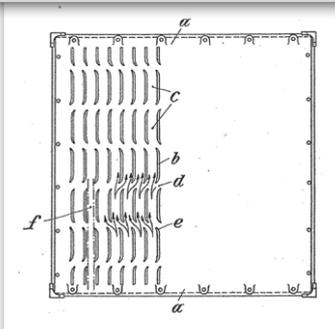




RENEWABLE ENERGY SOLUTIONS FOR THE NEXT GENERATIONS



„SAVING ENERGY by Heat Recovery“



- Cast-iron gilled heat exchangers
- Glass tube heat exchangers



Richard Kablitz GmbH

Kablitz stands for environmentally friendly energy production.

Active for a clean environment for tomorrow using modern energy and environmental technology.

The Kablitz finned tube-economiser conquered the whole market overnight. Alongside the public electricity plants and factories, over 100 of the largest sugar factories were equipped with Kablitz-economisers till the year 1914. It was not just a matter of the economiser, rather Kablitz-universal-high-performance-overthrust grate has been launched in Riga from head quarters in the meantime. As well as the stream lines-air heaters, whose task of supplying hot combustion air instead of cold air to the firing of boiler plants was resolved, by entrusting the experience with the finned tube economisers to the new tasks. At the same time, the residual heat economiser was launched.

As general contractors, we plan and construct biomass thermal power stations that use state-of-the-art firing technology and effective flue gas cleaning systems, as well as heat exchangers for gaseous media.

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.



Richard Kablitz – The inventor of gilled plates!



In the year 1899 Richard Kablitz founded the finned heating surfaces for heat exchangers.

From 1928 to 1930, Richard Kablitz invented and developed the cast-iron gilled heat exchanger, which was officially patented on 1 March 1933.

With this milestone and the experience gained from an installed

heat exchanger surface area of more than 1,000,000 m² worldwide, we have made it our business to adapt the Kablitz original product continually to our customers' requirements and to refine it for new areas of application.

Your energy centre:

Everything from a single source!

Energy technology backed by tradition

As general contractors, we provide you with turnkey 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 planing
- 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 Kahlitz 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.



KABLITZ gilled heat exchangers:

The ingenious technological and economical concept for recovering thermal energy!

Thermal energy is expensive.

So, use the KABLITZ gilled heat exchanger to lower your energy costs!

Effective heat exchange between gaseous media means better utilization of the thermal energy generated. Particularly nowadays, this is becoming a more and more crucial operating cost factor in profitability analysis. KABLITZ gilled heat exchangers have been providing the optimum solution here for more than 100 years:

A technically mature design made of high-quality cast iron. For flexible use in heating or cooling a wide variety of gaseous media – with a view to maximum heat recovery and a corresponding increase in efficiency up to the dew point limit.



Heat exchanger applications:

- Heat transfer plants
- Refinery plants
- Drying and hot air plants
- Thermal and catalytic post-combustion plants
- Steam boiler plants
- Air pre-heating for the combustion of low-value fuels
- DeNOx plants
- Casting smelting plants

Maximum heat exchange due to the optimum flow design

The special characteristic of the KABLITZ gilled plates is the streamline shape (concave/convex) of the gills arranged in cross-flow on each side. This principle and the different gill partitions of the individual plate types enable the wall temperature to

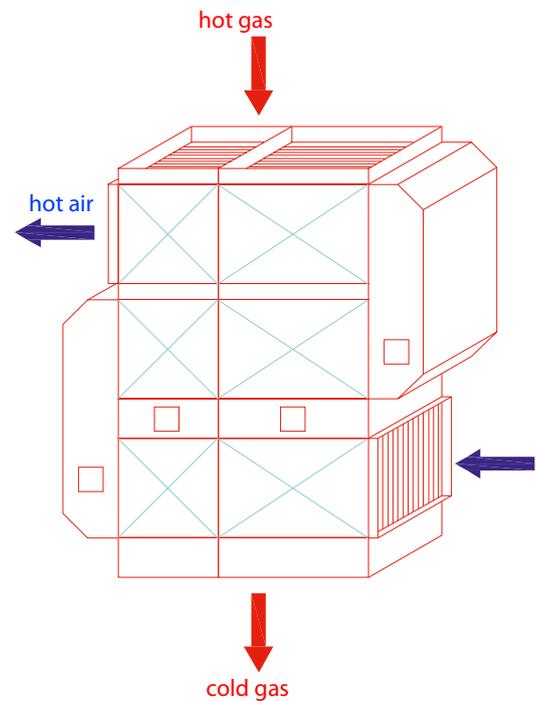
be calculated exactly and adhered to constantly in accordance with the dew point. Furthermore, the optimized flow enables very high heat transfer coefficients and a high heat output to be achieved.

Individual and requirements-oriented design through the gilled plate modular system

The individual KABLITZ gilled plates are screwed to bags, together with suitable sealing compound, and then form cubes of different sizes in a self-supporting design. The individual cubes can be assembled in a self-supporting structure according to the particular operating requirements.

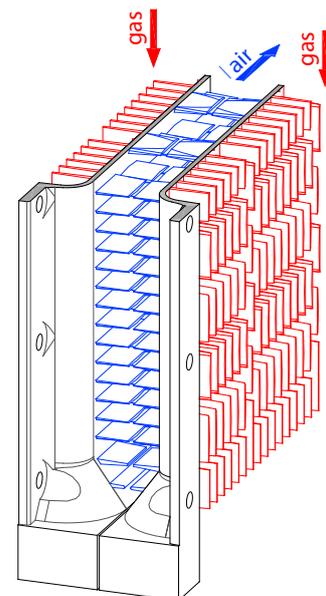
The different flow variants like cross-flow, parallel flow and counter-flow are taken into account here. Channel sections and self-supporting intermediate frames with inspection ports are fitted between the individual cubes. These are also used to install cleaning devices, where required.

The figure on the right shows a gas/air heat exchanger in counter-flow with plate types 1.0 x 1.0 m and 1.0 x 1.5 m.



Reliable adherence to the wall temperature – No falling below the dew point

The larger gills with the large additional gill at the flange on the side of the hot medium and the smaller gills on the side of the colder medium enable the wall temperature at the coldest point of the heat exchanger to be raised and prevent the temperature from falling below the dew point.



■ Section of a bag
(2 gilled plates)

Cast-iron heat exchangers

Advantages of KABLITZ gilled heat exchangers:

- ▶ Compact design and minimal radiation loss due to high heating surface concentration
- ▶ Short assembly times due to factory assembly into pre-mounted modules
- ▶ Self-supporting structure on a base frame allows free expansion in all dimensions
- ▶ Good cleaning options due to max. 1 m flue gas path
- ▶ Replaceable individual elements
- ▶ Externally gas-tight, welded design
- ▶ Small insulation thickness
- ▶ Additional loads of up to around 10 % of the heat exchanger weight can be borne without additional steel structure
- ▶ No moving parts, i.e. no additional energy requirements and no maintenance costs
- ▶ Flexible application and switching options due to standardized modular system
- ▶ Optimized energy saving and maximum cost-effectiveness



Advantages of using cast iron

- ▶ High corrosion resistance
- ▶ Good erosion resistance
- ▶ Very good thermal conductivity
- ▶ High pressure resistance

We have the critical dew point safely under control, as

- the wall temperatures at the critical points can be calculated exactly and reliably if the heating surfaces are designed accordingly.
- the various plate types allow precise adjustment to all prescribed operating conditions.

Cast-iron heat exchangers

Reference project



Cast-iron gilled heat exchanger

Biomass thermal power station, Bad Mergentheim (Germany)

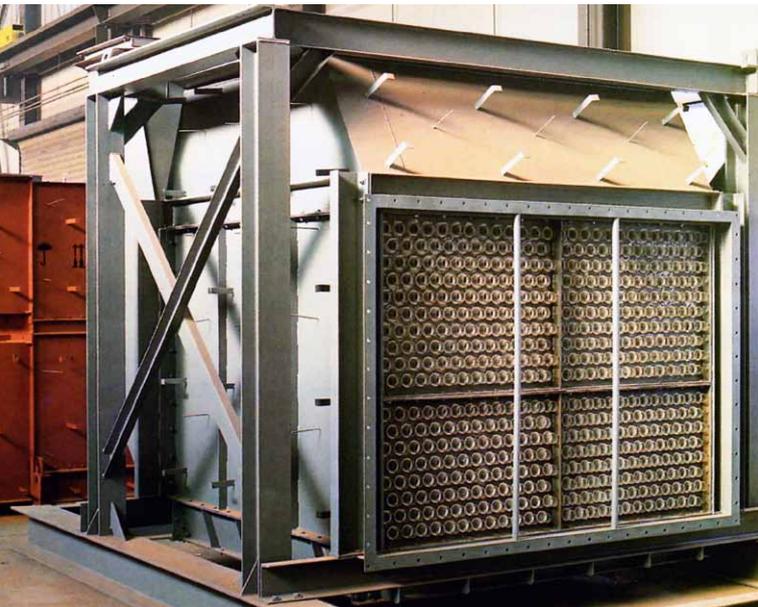
In order to increase the overall efficiency of a municipal energy supplier's biomass thermal power station, a KABLITZ gilled heat exchanger, which uses waste gas heat regeneratively to pre-heat the combustion air, was additionally connected downstream of the thermal oil heater.

The heat exchanger is connected downstream of the thermal oil economiser and is placed in the boiler house. The waste gases enter the heat exchanger at 210 °C and exit it at 150 °C. The air is heated up from 20 °C to 140 °C and supplied to the furnace as pre-heated primary air. The waste gas heat exchanger recovers 180 kW of heat: That is equivalent to a fuel cost saving of around 3 %.

To prevent temperatures from falling below the minimum values and sulphuric acid from condensing in the heat exchanger, so-called parallel/counter-flow switching was selected.

KABLITZ Glass tube heat exchanger

To achieve high efficiency, the residual heat in the flue gas needs to be utilized as fully as possible. As this may result in undershooting of the acid dew point, a KABLITZ glass tube heat exchanger is connected downstream.



Glass tube heat exchanger applications:

- As an ancillary heating surface, usually in combination with the cast-iron gilled heat exchanger, for recovering flue gas heat and pre-heating the combustion air for heat-generating plants operated by means of sulphur-containing fuels.
- As an ancillary heating surface for heating or cooling a wide variety of corrosive, gaseous media.

The glass tube heat exchanger consists of a robust steel framework which is used to bolt the tube plates protected by PTFE foil and the longitudinal tube cladding together in a gas-tight manner. The glass tubes are seated in PTFE gaskets and are gas-tight.

The medium to be heated is fed through the tubes and the medium to be cooled around the tubes. A water washing rake is installed above the heat exchanger for cleaning purposes.



Glass tubes

- Glass, previously mainly deployed only in the chemical and pharmaceutical industries, has been used as a tube material for heat exchangers for several decades, having been accepted and proven in practice.

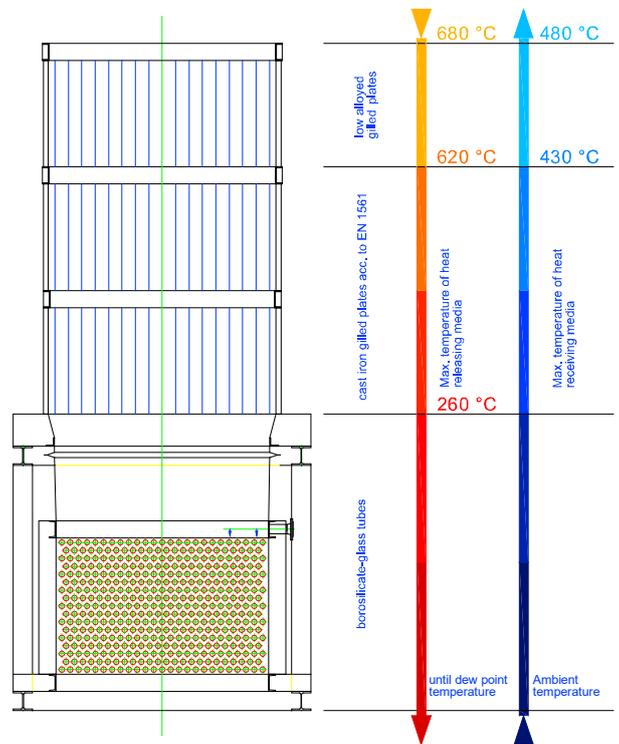
Temperature profile for the maximum permitted temperatures of the KABLITZ heat exchanger:

For the heat-emitting medium: 680 °C

For the heat-absorbing medium: 480 °C

Maximum pressure difference between the media: 300 mbar

In the acid dew point range, a KABLITZ glass tube heat exchanger made of borosilicate glass is connected downstream.



Design

The most important design element is the connection between the glass tubes and the steel tube plates. The PTFE gasket tested and proven in trials and in operation provides the best solution here.

It ensures:

- Permanent water and gas tightness between the heat-exchanging media
- Protection of the glass tubes against mechanical stress such as traction and twisting
- Free expansion of each tube while retaining tightness
- Compensation of the tube diameter tolerances
- Simple and quick removal of the tubes



Optimum cost-effective use of residual heat in flue gases and waste air

Advantages of KABLITZ glass tube heat exchangers:

- ▶ Complete material separation of the exchange media
- ▶ Tight and elastic sealing between glass tubes and tube plates using PTFE gaskets
- ▶ Corrosion resistance due to the use of borosilicate glass and PTFE foil for tube plates and longitudinal tube cladding
- ▶ Temperature-resistant up to 260 °C constant load
- ▶ Smooth, abrasion-proof exchanger surface
- ▶ Insensitive to soiling
- ▶ Effective cleaning in operation through washing rake
- ▶ Separate support structure in the case of an upstream cast-iron gilled heat exchanger
- ▶ High heat transfer coefficients and small pressure losses
- ▶ No moving parts, no maintenance
- ▶ Complete factory assembly

Properties of borosilicate glass:

- Chemically resistant to virtually all media, particularly to sulphuric acid
- High pressure resistance despite low tensile strength
- Low expansion coefficient
- Smooth, abrasion-proof surface, giving rise to higher heat transfer coefficients than is the case with steel.

This offsets the low thermal conductivity coefficient in relation to steel, such that the overall heat transfer coefficient for a glass tube heat exchanger is only around 4.5 % lower.

- Low soiling tendency



Glass tube heat exchanger

Reference project

Glass tube heat exchanger

Biomass steam generator, Rosières en Santerre (France)

A KABLITZ glass tube heat exchanger was used to optimize the operating costs of a biomass-fired process steam generator in the food industry. The heat exchanger is located in the open air and is set up after flue gas cleaning.

This arrangement means that no additional costs are incurred for cleaning devices. The waste gases of the saturated steam boiler are cleaned in a fabric filter and cooled from 155 °C to 105 °C in the heat exchanger.

As they are within the acid dew point range here, the KABLITZ glass tube heat exchanger was selected. This is corrosion-resistant to the condensing sulphuric acid. The air is heated from 35 °C to 100 °C and supplied to the firing system as pre-heated primary and secondary air. This increases the boiler efficiency to over 92 %, and annual fuel cost savings of 3.5 % are achieved.



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