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## Expert Report

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### Steam boiler Bosch U-MB

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Shell boilers, also called flame tube boilers, are considered easy to operate and maintain, resistant, rough and long-lasting. Even with changing loads they provide a high-pressure stability and good steam quality. In the long history of steam boiler technology this design type, particularly the three-pass flame-tube boiler, was able to assert itself due to the high energy utilisation and low emission rates. Thus, the boilers used for medium to high steam capacities of up to 55,000 kg/h are almost exclusively three-pass flame-tube boilers. However, for smaller steam quantities of up to approx. 2,000 kg/h, a multitude of steam boiler designs are competing on the market. This is mainly due to the demanding production processes for three-pass shell boilers compared to less complex designs. The U-MB three-pass shell steam boiler is a revolution in the market for steam generators in this performance range.

#### Structure and design

The product designation 'U-MB' stands for 'UNIVERSAL Modular Boiler'. As you can already gather from the name, the boiler consists of several modules, the heat generator part in three-pass design, the steam chamber located above it and an integrated economizer. Each module can be selected independent from the others in a customer-specific

way according to the customer's requirements. Energy efficiency, steam quality and emissions can be optimised that way.

As a genuine three-pass boiler it can reach a very high efficiency. Built-in flow control devices in the flame tubes are not necessary.

The heat generator part of the U-MB is based on the UT boiler design, which has already been proven and tested in practical application for decades.

### Modular and flexible

The individual boiler body modules are selected according to the customer requirements.

Here the heat exchanger part mainly influences the low emission rate. The generously dimensioned flame tube geometry facilitates an efficient combustion process that reduces the formation of nitrogen oxides.

The selection of the steam part influences the steam quality significantly. The generous dimensioning has a positive effect on the residual steam moisture.

The selection of the economizer directly influences the energy efficiency. The waste gas heat is used for preheating the boiler feed water and a large part of it is recovered that way. Furthermore, fuel consumption and emissions are reduced.

### Installation

The steam boiler bears the CE mark and meets the requirements of the Pressure Equipment Directive. Therefore, it can be installed and operated in Europe and also in many other countries.

Due to its small base area transport as well as installation can be carried out at low cost.

Due to its optimised water volume it is designated as “product boiler” in many countries. The product of water content x safeguard pressure (pressure capacity product) of many available sizes is less than 20,000. This way, the boiler can be installed almost everywhere e.g. in Germany and Austria. A separate boiler house is not mandatory.

Due to its compact design, the U-MB is also suitable for container transport or installation. The smaller capacity ranges can be perfectly integrated in a 20 foot standard container. Various parts of the equipment as well as steam and supply lines protrude from the container roof due to their installation height.

### Assembly

The U-MB is delivered as a completely equipped unit. This unit includes the insulated boiler with attached equipment, the boiler control cabinet and a low-emission burner. Sensors and actuators are already wired in the integrated terminal box. Ready-made, hidden and coded cable bundles make it easy for the

plant builder to install the electric wiring between boiler control cabinet and terminal box. The control cabinet (design as upright cabinet or wall-mounted cabinet) can be installed according to the conditions on site.

It goes without saying that the U-MB blends in with the extensive boiler component program from Bosch Industriekessel GmbH. All modules for fuel supply, water treatment, sewage disposal, water analysis, condensate treatment or heat recovery can be combined with the U-MB.

### Easy to use – new fully automatic system

As a genuine three-pass shell boiler, the U-MB provides all benefits of this design. It requires less maintenance, robust centrifugal pumps can be used and it achieves a high pressure stability and steam quality.

The control engineering equipment of the steam generator is unique in this performance segment. As it is the case with shell boilers, the boiler management system also uses a programmable logic controller, the BCO Boiler Control.

The device takes on all control and regulation functions of the U-MB and it can communicate with other controls (e.g. the System Control SCO, burner management systems, separate controls of boiler house modules, superordinate control systems) via bus system or network.

A graphically controlled touch panel facilitates easy and intuitive operation. Integrated protection functions make operating errors impossible. Storage of operating signals and operating data facilitates an exact analysis and optimisation of the boiler system.



Figure 1: Touch screen display of the BCO Boiler Control

The controls are already prepared for the cost-efficient Remote service.

New and innovative automatic functions have been integrated in the U-MB steam generator control.

The water capacity is heated with low burner capacity until a certain pressure is reached. During this process the system continuously monitors the water level and controls it with the aid of the automatic blow-down valve if necessary. It is important for the boiler water to blend well during the start-up process. Unnecessary strain of the system by thermal stress is avoided. This is achieved by an optimised starting cycle of the motorised steam shut-off valve. The downstream net is slowly heated with the steam that flows off. Thus the boiler's natural internal water circulation is triggered.

The automatic shutdown process can also be triggered by the push of a button or by an external signal. The steam shut-off valve closes and the burner capacity is slowly reduced until the burner eventually interrupts the fuel supply completely.

The boiler is now ready and waiting for the next request.

The integrated overload protection function provides for a high pressure stability and constant steam quality in case of sudden step changes in load. When the operating pressure of the steam boiler is reduced although the burner operates with nominal load this is a definite sign of overload. BCO realises the problem and reduces the steam outlet with the aid of the motorised steam extraction valve until the boiler pressure is stable again. This avoids water entrainment and its follow-up problems like brining and corrosion of downstream components.

### Easy maintenance and service

When it comes to maintenance expenditure, shell boilers have a general advantage compared to other designs. One of the advantages is the possibility to use maintenance-free circular pumps.

Besides, the boiler provides the necessary inspection and cleaning possibilities. The measuring and water level indicating module facilitates very good access to the water level control and limitation electrodes, and all other valves installed in the boiler crown are easy to access.

Above all, easy service signifies that an optimum adjustment of the steam generators can be carried

out quickly. Thanks to the analysing possibilities of the BCO control system (advance warning messages, operating signal storage, operating data storage), trouble shooting as well as energy or operation optimisation are extremely easy.

A close meshed customer service network and a reliable spare parts service all around the clock every day of the week all year long provide reliability and safe investment.

Quick and cost-efficient help is provided via the remote service which can be selected as an option.

### Quality and design

Our highly modern production facilities ensure that our equipment has a quality know-how, which is confirmed by the official test and quality seals of almost all the approval bodies and certification institutes in the world. More than 110,000 boiler systems supplied in over 140 countries are a clear testament to the high quality and reliability of our industrial boilers.

U-MB as well as the large industrial boiler series are exclusively equipped with high-quality components from high-quality manufacturers. The steam generator is type-examined and manufactured in accordance with the strict guidelines of the Module D quality assurance system of the Pressure Equipment Directive.

The product design of the U-MB clearly sticks out. We consciously omitted the circular basic forms. An aluminium-coloured silencer hood bearing the prominent brand logo marks the 'face' of the new U-MB. The distinctive layout of the line and elaborate angular shapes create an exciting play of light and shadows adding three-dimensional depth. The sculptural shape provides an optical experience of the steam boiler's dynamic product features.

### The price is right

During the development of the U-MB, particular attention was paid to an optimum cost-benefit ratio. The favourable price is due to high quantities, the modular design and the consistent use of common parts. Just as in the automobile industry, in which identical platforms are used for different types of vehicles, we use a wide variety of common components in the construction and controls of our systems. The annual production of more than 1,500 industrial boiler systems brings about cost advantages that can be passed on to the customers.

## Summary

The UNIVERSAL U-MB provides the customer with unmatched steam generator qualities in this class. Thanks to the modular design, the U-MB can be exactly aligned with customer requirements without having to sacrifice the benefit of cost advantages due to large quantities. The result is a steam boiler that matches any large industrial boiler series in function and quality any time.



Figure 2: UNIVERSAL Modular Boiler U-MB (boiler in modular design) –unique in design and all other features

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