



Optimizing efficiency

Identifying potential

Energy losses increase operating costs and place stress on the environment. That is obvious. Fuel costs rise and today it is more important than ever to use fossil fuels responsibly – not least of all from an ecological point of view.

A modern firing plant therefore has to extract as much power as possible from the available fuel – every quantum of fuel must be exploited as thermal energy. A prerequisite for this is a high degree of efficiency.

For this reason increase of efficiency plays a decisive role in the modernization of firing plant.

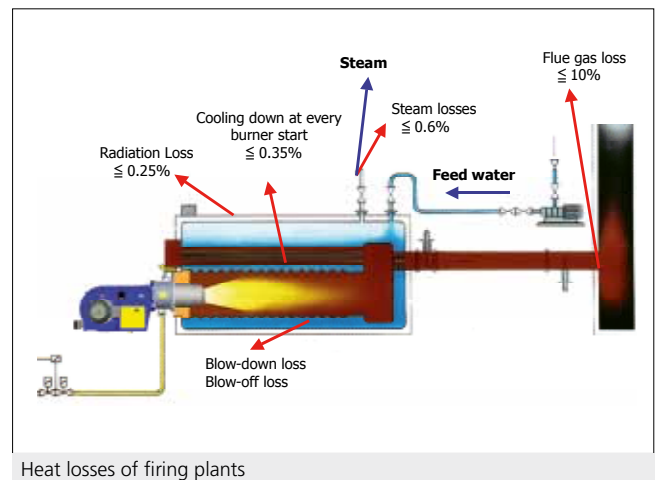
But how can one determine what energy losses are avoidable and, above all: how can one minimize these losses?

How can optimal efficiency be achieved so as not to give away any energy?

The factors

Mainly various types of heat losses negatively influence efficiency. The following diagram illustrates this:

To be able to exploit the energy used through the fuel, optimization measures have to be taken particularly with regard to flue gas losses.



Heat losses of firing plants

The two decisive factors for flue gas loss are

- the flue gas temperature and
- the air surplus.

The hotter the flue gas is, the more energy it contains. This means hot flue gas gives off considerable unexploited energy to the environment – and provides for a direct heat loss. Therefore, the lower the flue gas temperature, the lower the heat loss – and the better the efficiency of the firing system.

The second factor, the air surplus, is the difference between the actually set and the theoretically required combustion air volume. A low air surplus is necessary to ensure stable and low-emission combustion. With modern firing plants it is between 8 % and 15 %. If the air surplus is too high, however, valuable unexploited heat is lost.

Calculation of flue gas loss

The flue gas loss can be estimated with the help of the Siegert formula.

$$X_f = \left(\frac{A}{21 - O_{2,dry}} + B \right) \cdot (\vartheta_f - \vartheta_a) \quad \text{in \%}$$

X_f = flue gas loss
 ϑ_f = flue gas temperature in °C
 ϑ_a = combustion air temperature in °C
 $O_{2,dry}$ = O_2 value measured in the dry flue gas in vol. %

A and B: constants

	EL fuel oil	HFO	Nat. gas	Liquid gas	Town gas
A	0.68	0.69	0.66	0.63	0.63
B	0.007	0.007	0.009	0.008	0.011

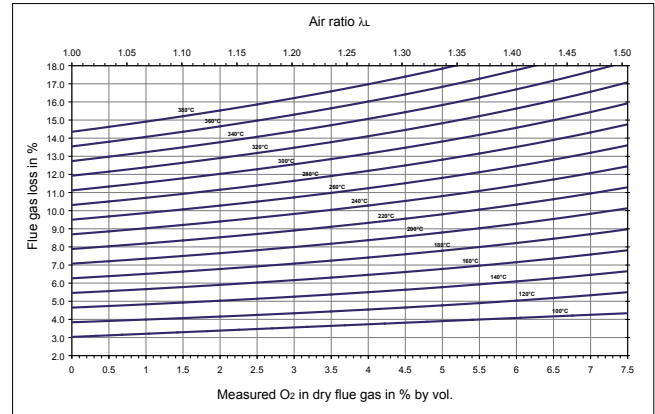
* Calculation basis: 1st German Immission Control Act (1. BImSchV)

The above-mentioned parameters are inputted in this formula directly or indirectly.

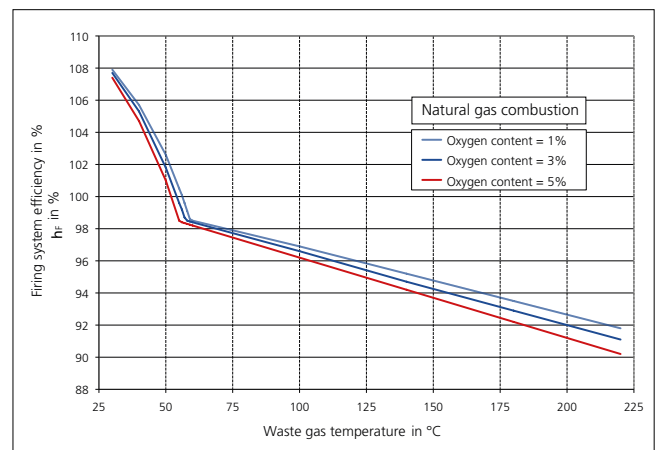
The following figure shows a selection of results of the Siegert formula.

In addition to flue gas losses, energy losses of fans or radiation losses of the boiler also have a significant impact. All loss factors here can be minimized, as a whole or individually.

SAACKE is intensively involved in efficiency increase of industrial firing plants. We would be glad to offer you a calculation of the potential for cost and emission reduction by means of the SAACKE Energy Efficiency Calculator – and then implement the appropriate measures for you.



Flue gas loss according to Siegert formula



Improvement of firing plant efficiency by means of condensing appliance technology

A brief excerpt from our portfolio

- Minimization of auxiliary energy, such as by using variable speed motors
- Highly efficient secondary heating surfaces (air pre-heater, economizer)
- Minimization of air surplus by means of CO-/O₂-control
- Service or process water heating (condensing appliance technology)
- Optimization of mode of operation and control parameters
- Minimization of startup losses by means of burner start with prepurging sequence

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