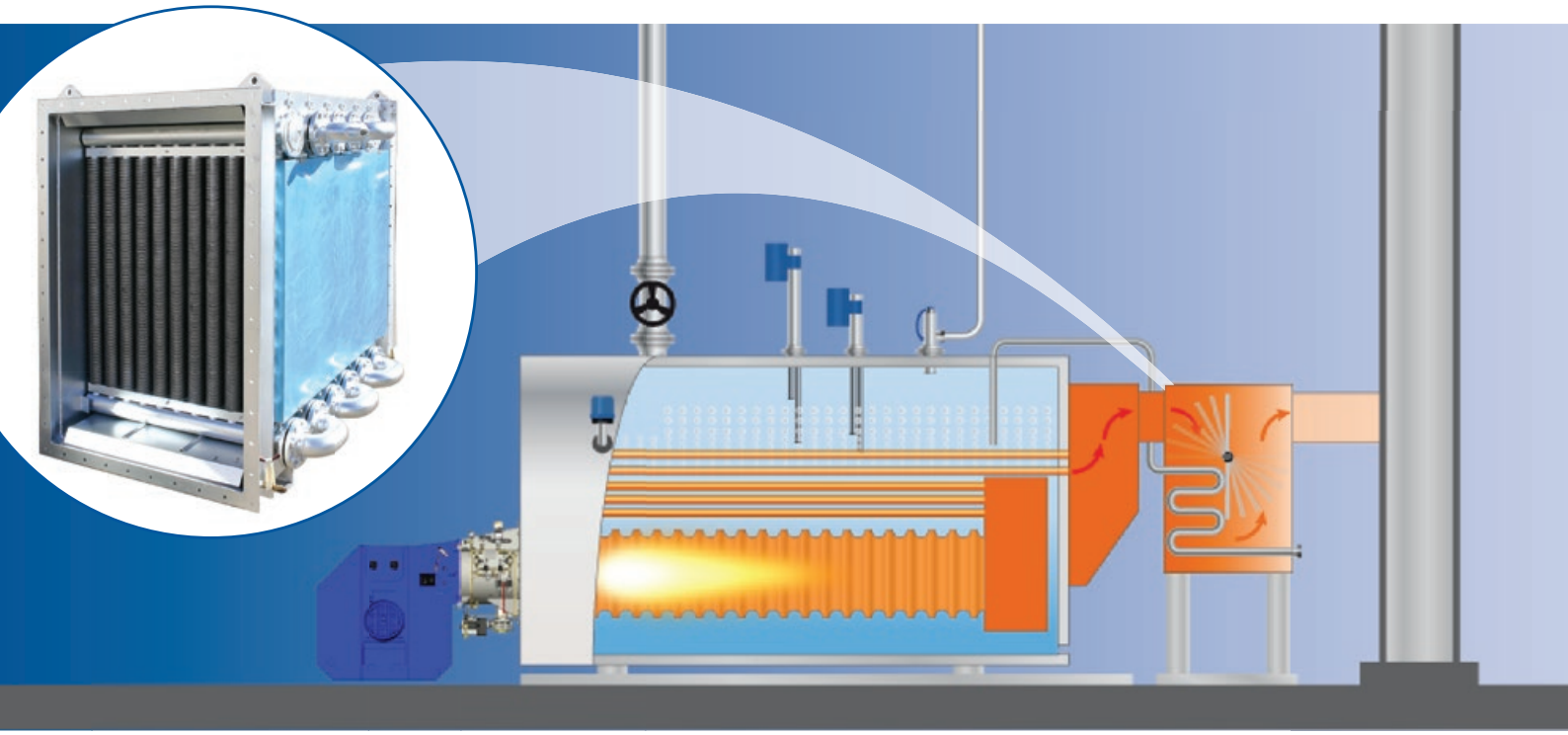


# Wind of Change – making intelligent use of waste heat

Waste heat means loss because energy is emitted unused into the atmosphere. And this loss is greater and the hotter the flue gas leaves the heat generator.
Flue gas heat exchangers remove valuable thermal energy from the flue gas in order to preheat feed water, process water or combustion air. Retrofitting pays for itself within an extremely short time since even small temperature differences result in significant benefits: a reduction in the flue gas temperature of 100 K increases the efficiency of the system by around 5 %
1Depending on the temperature level and the medium to be preheated, three different types of heat exchangers are available: economizer, condensing heat exchanger and air preheater.

## Advantages of a Flue Gas Heat Exchanger at a glance

- Reduction in fuel costs
- Increase in efficiency of up to 10 %
- Suitable for all heat exchangers
- Suitable for all standard fuels
- Can be retrofitted in existing systems

### Economizer

After thermal processing boiler feed water usually has a temperature of just over 100 °C and is thus "cold" compared to boiler water. This is where an economizer can bring its advantages to bear: it conveys the feed water through the flue gas flow before it enters the boiler and raises the temperature level to 130 - 140 °C in this way while the flue gas cools down to about 130 °C. By using this method, the burner has to heat up the feed water to a considerably lesser extent and efficiency increases significantly. Economizers are especially easy to use as heat exchangers in hot-water networks. In this case the economizer preheats the hot-water return.

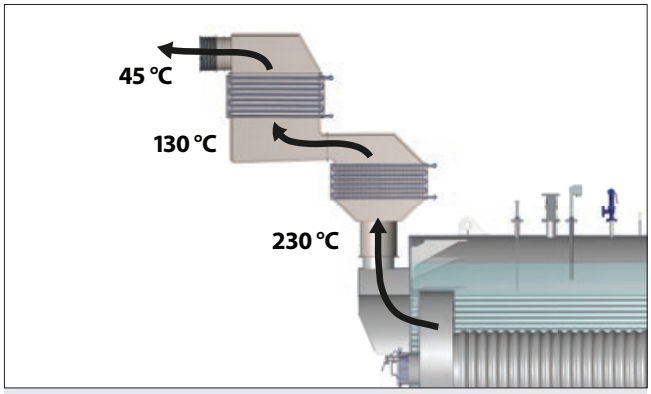

SAACKE GmbH | Head Office in Bremen: Südweststrasse 13 | 28237 Bremen | Germany | Tel.: +49 421 6495 0 | Fax: +49 421 6495 5224
International contact details: www.saacke.com | e-mail: info@saacke.com
0-0750-0026-02

## Condensing heat exchanger

The 130 °C limit for economizers makes sense even though the complete thermal energy is not utilized in this way. In this case the flue gas does not cool down on the way to the top of the stack to such an extent that the temperature drops below the dew point and the water vapour in the flue gas condenses. This would have fatal consequences, i.e. corrosion in the entire flue gas system. Things are different with stainless steel. This material is resistant to corrosion. If the economizer and the flue gas system are made of stainless steel, the flue gas temperature can therefore be substantially further reduced. This is referred to as “condensing appliance technology”.

The condensing appliance technology is of particular interest if a great deal of fresh water or process water has to be heated up. In other words, the lower the flue gas temperature can be reduced, the more efficient the condensing appliance technology.
The function of the condensing heat exchanger corresponds to that of the economizer, the big difference being that here the flue gas can be cooled down much more.

This technology is advantageous especially with fuels that contain a great deal of hydrogen (e.g. natural gas) because the water vapour in the flue gas begins to condense at higher temperatures (in the case of natural gas, for example, at 58 °C) and thus releases its energy at an early stage.



For maximum heat recovery from the flue gases use condensing appliance technology.

## Air preheater

If no cold water is available for preheating (e.g. with thermal oil heaters, whose flue gas temperature typically reaches 400 °C), a suitable method would be to utilize the flue gas heat to preheat the combustion air of the burner. Even though several aspects would have to be kept in mind with such a preheating system (fuel-air ratio, dew point of flue gas, additional cooling of components as of certain air temperatures), this form of flue gas heat exchanger also pays off within an extremely short time.

## Example of a system

The following sample calculation assumes a steam boiler with a capacity of 15 t/h and a burner with a capacity of 10 MW.
The flue gas temperature is lowered by up to 130 K by means of an economizer, resulting in a very significant efficiency increase.

### Steam boiler 15 t/h, 10 bar, natural gas 10 MW, without and with economizer

| Burner output max. MW | $O_2$ in the exhaust gas % | Exhaust temperature °C | | Operating hours h/a | Saving* | |
|---|---|---|---|---|---|---|
| | | without Eco | with Eco | | Energy kWh/a | Costs EUR/a |
| **4** | 2.8 | 210 | 130 | 1,500 | 217,200 | 8,700 |
| **6** | 2.6 | 230 | 130 | 2,500 | 673,000 | 26,900 |
| **8** | 2.4 | 250 | 130 | 1,500 | 640,500 | 25,600 |
| **10** | 2.2 | 270 | 130 | 500 | 310,000 | 12,400 |
| | | | **Amount** | **6,000** | **1,840,500** | **73,600** |

* Fuel costs: 0.04 EUR/kWh

For further information, please visit: **www.saacke.com**


SAACKE GmbH | Head Office in Bremen: Südweststrasse 13 | 28237 Bremen | Germany | Tel.: +49 421 6495 0 | Fax: +49 421 6495 5224
International contact details: www.saacke.com | e-mail: info@saacke.com