



Expert Report

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BOSCH
Invented for life

Boiler Insulation Technology

Most steam and hot water boilers are often in use for over 8000 hours a year, and during this time they emit heat into the surrounding atmosphere, depending on the technology they use. These losses from heat radiation and conduction are the same at every boiler load level. However, they differ completely for each manufacturer, depending on the design, the number and form of thermal bridges and the insulation technology applied.

The boiler designs from Bosch Industriekessel, which have been tried and tested for decades, use the best possible thermal technology and have a far better surface/performance ratio than other designs because of the heating gas conduits, geometry and layout of the combustion chamber and convection heating surfaces. In spite of this excellent starting point for keeping heat radiation losses low, we have also made use of further opportunities to minimise losses.

Insulating mats without spacers

With the insulating technology used, no spacers are placed between the boiler body and the cylindrical insulating cladding, thus preventing thermal bridges. There is no conduction of heat from the hot boiler drum to the insulating cladding, which means that the thermal insulation of the insulating mat is effective all over.

Insulated inspection openings

The interiors of steam and hot water boilers have to be inspected regularly by the competent supervisory authorities. This requires inspection openings with special locks in the boiler body, for which openings have to be made in the insulating cladding. These

openings are insulated and closed with screw-down insulating coverings. The inspection and cleaning openings in waste gas collection chambers and economiser housings are sealed using the same insulating technology, so that no increased radiation heat is lost through inspection openings. Marker labels are affixed over the inspection openings.

Minimal thermal bridges

Thermal bridges at boiler stools and platform consoles are reduced to a minimum using structural measures. Boiler feet, boiler stools and platform consoles, which only adjoin the boiler body at the weld connection, reduce the thermal bridge effect. Elements used to improve structural loading and rigidity are underneath the insulation and do not conduct heat to the insulating cladding.

More usable heat through innovative insulation materials

Boiler systems with front doors in contact with heating gas or built-on front reversing chambers use insulating materials that provide up to 30% better thermal insulation values than standard insulating materials.

Compact and surface-minimised

We have achieved this aim of increased customer benefits with virtually all our series of boilers. These boiler systems are fitted with fully integrated economizers for flue gas heat recovery without any appreciable increase in surface size.

Separate housings insulated on all sides are only used for economisers that are retrofitted onto existing boiler systems.

Boiler Insulation Technology in practice test

Thermographic measurements on the boiler during operation clearly show the high level of thermal insulation. The insulated areas show an even temperature distribution without visible, increased hot spots which is proven by the examples indicated below.



Figure 1:
Factory photo-
graph of a boiler
during insulating
without spacers
in the cylinder
area

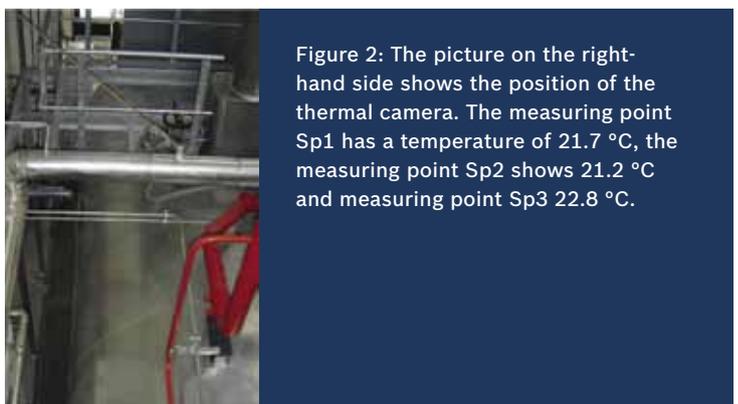
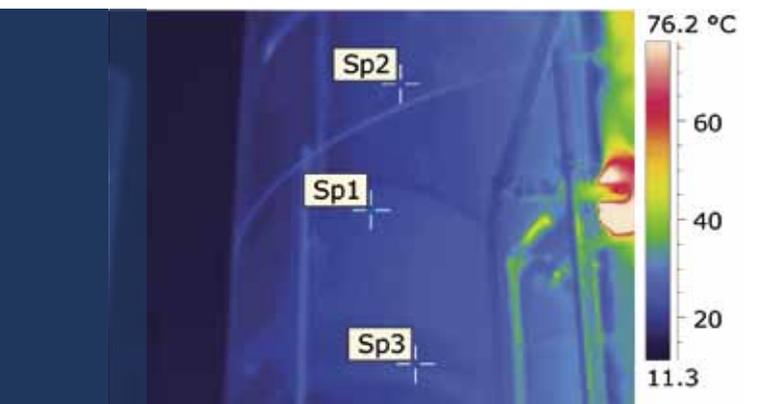


Figure 2: The picture on the right-hand side shows the position of the thermal camera. The measuring point Sp1 has a temperature of 21.7 °C, the measuring point Sp2 shows 21.2 °C and measuring point Sp3 22.8 °C.

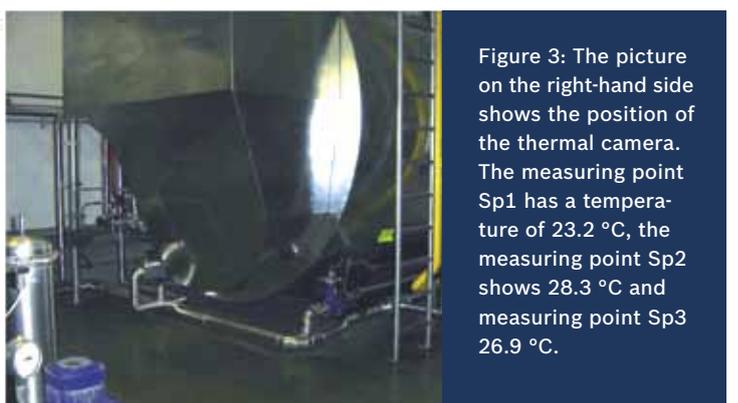
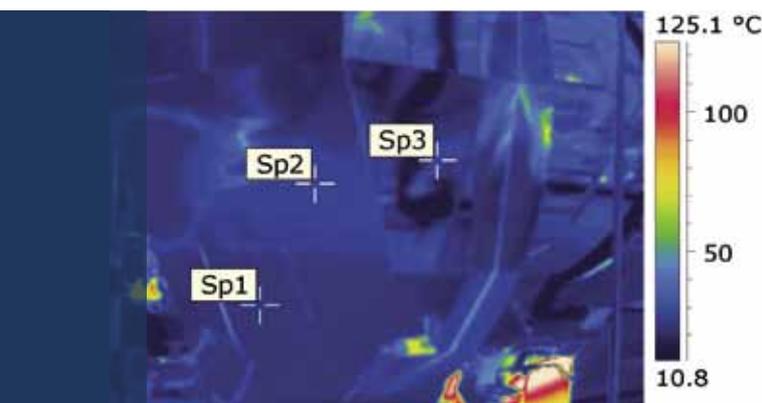


Figure 3: The picture on the right-hand side shows the position of the thermal camera. The measuring point Sp1 has a temperature of 23.2 °C, the measuring point Sp2 shows 28.3 °C and measuring point Sp3 26.9 °C.

Bosch boilers with outstanding thermal balances

In an examination of various manufacturers' boiler surfaces insulated with insulating mats and cladding designed for a particular performance, it is clear that very different quantities of fuel are required to cover thermal losses, depending on the manufacturer. In the case of the boilers compared here, (A = Bosch and B), the Bosch boiler has a smaller surface area, thus saving thousands of litres/cubic metres of fuel oil/gas.

Insulating claddings for every application

Insulation technology, using a cladding in heavy-metal-free aluminium with a structured surface, fulfils almost every requirement. For use outside buildings, overlaps are sealed so that they are weather proof, and resistant materials are also used, such as seawater-resistant aluminium, for aggressive environments.

Commercially outstanding, environmentally compatible

Calculations have shown that the insulation technology used by Bosch Industriekessel gives far more savings than any other insulation of the same thickness which is not in line with the latest technological developments. The diagram also shows that insulating mats more than 150 mm thick do not make sense economically. We have squeezed out every last drop of benefit, commercially and environmentally, with all boiler systems through our design measures and through the use of our insulation technology.

Mineral fibre mats, as used in house building, and biodegradable ceramic insulating mats are used, showing our total environmental awareness. The thermal insulation materials employed can be disposed of like normal building rubble on any disposal site with the appropriate approvals.

Example: Trend of heat loss from two boilers with the same steam output with different insulating surfaces and insulating mat thickness

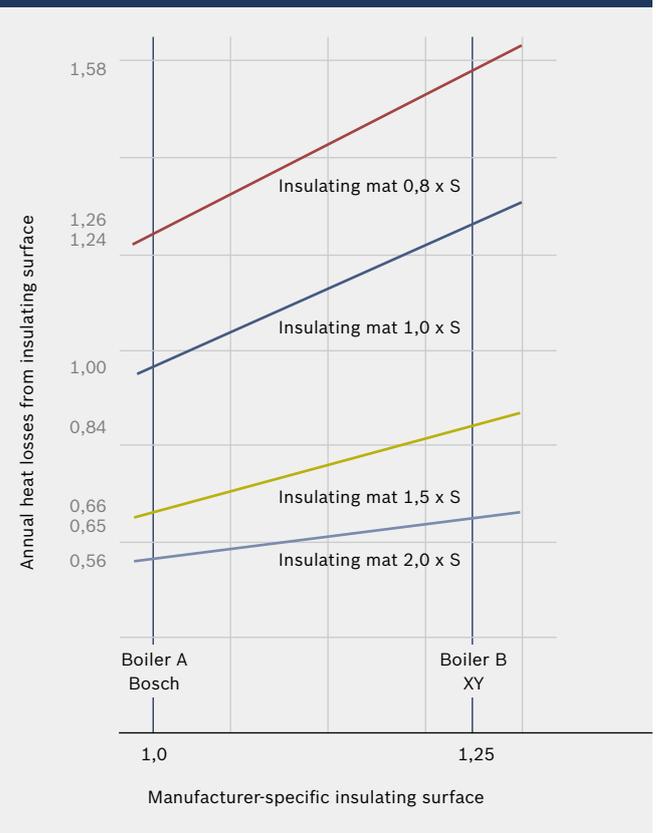


Figure 4: Free-standing boiler system in use at an oil company in France

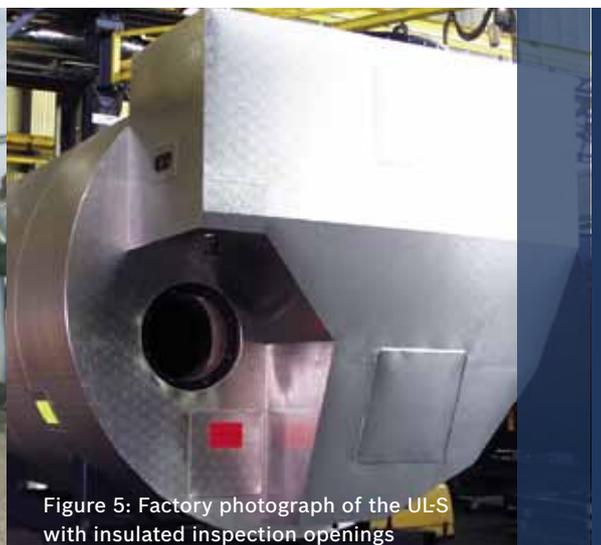


Figure 5: Factory photograph of the UL-S with insulated inspection openings



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