ARPA FVG
Agenzia Regionale per la Protezione dell'Ambiente del Friuli Venezia Giulia

FROM WOOD TO FIRE

how to obtain an efficient wood combustion in household stoves improving air quality (outdoor and indoor)

Wood fire smoke and air pollution

In the last years the usage of stoves for the household heating significantly increased.

The recourse to a renewable source of energy like wood is for sure a positive aspect, but not without drawbacks as it might seem.

Wood fire smoke contains more than 100 different chemical compounds, some of them extremely harmful for human health.

Even if it seems difficult to believe, **a large fraction** of particulate matter found in the surroundings of our houses are directly emitted by our own wood stoves or from those of our neightbours.

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Source: D.P.G.R. n. 010/Pres del 16/01/2012

The importance of a good combustion

An **inefficient (bad) combustion**, in facts, can release in air a large amount of pollutants and particulate matter.

When we realize that our chimney emits a lot of smoke we must intervene and reduce as much as we can those emissions for our and others health.

To obtain a **perfect combustion** we have to use only "natural" wood well dried and follow the suggestions of the heating plant producer and installer.

Only in this way it is possible to keep as low as possible the emissions of pollutants and in particular of particulate matter.

Particulate matter (PM10) comparisons

How many grams of PM10 are emitted when we burn 1 kg of wood?

Open fireplace

Traditional stove

Pellet stove

Methane or LPG

1m^3 of methane or LPG equals roughly the energy of 2,5 kg of wood and it emits only 0,006 g of PM10

WHAT TO BURN

Dry and seasoned wood

Dry wood can be light on easily and easily it burns. Moist, or even worst, green wood produces a lot of smoke emissions.

Seasoned wood is darker than just cut wood, it has several small cracks and it sounds hollow when beated against another piece of wood.

It is a good habit that to purchase seasoned wood at the beginning of summer (June or July).

If we have the resources to produce burning wood by our own, it is better to dry it for at least two years.

It is wise to pyle up wood in a protected place. If we hold it outdoor, we have to cover it and to take it up from the ground. In this way we will achieve a good seasoning of the wood.

Wood at 0 km

If possible, lets try to use wood locally produced, in this way we will avoid fuel consumptions as well as the emissions related to the wood transport.

Avoid cold wood

Lets prepare wood for the daily usage in a warm environment: wood burns better if it is not cold.

Clean wood

Lets clean wood from soil remnants or from other dirt before to burn it.

High quality pellet

It is wise to verify that wood pellets are produced using natural (not treated) wood.

It is better to purchase pellet coming from certified producers and with a high thermal power as well as with a small fraction of ashe (this information has to be present in the pellet envelope).

Another important aspect to verify is that pellet envelope does not contain a lot of dust.

Good pellet, in fact, is highly pressed and does not produce dust.

Suited quantity

It is wise to choose wood composed by small briquettes: it burns better.

Use always the quantity suggested by the stove manufacturer.

In fact, it we fill the stove with too much wood, it won't be burned efficiently: we will produce unburned compounds, squandering wood and wasting money, risking to damage the stove and to set on fire the flue.

If, on the contrary, we reload the stove only with one small piece each time, the flame never reaches the optimal temperature for a complete combustion.

NEVER BURN

Waste

It is forbidden to burn waste out of the plants authorized for their treatment because their uncontrolled combustion produces exhaust gases extremely harmful for human health.

Moreover, their emissions can seriously corrode the stove and its flue.

Plastic

Paper, packaging

Paper, newspapers, magazines with coloured pages, paperboard, tetra pak, imballi, rubberfoam...

Varnished wood, chipboard

Scrap wood from construction sites.

Dirty or stained wood from packaging (crates, pallets).

Wood from old furniture, windows or floors. Wood coated, painted, plywood, particle board, or any wood containing glue.

HOW TO BURN

Air intake

Before to light on the fire, complitely open the air vents of the stove and the chimney.

Let them open until you see a vigorous flame.

Light on from above

In stoves with a vertical combustion chamber, you will obtain a better combustion lighting on fire from above.

Source: SvizzeraEnergia (Photo: Regula Roost)

1. Choose pieces of wood suited for the purpose (roughly 3x3 cm wide and 20 cm long)
2. Prepare small and dry pieces of wood as a starter. Alternatively, use alcohol or a lighter. **Do not use paper as a starter**.
3. Place the wood logs at right angles each other, starting with the larger (bottom) and ending with the smallest (see figure).
4. Put the starter up in the empty space between the wood and light it on.

In a short time the fire will spread throughout the wood logs stack almost without smoke.

Close the aspiratipn inlets

You have to close the air aspiration inlets only when there is no more flame on the wood logs and in the stove there are only embers. In this way the combustion chamber will not cool rapidly.

Reload of the combusiton chamber

Reloading of the stove should be carried out only over the **embers**, never on the flame.

Cleaning

Take away regularly ash from the combustion chamber, followig the manufcturer instructions. It is extremely important that ash would not obstruct aspiration inlet and outlet.

REMEMBER

Air quality forecasts

Regularly look for the air quality forecasts issued by ARPA FVG in the web site www.arpa.fvg.it at the air quality section. In this way we could verify if in our area there are some restrictions in the use of wood combustion..

Experts advice and installation

Heating plants suited dimensioned to our household needs can supply an optima combusiton saving our money.

Stoves, fireplaces and other wood burning devices must be installed by specialized personnel.

Maintenance

Maintenance and control of the mechanical and electronic plant components ahould be carried out regularly by an expert.

Chimneis have to be regularly cleaned by an expert as well.

Ventilation

Indoor air quality is important to keep healty our houses and people that are living with us.

Flame

A clear, yellow-reddish coloured flame represents an evidence of a good combustion.

IF ENVIRONMENTAL POLLUTION LEVELS ARE ABOVE THE THRESHOLDS FIXED BY CURRENT LEGISTATION FOR THE PROTECTION OF HUMAN HEALTH WE SHOULD USE GAS HEATHERS OR ELECTRIC HEATING DEVICES.

Ash

Ash composed by gray and fine particles means that the stove performs a good combustion.

If, on the contrary, ash is dark and heavy or the top of the chimney is dirty and black coloured, this means that our stove burns badly the wood.

A regular cleaning and maintenance of the stove, flew and chimney reduce the pollutants emission, save money, prevents accidental fires and reveal timely damages or structural problems.

As an average, you can estimate that 1 mm of soot deposition in the chimney corresponds to roughly 6% of fuel waste

Smoke

During a good combustion, smoke has to be almost invisible: if you notice dense and opaque smoke at the chimney's top gray or yellowish coloured, then combustion is not good and you have to perform a check of your heating system.

Smell

Wood combustion should not produce any form of smell or release of odours: if your stove smells, this means that the stove is producing significant quantities of harmful pollutants.

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