FLOWSERVE GESTRA

GESTRA in Hospitals

Application Examples for Steam and Condensate Systems

Experience In Motion

FLOWSERVE GESTRA

Application Examples for Steam and Condensate Systems

Specific Requirements for Everyday Healthcare

Day after day, hospitals and their teams perform tasks of great responsibility – making it all the more important for each item of technical equipment to function smoothly. This applies just as much to the steam and condensate systems.

These units must be designed specifically for the hospital environment, because they often have to supply remote buildings with process steam and also have to provide sterilized pure steam wherever needed.

At the same time, hospitals have long been subject to the constantly rising demands of economic efficiency. As a result, the reliable supply of steam as well as the potential energy savings play a significant role in the decisions to be taken on the most suitable plant technology.

We have compiled various possibilities for saving energy, with a special focus on the requirements for steam and condensate systems in health services. With the GESTRA products recommended here, you can combine reliable plant functionality with financially attractive results.

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Schematic of a Hospital

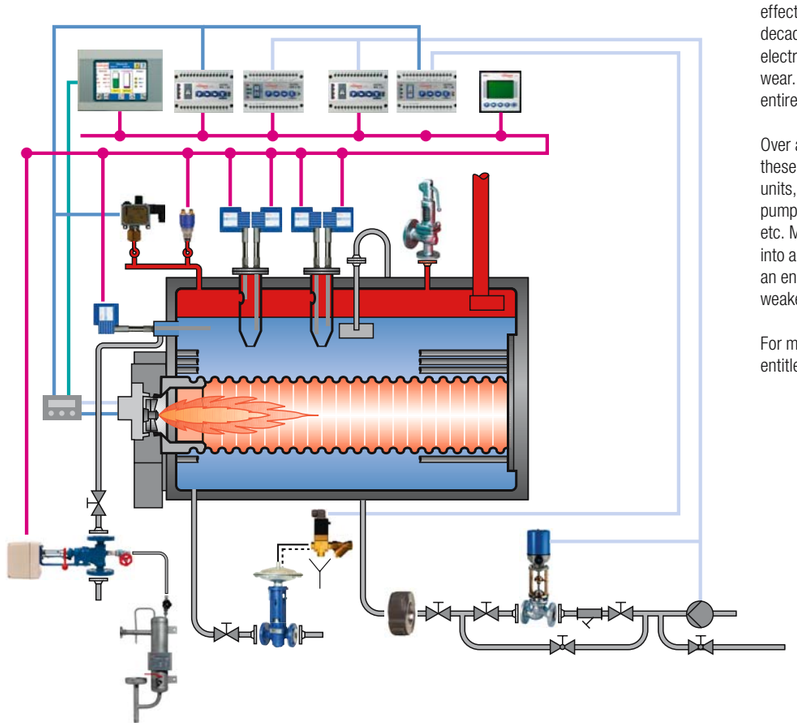
1. Steam boilers
2. Feedwater deaerating plant
3. Condensate recovery and return system
4. Electro-pneumatic pressure reduction
5. Steam regenerator
6. Economizer
7. Steam trap monitoring
8. Plant control with SPECTOR*control*
9. Self-acting pressure reduction
10. Steam flow measurement
11. Electrical temperature control
12. Flash vessel
13. Steam drier
14. Steam header
15. Air-conditioning plant
16. Disinfection of beds and mattresses
17. Sterilization
18. High-purity water treatment
19. Condensate header

To 2

Application Examples for the Boiler House

GESTRA Steam Boiler Equipment with Bus Technology

For operation e.g. according to TRD 604 (72 h) or EN 12953 (24 h)



Overview

Reliability, availability and economy have always enjoyed top priority in boiler operation. To an increasing extent, plant automation and visualization are playing a central role.

To implement these efficiency parameters as effectively as possible, GESTRA AG has for decades now been working exclusively with electrode systems that are low in maintenance and wear. In contrast to other systems, they function entirely without moving parts.

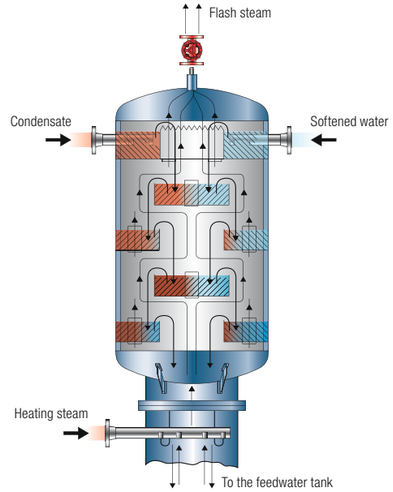
Over and above the boiler house equipment itself, these systems have now conquered the peripheral units, such as feedwater and condensate tanks, pumpless and pump-driven return installations etc. Many of our customers therefore do not enter into any compromises in this area too – after all, an energy supply centre is only as effective as its weakest element.

For more on this topic, see our separate brochure entitled “Equipment for Energy Supply Centres”.

GESTRA Feedwater Deaerating Plants

For the operation of steam boilers with a high thermal load on the heating surfaces, it is necessary to use boiler feedwater that has been treated and conditioned according to TRD 611, EN 12952 part 12 or EN 12953 part 10. The boiler feedwater must be free of hardening constituents, in order to prevent the formation of scale on the boiler heating surfaces.
Dissolved oxygen and carbon dioxide are likely to cause serious corrosion of metal boiler parts. With the GESTRA feedwater deaerating plant, dissolved aggressive gases are reliably removed from the boiler feedwater and make-up water.

The system consists of the feedwater tank SW and the deaerator dome NDR. Each deaerating plant for boiler feedwater is custom-designed for that particular application and meets the essential thermodynamic requirements to achieve optimal performance.

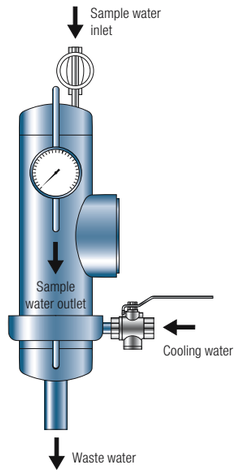


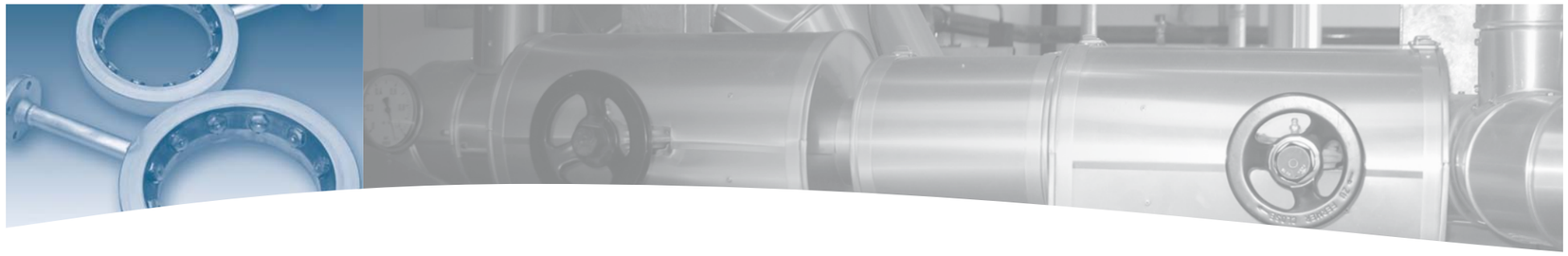
GESTRA Sample Coolers

For the smooth operation of steam boilers, it is especially important to analyse samples of the boiler water. However, to obtain proper and uncorrupted analysis values, you require accurate sampling methods and also testing instruments that function correctly.

Direct sampling of hot boiler water from pressurized lines always involves mastering a number of challenges. Firstly, there is the danger of scalding; secondly, analysis results may be corrupted as a result of flashing losses within the sampling line or in the sample container, which cause an increase in the density of the boiler water sample. The samples then no longer represent the true TDS content (salinity) in the steam boiler.

The perfect solution to these challenges is to use the GESTRA sample cooler PK. The boiler water sample is cooled down to the reference temperature of 25 °C and thus fulfils all of the requirements for precise water analysis and comprehensive work safety.





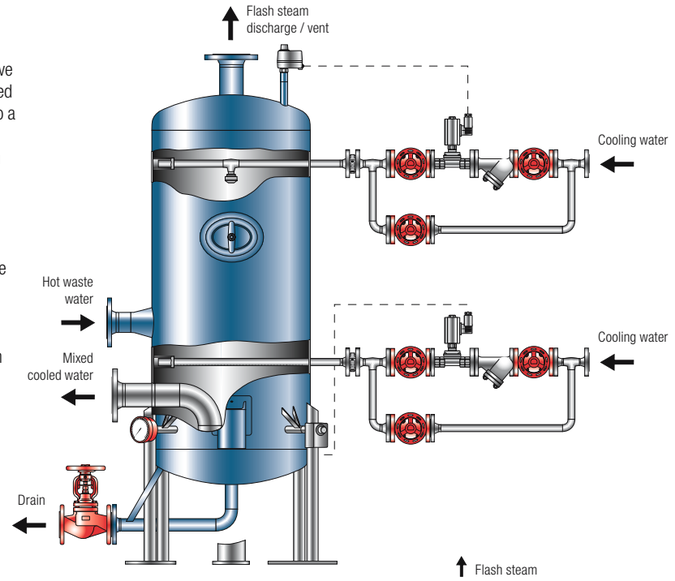
Challenges in the Boiler House

GESTRA Mixing Cooler VDM

Mixing coolers (a type of blowdown receiver) serve to cool hot waste water that can no longer be used for heat recovery and is therefore discharged into a basin, pit or drain.
Here it is necessary to ensure that the maximum temperature prescribed by law is observed.

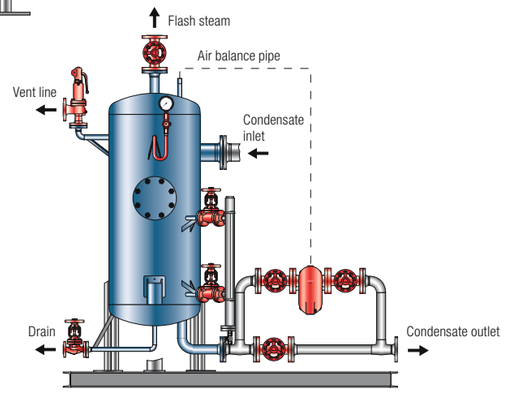
Typical applications for mixing coolers:

- Process plants where hot, contaminated waste water is formed
- Steam boiler plants where the blowdown is cooled with untreated water
- Mixing condenser for vapours and flash steam



GESTRA Flash Vessel Systems

Flash vessels reduce the operating costs considerably, because the sensible heat of the condensate is utilized economically. They can be used in all steam systems in which condensate from steam users can be flashed to a lower pressure. During the flashing process, heat is released, which leads to the formation of flash steam. In the flash vessel, this flash steam is separated from the water and fed into a steam system with a lower pressure for further use. Such a process can be repeated several times, depending on the possibilities for operating the steam system at different pressure ratings. The residual condensate in the flash vessel is passed into a condensate tank and reused as boiler feedwater.



Steam and Condensate Systems in Hospitals

In a modern hospital, the process steam needed for daily operation is usually generated in a central boiler house. As a rule, two or three steam boilers running in parallel are used to ensure that the necessary output is available. The specific demands of hospital operation on its steam and condensate systems are not related to steam generation in the central boiler house, however. The steam generation here differs little from that in other sectors. On the contrary, the steam generation in remote supply units represents a special challenge, e.g. clinic buildings widely distributed about the hospital grounds. For this reason, we will focus on the possible optimization of such a decentralized steam output and the corresponding potentials for saving energy.

In the ideal case, the process steam generated in the boiler house will be passed to the various consumption points via a process steam header.
To meet the demand while conserving resources, the quantities required by the corresponding users are continuously recorded by a steam flow measurement setup, and reliably monitored and controlled with the aid of an energy management system.

In the healthcare sector, process steam is needed for the following users, amongst others:

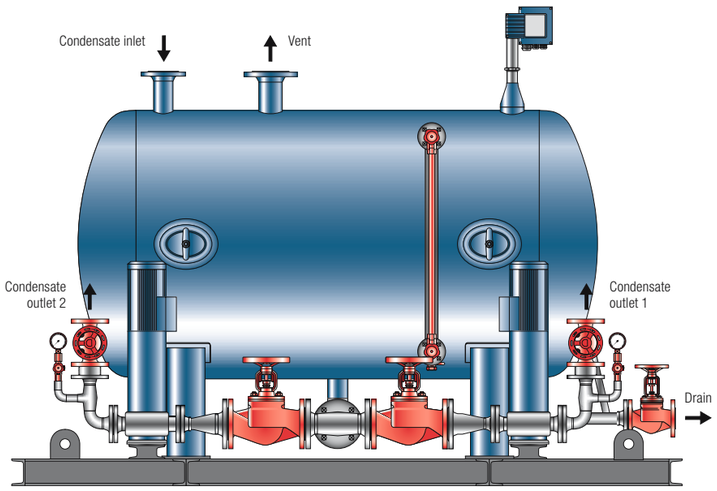
- For generating (pressurized) hot water and for heating systems
- Heating of service water
- Feedwater deaeration
- Pure steam for automatic cleaners and disinfectors
- Ironing, washing, calendering
- Kettles in the kitchen

Energy-saving tip: Reusing the condensate

The condensate produced at the various users is collected and then conveyed via steam-powered condensate return units to the central condensate recovery and return system. The condensate obtained from heat exchangers for the heating cycle and hot-water supply is also fed in here and then pumped back to the central boiler house. Thanks to the GESTRA monitoring systems, it is also possible to return condensate endangered by the ingress of foreign matter – no matter whether this concerns oils, greases, acids, alkalis, raw water or other substances.

Energy-saving tip: Undercooling on the condensate side

For heating cycles and the heating of service water, it is possible to use vertical heat exchangers with undercooling on the condensate side instead of horizontal heat exchangers controlled on the steam side. With condensate undercooling, it is possible to avoid the energy losses which would otherwise occur in the conventional horizontal heat exchangers through flashing of the condensate.



GESTRA condensate recovery and return systems

Specific Challenges in Hospitals

Rapid Provision of Exact Steam Pressures

The washing units as well as the automatic cleaners and disinfectors need pure steam or process steam with a lower steam pressure than that generally prevailing in steam systems. Since this steam pressure need not be exact, it can be regulated with the aid of self-acting pressure reducing valves. If operation of the plant requires that a precise steam pressure be provided very quickly, electro-pneumatic steam control is used.

Besides the need for correct sizing, it is also important to locate the control valve and the associated measuring transducers at the correct position in the piping. Only then can optimum plant function be ensured.

For effective and reliable operation of a plant, the control circuit must be designed carefully with a suitable measuring transducer, process controller and control valve as well as all the necessary system components.

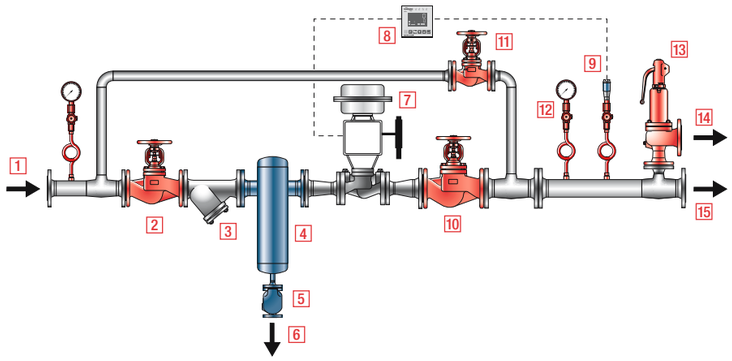
The higher the requirements in respect of control accuracy, rangeability, manipulating speed, cavitation, sound pressure level and optimizing of the operational and acquisition costs, the greater the care that should be exercised in selecting and sizing the plant components. Our experience shows that valves with too large a nominal size are often installed. If the valve is oversized, the smallest repeatable opening may be too large for the minimum flow that is needed. Incorrect valve selection can also lead to premature wear and excessive noise development. If cavitation arises in a control valve due to faulty sizing, this frequently results in damage to the internals, body or piping.

Owing to faulty (or no) calculation of the kv-value for control valves, often only a small part of the possible control range is used, or the required minimum or maximum flow is not achieved. In such cases, the control circuit will not function as it should.

Even with correct design of the control valves, it may happen that the standard version with parabolic plug is not able to fulfil the specific control task. Depending on the requirement, it may be necessary to fit the control valve with a reduced seat, hardened contours, multihole plug, Silent Pack or other additional internals.

Because of the building-block concept, the control valves of the series V725/726 offer a broad spectrum of applications. The modular construction permits easy expansion up to a fully-fledged control valve system offering communication functions. Thanks to the built-on positioner, this series offers a particularly compact structure. The pocket-free valve stem guarantees a long service life; the exchangeable internals facilitate maintenance, because the control valve can remain in the piping while the trim is replaced.

GESTRA electro-pneumatic pressure reduction



1 Steam inlet
2 Shut-off valve
3 Strainer
4 Steam drier
5 Steam trap
6 Drainage
7 Pneumatic control valve
8 General-purpose controller
9 Pressure transducer
10 Shut-off valve
11 Shut-off valve with throttling plug
12 Pressure gauge
13 Safety valve
14 Vent line
15 Steam outlet

From Process Steam to Sterilized Pure Steam

A core element for supplying steam to hospitals is the steam regenerator. For the operation of sterilizing equipment and air humidifiers in healthcare, the steam must be absolutely free of attendant substances that are noxious, chemically reactive or odorous. This is the case only with pure steam. For example, to guarantee uninterrupted supply of the operating theatres with pure steam, two steam regenerators are operated in redundant mode as a rule, i.e. one unit is keep on hot standby to take over the supply immediately in case of failure.

In the healthcare sector, pure steam is needed for the following users, amongst others:

- Sterilizing equipment
- Room air humidifiers
- Feedwater deaerating plants for highly purified water

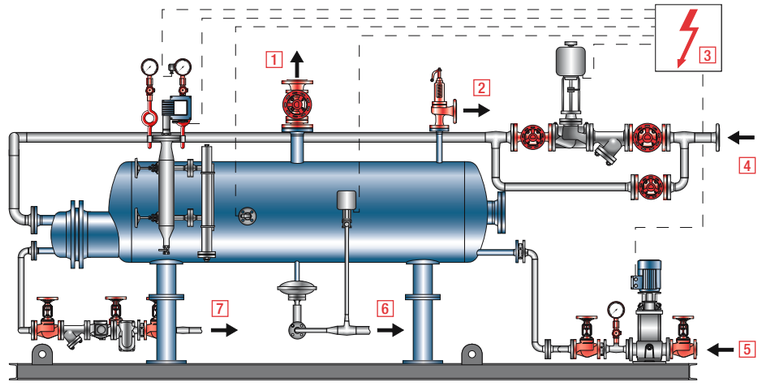
A well-planned hygienic installation considers the diverse aspects of energy efficiency and safeguarding sterility. For example, the condensate is collected from the sterilizing equipment and conveyed to the feedwater deaerating plant through a special recovery and return system.

What is more, the pure steam is used prudently. In the units for humidifying room air, it is sprayed in a fine mist. In the feedwater deaerating plant, it is atomized directly into the water bath by means of a steam injector. As a result, very little condensate is collected from the pipe drainage legs. To compensate for the difference in quantity, it is necessary to provide for a continuous feed of fully deionized water into the feedwater plant.

A smoothly functioning hygienic installation also needs professional planning and workmanship for the pure-steam and condensate lines. The pipes and valves to be used in medical sterilization must be made of chrome-nickel steel to ensure sterility. The energy still contained in the returned process-steam condensate can be put to good use in preheating the feedwater for the steam regenerator.

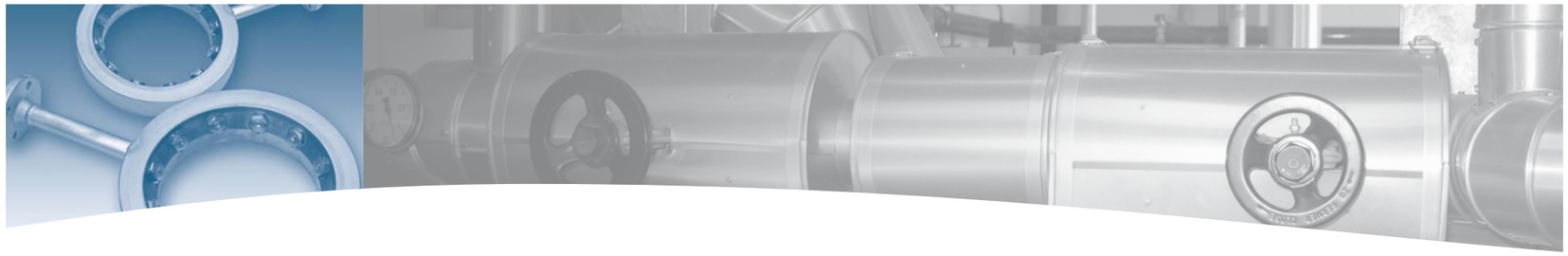
Frequently, energy supply centres do not have enough space left over for a separate feedwater deaerating plant. A compact alternative is offered by the GESTRA steam regenerators, for which a deaerator dome can be mounted on top. With the correspondingly adapted controls, the deaeration function can be integrated into the steam regenerator.

Depending on the plant operator's requirements, we can supply either conventional or PLC control equipment – the latter offering the added possibility of data transfer to a central control system.



GESTRA steam regenerator as a compact system

1 Pure steam outlet
2 Vent line
3 Control cabinet
4 Heating steam inlet
5 Feedwater inlet
6 Continuous/intermittent blowdown
7 Condensate outlet



Process Reliability and Energy Efficiency

Safety tip: Electronic monitoring

Automatic steam traps intrinsically offer a high degree of functional reliability. This can be increased further for particularly sensitive and cost-intensive steam delivery processes with the aid of electronic monitoring:

- Blocked and/or leaky steam traps are detected reliably and in realtime.
- The operating conditions of all monitored steam traps can be read off quickly and conveniently.
- The system can be configured in a versatile manner, and automatically suppresses error messages on startup and shutdown of the steam system.
- With the aid of a fault history function, it supports the possibilities for continuous system optimization.

Your benefit: Process reliability is enhanced; cost-intensive plant malfunctions are prevented.

Energy-saving tip: Steam trap monitoring

A leaky steam trap can lose as much as 5 to 20 kilograms of steam every hour. If we assume 8,000 operating hours for the steam trap per year and the smallest loss of live steam of 5 kg per hour, over 40 tonnes of unused steam will escape per year. Assuming the steam costs to be 50 euros per tonne, this means that just one leaky steam trap can cost you the unnecessary expense of 2,000 euros per annum.

With the steam trap monitoring system VKE by GESTRA, these costs can be ruled out permanently.

GESTRA condensate monitoring system

1 Level electrode for installation in GESTRA steam trap

2 Test unit

GESTRA Service

As an international leader in the manufacture of valves, traps and control technology for the steam and energy industry, GESTRA offers its customers many decades of experience and the technical service to match – giving you a decisive competitive advantage.

To make our technical service even more focused and effective, we have separated the service departments for GESTRA valves and steam traps and GESTRA electronic equipment for steam boilers, and also expanded them considerably. This gives our customers a direct line to the right experts, ensuring that assistance can be given speedily.

You can also count on us for superior maintenance: as a plant operator, you have to rely on the smooth operation of your installation. All systems must be checked and serviced regularly. However, your maintenance staff increasingly need to concentrate on the specific demands of the medical equipment, giving them less time to look at the basic steam and condensate system.

Our highly trained specialists can take on this task for you within the scope of a GESTRA maintenance agreement. We will be happy to advise you.

Process Data Visualization

Where Worlds Connect – for an Optimized Flow of Information

If you wish to integrate your boiler data within a higher-ranking control system, you need SPECTOR*com* or SPECTOR*control* by GESTRA. All measurement data are sensed by electronic signal transducers and passed on to the control centre, where they are combined to form high-level statements. The SPECTOR*control* system has a Touch PLC unit; this is used for automatic control of e.g. the pressure, temperature and conductivity, and also for the local visualization functions.

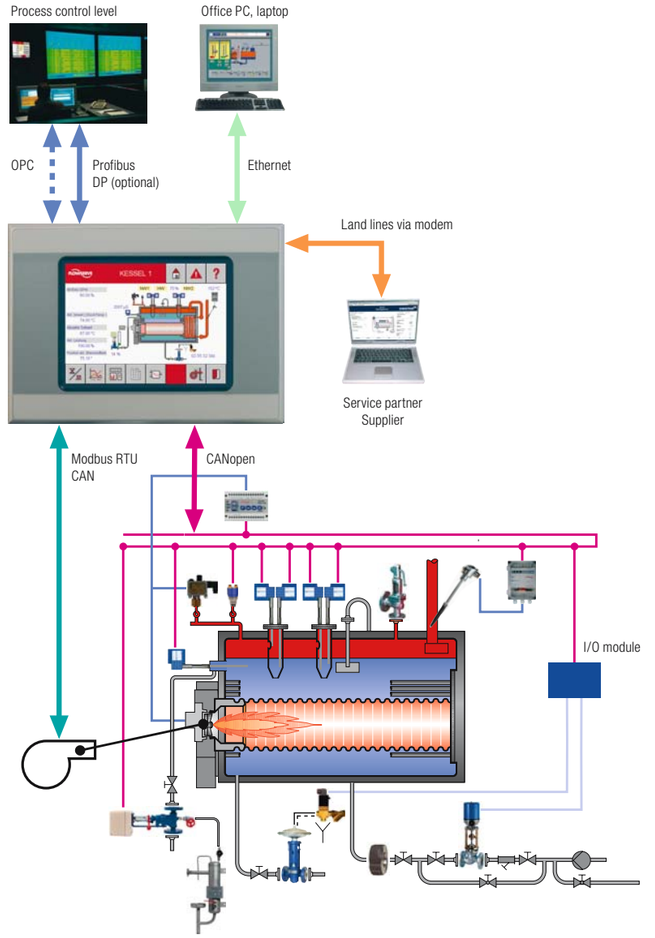
The Benefits for You

Better process overview:

- Enhanced overview of the process, through centralized process display
- Actual values indicated as bar chart
- Trend plot of the measurement values
- Prioritized display of faults
- List of maintenance intervals
- Designations of the measurement quantities, input/output signals, and logging of alarm and status messages – configurable by the operator
- Logical combination of all signals, limit and warning values possible
- The results are provided as a report

Greater efficiency:

- Better utilization of fuel
- Totalizing of consumption
- Improved environmental protection through monitoring of waste water and exhaust gases
- Modular, expandable architecture for all plant sizes
- Separate electronic control units no longer needed, thanks to the integrated control circuitry
- Input and output signals are easy to integrate



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With Energy into the Future