What advantage do you have when using the fully condensing boiler ?

Condensing boiler for fuel oil and gas:
BK 25, BK 50, BK 70, BK 100

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There are many boiler manufacturers – there is only one earth for us to live on.

This is why we should treat our natural resources carefully and do everything to conserve our natural resources.

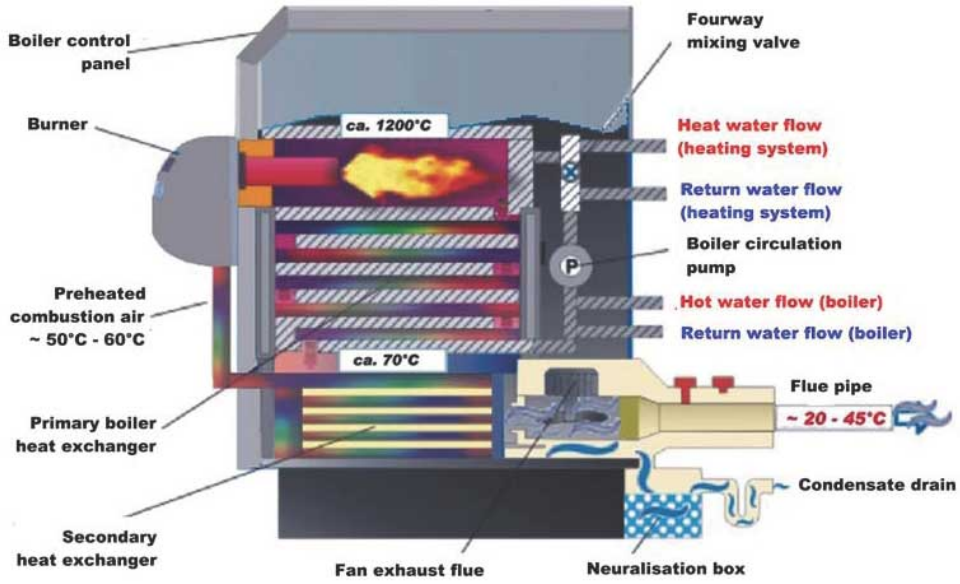
Which ecological points concern us and what is our contribution to reducing them?

Subject:	**Contribution:**
Climatic temperature rise	Reduction of flue gas temperature to between 20°C -45°C
Emission / pollution	Reduction of burner starts by approximately 50 %
Ozone layer	Reduction of CO_2 emission by up to 50 %
Acid rain	Neutralisation of raising sulphur up to 100 %

By using the Kroll condensing boiler you can contribute to the protection of our environment.

By condensation of the flue gases the heat, contained in the vapour, is fully utilized and at the same time, the sulphur, created by the combustion process, is bound and neutralised, thus not transmitted through the chimney into the environment .

Heating technology for generations



How much energy is lost through the chimney of traditional heating systems, if they run on temperatures of 140°C and more?
Unused energy is waste of money and this in times of permanently rising energy prices. Don't you expect more of a modern heating system? We do.

Highest efficiency + highest productivity
Environment protection + sophisticated technology ***= full condensing technology***

As apposed to the currently used semi-condensing boiler, the full condensing technology is able to use permanently latent heat of the vapour contained in the flue gases. Thereby the temperature of the heating circuit is irrelevant. The name of this technology comes from the capacity to operate during the **whole year** in a fully condensing state. It doesn't matter what temperatures you are running your heating and domestic hot water circuits at, our condensing boilers operate in a fully **condensing process permanently**, and hereby use the residual heat of the flue gases.

In order to facilitate this, the combustion air is, via a second heat exchanger made out of plastic, charged with heat of the flue gases and fed to the burner as pre-heated combustion air. In this way, the combustion air reaches temperatures of approximately 60°C, whereas the flue gas is cooled down to a **maximum of 45°**C (in case of working on fuel oil). By this method, the utilization of condensation-heat is **no longer dependant on the return-temperature.**

Some of the numerous advantages of this system are:

Permanent condensation independent of the return temperature
Permanent low flue gas temperatures of about. 20 °C - 45 °C.
The lower deviation of the condensation temperature (< 47 °C on fuel oil / < 57 °on gas) is construction-wise always given.
Exploitation of condensing heat also during production of domestic hot water
Absolute corrosion – resistance of the boiler chamber, as the condensation takes place in the second heat exchanger made of plastic, which has a very high chemical resistance
No heavy metals in the condensate.
Neutralisation of the created sulphur.
Emissions stay way below the values of "Blue Angel"
Low cost chimney of plastic (LAS) due to the low flue gas temperatures

- *Condensing-Boiler - "Hot Technology for the Environment"*

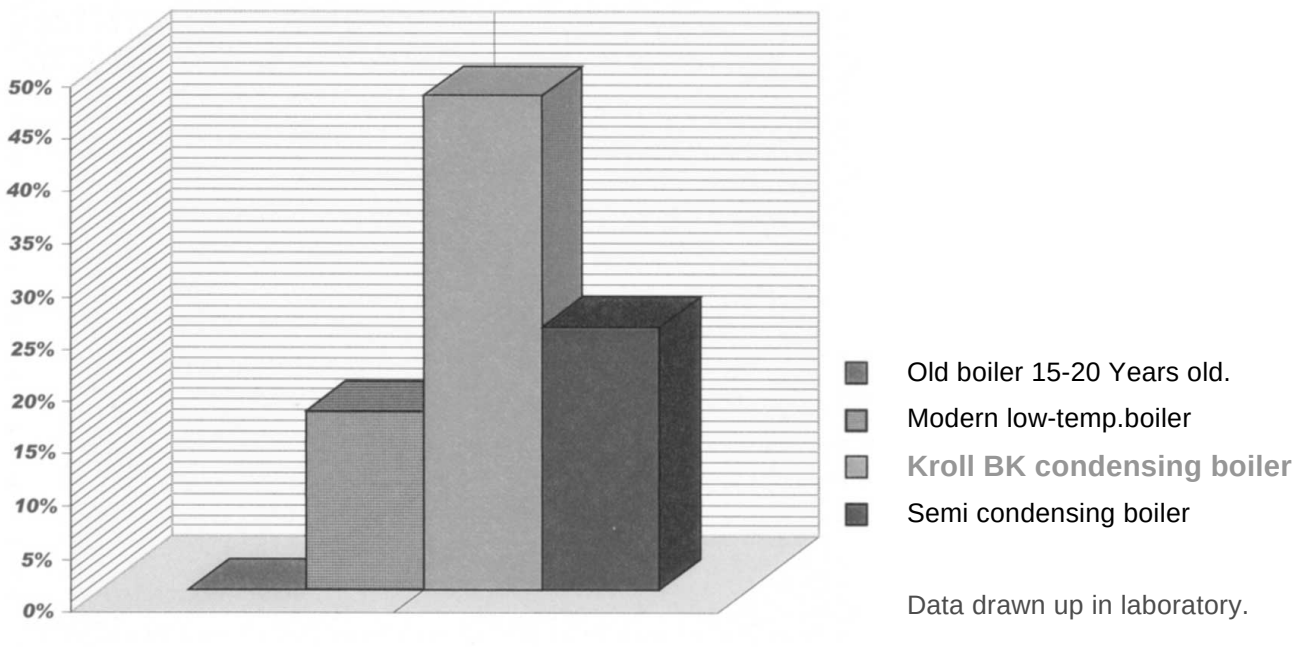
When purchasing a new heating system, often only the purchasing price is considered. This is understandable, as it is an investment for many years.
However, in fact, that the fuel running costs over the years are many times higher than the purchasing price.
Therefor it is important, not only to regard the capital costs, but the total cost, over the life period of the system.

Total cost = purchasing price + fuel cost

The condensing boilers from Kroll work much more efficient than conventional semi-condensing boilers. The evidence shows, that when having approximate **100°C** lower flue gas temperatures (energy saving by condensation of vapour out of the flue gas and the chimney-system), on the average there is a **20%** fuel is saving, compared to conventional semi-condensing boilers.
So, in a time of every increasing fuel prices, we help by lowering consumption.

Here you can clearly see, that, compared to the purchase of a cheaper and less efficient low-temperature boiler, you can achieve the pay back point very quickly. This moment depends mainly on the annual energy consumption of the system. With a less-efficient boiler you then pay constantly more, year by year.

Comparison of energy saving



The Kroll heat exchanger for recuperation of residual heat

The vital component of the Kroll condensing boiler is a secondary heat exchanger made of plastic which is fabricated in a precision procedure.

This heat exchanger is flooded by fresh air (soon to be combustion air). At the same time, the hot flue gases are guided in a controlled manner with regular speed through the tubes of the plastic heat exchanger. By this process, the unused heat energy is transmitted to the combustion air.

At the same time, part of the latent heat, contained in the flue gases, is transmitted to the combustion air by condensation. During this procedure, the flue gas temperature is lowered down under the dew point of the respective fuel.

The heat exchanger is made of special, high- quality and heat- resistant plastic. By the complete corrosion resistance of this material, no heavy metals are washed out. Therefore there is no delivery of heavy metals into the condensate, which is the case with most systems (and has to be disposed of via an expensive and special waste disposal system)

Most modern burner technology:

The Lowest waste gas emissions by complete combustion: oil becomes gas!

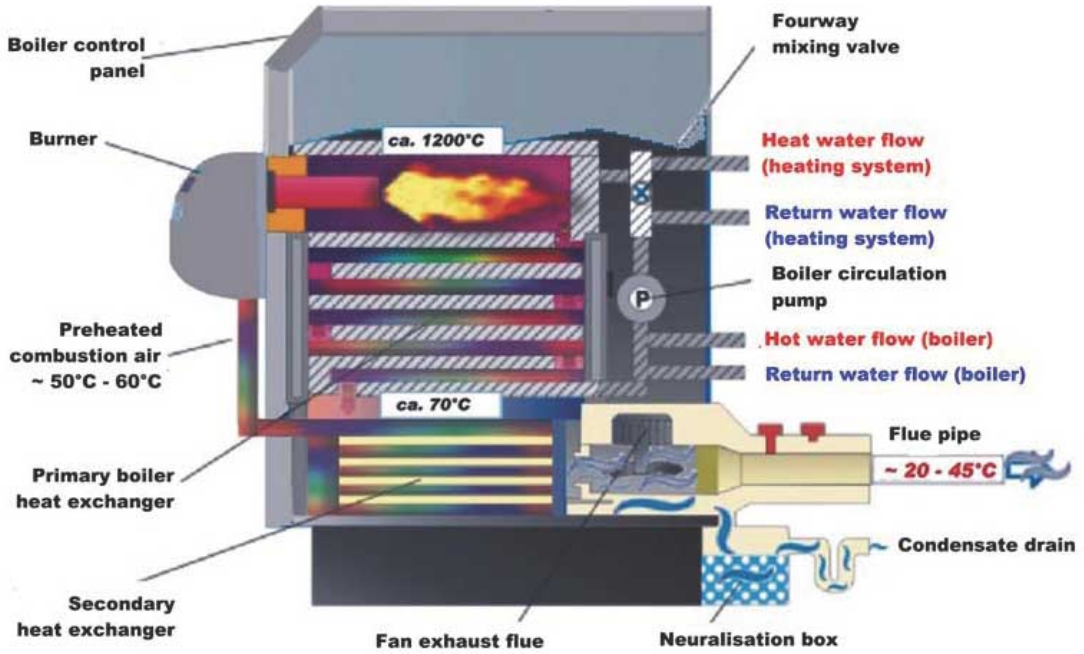
Perfect, soot-free combustion, minimum nitric oxide emissions, low waste-gas losses.
Future proof in regards to the ever stringent emission laws and regulations

The development of the burner technology has made rapid progress during the last few years. The “Blue Burner “is now the standard when it comes to oil and is also adequate for gas.
As the best heat exchanger is nothing without modern burner technology, which ensures a clean burn and therefore optimum utilisation of the fuel, we at Kroll have opted for the blue burner technology for oil-firing.

The absolutely pure, blue flame of the thousand-fold proved blue burners, in connection with our heat exchanger system creates a harmonic unit, with the result of considerable saving of combustible.
When it comes to oil- and gas firing, we offer top-quality.

No matter what fuel you use, we at Kroll offer the most modern burner technology, available.

Heating technology for generations



It doesn't take long to describe a perfect heating system:

Substantially energy-saving, with the least environmental pollution possible, and at the same time high utilisation of the burn- and heating value of the fuel to be used.

That the boiler has to aesthetically pleasing. But it's no secret that there is no accounting for design and tastes. But there is, for comfort, easy service user-friendly maintenance and reliability!

With these points in mind, we at Kroll have designed and manufactured a high technology, user friendly boiler for your perfect heating system:

- **The cooling down of the flue gases to approximate 70°C in the water chambers of the boiler is effected by a homogeneous flow in the flue-gas elements and the heat exchanger-surfaces.**
- **Cooling down the flue gas under the dew point by the introduction of the flue gases into the condensing- heat exchanger together with parallel fresh-air combustion air by the balanced flue chimney, means: "the condition and guarantee for permanent condensation".**

This reliable technical variety, wrapped in functional covering elements, with integrated digital heat-control, ensures optimised, adapted adjustment of the heat-temperature, corresponding exactly to your individual needs in all rooms of your home.

Kroll implies all of its knowledge to satisfying our clients. The quality of our solutions is based on years of experiences and on proved time-tested parts. The complete organisation of our company, from the development of the products until their fabrication and delivery, as well as continuous training of specialised companies, are subject to constant ISO9001 certified controls

View inside the production plant, intermediary stock, quality control and training inside the company.

According to the condensing tables for heating gases, vapour in waste gases of oil will condensing below approximate 47°C, in waste gases of natural gas the dew point is under approximate57°C, corresponding their water part inside the respective energy carrier.

As at the Kroll condensing boiler the flue gas temperature is, due to the cooling of the waste gases by the aspired fresh air, always under 47/ 57°C, a permanent condensation is granted independently from the return temperature of your system.

The Kroll condensing boilers are equipped by a ventilated oil or gas burner with an extremely high efficiency. In case of oil-firing, the most modern blue burners are used.

The hot flue gases are led through two heat exchangers, whereby highest energy usability is utilized.

The first heat exchanger is flowed by the water of the first heating circuit (boiler) and cools the waste gas down to about 70°C. The second, highly efficient tube heat exchanger made of a special plastic, is precision- manufactured and takes most of the energy contained in the steam by cooling the gases under the dew point.

This condensing procedure is followed by additional energy exploitation. The recycled energy is led back by the preheated combustion air inside the system.

This is why the degree of condensation does not depend on the return temperature, but mainly the outside temperature. That means, that the Kroll condensing boiler reaches its highest efficiency at that time, when highest efficiency is needed and heat is needed most – in **winter time!**

By the constantly high creation of condensate, also a big part of sulphur, contained in the combustible, is washed out and neutralised. This “de-sulphurisation” contributes to protection of our environment and also helps to reduce the creation of acid rain.

As a result this means, that the Kroll- Condensing Boiler does permanently and without any restrictions work inside the range of condensation.

The Kroll condensing system does not need to meet the following additional requirements:

- **No** low boiler water temperature of 40/30 °C are necessary, therefor no danger of “legionella” when producing domestic hot water and no problems when heating up the warm-water-boiler.

- **No** increase of radiator sizes or the undesired subsequent installation of an underfloor heating system in order to be able to work inside the range of condensation..

- **No** split heating / domestic hot water systems are required

- **Due to the low flue gas temperatures, a low-cost chimney of plastic can be used. This avoids the expense associated with Stainless Steel flue systems.**

2.1 The combustion chamber

The combustion chamber of the Kroll-condensing boiler is made of high- quality boiler-steel. It is a cold, sleek combustion chamber and all parts are surrounded by water. At the same time, the burning chamber is always fired with a constantly regular draught, generated by the suction pressure ventilator. This leads, in connection with the mounted blue burner in case of oil-firing, to a low polluted combustion and to nearly no creation of deposits or residues. Any cleaning can be achieved by opening the front of the boiler by taking off the front cover and the burner plate.

2.2 The steel heat exchanger

The flue gases are guided through several well positioned flue gas draughts and guide-plates in counter-current manner to the boiler water. An optimum heat-transmission of the flue gases to the boiler water is the result of it. Thereby the flue gases are cooled down to approximate 70°C, and the water in the hot part is heated to approximate 80°C.

2.3 The plastic heat exchanger for heat recovery

The plastic heat exchanger is flowed by the fresh air aspirated by the burner. The hot flue gases flow in counter current manner in regular speed through the tubes of the plastic heat exchanger. Thereby these flue gases give further still unused heat energy to the aspired fresh air, which is on this way preheated up to 60° C. At the same time, a part of the latent heat contained in the steam, is transmitted to the combustion air by the condensation.
During this procedure, the flue gas temperatures at fuel firing are lowered down to approximate 40-50°C. This warmth is rendered to the heat circulation. In this way, flue gas temperatures are reached, which are up to **100°**C lower as at conventional boilers.

The heat exchanger consists of special high-quality and heat resistant plastic. Due to the absolute corrosion-resistance of this material, no heavy metals are washed out. So there is no charge of heavy metals in the condensate, as it is the case with most of the existing heating systems. We discharge our environment and don't produce any toxic waste.

2.4 Neutralisation box with granulate

The box which is filled by granulates of magnesium hydroxide serves to neutralise the condensate created by the cooling of the flue gases in the plastic heat exchanger. Through direct tubes, the condensate is led to this neutralisation box, where it flows through different segments, whereby in a chemical reaction, the sulphuric acid is transformed into epsomit (bitter salt). So, the condensate is, with a ph-value of approximate 7 (neutral) harmless and can be led into the drainage system.

2.5 The suction- pressure ventilation

The suction-pressure ventilation integrated in the boiler, has two functions in the system:
On one hand, the flue gases are moved out, as due to the low flue temperatures only little lift is given. On the other, due to the electronic control of the number of rotations of the ventilator, a constant degree of vacuum is generated inside the burning chamber and the flue draughts. As a result, inside these elements a regular flow-speed of the flue gases is granted at the surfaces of the two heat-exchangers. This is the guarantee for an optimum heat-transmission to the heating water, as well as for regular working conditions for the burner, what means little start emissions and stable long-term operation conditions of the burner.

2.6 The vacuum control unit

The control of the heating gases is controlled by the vacuum inside the combustion chamber. Should this vacuum sink below a defined limit (e. g. too high resistance in the chimney), the burner is stopped. The controller is will check, if a regular operation is possible again, and, in case of a negative result, switches the boiler completely to lockout. A malfunction message with a corresponding message is generated

2.7 The boiler circulating pump / 4-way mixing valve

In order to ensure a regular flow of the heating water through the boiler-circulation and, at the same time, to avoid that the return- temperature sinks under the dew-point temperature of the heating gases, a circulation pump and a 4-way mixing valve is mounted in the boiler circuit. This pump is, activated only when needed, in order to save electrical energy.
The 4-way mixing valve on one hand ensures the return maintenance inside the boiler and on the other hand it controls a mixed heating circuit.

2.8 The boiler's temperature sensing element

Inside the boiler, there is a temperature sensing element, which takes the latest boiler water temperature and informs the control about it for further use. The set min. / max. Temperature determines the switch- on / switch-off moment of the burner.

2.9 The digital control

In order to control the boiler with is components, an own control with process-technology has been developed. This control has got a clear visual display; the user is guided by the text for the control of the boiler. Mounted on top of the housing of the boiler, it controls all functions of the boiler, the burner, as well as the heating circuits and the domestic how water generation

Return control:
In order to protect the boiler in the metallic area from corrosion, the internally mounted 4-way mixing valve is closed automatically in case of temperatures below approximate 58°C by the return-sensing element. In this way, warm flow water is mixed, so that the return temperature is rising again, and a further fall of the return temperature and creation of condensate inside the metallic heat exchanger is avoided automatically.

The heating circuits:
With the control, two heating circuits can be run independent of time, of curves and of outside-temperatures. By an additional controller, five more heating circuits can be driven, and controlled in a mixed manner.
Per day, two heating-lowering-periods are available. The order can be affected steady/ firm, as well as by the outside sensing element included in the delivery. The integrated 4-way mixing valve is applied for adjusting the first mixed heating circuit.

The warm-water generation:
The generation of warm water is driven by the standard control and can, exactly as the heating circuits can, too, lowered. Once per week, a protection against Legionella can be effected by heating up the heating installation.
The water temperature in the domestic hot water calorifier is heated up unit a sufficient legionell-protection is granted.

Circulation pump for Domestic Hot Water:
In order to avoid losses inside the sanitary water tubes, and unreasonable consumption of electricity of the circulation pump, you can drive it independent from time and temperature.

3.1 Flue pipes inside an existing chimney

When using a modern low-temperature boiler, nearly always a costly reconstruction of the chimney or the mounting of a humidity-resistant chimney becomes necessary, because in most of the old chimneys, the low flue gas temperatures (approximate 100 – 160°C) mean the creation of condensing water and the soot of the chimney.

Due to the constantly low flue gas temperatures, a modern and low-cost plastic ("LAS") chimney can be used with the Kroll condensing boiler. It is of double-wall until the chimney that means, inside the flue gases are led outside and in the surrounding "shell" of the chimney tubes, the fresh air is aspired. Inside the chimney only a single-wall plastic tube with distance-holders is mounted.

3.2 Outside wall installations

The flue gases can also led along the outside wall of the building until the projecting part of the roof. Therefore, the installation has to be double wall in LAS-version. The corresponding clamps and consoles are included in the set.

3.3 Heating plants under the roof

There is the possibility to install the heating installation under the roof. Then the double-wall chimney is led directly through the roof. The corresponding pitched-roof-penetration elements are available in black/red.
All chimney elements are assembled in our factory as a set and belong optionally to the delivery of the boiler.

4. Ventilation of the heating room

Due to the technical particularity of the aspiration of fresh air (combustion air) through the chimney (LAS), an operation independent of the room air is given. **It is not necessary to ventilate the heating room any more.**

With traditional ventilation of the heating room by flowing in of fresh air, losses of cooling down up to **18°C** are created.
By the way, these losses are never calculated in the efficiency of heating installations not working independently from room air, although they exist indeed as a matter of fact.

Make your decision
for a modern heating system
- The Kroll- condensing boiler!

The efficient heating technology for generations.

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Production und forwarding parc

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