ANDRITZ
Pulp & Paper

Fiber Technologies Division

Capabilities 2016

Fiber Technologies Division - Capabilities

Contents

- Global product group: Wood Processing
- Global product group: Fiberline
- Global product group: White Liquor Plant

Fiber Technologies Division

Overview

Offices	▪ ANDRITZ Oy (Kotka, Lahti and Savonlinna, Finland) ▪ ANDRITZ Inc. (Alpharetta, GA and Glens Falls, NY USA) ▪ ANDRITZ Ltd. (Lachine and Edmonton, Canada) ▪ ANDRITZ K.K. (Tokyo, Japan) ▪ ANDRITZ Brasil Ltda. (Curitiba, Brazil) ▪ ANDRITZ AB (Karlstad, Sweden) ▪ ANDRITZ (China) Ltd. (Foshan and Beijing, China) ▪ ANDRITZ TECHNOLOGIES Pvt. Ltd. (Chennai, India) ▪ Sales offices in Russia, Indonesia and Chile
Employees	▪ Approximately 320 worldwide

ANDRITZ
Pulp & Paper

Fiber Technologies Division

Global Product Group Wood Processing

Global Product Group Wood Processing

Contents

- Processes and products
- Advantages
- References
- Showcases

Global Product Group Wood Processing

Overview

Processes

Woodyard technology for the Pulp & Paper and Power industry

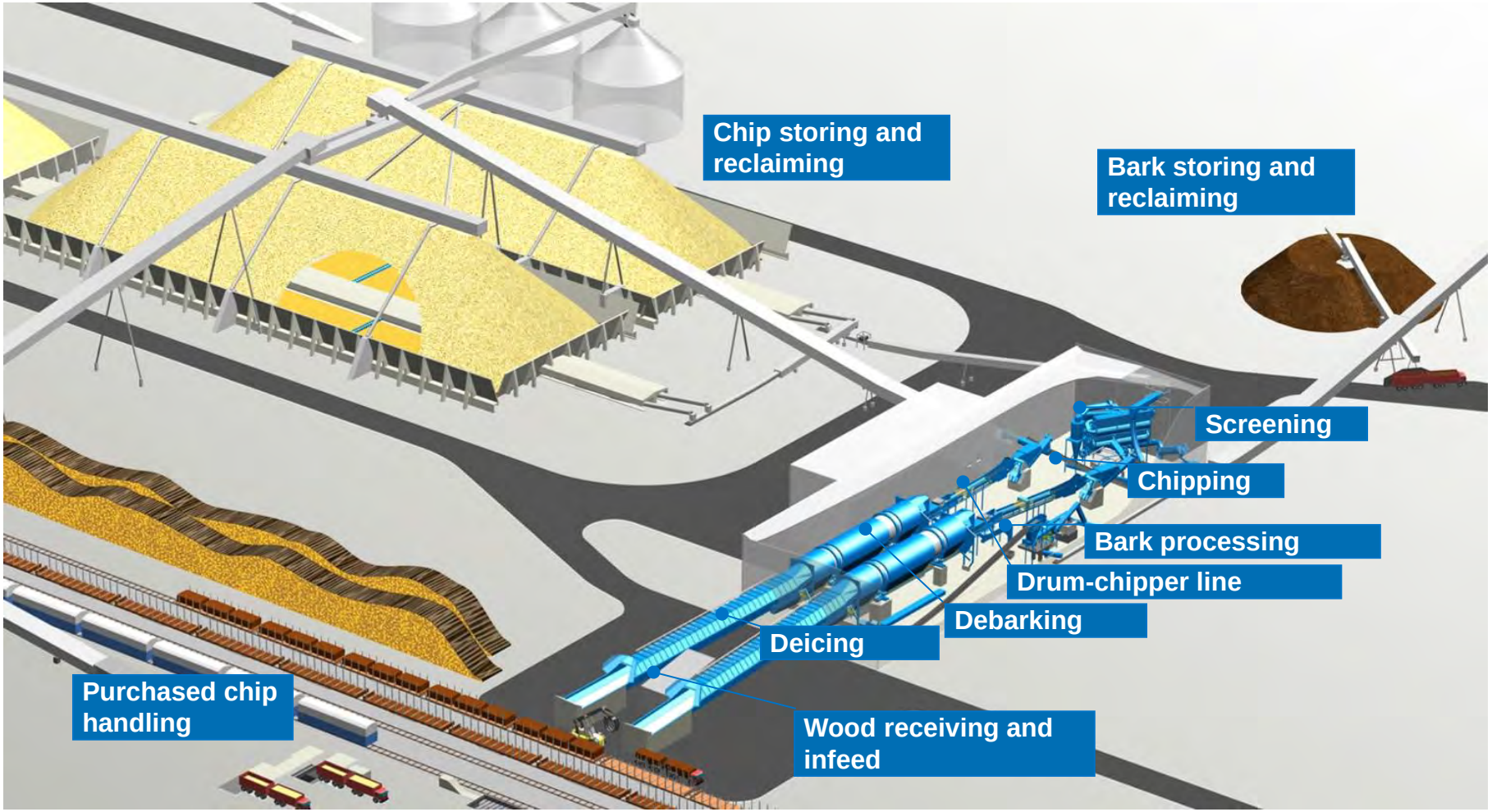
Wood infeed – Debarking – Drum-chipper line
Chipping – Chip storing & reclaiming – Chip screening
Bark processing – Grinder charging – Automation
Biofuel material handling - storing and reclaiming

Products

- Portal crane
- Wood infeed
- Debarking
- Drum-chipper line
- Chipping
- Chip storing and reclaiming
- Chip screening
- Bark processing
- Water treatment
- Grinder charging systems
- Automation
- Services

Modern woodyard process

Pulp quality starts in the woodyard



Wood processing products

Wood infeed – Debarking – Drum-chipper line

Wood infeed for constant infeed capacity and debarking degree	**Debarking** for desired debarking degree with minimum wood losses	**Drum-chipper line** for even log flow with effective impurity removal
▪ LogPorter portal crane ▪ PowerFeed drum infeed conveyor ▪ Conventional drum infeed conveyors ▪ Receiving and slashing decks ▪ Deicing on the conveyor	▪ Rubber tire supported drum ▪ Steel wheel supported drum ▪ Hydrostatic supported drum ▪ Large range of drum sizes with various infeed and discharge arrangements ▪ RotaBarker rotary debarker	▪ Drum discharge conveyor ▪ Roller conveyor with stone trap and washing station ▪ Effective removal of carry-over bark ▪ Metal and oversize log detection before the chipper

Wood processing products

Chipping – Chip storing & reclaiming – Chip screening

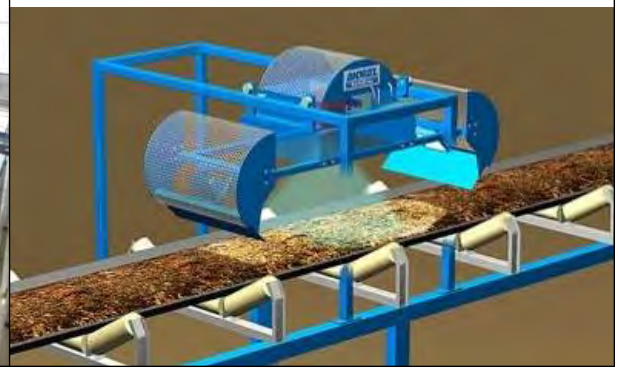
Chipping for maximum amount of accepted chips at high capacity	**Chip storing/reclaiming** for homogenous chip supply with first in – first out principle	**Chip screening** for more accepted chips to pulping with minimal fiber loss

▪ Chip quality is produced by the chipper
▪ Horizontal feed chippers
  ▪ HHQ-Chipper
▪ Gravity fed chippers
  ▪ HQ-Chipper
▪ TurnKnife systems
▪ Gentle side discharge
	▪ 360° stacker reclaimer
	▪ Slewing screw reclaimers
	  ▪ CenterScrew
	  ▪ PowerScrew
	▪ Traveling screw reclaimers
	  ▪ ParaScrew
	  ▪ CantiScrew
	▪ Chip silos or open storages
		▪ Gyratory screens for efficient fines and oversize separation
		▪ Thickness Screening with JetScreen or OPTI disc screens
		▪ Oversize and overthick chips transforming into accepts with HQ-Sizer or Chip Optimizer
		▪ Fines screening with Pocket Roll®

Wood processing products

Bark processing – Grinder charging – Automation

Bark processing for better bark quality for energy generation	**Grinder charging systems** for maximum grinder capacity and charging reliability	**Automation** for flexible, efficient and safe woodyard operation
▪ Bark shredding for optimum particle size ▪ Bark screening with disc screen for fine material to by-pass the shredder ▪ ANDRITZ drop fed and horizontal feed Crushers ▪ New HQ-Press	▪ Automated grinder charging and feeding systems for batch type grinders and for chain and high magazine grinders ▪ Automatic log sorting systems with LogScan ▪ Live Bottom Bins for log storage ▪ Drum-Type Log Aligners	▪ ChipperEKG condition monitoring system for chippers ▪ DebarkingACE for debarking process optimization ▪ BarkScan for wood loss measurement ▪ WoodScan for cleanliness degree measurement in debarking
		

Equipment and systems for biofuel handling

Material handling, storing and reclaiming

Material receiving

- Chain pockets
- Screw pockets
- Stocker reclaimer
- Truck dumper

Disc screen

Crushing

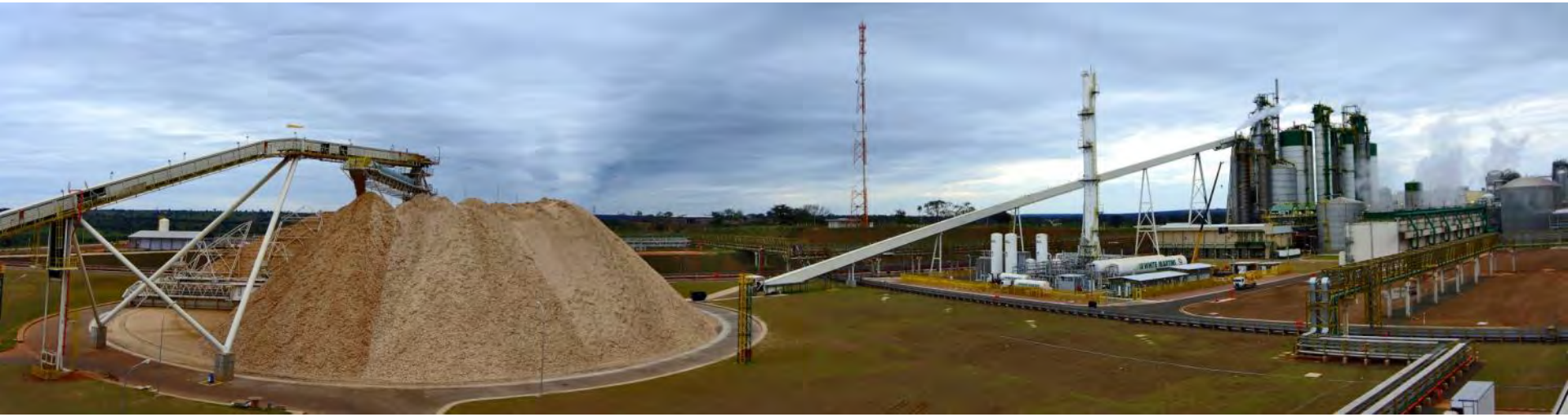
Storages & Reclaiming

- Round silos
- Linear storage
- Stocker silos
- Help silo
- Reclaimers

Conveyors

Wood processing

Advantages 1(2)



Uniform and high chip quality	Technology and services designed to provide the highest quality chips and the most effective utilization of expensive wood raw materials. Uniform chips lead to higher pulp quality (and paper/board/tissue quality) with increased production.
Proven process solutions	Comprehensive range of technically advanced products and more than 50 years' experience in supplying systems for all stages of wood, chip and bark processing operations.

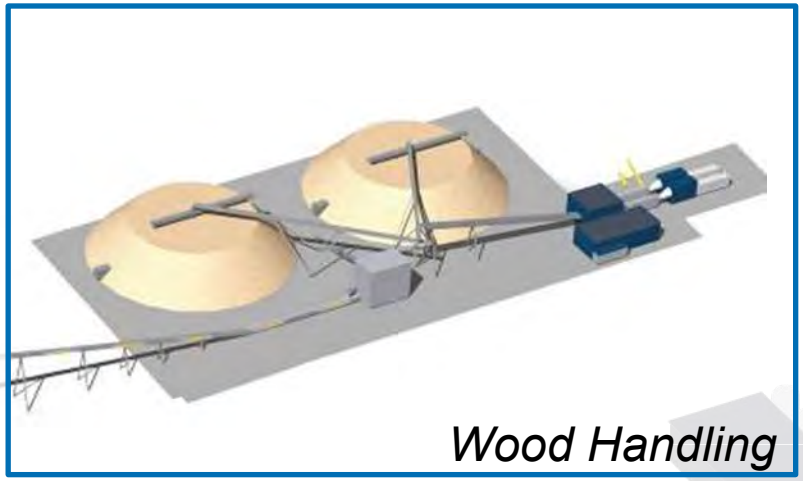
Wood processing

Advantages 2(2)

Systematic project execution	Active cooperation with customers – on time deliveries, smooth start-ups – shorten the investment payback time. On-site training ensures the best performance of the installation and gives high uptime.
Innovations through constant R&D	Goal is to create uncomplicated and straightforward production line configurations in close cooperation with customers. Recent R&D includes HHQ-Chipper, TurnKnife systems, JetScreen, HQ-Sizer, ScanChip analyzer, RotaBarker and 360° stacker reclaimer, and latest innovation HQ-Press for bark pressing.
Pioneer in woodyard automation	Process expertise and advanced control systems ensure smooth and efficient woodyard operation.

Pulp mill technologies

Innovations in Wood Handling



Wood Handling

Chipping line for woodyard

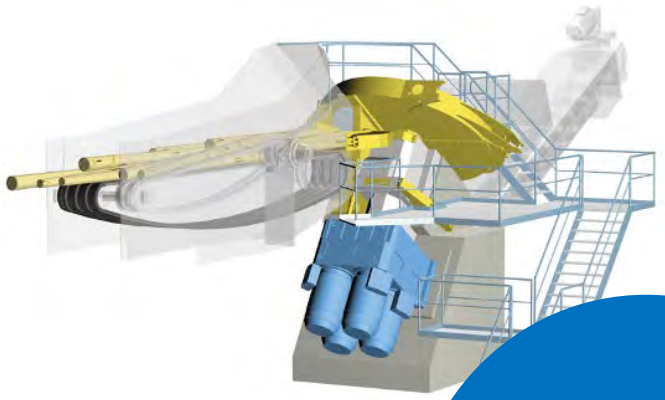
HHQ-Chipper EXL model – The world's biggest chipper

The Challenge:

Sustainable conversion of round wood into best possible chips at high capacity

Benefits & Features

- *Energy consumption reduced up to 30%.*
- *Superior chip quality: 1-2% increased cooking yield. Reduced Kappa variation and chemical consumption.*
- *1-2% increased woodyard fiber yield by minimum fines and pins generation.*
- *Advanced diagnostics and knife system services maintain high chip quality and availability.*



The ANDRITZ Solution:

ANDRITZ HHQ-Chipper, EXL model with 18-knives

ANDRITZ 360° stacker reclaimer

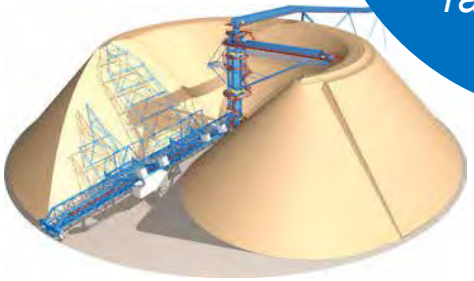
Homogenous chip supply to digester

The ANDRITZ Solution:
Unique chip storage and reclaiming system with a continuous 360° radial operation

The Challenge:
Securing continuous and homogenous chip supply to cooking process

Benefits & Features

- *Optimum cooking performance through homogenous and guaranteed continuous chip supply.*
- *Real FIFO chip pile management: blending feature reduces hourly chip moisture variations up to 30%.*
- *Minimal chip degradation for overall yield improvement.*
- *Feasible storage sizes up to 360,000 m^3*



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Increase energy value of bark in woodyard

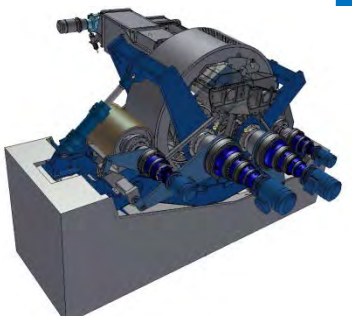
ANDRITZ HQ-Press – Maximizing the energy benefit of bark

The Challenge:

To gain maximum benefit from side streams in the debarking plant

Benefits & Features

- *5% increase in dry content of bark stream increases the net green energy value of the flow up to 15%.*
- *Advanced controls maximizes output efficiency in varying operational conditions.*
- *Significant reduction in odor and mold spores emitted into the environment.*



The ANDRITZ Solution:

HQ-Press

– The most economic way to drain bark

ANDRITZ Pulp & Paper

Recent major wood processing references

Year	Company	Country	Reference
2017	Sappi Skowhegan, Maine	USA	Debarking line
2017	GP Alabama River Cellulose	USA	Threelength logline
2017	Ilim Pulp Ustilimsk	Russia	Wooyard
2018	Chenming Shouguan Meilun	China	Chip handling with 2 x S/R
2018	SCA Östrand	Sweden	Woodyard
2017	MetsäFibre, Äänekoski	Finland	Woodyard
2016	Mondi, Richards Bay	South-Africa	Chipping line
2016	StoraEnso , Tiger	China	Woodyard for APMP plant
2016	Klabin S.A., Ortigueira Mill	Brazil	Woodyard (EPC)
2015	Asian Pulp and Paper, OKI	Indonesia	Woodyard equipment
2014	Rock Tenn Florence	USA	Woodyard with Circular Cranes (EPC)
2014	XuanYuan Ind. Development Co., Ltd. Dobrush	Belarus	Woodyard
2014	North Star Pulp Industrial Compl. LCC, Amazar	Russia	Woodyard
2014	China CAMC Engineering Co., Ltd. Svetlogorsk	Belarus	Woodyard
2013	Montes del Plata Co. Ltd.	Uruguay	Woodyard (EPC)
2013	Phoenix Pulp and Paper Co., Ltd.	Thailand	Woodyard
2012	Iggesund Workington UK	UK	Biomass handling for boiler
2012	StoraEnso Skoghall Mill	Sweden	Woodyard
2012	Eldorado Celulose e Papel Ltda	Brazil	Woodyard (EPC)
2012	Metsä-Botnia Joutseno Mill	Finland	Biomass handling for gasification
2012	EON Värme, Örebro	Sweden	Biomass handling
2011	Domsjö Fabriker AB	Sweden	Debarking line
2011	PT. TEL, Musi	Indonesia	RotaBarker™ debarking line
2011	CMPC Celulosa S.A., Santa Fe Mill	Chile	Debarking lines (2 pcs)
2011	CMPC Celulosa S.A., Santa Fe & Laja Mills	Chile	Biomass handling (2 pcs)
2011	Celulosa Arauco y Constitucion S.A., Nueva Aldea & Arauco Mills	Chile	Debarking lines (2 pcs)
2011	Chenming Zhanjiang	China	Woodyard

Woodyard

Showcase

UPM, Frey Bentos, Uruguay

Highlight

Designed specially for eucalyptus.

Start-up:	2007
Process:	Pulpwood
Capacity:	2 × 330 m³ sub/h

- Complete two-line chipping plant
- Efficient 3-stage log washing system
- Horizontally fed HHQ-Chippers for homogenous high-quality chips
- Chip storage utilizes the latest blending bed technology with a rotating stacker/reclaimer

Woodyard

Showcase

Stora Enso Varkaus, Finland

Highlight

Designed specially for cold climate conditions.

Start-up:	2007
Process:	Pulpwood / TMP
Capacity:	SW 350 m³ sob/h, HW 250 m³ sob/h
Wood species:	Pine, Birch, Spruce

- Two-line debarking plant with PowerFeed deicing conveyor
- JetScreen chip separation with air impulse based on chips size, thickness and chip density
- HHQ-Chippers
- ScanChip - Chip Quality Analyzer

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Woodyard

Showcase

Veracel Celulose S.A., Eunapolis, Brazil

Highlight

Chipping line designed specially for eucalyptus – First EXL-size HHQ-Chipper.

Start-up:	2009
Process:	Pulpwood
Capacity:	500 m³ sob/h
Wood species:	Forest-debarked eucalyptus

- The HHQ-Chipper, model EXL
  - disc diameter 3.87 m
  - equipped with 18 knives
- After Veracel's first unit,12 HHQ-EXL chippers has been sold

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Biomass handling

Showcase

CMPC Celulosa, Laja Mill, Chile

Highlight

Biomass preparation plant delivery from ANDRITZ.

Start-up: 2012

Scope of supply:

- Biomass receiving with truck dumper and receiving pockets
- Oversize scalping with shredder
- Stone removal and cleaning with JetScreen
- A-frame storage with two reclaimers

Fuel:

- Forest residues, bark, saw dust, roots, sludge

Gasification plant

Showcase

Metsä Fibre, Joutseno Mill, Finland

Highlight

Complete gasification plant delivery from ANDRITZ.

Start-up: 2012

Scope of supply:

- Biomass handling
- Biofuel feeding and ash handling
- Dryer
- Gasifier
- Lime kiln burner

Fuel: Bark

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Fiber Technologies Division

Global Product Group Fiberline

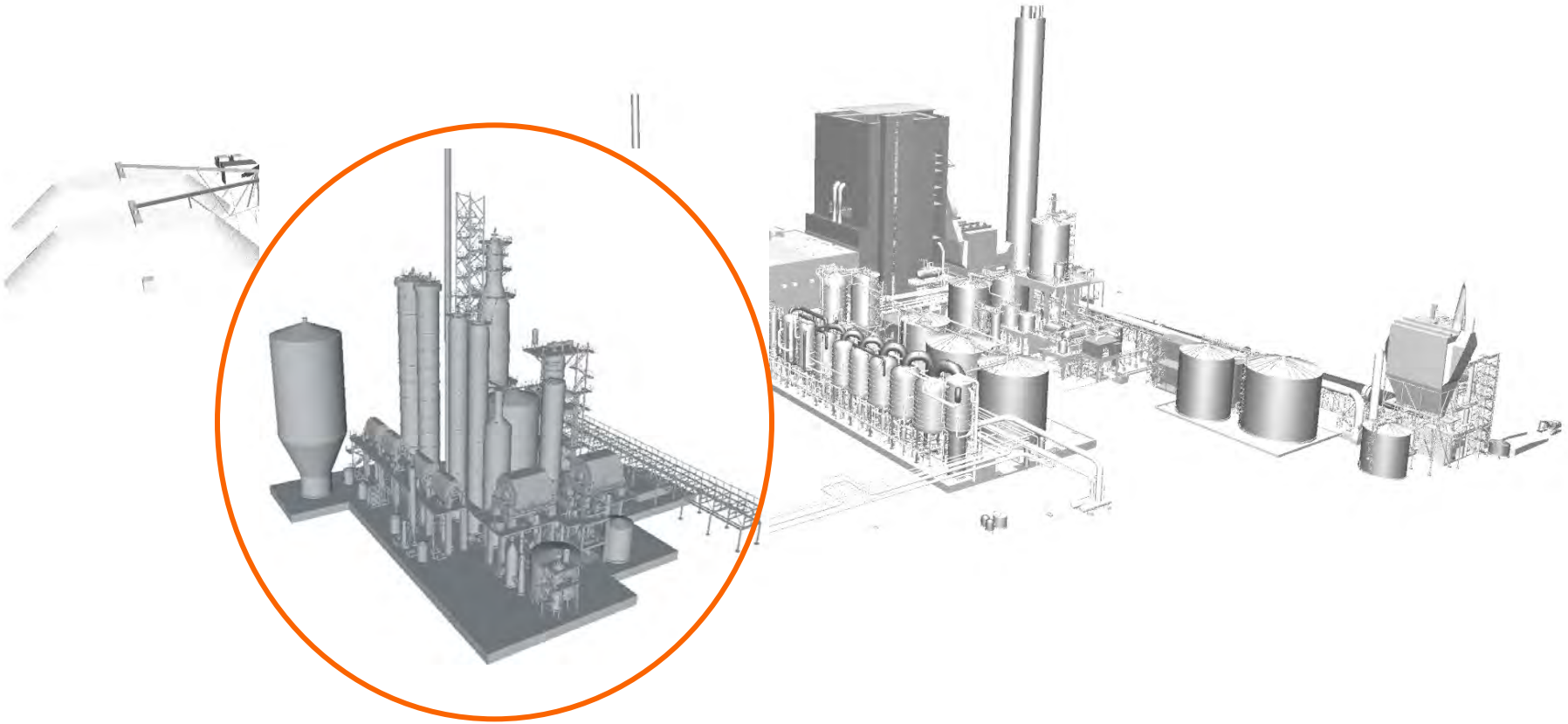
Global Product Group Fiberline

Contents

- Processes and products
- Advantages
- References
- Showcases

Complete Pulp Mill

Fiberline



Global Product Group Fiberline

Overview

Processes

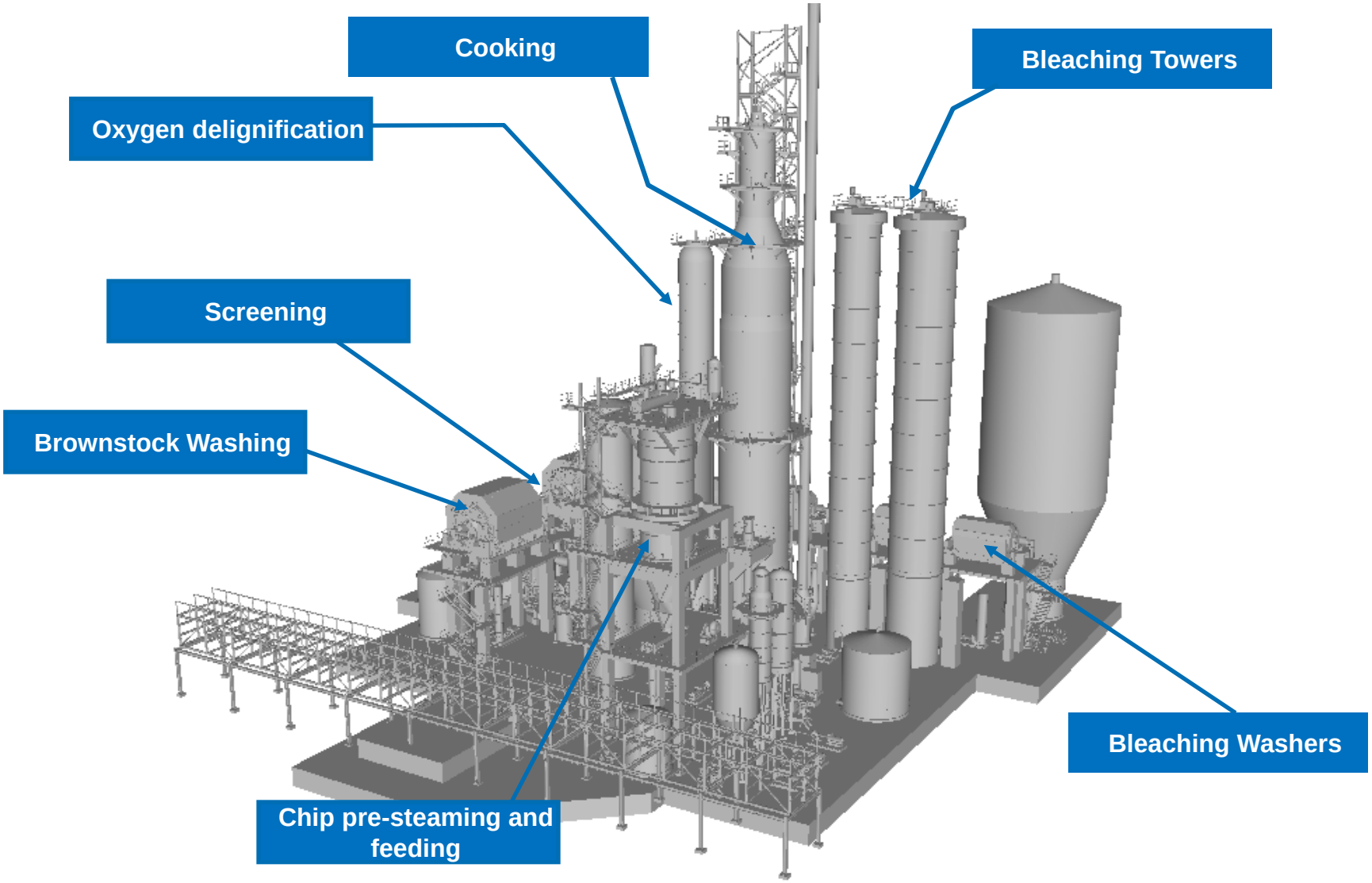
Fiberline equipment and systems for chemical pulp mills

- Cooking
  - Dissolving cooking with Pre-Hydrolysis Vessel (PHV)
  - Polysulfide cooking
- Washing
- Oxygen delignification
- Screening
- Bleaching
- MC Technology

Main products

- Lo-Solids concepts, DiamondBack chip bin and Turbofeed system in cooking process
- Drum Displacer (DD) washer in washing and bleaching processes
- CombiScreen FTK and knot/reject washer KW/KW-R in screening process

Fiberline processes



Cooking

Bringing out the potential in fibers

- Proven Lo-Solids concept
- State-of-the-art technology in innovative chip feed and cooking process:
  - DiamondBack chip bin
  - Turbofeed
  - Downflow Lo-Solids cooking concept
- Improvements in pulp strength, bleachability and yield for essential savings in the cost of overall fiberline operation.

Cooking

Polysulfide cooking process

Polysulfide cooking —
Higher pulp yield

- Polysulfide liquor (orange liquor) is used when cooking the wood chips
- The orange liquor is added to the impregnation stage in the beginning of the cooking process
- Polysulfide oxidizes the end groups of the hemicelluloses
  - Slows down the alkaline peeling reactions
  - Higher hemicellulose yield (specially glucomannan)

Cooking

Cooking process for dissolving pulp

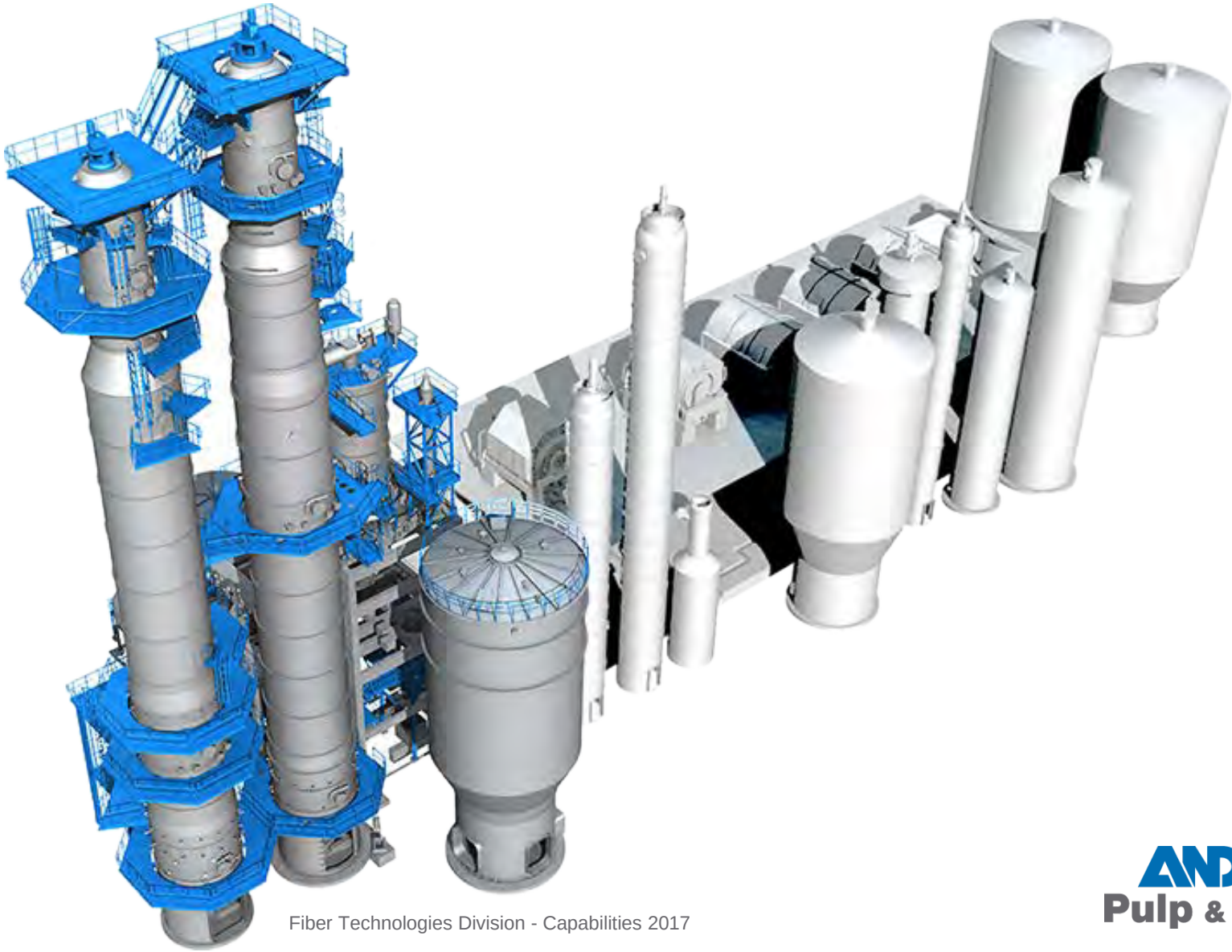
Dissolving pulp — Design can easily be retrofitted to existing installations

- Technology is based on long experience with chemical pulp fiberlines and intensive R&D on high alpha-cellulose dissolving pulp grades.
- The key to dissolving pulp production is efficient removal and recovery of hemi-cellulose from the fiber source.
- Cooking process is re-designed to include auto-hydrolysis for efficient hemi-cellulose removal
- The new pre-hydrolysis vessel (PHV) has been developed for cost-effective production of high quality pulp and valuable by-products.

ANDRITZ Pulp & Paper

Cooking

ANDRITZ dissolving cooking process



ANDRITZ Pulp & Paper

Washing

The key unit for superior performance in the fiberline

Drum Displacer washer — highest washing efficiency

- Contributes to the excellent overall economy experienced in ANDRITZ fiberlines
- Multi-stage operation for brownstock and post-oxygen washing
- Single-stage operation with fractionation of filtrates in bleaching
- The highest unit capacities – over 6,000 t/d with single equipment
- Minimum emissions

Oxygen delignification

Maximum delignification and high selectivity

- High degree of delignification is required to minimize the usage of chlorine-based chemicals in bleaching
- ANDRITZ is a pioneer in oxygen delignification having both single and two stage system depending on customer’s needs

Screening

Clean pulp with the best overall economy

- The optimization of the total fiberline economy assumes screen room location after the oxygen stage

- Screening equipment:
  - CombiScreen **FTK**
  - Knot/reject washer **KW/KW-R**
  - ModuScreen **FTF**
  - ModuScreen **FT**
  - ModuScreen **CT**
  - Sand removal cleaner **RB/SR**

Bleaching

Optimized solutions for individual needs

- Superior economy in bleaching — the flexibility to apply the most effective combination of chemicals and the optimum recirculation of Drum Displacer (DD) washer filtrate fractions.
- A combination of bleaching stages for improved efficiency (A/D, Z/D)
- A-stage for enhancing HW bleaching with reduced bleaching chemical need
- Use of Drum Displacer (DD) washer

Fiberline

Advantages 1(3)

Lo-Solids cooking concept – excellent brown stock quality	Diamondback chip bin together with Turbofeed feed system gives excellent presteaming and ease of operation. The Lo-Solids cooking process guarantees superior fiber properties, excellent bleachability and improved yield. The downflow mode provides simplicity and enables the highest production rates (over 6,000 t/d)
Polysulfide cooking – higher pulp yield	The process increases yield for the pulp producer – and improves pulp properties for papermakers. Polysulfide cooking improves several pulp properties: beatability, tensile strength, stiffness, and internal bond strength.

ANDRITZ Pulp & Paper

Fiberline

Advantages 2 (3)

Most efficient washing solutions – friendliness to the environment	Drum Displacer washers offer attractive washing solutions and superior washing results with the least number of washing equipment. The compact and closed systems eliminate air emissions to a minimum.
Extended oxygen delignification – extended savings in fiberline operations	Experience gained from 2-stage oxygen delignification processes since the late 80's has been the basis for continuous improvement of selective extended delignification processes. The unique MC machinery provides uniform and optimum process conditions. The efficient multi-stage drum displacer washer completes the delignification process.

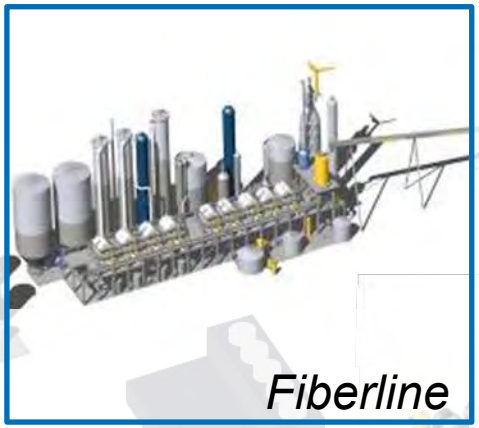
Fiberline

Advantages 3 (3)

Compact screening system – highest efficiencies	The ModuScreen product family provides the highest unit capacities in screening and offers simple screen room solutions. The combined knotter and primary screen FTK brings further simplification.
Innovative bleaching concepts – world records in performance	Latest bleaching innovations (such as the A-stage) and the efficient use of Drum Displacer washer filtrate fractions, boost the efficiency of bleaching systems and guarantee the lowest chemical consumption in bleaching. The world record of lowest chemical usage has been reached in a single-line bleach plant.

Pulp mill technologies

Innovations in Fiberline



Fiberline

Yield enhancement with ANDRITZ processes

A-Yield (Advanced pulp yield)

The ANDRITZ Solution:

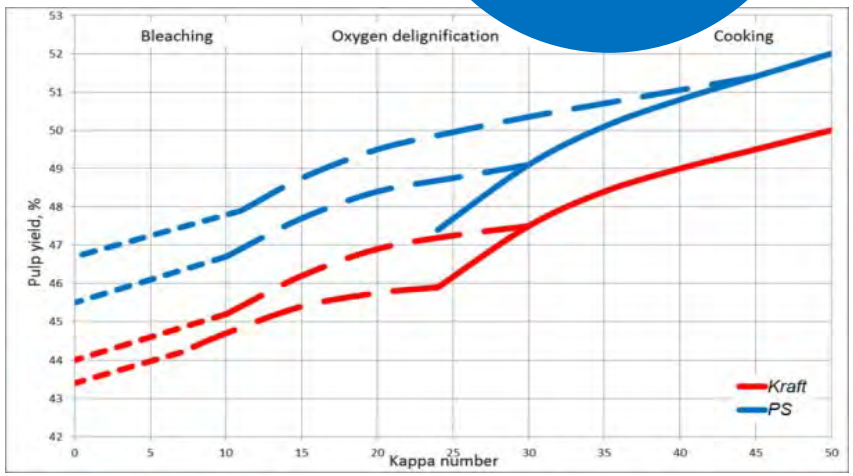
A-Yield concept for increased pulp yield

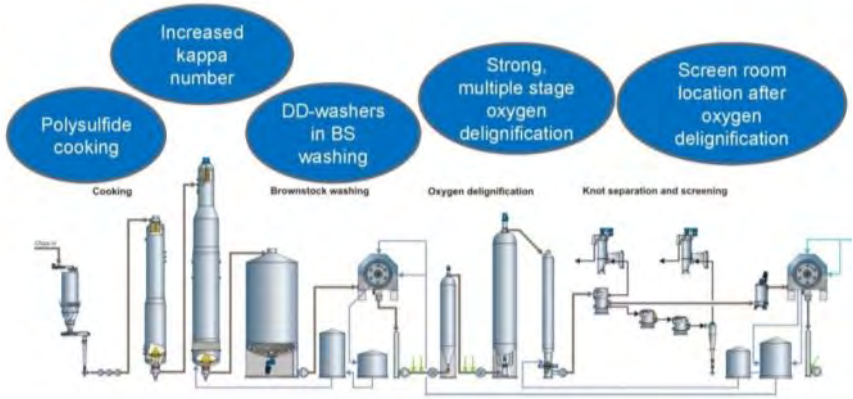
The Challenge:

More efficient utilization of wood raw material

Benefits & Features

- *Higher production rate if recovery boiler is the bottleneck.*
- *Polysulfide cooking: 1.5-2% unit yield increase with improved pulp properties.*
- *Increased kappa number in cooking (30 → 45+) gives 0.5-1.5% unit bleached yield increase.*
- *Screen room position after oxygen delignification with reject recirculation: yield increase 0.3-0.5% unit.*
- *2-4 % units higher bleached pulp yield achieved if all A-Yield processes are utilized.*





ANDRITZ Pulp & Paper

Dissolving pulp

Continuous cooking technology for flexible pulp production

The Challenge:

Production of dissolving pulp with a continuous digester

Benefits & Features

- *ANDRITZ pre-hydrolysis kraft continuous cooking technology: the cooking plant can swing between high-quality dissolving pulp and normal paper grade pulp.*
- *Continuous cooking for dissolving pulp production enables hydrolysate separation and refining to new bio-products.*
- *Several references and wide experience in continuous cooking of dissolving pulp!*

The ANDRITZ Solution:

By adding a PHV the line can swing between paper grade to dissolving pulp

ANDRITZ Pulp & Paper

Recent major fiberline references

Year	Company	Country	Systems/Equipment
2018	Chenming Shouguang, Meilun	China	Complete Fiberline
2017	Chenming Huanggang	China	Cooking plant to produce both kraft and dissolving pulp (includes pre-hydrolysis vessel)
2017	Fibria, Três Lagoas	Brazil	Complete Fiberline
2017	Metsä Fibre Äänekoski	Finland	Complete Fiberline
2016	Klabin S.A.	Brazil	Complete Fiberline
2016	Shandong Sun Honghe Paper Industry	China	Complete Fiberline (kraft and dissolving cooking)
2016	China CAMC Engineering Co., Ltd, Svetlogorsk	Belarus	Complete Fiberline
2016	North Star Pulp, Amazar	Russia	Complete Fiberline
2013	Montes del Plata	Uruguay	Complete Fiberline, EPC
2012	JK Paper Ltd., Rayagada	India	Complete Fiberline
2012	Eldorado Papel e Celulose Ltda.	Brazil	Complete Fiberline, EPC
2011	CMPC Celulosa, Santa Fe	Chile	Cooking, Washing, Bleaching (upgrade, EPC)
2011	Chenming Zhanjiang Pulp & Paper Co, Ltd.	China	Complete Fiberline
2009	Shandong Sun Paper Co. Ltd.	China	Complete Fiberline
2009	Mondi Syktyvkar Pulp and Papermill, Komi	Russia	Cooking, Washing and Bleaching (upgrade)
2009	Visy Pulp & Paper, Tumut	Australia	Cooking, Washing (upgrade)
2009	Fibria, Trés Lagoas	Brazil	Complete Fiberline, EPC
2008	Hunan Juntai Pulp & Paper Company	China	Complete Fiberline
2008	Sappi Saiccor (Pty) Ltd., Umkomaas	South-Africa	Complete Fiberline (excluding Cooking)

Dissolving pulp

Showcase

Sun Paper Industry Joint Stock Co., Ltd., Yanzhou, China

Highlight

First cooking pre-hydrolysis upgrade from ANDRITZ.

Start-up in October 2011

- ANDRITZ has re-designed the cooking process to include auto-hydrolysis for efficient hemi-cellulose removal.
- The new pre-hydrolysis vessel (PHV) was installed for cost-effective production of high quality pulp and valuable by-products.
- Dissolving pulp quality and operation of the process and equipment has fulfilled customer’s expectations

ANDRITZ Polysulfide cooking and Moxy plant

Showcase

Metsä Fibre, Joutseno Mill, Finland

Highlight

World’s largest single polysulfide cooking line.

Start-up: May 2013

- ANDRITZ provided technology for the preparation of polysulfide, and the digester modifications to enable production of the improved softwood pulp.
- The polysulfide process modifies conventional white cooking liquor to “orange liquor” by oxidizing sodium sulfide in the liquor to polysulfide.

Fiberline modernization

Showcase

Stora Enso Skoghall mill, Sweden

Highlight

Modernization project to achieve better pulp quality, capacity increase and lower maintenance costs.

Start-up of the modernization projects: 2014

Fiberline modernization, scope of supply:

- Cooking upgrade with TurboFeed system
- Screen room upgrade
- New DD washers (2 pcs)
- Engineering package

Fiberline modernization

Showcase

Stora Enso Oulu mill, Finland

Highlight

To improve operational cost efficiency by increasing energy efficiency and reducing chemical consumption.

Start-up in two phases - 2014 and 2015

Scope of supply:

- Cooking upgrade with a new Help pre-steaming chip silo
- New bleaching stage with a drum displacer washer

Greenfield pulp mill

Showcase

Huanggang Chenming, China

Highlight

Confirms ANDRITZ's leading global position in continuous cooking technology suited for flexible pulp production

- Start-up is scheduled for Nov. 2017

Scope of supply:

- Cooking plant including pre-hydrolysis vessel
  - → to produce both softwood kraft pulp for paper grades and dissolving pulp for textiles and industrial applications.
- Equipment for handling non-condensible gases in order to eliminate odorous emissions in the mill.

ANDRITZ
Pulp & Paper

Fiber Technologies Division

Global Product Group White Liquor Plant

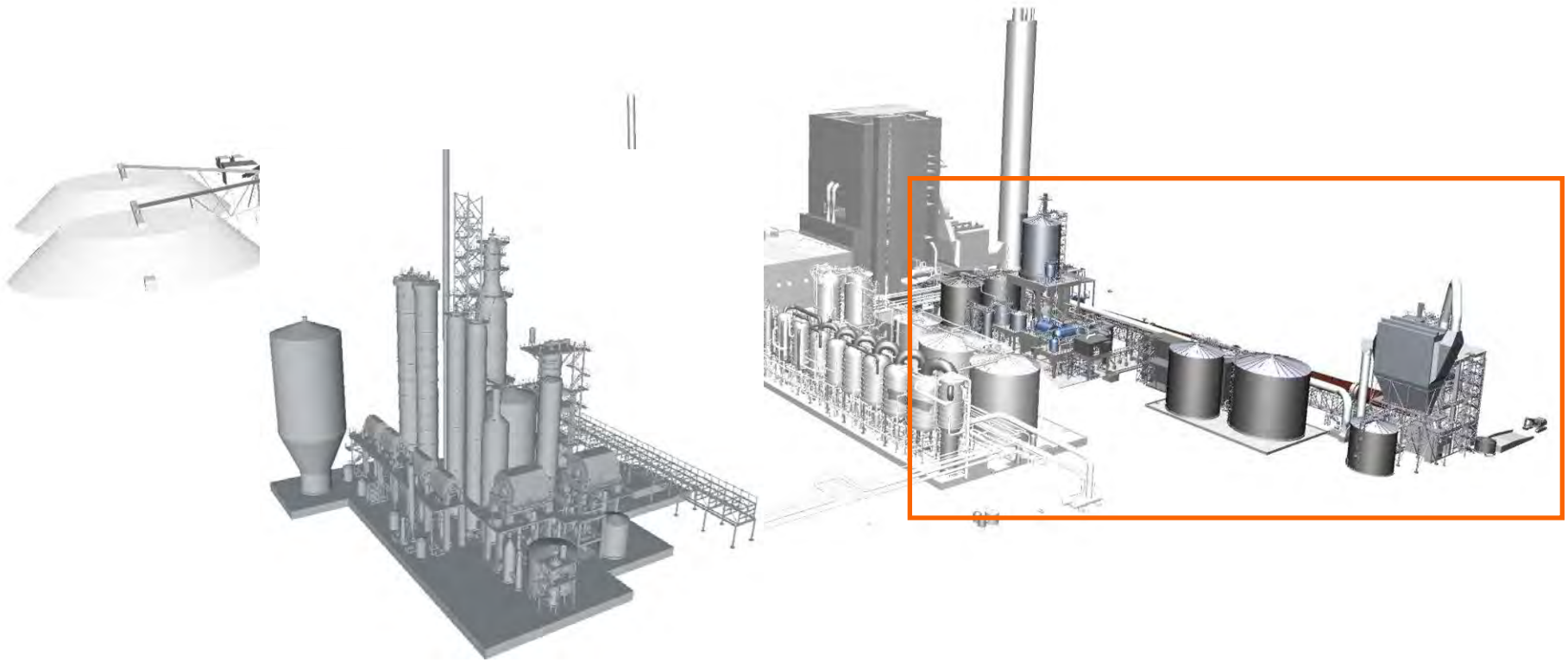
White Liquor Plant

Contents

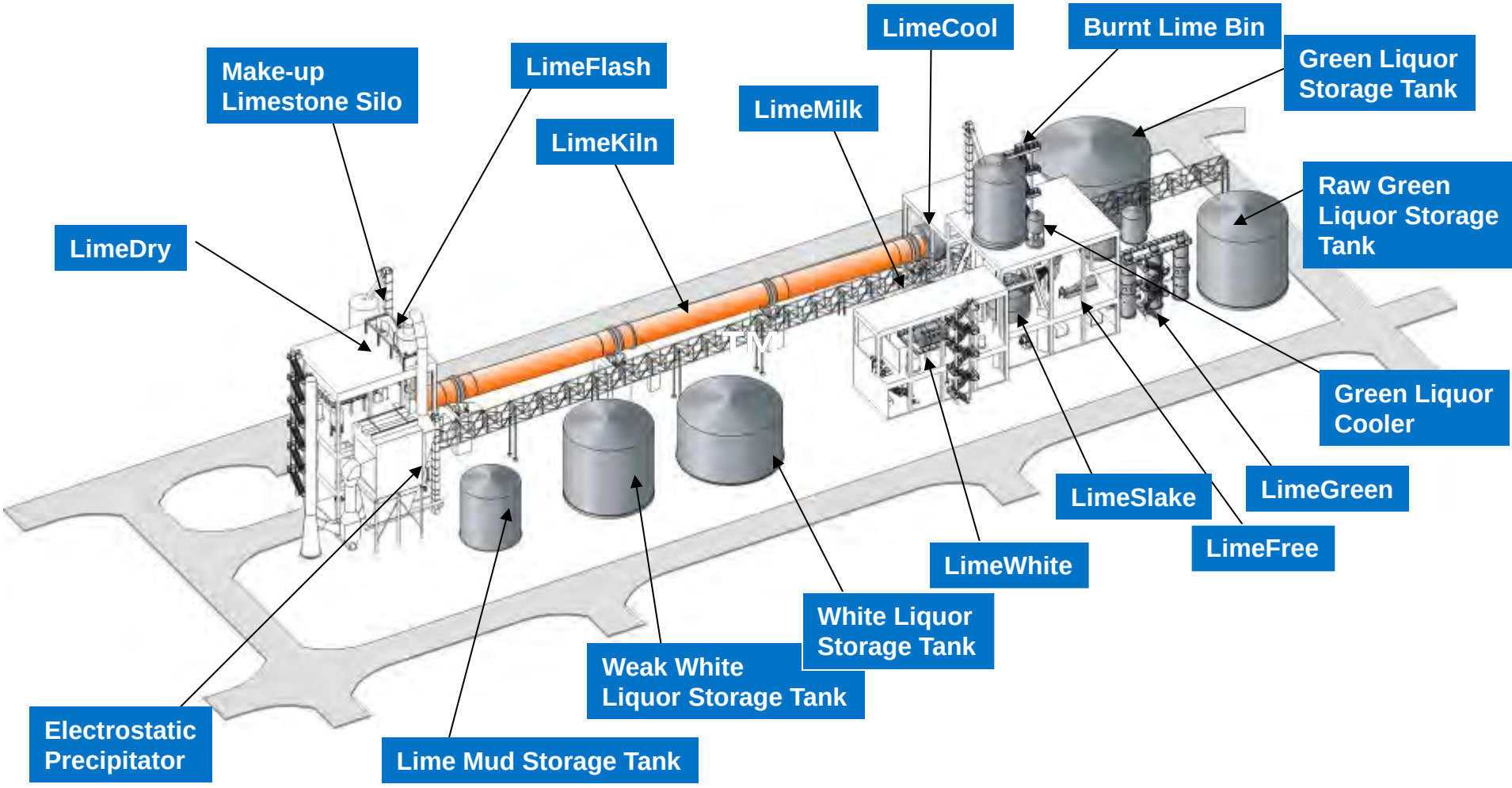
- Processes
- Products:
  - Recausticizing
  - Lime Kiln
  - White liquor modification
- Advantages
- References
- Showcases

Complete Pulp Mill

White Liquor Plant



Advanced WLP Processes



ANDRITZ Pulp & Paper

Global Product Group White Liquor Plant

Overview of products

Products

Equipment and processes for White Liquor production

Recausticizing

- LimeGreen Green liquor filter
- LimeSlake Slaker-Classifier
- Causticizers
- LimeWhite White liquor filter
- LimeDry Lime mud filter
- LimeFree Dregs centrifuge
- Green Liquor Cooler

Lime Reburning

- LimeKiln
- LimeCool Sector cooler
- LimeFlash Lime mud dryer

Modified Cooking Liquors

- StiroX
- Moxy

WLP Products

Recausticizing 1(3)

LimeGreen Falling fim, cross-flow, green liquor filtration	**LimeFree** Lime mud free dregs handling solutions	**Green Liquor Cooler** Efficient and trouble-free cooling of green liquor
▪ Efficient separation of impurities with high availability ▪ No need for lime mud precoat which also means Less make-up lime for total process ▪ Better operation in lime kiln and recausticizing ▪ Stable operation efficiency in digester and evaporation	▪ No lime mud needed – minimizes the amount of waste to landfill ▪ Optimized lime purging – allows efficient P removal from LK ESP ▪ Flexible to use – possible to expand production ▪ Small footprint needed for installation	▪ Less over-liming and over-boiling ▪ No cleaning required ▪ Less acid washing shutdowns in white liquor filtration ▪ Easier causticizing control ▪ Integrated structure with hot water production
		

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WLP Products

Recausticizing 2(3)

LimeSlake Multi-compartment lime slaker	**LimeMilk** Trains of one to three compartment causticizers	**LimeWhite** For white liquor filtration
▪ Big lime mud particles which gives improved separation of white liquor and lime mud filtration and alkali savings ▪ Higher dry solids in lime mud which gives energy savings in lime kiln ▪ Self-cleaning system ▪ Effective cyclone for GL and burnt lime mixing – no scrubber needed	▪ Causticizers can be supplied 1-3 compared, optimized for actual mill conditions ▪ Carefully agitated ▪ No lubrication water needed ▪ No bottom bearing	▪ Continuous operation - precoat change during operation ▪ Clean and hot white liquor with minimum dilution ▪ Fully automated control – capacity adjust itself acc. to green liquor flow to slaker ▪ Higher white liquor yield from green liquor
		

WLP Products

Recausticizing 3(3)

LimeDry
Lime mud washing and dewatering with the continuous precoat renewal system

- Reliable continuous operation – CPR replaces precoat during the operation meaning continuously high dry solids of lime mud and low heat consumption of lime kiln
- Excellent filter cloth washing during operation
- Less ring formation and low TRS emission in lime kiln
- Excellent burnt lime quality from the lime kiln because of stable lime feed conditions and quality
- Totally closed design gives dust proof and clean working environment

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WLP Products

Lime reburning kiln 1(2)

LimeKiln

For efficient and reliable lime reburning

- Low emissions and low heat consumption kiln technology
- Low NO_X Technology for burners
- Reliable control of flue gas temperature
- Easy and fast start-up
- No internals needed in shell part and proven long lifetime design for product coolers which means low maintenance costs

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WLP Products

Lime reburning kiln 2(2)

LimeFlash Lime mud drying at the kiln feed end	**LimeCool** Compact lime handling, cooling and primary air heating
▪ Dries mud completely before kiln feed ▪ No chain section ▪ Better flue gas temperature control ▪ Utilizes heat energy in flue gases ▪ Higher capacity for given size of a kiln shell ▪ High efficiency cyclone	▪ Low heat loss and optimum cooling of lime ▪ Low head room requirement ▪ Burnt lime prescreening ▪ Clean and cool working environment ▪ No burner tunnel ▪ Operation conditions monitoring possibility during operation

WLP Products

White liquor modification

Moxy Ultimate efficiency in converting white liquor sulfide into polysulfide	**Stirox** Pressurized white and green liquor oxidation with oxygen gas
▪ Polysulfide cooking offers a way to increase cooking yield ▪ Optimal conditions for polysulfide reaction are achieved by blowing air and white liquor through a catalyst bed with Teflon® coated activated carbon	▪ White liquor with low residual sulfide content for oxygen delignification ▪ Oxidized white liquor helps to control mill sodium and sulfur balance ▪ Excessive heat energy from exothermic oxidation reactions is recovered as hot water ▪ Less emissions

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White liquor plant

Advantages 1(2)

Knowledge of the whole white liquor plant	Products and expertise cover the complete white liquor preparation process – integrated systems for recausticizing and lime kiln
Proven expertise	Depth of experience and a successful record of installations
Investments in R&D	Constant investment in R&D to develop new technology which brings increased equipment reliability, efficiency, and product quality to its customers
Energy efficient	Less dead load chemicals within the lime circulation and pulp mill alkali circulation – less power consumed and less scaling

White liquor plant

Advantages 2(2)

Meets the highest environmental demands	All waste water is recycled – no effluent to the environment
Designed for high availability	Designed for good runnability and controllability during any process conditions – high performance
Fully automatic	Better control through higher level of automation

Recent major WLP references

Year	Company	Country	Systems/Equipment
2018	SCA Östrand, Timrå – Helios project	Sweden	White Liquor Plant
2018	Chenming Shouguang, Meilun	China	White Liquor Plant
2017	Fibria, Três Lagoas	Brazil	White Liquor Plant
2017	Metsä Fibre Äänekoski	Finland	Recausticizing Plant
2016	Klabin S.A.	Brazil	White Liquor Plant
2016	Shandong Sun Honghe Paper Industry	China	White Liquor Plant
2016	China CAMC Engineering Co., Ltd, Svetlogorsk	Belarus	White Liquor Plant
2014	Mondi Dynäs	Sweden	Lime Kiln
2013	Ilim Group, Koryazhma	Russia	Lime Stone Kiln and WLP modernization
2013	Montes del Plata	Uruguay	White Liquor Plant, EPC
2012	JK Paper Ltd., Rayagada	India	White Liquor Plant
2012	Eldorado Papel e Celulose Ltda.	Brazil	White Liquor Plant, EPC
2011	CMPC Celulosa, Santa Fe	Chile	White Liquor Plant, EPC
2011	SCA Graphic Sundsvall, Östrand	Sweden	LimeKiln, LimeDry,LimeWhite
2011	SCA Packaging Obbola AB	Sweden	LimeGreen, Lime mud filter, LimeFree
2011	Chenming Zhanjiang Pulp & Paper Co, Ltd	China	White Liquor Plant
2010	Asia Pacific SSYMB (Shandong) Pulp and Paper	China	White Liquor Plant
2009	Visy Pulp & Paper, Tumut	Australia	LimeKiln, Recausticizing Plant Upgrade
2009	West Coast Paper Mills, Dandeli	India	Recausticizing Plant
2009	Fibria, Trés Lagoas	Brazil	Complete White Liquor Plant, EPC

Saw dust burning in lime kiln

Showcase

SCA Östrand, Sweden

Highlight

Biomass fired limekiln

→ new kiln is 100% fueled by wood dust .

Start-up: November 2011

Scope of supply:

- Pellet and sawdust handling
- Cyclon filter
- Wood powder burner
- LimeKiln and LimeDry (LMD filter) for new line
- LimeWhite (white liquor filter) for existing line

White liquor plant

Showcase

Fibria, Trés Lagoas (Horizonte 1)

Highlight

Good planning and co-operation with the VCP team led to excellent and smooth mill start-up.

Recausticizing and Lime Kiln Technology Concept

- White liquor filtering with LimeWhite Filter of new, more compact design
- Green liquor handling with LimeGreen filters
- Dregs handling without lime mud with LimeFree
- Lime mud washing and dewatering with LimeDry filter
- Lime kiln production with LimeCool and LimeFlash

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Thank you for your attention!

Any questions?