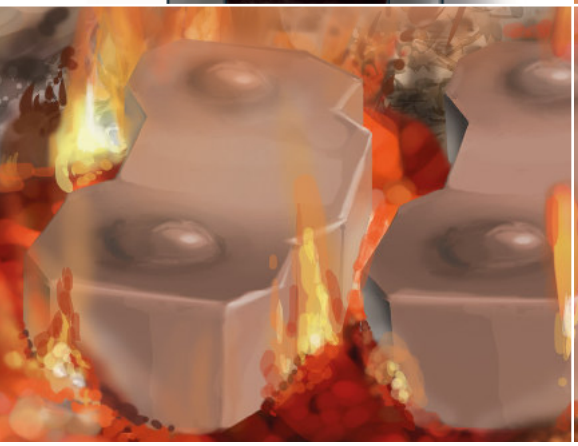
HEATING WITH BRIQUETTES - THE PROPER WAY

Reducing emissions - Sparing the environment



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Foreword

Photo: HKI

Ladies and Gentlemen:

As already with our brochure „Heizen mit Holz – so geht's richtig" (Heating with wood – The proper way), which appeared with the support of Germany's Federal Ministry of Food and Agriculture (BMEL) and was published jointly with Fachagentur Nachwachsende Rohstoffe e.V. (FNR), the intention of the present brochure, too, is to help raise environmental awareness in heating with briquettes using single-room appliances.
The focus last time was on heating with split logs. In the new brochure we would like to explain proper heating with low emissions using lignite briquettes and wood briquettes. Lignite briquettes have been a popular domestic-source fuel for many decades. They are highly regarded on account of their merits in heating appliances. When used properly and with the right heating technique, lignite briquettes enable low-emission and low-cost heating.
Germany has extensive lignite deposits. Although this domestic energy carrier is mainly used to generate electricity, selected qualities are also upgraded to make efficient industrial fuels and high-grade lignite briquettes. Wood briquettes, too, are produced in Germany and also imported in large quantities, usually from European countries. In this brochure, we have compiled the most important information on how to heat properly with lignite briquettes and wood briquettes, and on their proper storage and use. You will also find an overview of the appliances usually installed in Germany.
If you don't own a heating appliance for solid fuels yet and are thinking about buying one or replacing your old unit with a new one, this brochure will give you important tips.

Happy reading.

Frank Kienle
General Manager at HKI
Industrieverband Haus-, Heiz und Küchentechnik e.V.

Photo: UNITI

Ladies and Gentlemen:

Germany has set itself ambitious goals with its energy transition – not only in the area of power generation, but also in the supply of heat, especially to residential buildings. Whether and what changes are upcoming in this connection in the medium to long term is hard to foresee. What is quite clear, however, is that a secure supply of heat and its affordability will go being a vital issue.

Especially in Germany, it is obviously good and helpful to have a wide choice in the energy mix. Having options and freedom to decide are the most important guarantors of affordability and security in the heat supply.

In this broad energy mix, solid fuels have their place, and these include wood and lignite briquettes. You can use briquettes to build up your very personal fuel stocks, control your consumption with ease, and acquire some leeway in deciding when to replenish your stocks – advantages with a feel-good factor which will soon pay off. At the same time, there are some rules to be heeded in the proper and efficient handling of these energy sources. That will spare your wallet as well as the environment. One important point in all of this: the quality of the wood and lignite briquettes must be right!

In this brochure you'll find valuable tips on these issues.

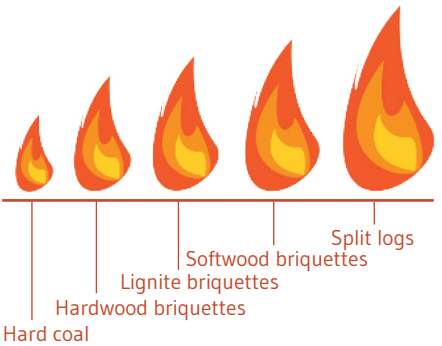
To supplement them, it is recommended that you seek competent customer advice – whether from appliance manufacturer, chimney sweep or tradesmen, or from your local specialist solid-fuel dealer.

We hope this brochure will bring you new insights and prompt you to invest in a solid-fuel appliance.

Dirk Arne Kuhrt
Manager at UNITI
Bundesverband mittelständischer
Mineralölunternehmen e.V.

1. Solid fuels for single-room appliances in Germany

Due to their different compositions, the various solid fuels also have different combustion properties.
Properties that go far to meet individual demands and the user behaviour of various appliance owners.
Solid fuels like lignite briquettes and wood briquettes consist of solid and volatile components. In a first step, the – invisible – volatile components are burned. This raises the temperature in the firebox so much that the fuel's solid components, too, can be split into combustible gases and react with the oxygen in the combustion air. Pursuant to environmental-protection laws (here: First Ordinance on the Implementation of Germany's Federal Act on Air Pollution Control and Noise Abatement (1st BImSchV)), a whole range of solid fuels may be used in single-room appliances.



Flame pattern of different fuels

When you use such fuels, it is essential that they are expressly identified as suitable in the appliance manufacturer's operating instructions.

Generally speaking, it is advisable, when buying a heating appliance, to make sure that several fuels can be used.

In practice, this means use of the following solid fuels:

- ☑ Lignite briquettes
- ☑ Non-pitch-bonded hard-coal briquettes, hard coal
- ☑ Natural (untreated) lumpy wood, incl any attached bark, specifically in the form of split logs
- ☑ Pressed blocks made from natural (untreated) wood in the form of wood briquettes or in the form of wood pellets, each with quality certificate

Not admissible are, for example:

- ☒ Treated woods
- ☒ Waste wood
- ☒ Wood treated with preservatives
- ☒ Painted, lacquered or coated wood
- ☒ Plywood, chipboard, fibreboard or otherwise glued wood
- ☒ Bark briquettes
- ☒ Plastics of any kind
- ☒ Any type of refuse!

Owing to the high amount of pollutants emitted, use of inadmissible fuels has an adverse impact on the environment and leads to neighbourhood disputes.

In addition, the pollutants produced can damage your appliance and chimney and entail high clean-up costs.

Remember:
Your appliance is no waste-incineration plant!

1.1 Lignite briquettes

The lignite briquettes offered in Germany are pressed from dried, processed domestic raw coal without using bonding agents. Lignite briquettes are a mineral fuel. They have a uniform quality and a high energy content. Once lit, they are marked by a long-lasting, calm play of flames.

7-inch single block, 25kg bundle and 10kg pack

When lignite briquettes are used, more combustion air must be added through the fire grate in the firebox floor than for split logs.
Which is why lignite briquettes are admitted for appliances that have a fire grate in the firebox floor. Where lignite briquettes are used in the appliance, the operating instructions of the appliance manufacturer are crucial.

1.2 Wood briquettes

In addition to split logs and lignite briquettes, wood briquettes, too, may be used in modern appliances if they are listed as suitable in the appliance manufacturer's operating instructions. Wood briquettes are made from sawdust or fine wood shavings compacted into blocks under high pressure. Wood briquettes can be divided into softwood and hardwood briquettes; they differ in their outer appearance:

- Softwood briquettes are light in colour, like sawdust;
- Hardwood briquettes, by contrast, are dark brown in colour.

Softwood briquettes, hardwood briquettes

Wood briquettes must always be stored in a dry place, since otherwise they may fall apart owing to moisture.

While softwood briquettes ignite easily and burn swiftly under high heat, longer-lasting combustion can be obtained using hardwood briquettes.

Softwood briquettes, like split logs, usually require no or only little combustion air through the floor grate. For hardwood briquettes, by contrast, more combustion air should generally be added through the fire grate in the firebox floor.
Softwood briquettes may expand when burning.

You must ensure that the firebox is not overloaded. Sufficient distance must be kept to the firebox's walls and doors.

When buying wood briquettes, look out for tested quality!

Not all commercially available wood briquettes are suitable for your fireplace. Wood briquettes of poor quality may lead to higher emissions and damage your system!

Tested quality is indicated in the data of the package insert, with quality certificate, weight and origin.

1.3 Comparison of fuel properties

The following table presents an overview of the different properties of the various fuels:

	Fuels		
Properties	**Lignite briquettes**	**Softwood briquettes**	**Hardwood briquettes**
Ignition behaviour	Ignite slowly, need undergrate air and an existing fuelbed. Lay lignite briquettes a finger's width apart on wood embers!	Ignite quickly on an existing fuelbed.	Ignite slightly slower than dry wood. Burn best on existing fuelbed; may need some undergrate air.
Combustion	Slow and even	Quick to very quick	Even
Combustion behaviour	Pleasantly calm play of flames passing into an even glow; of the fuels shown, they have the longest refuelling interval.	Short and lively play of flames. Softwood briquettes may expand, so never completely fill up the firebox! Keep distance to the firebox's walls and doors.	Calm play of flames with longer refuelling interval than for softwood briquettes.
Ember formation	Long-lasting glow; formation of a fuelbed	Often large, loose amount of embers	Formation of a fuelbed
Heat development	Even and long-lasting heat thanks to pronounced fuelbed	High initial heat, sometimes very quick combustion	Long-lasting heat, though shorter than for lignite briquettes
Optimal deployment	For long fireside evenings and as supplement to central heating in winter and on chilly autumn and spring evenings	Short utilization of the appliance for a few hours	Suitable for long fireside evenings

Further explanations and tips on proper lighting up and heating after p.15.

1.4 Buying and storing fuels

Lignite briquettes and wood products are available from traditional specialist dealers and cooperatives, DIY stores, supermarkets and petrol stations.
Lignite briquettes are available in various sales units. If your fuel needs are high, we recommend bulk goods or 25-kg bundled briquettes. If your requirements are more modest, go for briquettes in smaller sales units, usually in packs of 10kg.
It is the easy procurement and storage of small fuel amounts that make a heating appliance an attractive option for a city home as well. Lignite briquettes and wood briquettes should be stored in storerooms or at least be roofed over. They can be stored in a dry place (garage, cellar) for long periods of time without losing quality.

In storing solid fuels, avoid naked flames. If your appliance has a special fuel-storage compartment, you can keep your fuel there. If you do, do follow the appliance manufacturer's operating instructions without fail.

Fuels may not be stored in the direct vicinity of heat sources and easily flammable substances.

2. Single-room appliances for solid fuels

Open-fire stoves, tiled stoves and closed fireplaces conveniently spread a cosy living atmosphere. In addition to the play of flames, it is above all the pleasant radiated heat of modern appliances that ensures well-being and an agreeable room ambience.
Appliances with boilers can support a home's central-heating system. Classic open fireplaces, due to their low efficiency, are not suitable for heating the room in which they are installed. The lawmaker prescribes that an open fireplace may only be used occasionally.

2.1 Appliances usual in Germany

Germany currently has some 10.7 million single-room appliances installed. The most usual fireplaces are:

- ☑ Open-fire stoves
- ☑ Tiled stoves
- ☑ Closed fireplaces
- ☑ Range cookers
- ☑ Appliances with boilers

How do these appliances work?

The basic principle behind all these appliances is the burning of split logs, lignite briquettes and wood briquettes in a closed firebox.

The necessary combustion air is taken from the installation room or from another room in the building. It may also be added from outside. The correct amount of combustion air is usually set manually, depending on appliance type and design. Some appliances have a so-called automatic system (air-inlet control and/or air regulation). The effect is that the fire is supplied with the right amount of combustion air across the entire combustion process.

Schematic illustration of a stove

The heat that emerges during combustion is distributed via heating surfaces to a heat-transfer medium (air / water) and, by heat radiation, to the installation room and any connected adjacent rooms.

On this point, please follow the appliance manufacturer's operating instructions. Appliances with floor grate and ash pan create optimal conditions for burning lignite briquettes and wood briquettes.

What follows describes the features of the various appliance types, although, for reasons of space, not every variant or special design can be discussed.

You will find the precise working mode of your stove in the manufacturer's installation and operating instructions. The specifications laid down in these instructions are of general application.

2.1.1 Open-fire stoves

The **open-fire stove** is an appliance manufactured in series with a basic metal design. It is enclosed in the most varied of materials, eg lacquered or enamelled metal, tiles or natural stone. The firebox is usually lined in minerals and fitted with a shallow-bed firing system with or without grate. The heat output to the installation room is mainly by warm-air convection (cold air near the floor warms up and rises) and less by heat radiation.

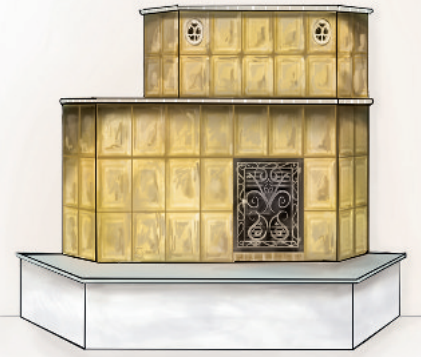
The open-fire stove

It is surrounded by an individually faced, professionally set up heating chamber made from mineral construction materials (eg tiles). Pre-fab modules, too, are available. The firebox is usually lined in minerals and, depending on the appliance type, fitted with a shallow-bed firing system or a full-bed firing system in the case of slow-combustion appliances.

Operation of an open-fire stove at other than the output specified in the operating instructions, so-called light-load operation (slow combustion), is not envisaged.

2.1.2 Tiled stoves

A distinction is made, in principle, between hot-air tiled stoves and basic tiled stoves. Hot-air tiled stoves consist of an industrially made metallic firebox with downstream heat exchanger.



The tiled stove

ATTENTION!
If you own a slow-combustion appliance with a so-called fuel-hopper firing system, please note: large amounts of fuel should not be employed in compact fashion, but leaving some space between the briquettes. This also applies to the low position of the grate in the case of ranges.

Firing involves adding a sufficient quantity of fuel to existing embers and burning at the rated heat output. Heat is distributed into the installation room mainly via warm-air convection and less by heat radiation. Operation of a tiled stove at other than the output specified in the operating instructions, so-called light-load operation (slow combustion), is not envisaged.

A **basic tiled stove**, also referred to as **storage heater**, consists of a metal or mineral firebox in which a large amount of fuel is burned in one or several loads. The released heat is transferred to a large mass of storage material (eg fireclay) via the heating gases on their way to the chimney. The heat is slowly released into the installation room with a low output, mainly via heat radiation and some outer-wall convection. Basic tiled stoves are installed individually or offered industrially as modules.

A **combination** of these two systems is a hot-air tiled stove with the mineral store downstream of the firebox. Although it does not have the storage capacity of a **basic tiled stove / storage heater**, it significantly prolongs the heat release after the fire extinguishes compared with a straight convection stove.

2.1.3 Closed fireplaces

Closed fireplaces have a similar design to hot-air tiled stoves. They consist of an industrially manufactured metallic firebox with a large viewing panel and only rarely have a downstream heat exchanger.
They are faced individually by a professional or built industrially using pre-fab modules. Their firing and heat release are comparable with those of open-fire stoves.

The closed fireplace

2.1.4 Range cookers

Range cookers are used above all for cooking and baking. As a side effect, they also heat the installation room. One exception is the heating range which can feed some of the emerging heat via a water heat exchanger into the central heating system. Often, range cookers have a height-adjustable grate. Its position determines the fuel amount and the refuelling interval.

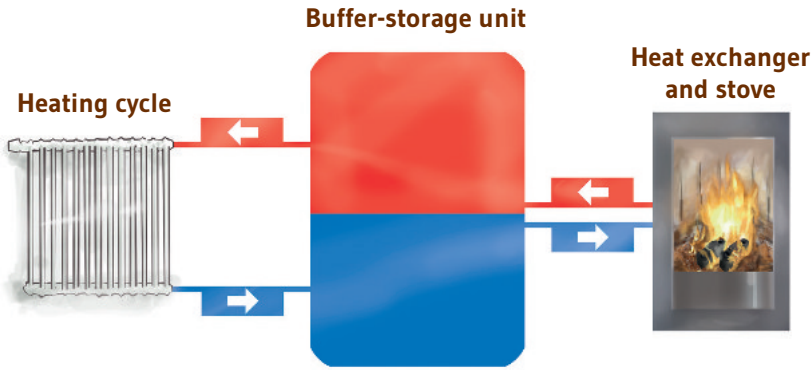
The range cooker

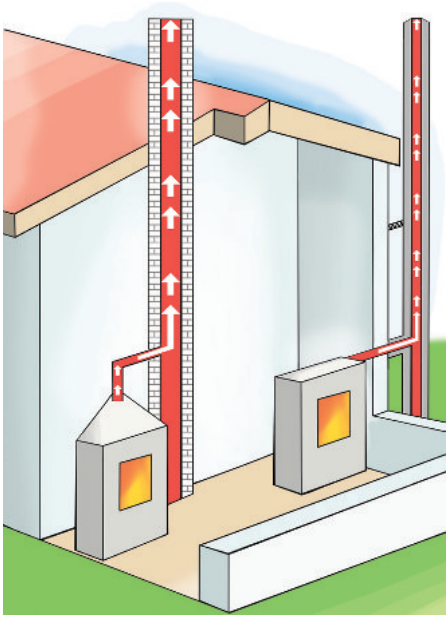
2.1.5 Single-room appliances with boilers

The technology of single-room appliances with boilers enables the heat generated to be released to other rooms in the house. Here, use of buffer storage is meaningful. This is also fed by the house's main heat source, the central-heating system. At all events, installations of this type must be planned and executed by a specialist firm.

3. Chimney

The chimney is the engine of your appliance. Irrespective of whether a chimney is already in place, must be built after the event or is planned for a new building, the chimney ensures safe discharge of the combustion gases emerging when the appliance is in operation. For this purpose, it is necessary to match chimney and appliance.





The chimney

The data (minimum feed pressure, flue-socket temperature, flue-gas mass flow, rated heat output, possibly thermal rating) necessary for this may be found in the documents for your appliance and on its type label. Using these data, your chimney sweep or specialist firm can assess your existing chimney's suitability or can design a new chimney. As operator of a fireplace, you have a duty before commissioning it to inform the licensed district chimney sweep about the installation. It is meaningful to have a word about your ideas with the chimney sweep and specialist firm before buying the appliance, in order to define, among other things, its optimal output.

4. Heating properly

Anyone can light a fire. Efficient and low-emission heating needs learning. Operating a fireplace on a completely emission-free basis is not possible. What follows describes how you can avoid unnecessary emissions, eg particulates, by proper ignition and firing. Please note that the appliance must have a floor grate for optimal and low-emission burning of lignite briquettes and hardwood briquettes.
To get off to a good start, make sure the appliance is clean and in a technically unobjectionable condition. It must also be connected to a matching chimney. Every installed system is checked by a chimney sweep.

Regular maintenance by a specialist firm is recommended.

Open the air vent

Position split logs on the kindling material

Ignite the fire-lighters

4.1 Lighting up / kindling

What you need to light up:

- Suitable kindling material in a sufficient quantity. Suitable forms include, eg, fire-lighter cubes, fire-lighter pads or wood wool. These are commercially available.
- Kindling wood cut roughly into pieces about the thickness of your thumb. They are also commercially available.
- Two to three logs with a circumference of approx. 20cm.

On no account should you use:

- Flammable liquids, like spirit or kerosene, because of the risk of deflagration
- Unsuitable flammable substances

The kindling materials are placed on the opened floor grate. Place the fire-lighters between the kindling wood. Next, stack about two layers of kindling wood on top.
Then, on the kindling wood, at short intervals and with the chopping edge facing down, place two to three not-too-thick logs.

Since the ignition process needs large amounts of combustion air, set the air vent to the „Anzünden" (ignite) or „max" position. The precise position of the air-vent slider may be found in the operating instructions under the keyword „Anzünden".

Make sure that any existing flue dampers and gate valves are opened. Ignite the fire-lighters and then shut the firebox door. After a brief time already, visible flames will develop in the firebox.

Carefully place the briquettes on the compact fuelbed

Three briquettes are enough

4.2 Heating with lignite briquettes and wood briquettes

As soon as the flames have reached the entire fuel amount and lit it up, the air supply is lowered. Here again, please refer to the operating instructions for the exact settings of your appliance. The correct point in time for starting the heating mode with lignite briquettes and wood briquettes has come when an ember base has emerged from the ignition process and when merely smaller flames can still be seen. Slowly open the firebox door to avoid smoke escaping.

Before carefully putting more fuel on the fire, push together the embers to make a compact fuelbed, but ensuring that the floor grate is completely covered with embers. Now, place lignite briquettes or wood briquettes on the embers. On no account should you throw the fuel into the firebox. This could damage the firebox's lining and cause embers to escape. Lignite briquettes are laid on the embers with their flat side facing down, the width of a finger apart. To achieve quick cross-ignition of the added fuel, briefly open the air vent. As soon as the briquettes have lit up, reduce the combustion-air supply to normal.

Design-related changes might also have to be made to the floor grate's settings, as described in the operating instructions. You can repeat the heating process described above as often as you like.

The amount of fuel you may use in your appliance is stated in the manufacturer's operating instructions.

4.3 At the end of heating

No more fuel is added to the fire.
Any residual embers extinguish automatically. Please note that seemingly cold ash may still contain small embers. Especially in the case of ash from lignite briquettes, embers may still be present after quite some time. To avoid fires, therefore, it is recommended that you place the ash removed from the appliance in interim storage in a metal bucket with a lid suitable for this purpose before it is disposed of in the bin for residual waste. The bucket should not be placed on floors susceptible to damage.
When the appliance is not in use, the air vent must be shut. This prevents the installation room from cooling off.

Place the ash in interim storage in a metal bucket

5. Buying an appliance

5.1 New unit

Before you buy a new fireplace, give a thought to the personal requirements that your appliance must meet. Here, account should be taken of the size of the installation room and adjacent rooms. In addition, clarify in advance how often you intend to operate the appliance, and how much money and effort you want to expend on fuel procurement and handling.
In selecting a suitable unit, you are already setting the scene for the fuels you can use in future. If you also propose to use lignite briquettes besides wood, the unit must have a grate and an ash pan. This being so, it is advisable to pay attention to this when selecting a stove already. If the appliance can operate using different fuels, you will be all the more flexible in its later use.

Before deciding to buy, you should clarify the following points:

- What is my heat requirement, what do I want to heat? Is it only the installation room or adjacent rooms as well? Is the appliance to have a water heat exchanger and thus feed into the central heating system? (Attention: only specialist firms – no DIY job!)

- With which fuels do I wish to heat in future? Combination: wood and briquettes?
- Do I wish to heat for short periods only or constantly?
- What do I personally find more agreeable: heat output via warm-air convection, via radiation, or do I want both?
- Do I want to be able to see the play of flames?
- How much may the appliance cost?
- Who will install the appliance?
- Can I store the fuels properly?
- Can I dispose of the ash that occurs?
- Can the floor of the installation room bear the load? Storage heaters, but also tile- / stone-faced appliances can be very heavy.
- Is the floor of the installation room flammable? Precautions must be taken into account!
- Is my existing chimney suitable for the appliance of my dreams?
- What about the manufacturer's service if something goes wrong?
- May I operate an appliance for solid fuels where I live at all?

Skilled trades, chimney sweeps and fuel dealers are only too happy to answer these and other questions.

5.2 Exchanging old single-room appliances

5.2.1 Statutory provisions

If you have had an appliance for some years now, you should note the following points:

Lawmakers in Germany have tightened the admissible emission thresholds for appliances. Owners of stoves have a duty to prove to their chimney sweep that their appliance meets the requirements under Germany's Small Firing Installations Ordinance (1st BImSchV). If a unit does not meet the requirements, it must be retrofitted, exchanged or shut down. Transition periods apply; your chimney sweep has more information. HKI has a database with technical information on appliances. This database also contains information on whether an appliance meets the applicable requirements of the 1st BImSchV.

Please find the appliance database at:
http://cert.hki-online.de
(in German)

The evidence for the chimney sweep that you meet the statutory requirements may be provided by submitting a test certificate / manufacturer's declaration or using the HKI database.

Date on the type label	Time of retrofit or shutdown
up to and incl 31 December 1974, or date no longer ascertainable	31 December 2014
1 January 1975 to 31 December 1984	31 December 2017
1 January 1985 to 31 December 1994	31 December 2020
1 January 1995 up to and incl 21 March 2010	31 December 2024

You can also task your chimney sweep with measuring the emissions in your home, although this is associated with certain outlays, ie costs. Moreover, there is no guarantee that your appliance adheres to the prescribed emission thresholds.

Retrofitting your appliance with emission-reducing measures, too, is possible. The legislator has set terms for shutting down / exchanging old appliances: if carbon-monoxide emissions and particulates from old appliances are higher than those prescribed in the current 1st BImSchV, the units must be retrofitted or shut down. The time of shutdown depends on the date on the appliance's type label. Please find the periods in the above Table.

5.2.2 Other good reasons for a replacement

Besides statutory duties, there are other cogent arguments for replacing legacy fireplaces with new appliances:

- New modern appliances, compared with legacy units, have a higher efficiency and, hence, consume less fuel. This makes for more efficient heating.
- Thanks to lower fuel consumption, heating costs can be saved.
- New heating appliances cause much lower emissions. The rule of thumb here is: the older the appliance, the higher the likely level of carbon and particulate emissions.
- Thanks to lower emissions and higher efficiency, new units are more sparing on the environment than legacy appliances.
- Legacy units require more maintenance, since an exchange / renewal of seals, firebox linings and diverters is necessary. Hence, it is advisable to buy a low-maintenance new unit with modern materials.

- In the case of modernized buildings with heat insulation, too, a modern performance-adjusted new unit should be used. This prevents the room from overheating and avoids unnecessary waste of energy due to constant ventilation. Here again, what matters is:

Lower fuel consumption =
lower heating costs +
sparing the environment!

Whatever you opt for, always contact your chimney sweep and have any upcoming work done by a specialist firm.

5.3 What else to watch out for...

Besides emission-law requirements, appliances also have to meet construction-law and safety-related specifications, of course. These are usually stipulated in national and European standards and are checked within the scope of a type test by a notified inspection office, as is the emission behaviour. For instance, the data on the chimney's dimensions mentioned above and fire safety are tested in a fire trial where the appliance is significantly overloaded. This test also yields the safety distance to flammable elements in the installation room, as indicated in an appliance's manual and type label. Make sure that this evidence is available when buying an appliance.

Further information may be found in the above appliance database.

6. Combustion bans

Before planning and obtaining a new appliance, you must clarify whether there is a combustion ban in the locality where you live. Such bans may be found in municipalities' development plans or land-sale contracts. Municipalities may define certain emission thresholds in solid-fuel regulations (BStV) or prohibit the use of certain systems. By-laws may prescribe a connection to the local- / district-heating grid.

Contact the representatives of your local town or city council, and ask about such restrictions.

You will also find further information on the subject at:

www.verbrennungsverbote.de

(in German)

7. Further information

Please find more detailed information on the following websites:

Appliance database	www.cert.hki-online.de (in German)
HKI	www.hki-online.de (in German)
Guide to stoves	www.ratgeber-ofen.de (in German)
Heating properly using wood	www.richtigheizenmitholz.de (in German)
Combustion bans	www.verbrennungsverbote.de (in German)
	www.brikett-rekord.com (in German)
	www.heizprofi.com (in German)
	www.schornsteinfeger.de (in German)

Brochure for downloading at: www.ratgeber-ofen.de

References:

First Ordinance on the Implementation of Germany's
Federal Act on Air Pollution Control and Noise Abatement
(Small and Medium-sized Firing Installations Ordinance – 1st BImSchV)
dated 26/01/10

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