



ANDRITZ GROUP

BIOMASS BOILERS

II FINNISH HISPANO BIOMASS SEMINAR

SEPTEMBER 25, 2019
ILKKA VENÄLÄINEN

ANDRITZ

ENGINEERED SUCCESS

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ANDRITZ is a globally leading supplier of plants, equipment, systems and services for hydropower stations, the pulp and paper industry, the metalworking and steel industries, and solid/liquid separation in the municipal and industrial sectors as well as for animal feed and biomass pelleting

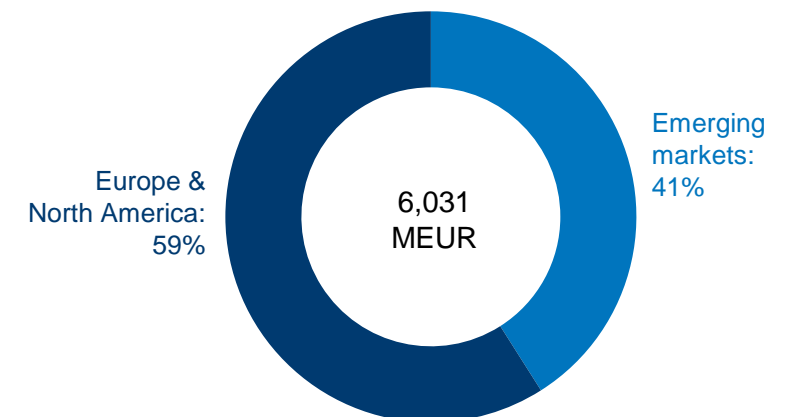
Global presence

Headquarters in Graz, Austria; over 280 production sites and service/sales companies worldwide

KEY FINANCIAL FIGURES:

	UNIT	H1 2019	2018
Order intake	MEUR	3,705.2	6,646.2
Order backlog (as of end of period)	MEUR	7,724.2	7,084.3
Sales	MEUR	3,062.4	6,031.5
Net income (including non-controlling interests)	MEUR	75.8	219.7
Employees (as of end of period; without apprentices)	-	29,616	29,096

SALES BY REGION 2018 (%)



A WORLD MARKET LEADER WITH FOUR BUSINESS AREAS



PULP & PAPER



39

% order intake*

PRODUCT OFFERING

Equipment for production of all types of pulp, paper, tissue, and board; energy boilers

METALS



29

% order intake*

PRODUCT OFFERING

Presses/press lines for metal forming (Schuler); systems for production of stainless steel, carbon steel, and non-ferrous metal strip; industrial furnace plants

HYDRO



22

% order intake*

PRODUCT OFFERING

Electromechanical equipment for hydropower plants (turbines, generators); pumps; turbo generators

SEPARATION



10

% order intake*

PRODUCT OFFERING

Equipment for solid/liquid separation for municipalities and various industries; equipment for production of animal feed and biomass pellets

* Share of total Group order intake 2018

ANDRITZ PORTFOLIO FOR BIOMASS



Equipment for biomass preparation and handling



Dryers



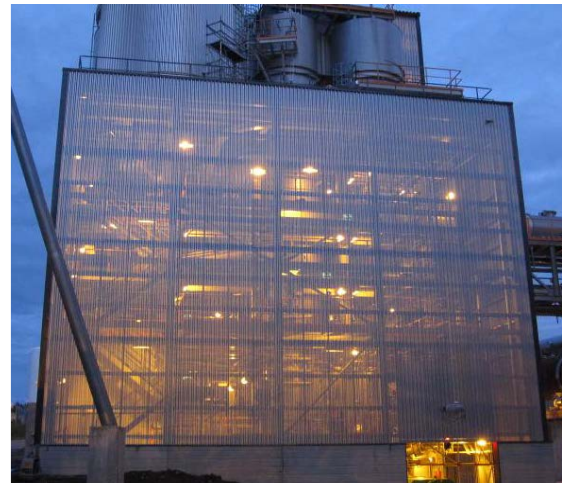
Pelleting machines & complete lines



Fluidized Bed Boilers



Gasifiers for lime kilns



Services for equipment



ANDRITZ FLUIDIZED BED TECHNOLOGY



Applications for all biomass fuels

Fuel ash characteristics

- Boiler technology and combustion temperature selected and controlled considering ash softening behavior
- Ash fouling must be considered in boiler design

Varying chlorine contents

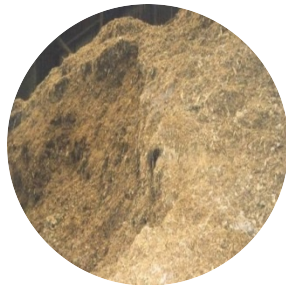
- Steam parameters must be carefully selected
- Arrangement of heating surfaces along the flue gas flow adjusted to fuel



Sludge



Wood Chips



Poultry Litter



Waste Wood



Rejects, RDF



Pellets



Palm Kernel Shells (PKS)

Liquid- and gaseous fuels:

- As start up- or back up fuel

➤ Optimized Power Boiler type technology for each application

ANDRITZ POWER BOILERS – PRODUCTS



Different products for different fuels

EcoFluid

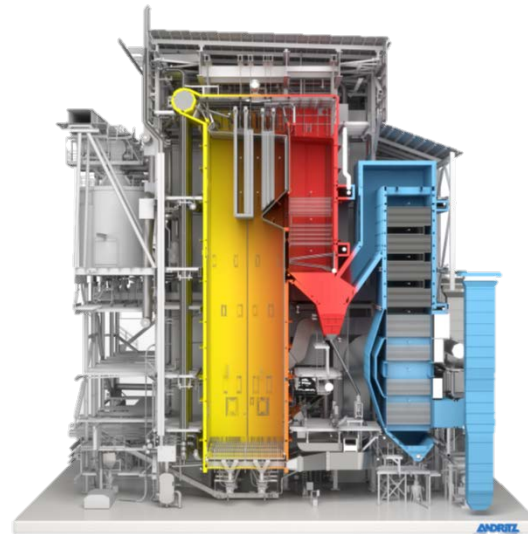
Bubbling Fluidized Bed (BFB) boiler

Data:

5 ... 15 MJ/kg (LHV)
50 ... 450 t/h
40 ... 350 MW_f
10 ... 100 MW_e

Fuels:

- Biomass (wood chips, agro-biomass)
- Waste wood
- Peat
- Sludge
- Pre-treated municipal & industrial waste
- Rejects
- RDF
- Animal litter



PowerFluid

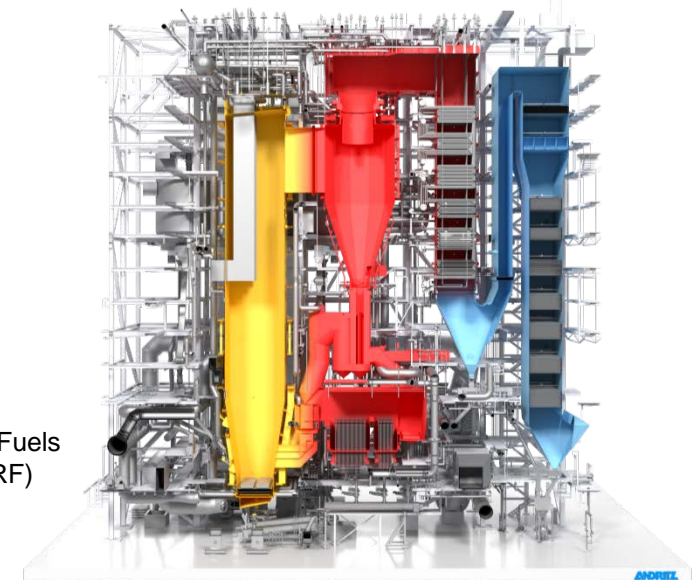
Circulating Fluidized Bed (CFB) boiler

Data:

5 ... 42 MJ/kg (LHV)
100 ... 750 t/h
80 ... 550 MW_f
20 ... 250 MW_e

Fuels:

- Biomass (wood chips, pellets, agro-biomass, palm kernel shells)
- Waste wood
- Peat
- Municipal waste, Refuse-Derived Fuels (RDF), Solid Recovered Fuels (SRF)
- Industrial waste (rejects)
- Sludge (co-firing)
- Coal, lignite

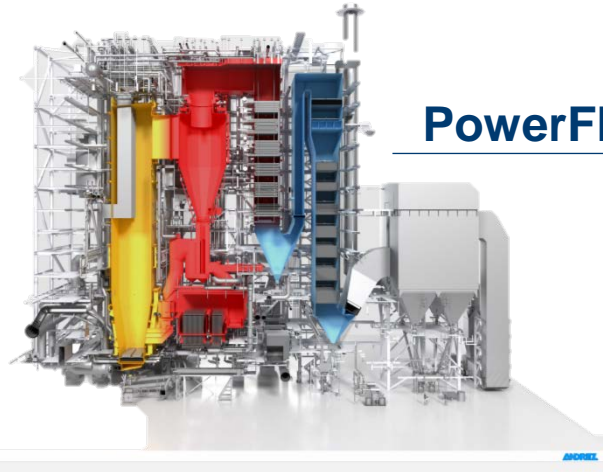
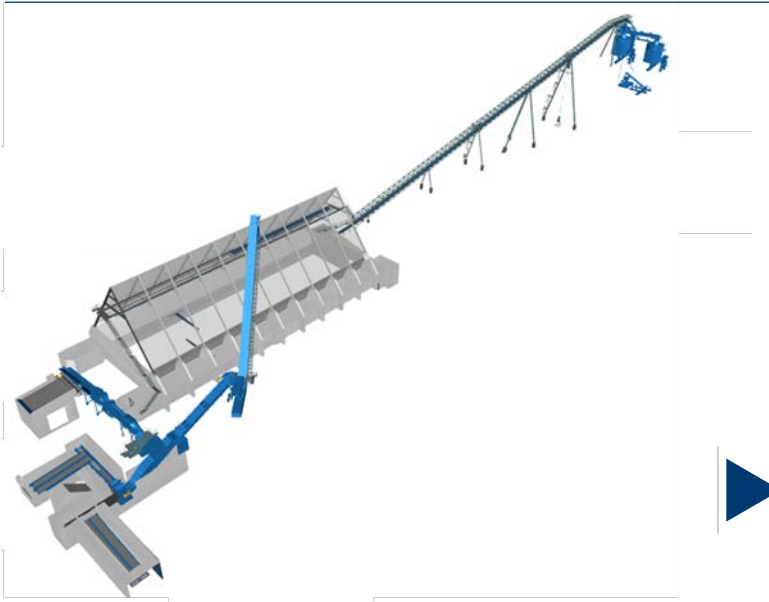




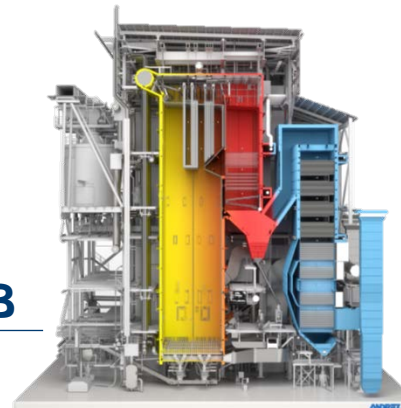
ANDRITZ POWER BOILERS – PRODUCTS

Full-line capabilities – BIO-/MULTIFUEL

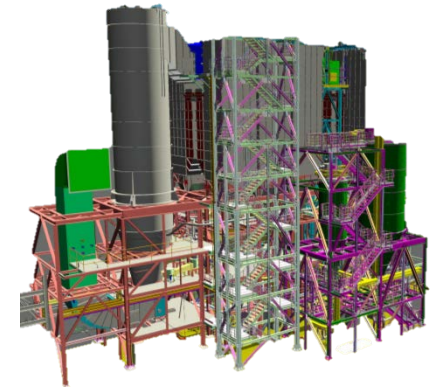
Fuel preparation



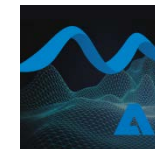
PowerFluid CFB



EcoFluid BFB



Flue gas cleaning



Automation / Metris



FLUIDIZED BED ADVANTAGES

IMPROVED PLANT ECONOMICS

Fuel flexibility

Multi-fuel combustion - from biomass to alternate fuels. Large fuel moisture content and particle size variation acceptable. With CFB allows also coal firing.

High boiler efficiency

Low amount of excess air, high burn out rate with low CO, TOC emissions and low unburned carbon in ash. Optimized flue gas temperature after boiler.

High plant efficiency

High steam parameters (temperature and pressure) considering fuel properties. Reheat cycle available. Optimized power consumption. High boiler efficiency (see above).

Lowest emissions

Low NO_x with air staging and controlled furnace temperature, SNCR and SCR available for further NO_x reduction. Low SO_x with infurnace limestone feeding (CFB). Lowest HCl and SO₂ with sorbent injection and bag filter.

High availability and long operating time

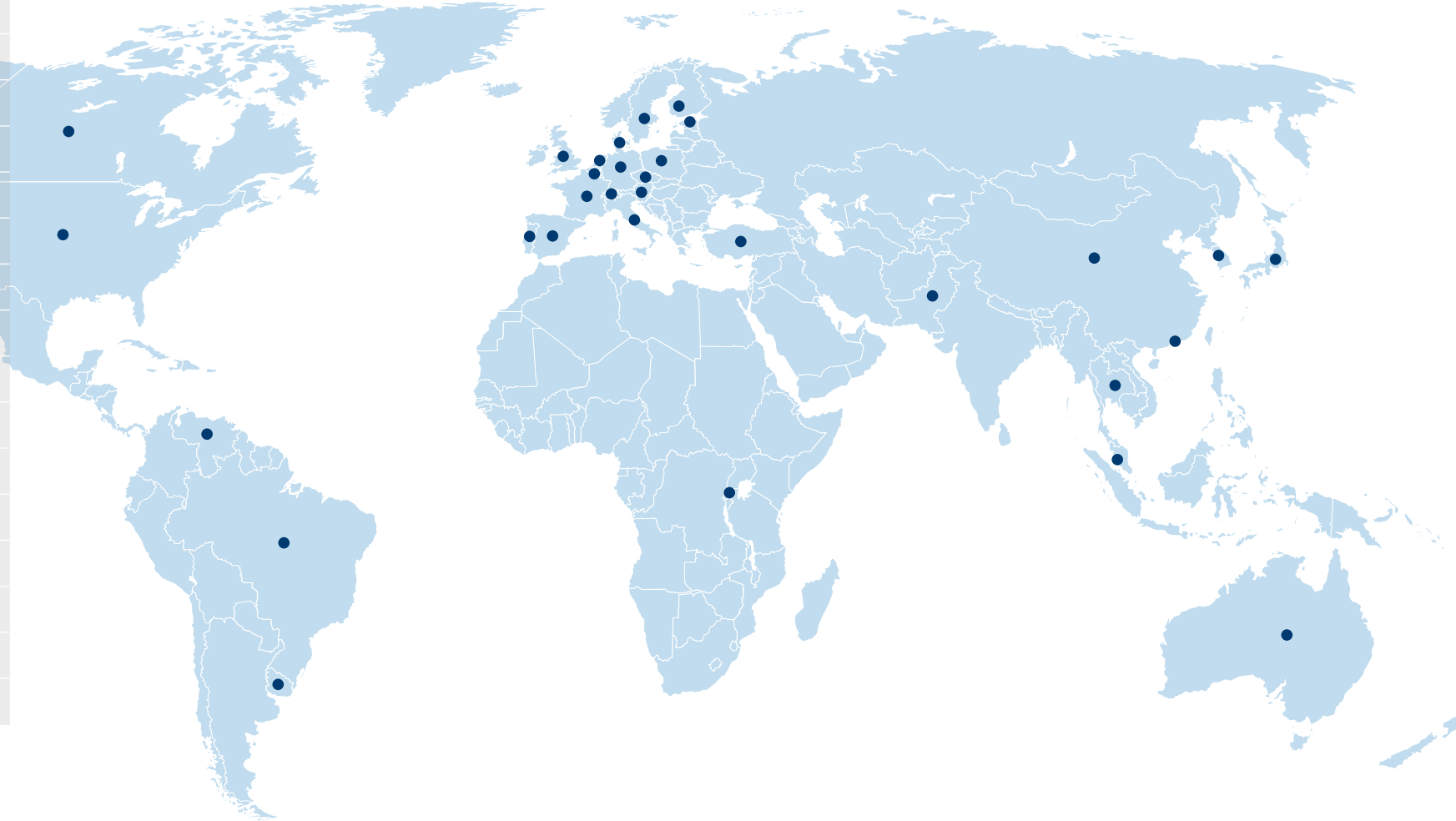
Proven boiler design with simple and reliable construction, no moving parts inside furnace, efficient heating surface cleaning, high quality components.



ANDRITZ POWER BOILERS – MORE THAN 120 REFERENCES WORLDWIDE



References (as main fuel): Biomass ~55, Waste ~25, Sludges ~30

Austria	 	Germany	 
Czech Republic		Poland	 
Estonia		Finland	 
Sweden	 	Denmark	
Netherlands		Great Britain	
Belgium		France	
Portugal		Spain	
Italy		Switzerland	
Turkey		Pakistan	
Rwanda		China	
Thailand	 	Hong Kong	
Republic of Korea	 	Japan	 
Australia		Canada	
USA	 	Venezuela	
Brazil		Uruguay	
Malaysia			



 EcoFluid / BFB units
 PowerFluid / CFB units

ANDRITZ POWER BOILER ADVANCED SOLUTIONS FOR BIOMASS



Recent EcoFluid BFB references for biomass

EcoFluid-BFB

Ence Navia
Spain



Fuels: Euca bark, fines, biomass residues

Steam flow 120 t/h

Steam pressure 124 bar(a)

Steam temp. 500° C

Start-up 2009

EcoFluid-BFB

Ence Huelva
Spain



Fuels: Euca chips, energy crops

Steam flow 195 t/h

Steam pressure 101 bar(a)

Steam temp. 500° C

Start-up 2011

EcoFluid-BFB

Navigator Setúbal & Cacia
Portugal



Fuel: Bark (euca, pine), wood residues

Steam flow 2 x 58 t/h

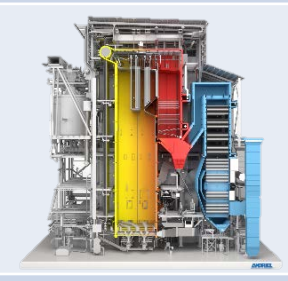
Steam pressure 93 bar(a)

Steam temp. 472° C

Start-up 2010

EcoFluid-BFB

Navigator Figueira
Portugal



Fuels: Bark, screening rejects, sludge

Steam flow 150 t/h

Steam pressure 92 bar(a)

Steam temp. 490° C

Start-up 2020

ANDRITZ POWER BOILER ADVANCED SOLUTIONS FOR BIOMASS



Recent EcoFluid BFB references for biomass

EcoFluid-BFB

Karlstad
Sweden



Fuels: Forest residues, bark, saw dust

Steam flow 127 t/h

Steam pressure 142 bar(a)

Steam temp. 547° C

Start-up 2011

EcoFluid-BFB

Växjö
Sweden



Fuels: Forest residues, bark, saw dust

Steam flow 155 t/h

Steam pressure 140 bar(a)

Steam temp. 541° C

Start-up 2014

EcoFluid-BFB

E.ON Climate & Renewables
UK



Fuel: Demolition wood

Steam flow 119 t/h

Steam pressure 85 bar(a)

Steam temp. 490° C

Start-up 2014

EcoFluid-BFB

Virginia
USA



Fuels: Bark, wood residues, sludge

Steam flow 298 t/h

Steam pressure 105 bar(a)


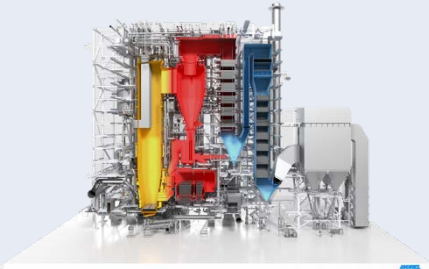
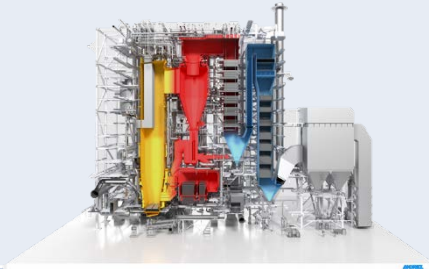
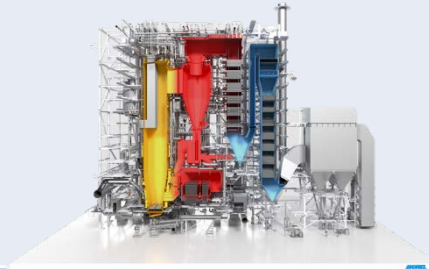
Steam temp. 524° C

Start-up 2014

ANDRITZ POWER BOILER ADVANCED SOLUTIONS FOR BIOMASS



Recent PowerFluid CFB references for biomass

PowerFluid-CFB	PowerFluid-CFB	PowerFluid-CFB	PowerFluid-CFB
Värtaverket-138 MWe Sweden	Ichihara-50 MWe Japan	Kamisu-50 MWe Japan	Tokushima-75 MWe Japan
			
Forest residues, bark, saw dust, biomass pellet, peat (coal)	Wood Pellets, PKS	Wood Pellets, PKS	Wood Pellets, PKS
Steam flow 467 t/h	Steam flow 149/130 t/h	Steam flow 148/137 t/h	Steam flow 230/217 t/h
Steam pressure 143 bar(a)	Steam pressure 140/31 bar(a)	Steam pressure 136,5/34 bar(a)	Steam pressure 153/42 bar(a)
Steam temp. 562° C	Steam temp. 543/543° C	Steam temp. 543/543° C	Steam temp. 542/541° C
Start-up 2016	Start-up 2020	Start-up 2021	Start-up 2022

ANDRITZ OFFERS A FULL RANGE OF VALUE-ADDED SERVICES



Power boiler service

Service packages for greater reliability and availability

- Status inspections and diagnostics
- Shutdown planning
- Start-up support and optimization
- Annual safety function check
- Advisory services
- Online monitoring

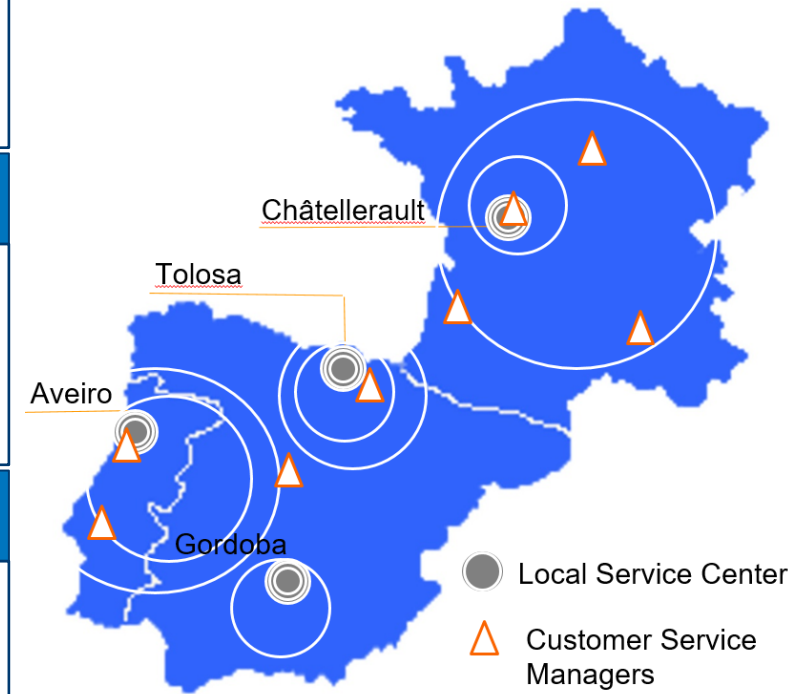
24/7 services near your plant

- Qualified welders and fitters
- Pressure part manufacturing
- WPS and WPQR for any material and material combination

Spare and wear parts

- Full range of replacement parts and engineered wear products for ANDRITZ and other OEM machines

LOCAL SERVICE CENTERS



WE OFFER A FULL RANGE OF VALUE-ADDED SERVICES

Power boiler service



ReplacementPlus products

- Superheaters
- Heating surface protection
- BFB nozzle grids
- CFB primary loop key components
- Economizers
- Advanced fuel and ash handling systems
- Advanced corrosion and fouling mitigation

Upgrades and rebuilds

- Turnkey solutions for maximum efficiency and availability
- 1st step: Concept development
- 2nd step: Feasibility study
- 3rd step: Realization
- Fuel and firing enhancements
- Capacity increase
- Emissions reduction
- Increased availability and lifetime
- Waste heat recovery





SUMMARY

ANDRITZ is experienced supplier of biomass related equipment and services

Products for biomass include biomass handling equipment, fluidized bed boilers, gasifiers, dryers and pellet machines

Extensive knowledge on different biomass fuels

Local service available for customer support





ANDRITZ GROUP

THANK YOU FOR
YOUR ATTENTION

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ENGINEERED SUCCESS