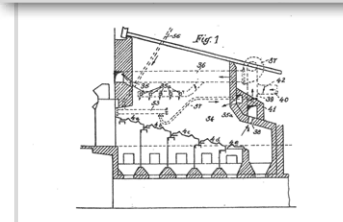




RENEWABLEENERGYSOLUTIONS
FOR THE NEXT GENERATIONS



**„BIOMASS
and WASTE
to Energy“**



- Biomass thermal power stations
- RDF thermal power stations
- Boiler plants
- Hot gas generators



Richard Kablitz GmbH

Kablitz stands for environmentally friendly energy production from “biomass and waste“.

Alternative energy for a clean environment for the future using modern energy and environmental technology.

As general contractors, we plan and construct biomass and waste thermal power stations that use state-of-the-art firing technology and effective flue gas cleaning systems.

Our decades of experience in the construction of plants and power stations gives us the in-depth expertise to find a tailor-made solution to suit your requirements, and one from which you will reap long-term benefit.

Boasting a history reaching back to 1901 we are a long-established medium-sized company that has been family-owned for many generations. Quality, reliability and innovativeness are the main values of our corporate philosophy, with which we will also meet market requirements in future.

By continually developing and testing new technologies, we offer our customers ground-breaking plant concepts that ensure efficient and reliable operation. In so doing, we act as an experienced partner, continually providing our customers with assistance in all project-related matters.

Your energy centre: *Everything from a single source!*

Energy technology backed by tradition

As general contractors, we provide you with turn-key services from a single source, including the specification of all interfaces.

Wherever you need us – we will be there:
An expert project manager will act as your contact point, assisting you during the entire project through to the commissioning period, during the trial operation and the warranty period and beyond.



■ Planning

- Plant and layout planning
- Process engineering design
- Thermodynamic design
- Electrical engineering and process control planning
- Basic and detailed engineering

■ Delivery

- Specification, selection and procurement of all components
- Monitoring of the planning and production services of subcontractors
- Approval inspections of subcontractor services

■ Assembly

- Site management and supervision of all trades
- Schedule tracking
- Interface coordination
- Quality assurance

■ Commissioning

- Cold and hot commissioning
- Trial operation
- Certificate of performance
- Approval
- Documentation and training
- Turnkey handover

■ Warranty

- Support, during the warranty period, from the project team familiar to you
- Maintenance service

More than 6,500 Kablitz plants exist throughout the world: in Europe, Asia, South and North America as well as Australia and New Zealand.

Our commitment continues even after a plant has been commissioned:

Qualified maintenance and tailor-made service ensure that our customers' plants have a high availability and operational reliability in the long term.

Goch (Germany)

Biomass thermal power station with vertical pass boiler



Technical data

Fuel:	Wood residues, landscape maintenance material
Calorific value range:	1.5 – 3.2 kWh/kg
Annual fuel throughput:	approx. 100,000 t
Firing capacity:	Reciprocating grate: 28.0 MW
Electrical power:	5.0 – 7.2 MW
Process steam offtake:	max. 27 t/h
Steam output:	30.0 t/h
Steam temperature:	480 °C
Steam pressure:	65 bar (a)
Feed water temperature:	107 °C
Operating licence:	4 th BImSchV (Federal Immission Control Act)
Commissioning:	2012

The challenge

To generate electricity and process steam economically, a large German energy supplier was planning a biomass power station with an extraction condensing turbine and process steam offtake for a potato processing plant. As the plant is able to absorb the waste heat only during the week, a flexible concept that worked both economical and environmentally friendly was needed to be planned.

The implementation

In order to achieve the maximum possible fuel flexibility, the firing system has a steam air pre-heater, which permits fast and exact temperature control. The long grate ensures that there is a very good burn-out. The 3-pass steam generator works in natural circulation, making optimum use of the flue gas energy through the downstream economisers. A combination of intelligent superheater switching, moderate flow velocities and increased wall thicknesses enables the risk of corrosion and erosion by the critical fuel to be significantly reduced. The dust-containing waste gases of the boiler plant are cleaned in an electrostatic precipitator and the dry ash produced conveyed mechanically to a waste material silo.

The result

As a result of the design measures for lowering the corrosion risk and the firing system's flexibility, which enables it to burn even wet biomass, the plant works economically and reliably in all operating states. It is also set up to accommodate future changes in fuel quality.

The optimum co-generation concept is proving its worth in practice: During the week, the power station supplies the neighbouring potato processing factory with low-cost process steam, resulting in the production of around 5.0 MW of electrical energy. The steam generator and the turbine have been designed to operate in condensing mode at the weekend, enabling increased electrical power of around 7.2 MW to be fed into the grid.

Our scope of supply and services

- Air-cooled reciprocating grate furnace with hydraulic fuel feed system
- Steam generator in vertical pass design with downstream economiser
- Refractory lining
- Feed water system with thermal deaerator and boiler feed pumps
- Electrostatic precipitator with mechanical ash discharge to a waste material silo
- Heat insulation
- Steel structure with platforms and stairs
- Boiler house steel structure and façade
- Electrical and I&C engineering
- Assembly, commissioning and trial operation

Wiesbaden (Germany)

Biomass thermal power station with horizontal pass boiler



Technical data

Fuel:	A I – A IV wood waste
Calorific value range:	2.7 – 3.8 kWh/kg
Annual fuel throughput:	approx. 100,000 t
Firing capacity:	Reciprocating grate: 38.4 MW
Electrical power:	10.0 MW
Process heat output:	24.0 MW
Steam output:	49.0 t/h
Steam temperature:	425 °C
Steam pressure:	42 bar (a)
Feed water temperature:	120 °C
Operating licence:	17 th BImSchV
Commissioning:	2013

The challenge

A German energy supplier intended to set up and operate a biomass thermal power station fired by class A I to A IV wood waste. The new plant was to generate electricity and heat energy on the cogeneration principle to supply the customer-specific district heating network. It was particularly important for the customer to generate electricity and heat at optimum efficiency levels and to fall significantly below required emission limit values.

The implementation

The firing system implemented by Kahlitz uses a mechanical reciprocating grate and a three-phase combustion air supply. To provide optimum control of the temperature in the combustion chamber and to prevent ash flow and nitrogen oxide emissions, acoustic temperature measurement was used.

The steam generator in horizontal pass construction was designed to render corrosion and erosion risks minimal but, in cases of doubt, to allow easy replacement of the heating surfaces most used. To control the waste gas temperature reliably, a drum pre-heater was additionally used. On exiting the boiler, the waste gases are cleaned in the flue gas cleaning system on the conditioned dry sorption principle. A mixture of lime hydrate and activated lignite HOK ensures, with due regard for operating costs, that emissions are safely below the strict emission limit values.

The result

With the power station's forward-looking maintenance concept due to the use of high-quality products, the outstanding accessibility and the corrosion and erosion protection measures, our customer is excellently prepared to cope with future developments in the fuel market. Cogeneration makes the project a complete success for man and environment:

The energy recovery from wood waste makes it possible to provide low-cost energy for the consumers in the form of electricity and heat, while saving natural resources.

Our scope of supply and services

- Fuel distribution bin with screw discharge
- Air-cooled reciprocating grate furnace with hydraulic fuel feed system
- Steam generator in horizontal pass design
- Refractory lining and cladding
- Feed water system with thermal deaerator and boiler feed pumps
- Flue gas cleaning (conditioned dry sorption using a mixture of lime hydrate and activated lignite)
- Heat insulation
- Steel structure with platforms and stairs
- Electrical and I&C engineering
- Assembly, commissioning and trial operation

Rosières en Santerre (France)

Biomass thermal power station with saturated steam generator



Technical data

Fuel:	Wood chips
Calorific value range:	1.9 – 3.1 kWh/kg
Annual fuel throughput:	approx. 65,000 t
Firing capacity:	Reciprocating grate: 19.9 MW
Steam output:	28.1 t/h
Steam temperature:	207 °C
Steam pressure:	18 bar (a)
Feed water temperature:	105 – 130 °C
Operating licence:	Arrêté du 23 juillet 2010 (Ordinance of 23 July 2010)
Commissioning:	2012

The challenge

One of France's biggest energy providers was planning to construct and operate a biomass thermal power station with a view to low-cost process steam generation for a production plant in the food industry in Rosières en Santerre. The energy was to be generated from wood chips.

Our scope of supply and services

- Fuel distribution bin with screw discharge
- Air-cooled reciprocating grate furnace with hydraulic fuel feed system
- Steam generator in combined water tube/smoke tube design with downstream economiser
- Refractory lining
- Heat insulation
- Steel structure with platforms and steps
- Electrical and I&C engineering
- Assembly, commissioning and trial operation

The implementation

The solution implemented by Kablitz including a mechanical grate firing and fly-ash feedback into the combustion chamber ensures that fuel is used efficiently across the entire fuel range. Economisers and a flue gas cleaning plant are also connected downstream of the natural circulation steam generator, that is designed as a combination of water tube and smoke tube evaporators. To increase efficiency, the KABLITZ glass tube heat exchanger, which is resistant to dew point corrosion, was also used. The heat exchanger uses the waste gas heat regeneratively by pre-heating the combustion air.

The plant was commissioned in December 2012.

The result

By switching to biomass energy and the related independence from fossil energy resources and their price fluctuations, it proved possible to lower the production plant's energy costs and significantly improved its carbon footprint. It was possible to reduce necessary downtimes for cleaning and maintenance purposes to a minimum due to a conservative process engineering design and the use of high-quality component parts. High savings in terms of personnel costs were also obtained owing to a high degree of automation and the process control equipment for operation without continuous supervision (OWS 72h). Use of a mechanical fly-ash feedback system and a regenerative waste gas heat exchanger enabled fuel requirements and related costs to be lowered by around 3 %.

Bad Mergentheim (Germany)

Biomass thermal power station with thermal oil heater



Technical data

Fuel:	Wood chips
Calorific value range:	1.7 – 3.5 kWh/kg
Annual fuel throughput:	approx. 25,000 t
Firing capacity:	Reciprocating grate: 6.43MW
Electrical power:	0.95 MW
Process heat output:	4.095 MW
Thermal oil output:	5.135 MW
Feed temperature:	310 °C
Return temperature:	130 °C
Operating licence:	4 th BImSchV
Commissioning:	2012

The challenge

To supply the city of Bad Mergentheim with heating, the administrative district's municipal energy supplier was planning a biomass thermal power station, which was to provide not only environmentally friendly district heating, but also "green" electricity. The plan was to supply municipal facilities and private households with natural heat from the region via a heat network approximately 5.5 km in length. The energy for this was to be generated from untreated wood chips from the region.

The implementation

With the refractory brick-lined grate and secondary combustion chambers, our customer has flexibility with regard to fuel mix, as an optimum burn-out is achieved even if the water content is high. A bipartite thermal oil heater, consisting of a radiation and a convection part, is connected downstream of the vertical secondary combustion chamber. To make optimum use of the flue gas energy, the boiler has a "split system", which lowers the waste gas temperature even further, thereby increasing efficiency. Additional efficiency gains are obtained by connecting a KABLITZ gilled heat exchanger downstream to pre-heat the combustion air. The dust-containing waste gases are cleaned in an electrostatic precipitator and vented out via the chimney.

The result

The construction of the natural heat power station not only enables our customer to benefit in the form of new, major heating customers, but the new purchasers of the green energy can make significant energy cost savings and contribute actively to environmental protection.

Our scope of supply and services

- Fuel supply with push floor and trough chain conveyor
- Air-cooled reciprocating grate furnace with hydraulic fuel feed system
- Grate combustion chamber and secondary combustion chamber
- Refractory lining
- Electrostatic precipitator with mechanical ash discharge
- Thermal oil heater with wound radiation part, meandering-shaped convection part and thermal oil economiser
- Heat insulation
- Electrical and I&C engineering
- Assembly, commissioning and trial operation

Sanem (Luxembourg)

Hot gas generator using grate and granulate firing



Technical data

Fuel:	Bark, wood waste from production, sawdust
Calorific value range:	2.6 – 3.5 kWh/kg
Annual fuel throughput:	approx. 80,000 t
Firing capacity:	Reciprocating grate: 15.0 MW Granulate burner: 3 x 5.0 MW
Commissioning:	2010

The challenge

With a view to lowering the high energy costs associated with fossil fuel-fired hot gas generators, our customer was planning to switch to a system fired by biomass solid fuel. The wide variety of waste materials from OSB, MDF and flooring production was to be used as fuel.

Our scope of supply and services

- Fuel supply with push floor and trough chain conveyor
- Air-cooled reciprocating grate furnace with hydraulic fuel feed system
- Grate combustion chamber and secondary combustion chamber with special granulate burners
- 90 m hot gas duct
- Refractory lining
- Heat insulation
- Steel structure with platforms and steps
- Electrical and I&C engineering
- Assembly, commissioning and trial operation

The implementation

Kablitz succeeded in adapting the heat supply to the special requirements of the production process: Production wastes, shavings, bark, crushed MDF boards and wood granulate can be used for combustion in the modern and flexible hot gas generator. The base load is covered by a reciprocating grate while power peaks are met by 3 specially developed, adjustable granulate burners. The plant was set up in the open air with no building and supplies the dryer with 350 °C flue gases via a 90 m long hot gas duct.

The result

The switch to biomass energy enabled our customer to make long-term energy cost savings and also to make an active contribution to environmental protection. As virtually 100 % of the hot gases generated are used in the production process, efficiency is also excellent.

Owing to the high quality of the materials used and the high level of automation, our customer did not incur any disadvantages in terms of availability and personnel costs compared with the plants fired by fossil fuels.

Pemuco (Chile)

Biomass-combined heat and power plant with vertical boiler



The challenge

A big German sugar manufacturer intends the installation and operation of a wood-fired power plant for the energy supply of their factory in Chile. In addition, there is the task to co-fire up to 20 % of stone coal, as well as 4.5 MW with biogas. For the customer it was important to install the system in such a way that the plant can be operated in "Island mode".

The implementation

The firing system established by Kablitz, works with a mechanically air-cooled grate. The hanging 4 pass boiler optimally uses the flue gas and to produce superheated steam for a turbine to generate electricity. The exhaust steam from the turbine then goes directly to the production. Furthermore, an emergency cooler has been installed for the "emergency case".

The fuel is transported to the furnace with a conveyor. In addition to the biomass fuel storage, there is also a coal bunker from which the coal is dosed onto the conveyor by screws. The biogas is used for a specially designed burner in the first boiler pass.

The result

Through the energetic use of biomass and the further addition of coal and biogas, it is possible for the client to fulfil the energy demands of their factory by themselves. By the exhaust steam of the turbine, an autonomous self-supply of the production is ensured.

Technical data

Location:	Chile, Region BioBio
Fuel:	Wood chipping from Pinie, poplar, eucalyptus up to 20 % stone coal, 4.5 MW heat output with biogas
Calorific value range:	5,920 kJ/kg – 11,000 kJ/kg
Annual fuel throughput:	306,600 t
Firing capacity:	62 MW
Steam output:	66 t/h
Steam temperature:	485 °C
Steam pressure:	76 bar
Feed water temperature:	120 °C – 130 °C
Commissioning:	2015

Our scope of supply and services

- Push floor
- Fuel supply system with additional emergency feeding and stone coal feeding system
- Air-cooled reciprocating grate with complete combustion technology
- Start up and biogas burner
- Hanging vertical boiler due to the Chilean seismic zone 2
- Feed water system with tank, pumps, valves
- Dosing station
- Sample station
- Refractory lining with SIC plates
- Flue gas cleaning system with pneumatic ash handing into the ash silo
- Engineering for structural steel structure and isolation
- Electrical engineering, switch cabinet, course and cables
- Complete PLC system with Siemens PCS7 including programming and visualization
- Assembly supervising, commissioning, trial run

Menznau (Switzerland)

Hot gas generator with thermal oil heater



Technical data

Fuel:	Waste production wood, dust, granulate
Calorific value range:	1.7 – 5.1 kWh/kg
Annual fuel throughput:	approx. 250,000 t
Firing capacity:	Reciprocating grate: 40.0 MW Dust burner: 25.0 MW Granulate nozzles: 2 x 6.0 MW
Thermal oil output:	25.0 MW
Feed temperature:	285 °C
Return temperature:	255 °C
Commissioning:	2009

The challenge

At its Menznau site, a Swiss wood-based materials manufacturer was planning to switch the energy supply for the MDF and particle board presses as well as dryer heating to biomass-fired solid fuel combustion. It was particularly important to the customer that the plant concept should take future development possibilities into account and provide a flexible design.

The implementation

Our solution consists of a solid fuel-fired hot gas generator, to which a thermal oil heater in membrane wall design is connected downstream. A vertical dust burner is installed in the capping of the first heater pass. The combination of the individual firing concepts allows industrial waste wood, production wastes, dust, granulate, and even moister types of wood like log-wood and bark to be used. The membrane wall design of the thermal oil heater, which is highly reminiscent of a water tube boiler, enables optimum use of the flue gas energy from the wood combustion to be made. The ample flow cross-sections and channel widths of the convection heating surfaces enable dirt and corrosion to be countered.

Our scope of supply and services

- Fuel distribution bin with screw discharge
- Air-cooled reciprocating grate furnace with hydraulic fuel feed system
- Grate combustion chamber and patented secondary combustion chamber
- Thermal oil heater as a membrane wall design with meander-shaped convection heating surfaces
- Dust burner
- Refractory lining
- Multi-cyclone with mechanical ash discharge
- Heat insulation
- Steel structure with platforms and steps
- Electrical and I&C engineering
- Assembly, commissioning and trial operation

In the event that a steam turbine is to be used to generate electricity in future, the firing system and the thermal oil heater are designed to supply additional heating surfaces for steam generation.

The result

The new energy centre supplies production reliably and flexibly around the clock. The modern firing control mechanism adapts firing capacity fully automatically to production requirements, thereby preventing unwanted power fluctuations and downtimes. The combination of grate and dust firing enables power peaks to be optimally covered and production-related waste materials to be converted into energy in an environmentally friendly manner. In addition, this also provides a significant improvement in the carbon footprint.

Burgos (Spain)

Biomass-combined heat and power plant with thermal oil heater



Technical data

Fuel:	Wood waste A I – A II, wood granulate
Calorific value range:	1.94 – 2.92 kWh/kg
Annual fuel throughput:	ca. 160,000 t
Firing capacity:	35 MW Reciprocating grate
Granulate nozzles:	2 x 6 MW
Firing capacity installed:	47 MW
Thermal oil output:	27 MW
Thermal oil flow temperature:	280 °C
Hot gas temperature:	350 °C
Feed water temperature:	120 °C – 130 °C
Commissioning:	2016

The challenge

The new hot gas generator with thermal oil boiler is supposed to dry chips for the OSB plates to the appropriate moisture as well as to heat the press and the hall with thermal oil.

Our scope of supply and services

- Fuel feeding system incl. push floor and conveyors
- Intermediate bunker with screw conveyors
- Air-cooled reciprocating grate with hydraulic fuel feeding system
- Thermal oil boiler with pumps and piping
- Air distribution system
- Flue gas cleaning system (Multi-cyclone)
- Hot gas channel with start up chimney
- Electrical engineering and PLC technology
- Assembly supervising, commissioning, trial run

The implementation

From the hot gas generator implemented by Kablitz with air-cooled grate, a thermal oil boiler is down-streamed. After the combustion process the flue gases flow through the thermal oil boiler and heat the oil. The heated thermal oil is used for the heating of the press as well as for the hall heating. The flue gases then go on to the chips dryer and in the atmosphere via a flue gas cleaning system.

The result

Through the energetic use of production waste, hot gases are generated and thermal oil is heated. The chips are dried in an environment-friendly manner, through the use of residual fuels. Through the combination of grate and granules firing, the power peaks can be covered quickly and optimally.

Brasov (Romania)

Hot gas generator



Technical data

Fuel:	Bark, forest wood chips, wood waste A IV
Calorific value range:	1.80 – 2.90 kWh/kg
Annual fuel throughput:	250,000 t
Firing capacity:	60 MW Reciprocating grate
Hot gas capacity:	60 MW
Hot gas temperature:	850 °C
Commissioning:	2016

The challenge

The new hot gas generator should be set up on an installation area that is concealed from a side, in a particle board plate plant in Romania and the hot gases should be supplied for the expanded production needs.

Our scope of supply and services

- Intermediate bunker with screw conveyors
- Air-cooled reciprocating grate with hydraulic fuel feeding system
- Hot gas cyclone with emergency and hot gas shut off valve
- Reformatory lining
- Air distribution system
- Electrical engineering and PLC technology
- Assembly supervising, commissioning, trial run

The implementation

The firing system implemented by Kahlitz, works with a mechanical grate and a three-stage combustion air supply. The exhaust of the press hall and dryer circuit will be used as combustion air. The hot gas valve built-in at the outlet of the hot gas generator, safely disconnects the new plant from the existing system using sealing air and thereby enables the safe execution of the maintenance work during ongoing production operation.

The result

Owing to the energetic recovery of the residual materials from the production, hot gases are generated. These hot gases go in a heat exchanger that heats up fresh air to go into the chip dryer, to dry the chips to the appropriate moisture in a "clean" way. The cooled exhaust gases then flow to the on-site dryer, via a flue gas cleaning in the atmosphere.



The challenge

One of the largest producers of sugar and starch from Hungary planned a new production site in Hungary (Tiszapüspöki).

Kablitz was assigned with the delivery of two identical 21 t/h saturated steam systems.

The used fuels straw/miscanthus, pose an increased challenge to combustion due to their low ash melting point.

The implementation

In the project, due to the particularly low ash melting point of the fuel, the boiler geometry is especially taken care of. The resulting gases are coarsely pre-cleaned through an upstream cyclone and then through a fabric filter.

The result

The two saturated steam systems were integrated in a system with two other gas boilers and thus provide for the energy production of the food plant.

Technical data

Fuel:	Straw, Miscanthus
Calorific value range:	3.85 – 4.42 kWh/kg
Annual fuel throughput:	2 x 34,000 t
Firing capacity:	2 x 15.3 MW Reciprocating grate
Steam output:	2 x 21 t/h
Steam temperature:	196 °C
Steam pressure:	14 bar (a)
Feed water temperature:	105 °C
Commissioning:	Beginning 2018

Our scope of supply and services

- Fuel feeding shaft
- Reciprocating grate
- Ash handling system
- Engineering structural steel structure
- Saturated steam boiler (smoke tube boiler) with economizer
- Refractory lining and isolation
- Electrical engineering and PLC technology
- Flue gas cleaning system (cyclone and baghouse filter)
- Assembly supervising, commissioning, trial run

Peak performance due to robust technology and intelligent control:

The KABLITZ process control system

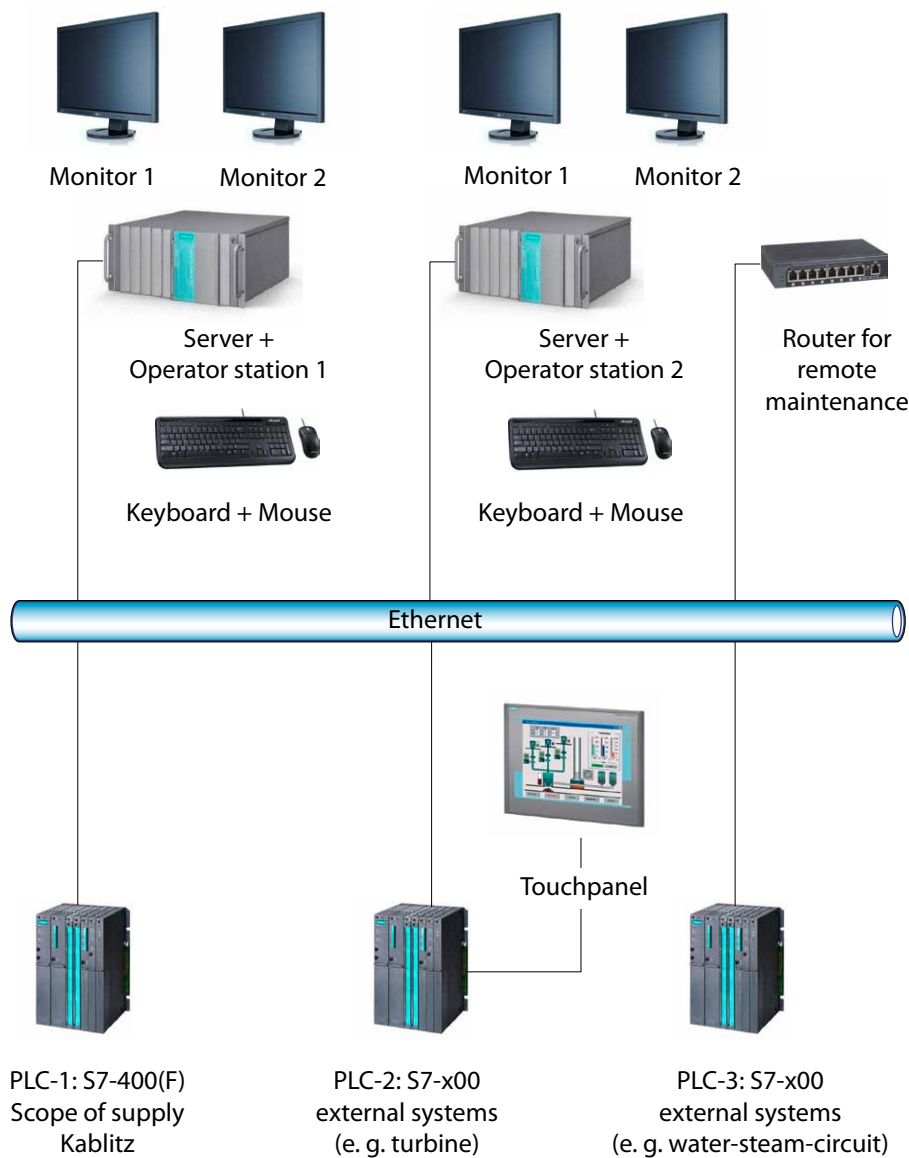
To achieve the performance required by customers while complying with statutory requirements, the process-engineering processes of our plants are automatically controlled and monitored by the process

control system. We use only components from renowned manufacturers of process control and electrical engineering equipment, so that these objectives are met.

Highlights of our process control system at a glance:

- High-quality sensors constantly transmit currently measured values from the firing system and boiler to the programmable logic controller (PLC). The field bus used here is the Profibus DP, the field bus most installed throughout the world. The information is processed in the PLC's firing capacity control system, with any necessary changes being made automatically via the automation stations.
- The PLC, implemented as a Siemens S7-400, has a failure-proof part for safety-related tasks and provides remote alerts via telephone, SMS or e-mail. Ethernet is used as the standard plant bus.
- At the operating and monitoring level, visualization is implemented via PCs. A freely available SCADA system, via which processes are monitored and controlled, is used as software.
- A remote maintenance option via DSL is included as standard.





■ KABLITZ process control system as a PLC/SCADA solution (Example)

PLC / SCADA system

To create a modern and reliable control station, it is advisable to set up 2 server stations, which undertake the corresponding communication and handling of the connected PLC stations.

These server stations, on which a freely selectable process visualization system runs, are set up as an engineering station and a pure operating station, respectively. A software redundancy package enables the servers to be operated in parallel and to monitor each other. If one of the two server computers fails, the second server assumes control of the entire system. When the failed server resumes operation, the contents of all message and process value archives are copied back to the restored server.

Overall, this results in significantly higher levels of system availability. Your production therefore remains online even if one of the servers fails.

In addition, further client stations, which are connected to the servers via a separate network, can also ensure operation. The selection of the SCADA system enables enhancements to be made at any time so as to meet individual customer requirements.

“Biomass and Waste“ as an energy source as versatile as nature!



Wood



Agriculture fuels



Waste / RDF

Our delivery programme at a glance

- “Biomass and Waste“ thermal power stations
- Boiler plants
- Hot gas generators
- Firing systems
 - Reciprocating grates
 - Overthrust grates
 - Injection burners
- Heat recovery
 - Cast-iron gilled heat exchangers
 - Glass tube heat exchangers
- Service
- Customized casting

Service

We provide the complete service for
your plant:

- 24 h hotline / online service
- Conversions to existing plants
- Inspection, service and maintenance
- Assembly and disassembly
- Commissioning and commissioning support
- Plant optimization
- Emission measurements
- Spare and wear parts
- Process engineering consultancy