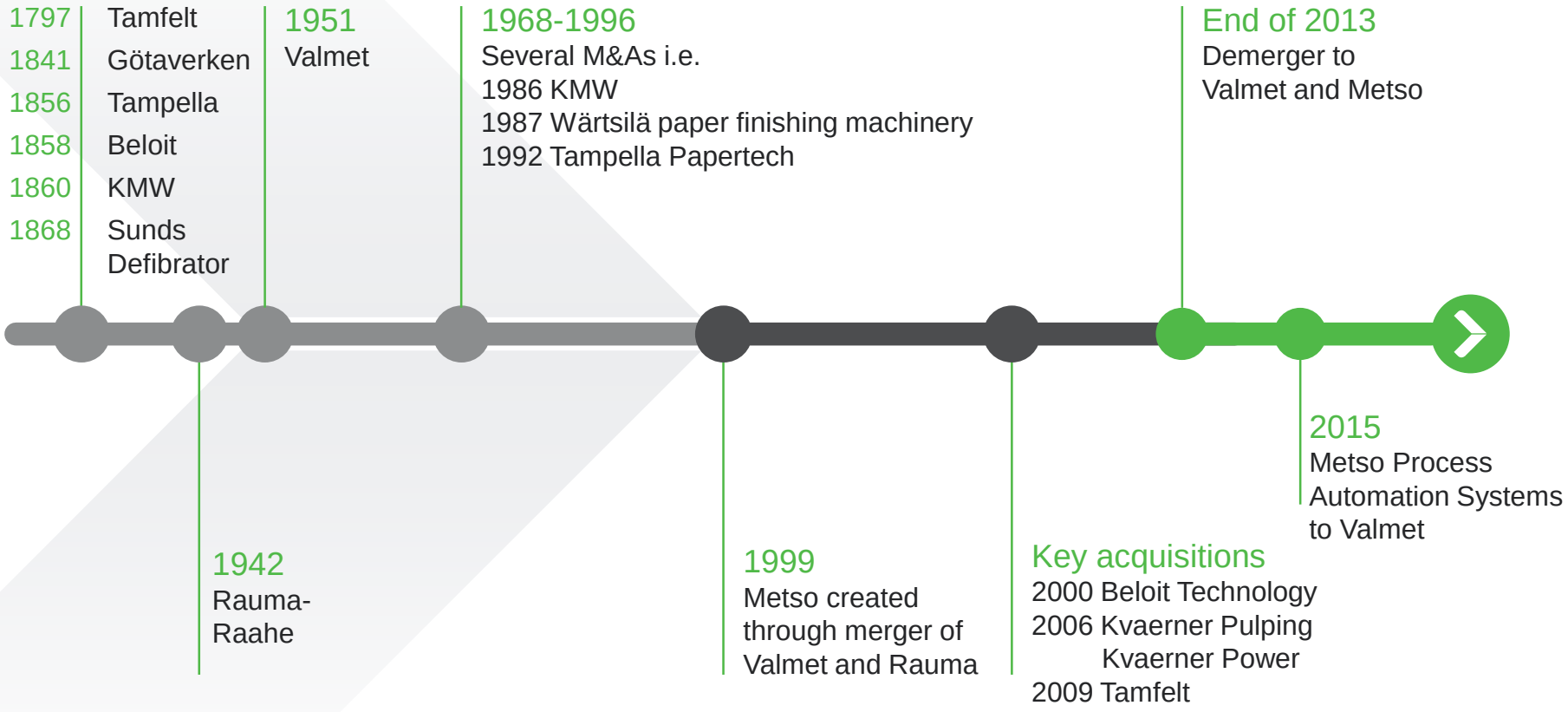
Valmet

Leading global developer and supplier of process technologies, automation and services for the pulp, paper and energy industries

Over 200 years of industrial history



Process technology, services and automation

Valmet's unique offering differentiates the company from its competitors

Valmet has the widest offering and leading market position in all markets

Pulp

Energy

Board

Tissue

Paper

Services

Automation

Significant, customer focused reasearch and development work

Focus areas

- Advanced and competitive technologies and services
- Raw material, water and energy efficiency
- Promotion of renewable materials

16
Research and development centers

EUR **59** million investment in R&D year 2015

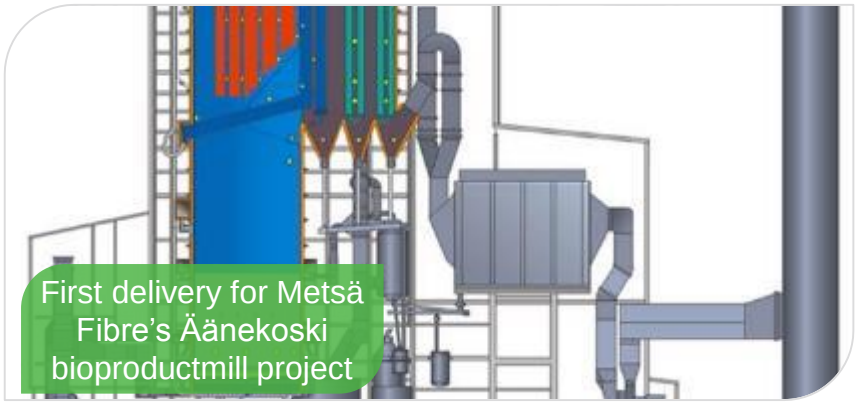
1,500
Protected inventions

Our new technologies have been successful in the markets

OptiConcept M board and paper machine

Advantage NTT tissue machine

High Power RECOX recovery boiler



Valmet IQ quality management solution

Key figures
2015

Orders received
EUR 2,878 million

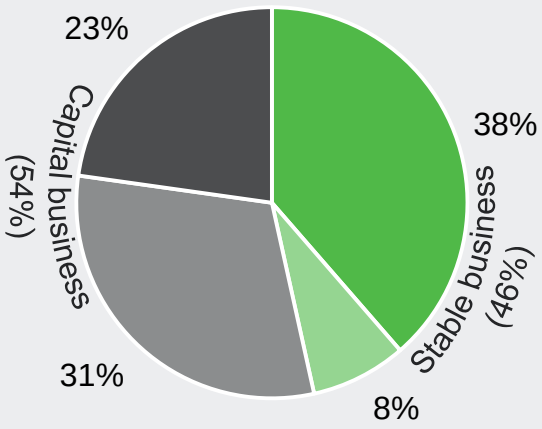
Net sales
EUR 2,928 million

EBITA[1]
EUR 182 million

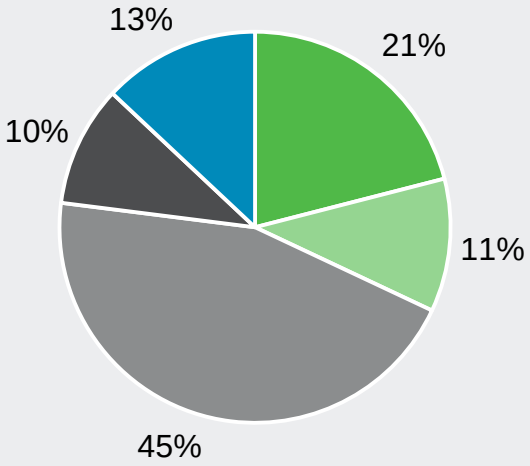
EBITA[1] margin
6.2%

Employees
12,306

Net sales by business line



Net sales by area



1) Before non-recurring items (NRI)
Stable business = Services and Automation business lines
Capital business = Pulp and Energy, and Paper business lines

How fibers to be treated to be suitable for further processing in board, paper and tissue mill?

Requirements for paper, board and tissue

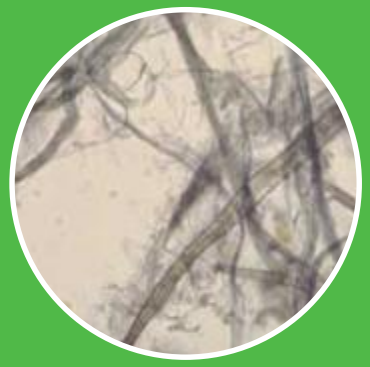
Extremely high number of different grades – every grade different requirement

Some examples:

- e.g. copy papers - high stiffness
- e.g. bag papers - high burst
- e.g. label and cooking papers - good smoothness
- e.g. folding boxboard or liquid packaging boards - high stiffness and good smoothness for printing
- e.g. toilet paper - high tensile strength for runnability, while good softness, absorbency in use, but not wet strength.
- e.g. kitchen towels – as previous, but also high wet strength.

What is needed?

FIBERS USED
(softwood, hardwood, recycled fiber with certain tensile, length, brightness, coarseness, fibers per gram, cleanliness, ash content, pH etc)

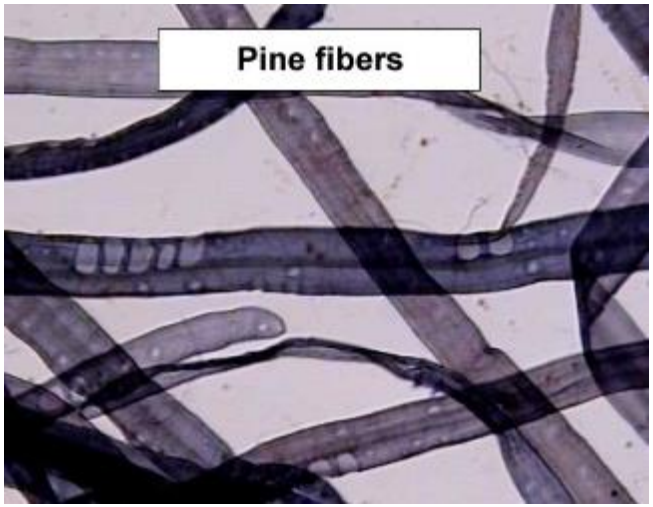


STOCK PREPARATION:
Mechanical treatment
and
Chemicals used

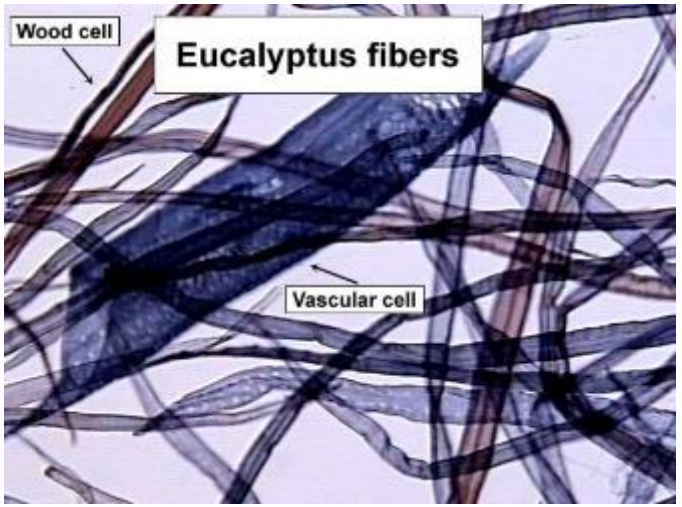
END PRODUCT
(tensile, burst, opacity, stiffness, softness, bulk, light scattering SCT, tear, smoothness, scott bond, dimension stability, dustless, etc)

Fibers are not suitable for paper making without further treatment...

- …because they don’t have bonding ability enough
- …because they are not flexible
- …because they are not given good printability
- …because they are not transparent
- …because they…



Gives strength



Gives printability and formation

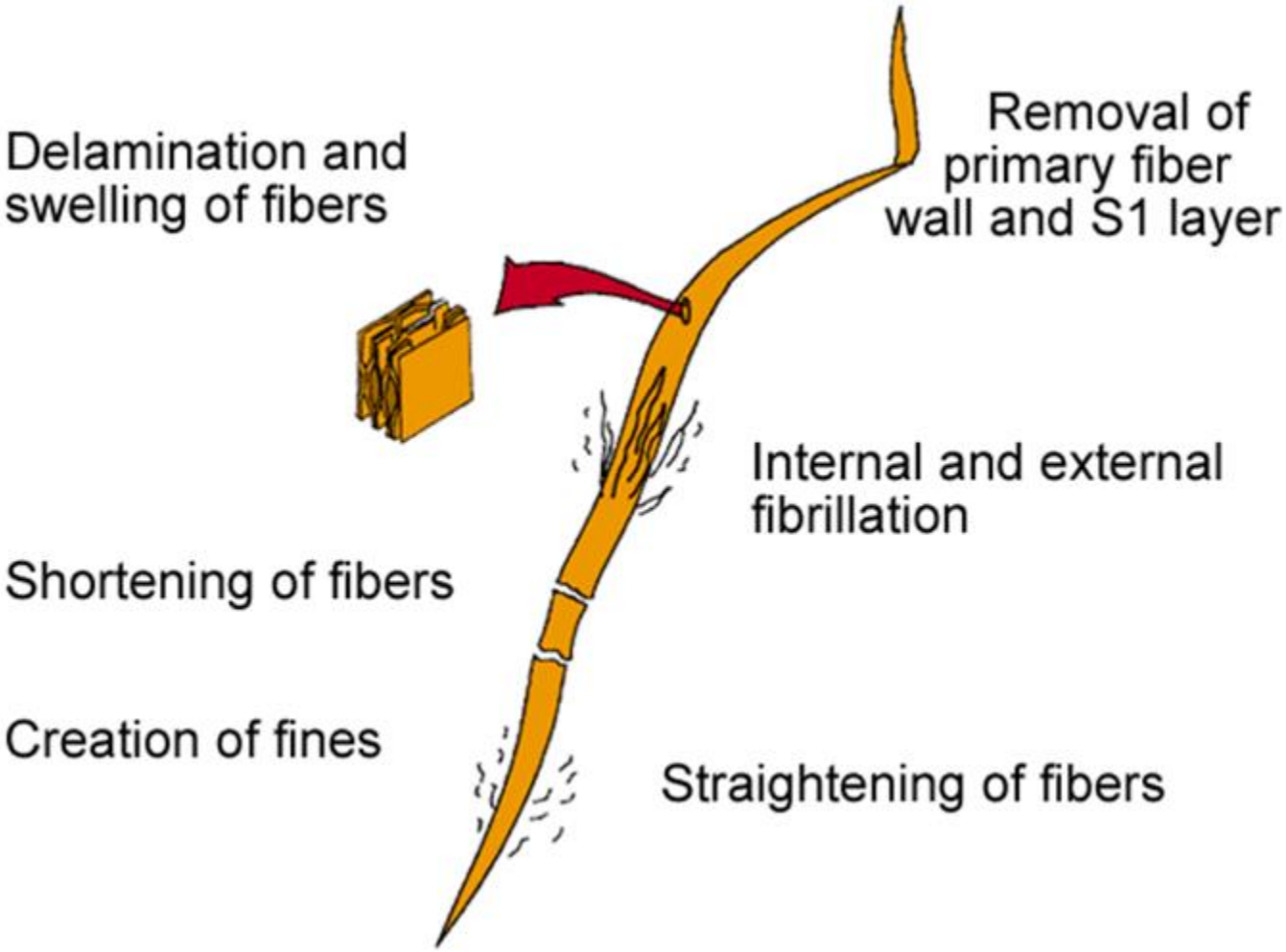
OLD PAPERMAKERS SAYING:

"PAPER IS MADE IN REFINING"

Préparation de la pâte à papier
Eugène NOACK 1947

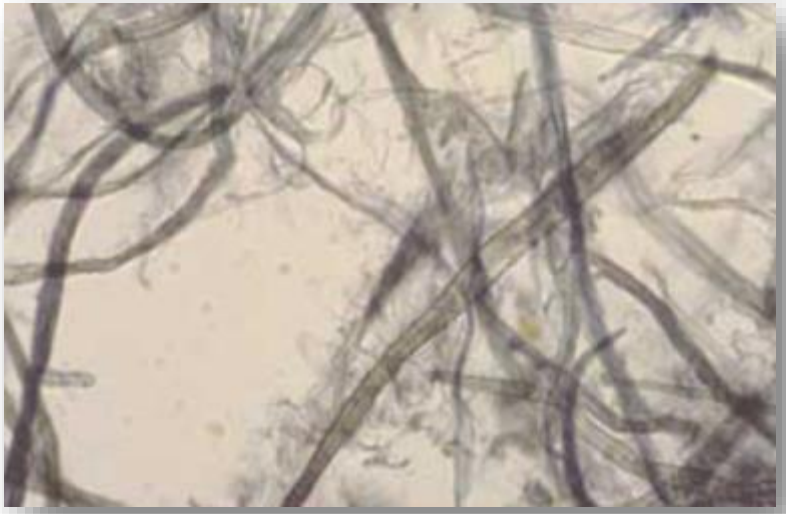
Refining is changing fibers mechanically

Effects of refining on fibers



What happens for fibers in refining?

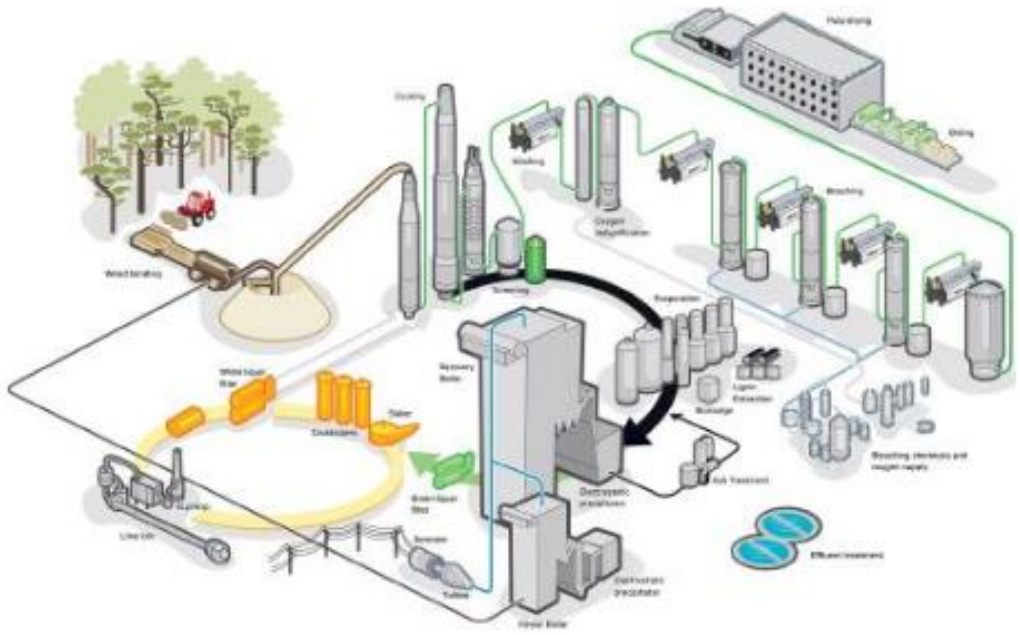
- Fibrillation of fibers:
  - Increase tensile and burst
  - More area for hydrogen bonds, so more difficult to get water out
- Delamination and swelling of fiber walls:
  - Tear strength is decreasing
  - Lower opacity
  - Lower stiffness
  - Reduced bulk
  - Lower dimension stability



- Generation of fines and removal of primary and S1 layer
  - Improved formation
  - Better printability
- Shortening i.e. cutting fibers
  - Improved formation
  - Better printability

OLD PAPERMAKERS SAYING:

"PAPER IS MADE IN REFINING" …



…BUT MAYBE NEW PAPERMAKERS WOULD LIKE TO ADD

"CHEMICALS GIVE FINE TUNING"

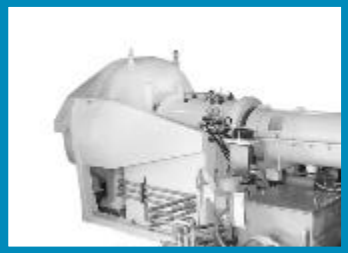
Chemicals used for treating fibers

- **Starch** for increasing tensile strength and reduce need of refining.
- **Coloring additives** gives desired color for end product.
- Different **fillers** (e.g. kaolin, talc, calcium carbonate or titanium dioxide) for improving opacity, printability, formation and economy.

- Latest development are **enzymes**.
- They generates external fibrillation i.e. improve strength of fibers.
- Enzymes are used rather widely in tissue

Valmet refining technology

New, reconditioned, overhauled machines as well as improvements



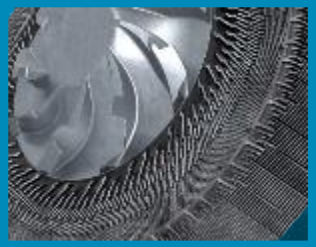
OptiFiner High Consistency

OptiFiner Disperger

OptiFiner Conflo

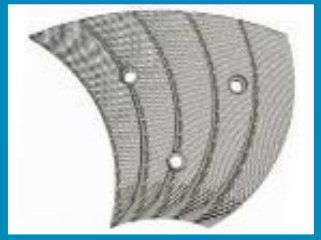
OptiFiner Pro

Refiner segments and fillings for all applications and manufacturers



High consistency segments

Low consistency fillings



Low consistency segments

Development and manufacturing

OptiFiner Conflo

- Six different size
  - Capacity with one unit 5….800 tpd
  - Motor power with one unit 90….2600 kW

- One single gap = excellent refining result
- Small diameter = low no load power
- Wide range of fillings, narrow bars from starting from 1,0 mm

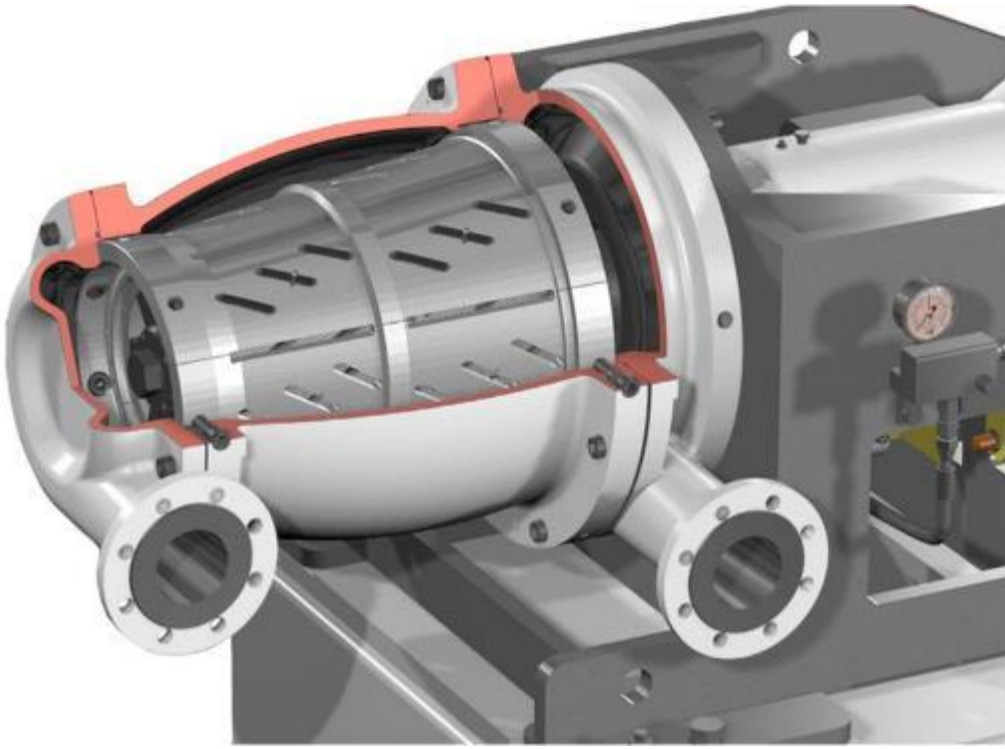
- Market share 36% in Europe = Valmet is clear market leader in low consistency refining.

New generation – OptiFiner Pro

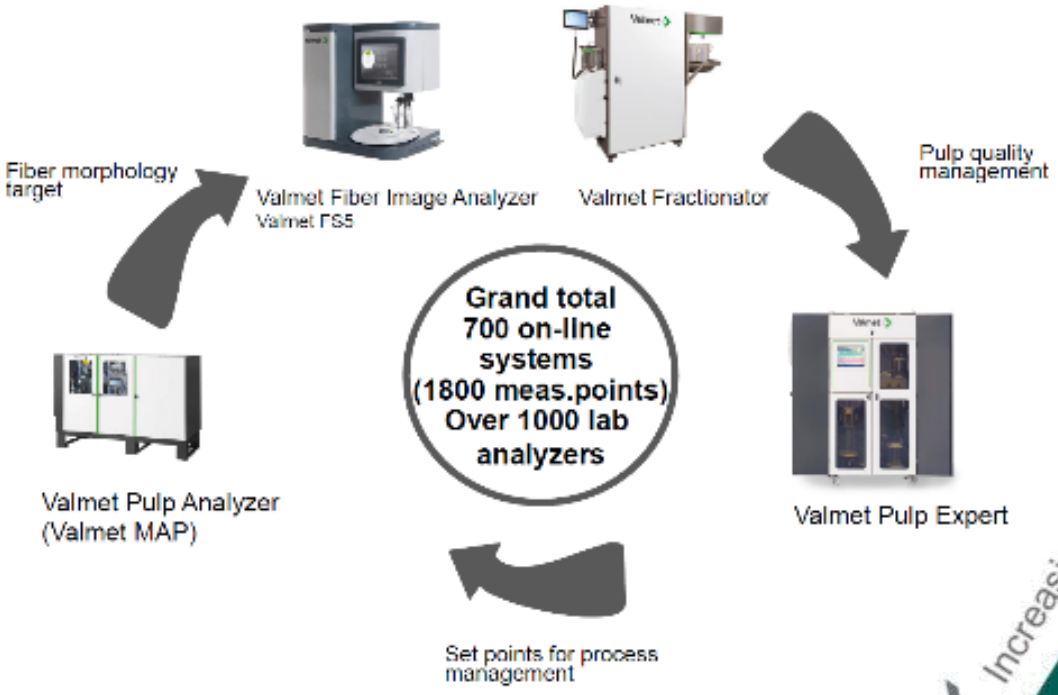
Two end feeding – flow through fillings

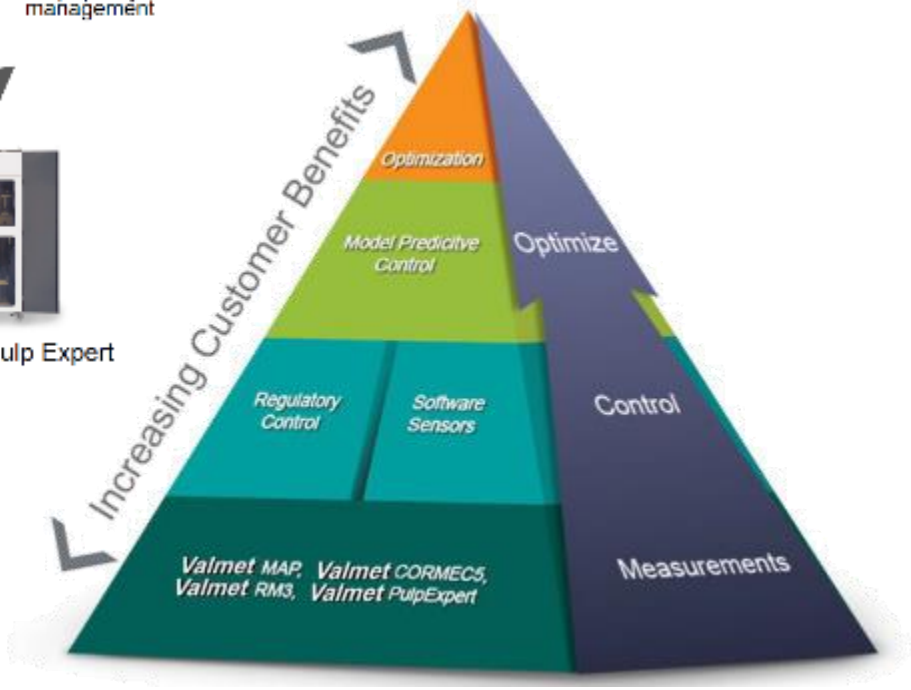
Winner of ATIP Innovation Award in 2012

- Proactive feed ensures equal fiber distribution to refining area
- Increases the number of fibers that receive proper refining treatment
- Even lower no load power than Conflo refiners
- High capacity through one unit
- Trials at Valmet Technology Center, Finland



Valmet automation solutions for refining





Recent Customer Highlights

Major pulp mill expansion

- SCA Graphic Sundsvall AB, Östrand
  - Production capacity increase from 430,000 tons to 900,000 tons per year
- Valmet delivered technology
  - Compact Cooking G2
  - TwinRoll press based fiber line for both ECF and TCF pulp production
  - Evaporation plant with a capacity of 1,150 tons of evaporated water per hour
- The total package is optimized for superior water and energy efficiency
- Start-up May 2018

SCA Graphic Sundsvall AB, Östrand, Sweden

Major pulp mill expansion

- CMPC Guaíba pulp mill second line
  - Annual production capacity 1.3 million tonnes of bleached eucalyptus market pulp
  - Addition to the old fiber line of 0.5 million tons
- Valmet delivered technology
  - Cooking plant and fiber line, pulp drying and baling
  - Chemical recovery with evaporation, power boiler, recovery boiler, causticizing and lime kiln
  - Non-condensable gas treatment system
- Valmet delivered automation system
  - Integrated Valmet DNA automation solution
  - Operator training simulator

CMPC Celulose Riograndense,
Guaíba II pulp mill,
Brazil

One of the World's Largest pulp mills

- The Suzano Maranhão pulp mill
  - Annual production capacity 1.5 million tons of bleached eucalyptus market pulp
- Valmet delivered complete pulp mill technology
  - Wood handling, cooking plant and fiber line, pulp drying and baling, evaporation, power boiler, recovery boiler, causticizing and lime kiln
- Valmet delivered mill wide automation system
  - Integrated mill wide DCS with 40,000 I/O's, QCS and Profilers
  - Web runnability monitoring and Condition monitoring

Suzano Papel e Celulose,
Imperatriz, Maranhão, Brazil

The project demonstrates our strong capabilities as full-scope supplier

The Biggest Soft Wood Pulp Mill in the World

- A softwood pulp mill for fully bleached pulp
- The mill is based on a standard Elemental Chlorine-Free (ECF) process
- Based on Valmet TwinRoll press technology
- Low water, energy and chemicals consumption

OJSC ILIM Group,
Bratsk, Russia

Worlds biggest CompactCooking G2 digester, capacity 800,000 tons per year

Pulp Mill with Low Environmental Impacts

- One of the largest pulping lines in the world
- State-of-the-art technology
- Ecologically friendly and odorless production
- One of the world's largest recovery boilers with 7,600 tons of dry solids capacity per day

Asia Symbol (Shandong), China

10-30% savings in energy, water and chemicals compared to an average modern pulp mill

Biomass based power boiler and automation solutions

- Biomass based combined heat and power plant
  - Valmet delivered HYBEX power boiler, flue-gas cleaning and fuel handling systems
  - Plant-wide Valmet's automation and information management system, BFB combustion optimizer and fuel handling controls
    - Fully integrated information management, environmental monitoring and reporting
- Results reached with Valmet DNA automation solution:
  - Efficient process control, reporting and communication
  - User-friendly interface enables efficient operations and quick decision making to maintenance needs

Dalkia, Facture power plant,

France

50 MW electricity and 74 MW process steam

Renewable Energy in Texas

Largest biomass BFB boiler in the world

Biomass fired power plant

- Bubbling fluidized bed (BFB) boiler plant fuelled by 100 percent non-merchantable wood
- Complete delivery with erected boiler island, flue gas cleaning system, automation and long-term service agreement

Key results

- Renewable power to 70,000 homes in Texas helps to reduce CO_2 emissions

Nacogdoches Generating Facility, Southern Company, Texas, USA

Project of the Year in 2012 in the Biomass category by Power Engineering Magazine.

Additional Revenue from Bio-oil Production

Fast pyrolysis of biomass integrated to a fluidized bed boiler

Production of bio-oil by pyrolysis from forest residue and other biomass

Renewable bio-oil production of 50,000 t per annum

Key results

- Results in significant reductions in CO_2 emissions
- Bio-oil can replace heavy fuel oil in heat and power generation and might be further refined to transportation fuel
- Integration provides maximum energy efficiency

Pyrolysis demonstration plant

Fortum, Joensuu, Finland

Production of Climate-friendly Bioethanol from Agricultural Waste

Second generation bioethanol produced from agricultural waste

Up to 1,000 tons of cellulose ethanol from around 4,500 tons of wheat straw

Key results

- Biofuel cuts CO_2 emissions by about 95% compared to fossil-based

Germany's largest second generation bioethanol plant

Clariant, Germany

Renewable fuel for over 1,000 cars running with 100% bioethanol


Valmet
FORWARD