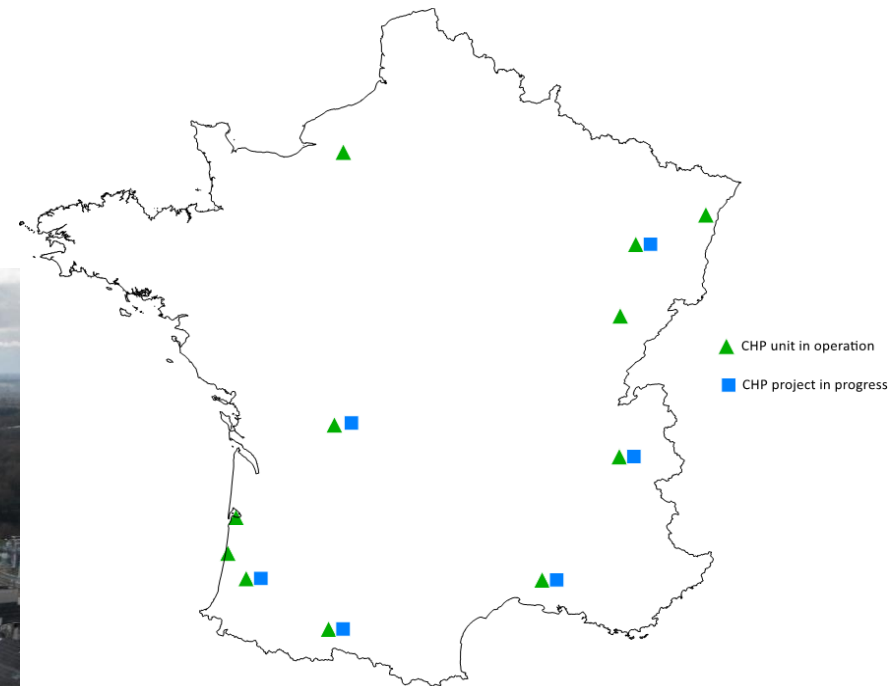
| | CRE 1 | CRE 2 | CRE 3 | CRE 4 | CRE 5 |
|---------------------------------|-------------|------------|------------|-------------|--------------------------|
| Call for tenders | 2003 | 2006 | 2009 | 2010 | 2016 - 2019 (3 calls) |
| Power production capacity | 12 MWe min. | 5 MWe min. | 3 Mwe min. | 12 MWe min. | From 0,3 to 25 Mwe |
| Feed-in tariff duration | 15 yr | 20 yr | 20 yr | 20 yr | 20 yr |
| Energy efficiency specification | - | 50% min. | 50% min. | 60% min. | 75% min. |
| Pulp and paper CHP projects | 5 | 2 | 0 | 2 | 7 |

Source : MTES

- Since 2003, 16 CHP plants in pulp and paper mills are being developed or are in operation both to improve heat production efficiency and to reduce carbon emissions.

□ Overview of CHP units using biomass

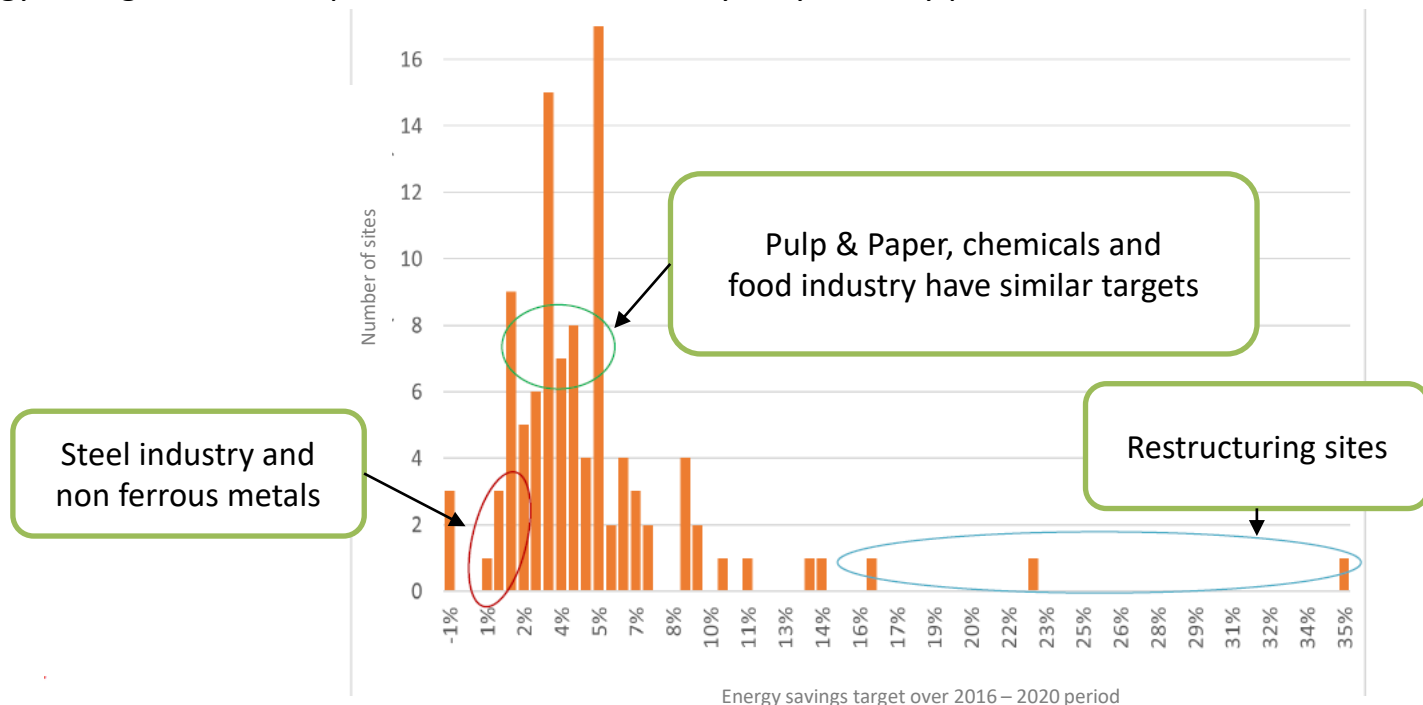
- Since 2003, total estimated investment in CHP units is above 1 billion euros
- 12 CHP units are in operation with “green power” production capacity of 250 MWe
- 5 CHP projects in progress and additional “green power” production capacity is 90 MWe by 2023



Source : COPACEL

□ Energy performance programs in energy intensive industries

- Regulations incentivize energy-intensive companies to perform energy performance plans
- Targets are defined on a 5 years period in the frame of energy audits by each company
- Energy savings and action plans are monitored on a yearly basis by public authorities



Source : ADEME

- Over the last 5 years, energy efficiency in the pulp and paper industry would have been reduced by 3 to 6%
- Energy efficiency improvements above 15% can only be achieved in the context of sites restructuring, requiring large capital investments with long pay back time

Can energy efficiency in the pulp and paper industry be further improved ?

- ❑ **Further energy savings based on operational excellence or existing technologies are rather limited**
 - Most of the mills already performed energy audits or have implemented Energy Management Systems;
 - Energy projects are regularly conducted to reduce energy consumption and improve productivity of existing processes through :
 - Automation and advanced process control implementation
 - Installation of motor drives
 - Replacement of motors or valves
 - Implementation of waste heat recovery solution...

- ❑ **Decrease in production volumes partly due to the health crisis, and implementation of decarbonation solutions, negatively impact energy efficiency**

- ❑ **Higher energy savings can only be achieved based on cross-cutting technologies**
 - Leveraging existing European solution providers expertise in the field of digital solutions, high temperature heat pump technology, or mild pulping process (deep eutectic solvent) ...
 - Promoting joint research and development programs
 - Financing or subsidize “first of its kind” projects

How to create a “stimulating environment” to develop breakthrough technologies and maintain industry competitiveness ?