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ANALIZA LEGISLAŢIEI CU PRIVIRE LA COMBUSTIA LEMNULUI TRATAT

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TREATED WOOD COMBUSTION REGULATION ANALYSIS

In the latest years the European Union has started a review of the regulations about the combustion of the woody biomass, a resource widely available on the Earth with neutral impact in increasing greenhouse gas emissions. Firstly, an overview of the legal situation at global level is presented, and then a detailed explanation of the Italian regulation is the core of this article. Basically, in 2006 the introduction of the Legislative Decree n. 152 has established that virgin wood falls in the category of fuels, instead treated wood (deriving from wood-furniture industry rejects) is considered as waste: the consequence is that its combustion is subjected to more stringent restrictions in term of process monitoring and emission limit values. Finally, this paper wants to underline that the legislative framework is not completely clear, so not homogeneous interpretations by local governments (responsible for authorisations) are possible.

Keywords: combustion, industrial, regulation, virgin biomass, wood
Cuvinte cheie: biomasă naturală, combustie, industrie, lemn, legislație

1. Introduction

In the last two decades, worldwide, a growing interest in renewables and energy saving is shown, as a result of realizing that

this is the only way to the security of energy supply, to the climate change mitigation and to sustainable development on Earth [1, 2].The virgin woody biomass is considered, among the renewable ones, a neutral energy source in terms of emissions of greenhouse gases: therefore, governments are promoting new policies aimed to its more extensive use [3, 4, 5].

Total woody biomass comes from two categories: primary sources (virgin wood) and secondary sources (industrial residuals, primary processing and agro-foodstuffs industrial products) [6, 7, 8].

On a worldwide scale, the exploitation of biomass out of total energy consumption varies widely among different geographical areas: in 2009, it ranged between 1 % (Japan) and 35 % (India) [9]. The biomass demand is steadily increasing in the European Union (EU) and actually its share is approaching 67.1 MTEP (about 4.5 %) up to become a serious alternative to traditional fossil fuels, especially in the Scandinavian and Baltic countries, Germany, Austria and Switzerland [9].

In this frame, the interest for a simplified approach to energy recovery from treated wood is clear. The issue is particularly acute in Italy because every year the wood-furniture sector produces around 3.4 million of tons of woody waste: more than 74 % of which are made of virgin wood, the remaining are wood rejects treated with glues and/or coatings of various kinds, also with substances of toxicological concern [10]. The industry has always seen the woody waste as a useful reserve to direct at subsequent energy recovery operations, often in small-medium thermal plants (between hundreds of kW and few MW).

It must be underlined that the woody supply chain largely makes use of different types of preformed boards (plywood, raw and coated particleboards, multilayer lumber) due to needs of the market: consequently, they fall in the treated-wood group[11].The combustion of treated-woody waste is a potential source of air pollution, in fact, in addition to the typical oxidation products (NO_x, SO_2, CO, CO_2), it is possible the release of gases and substances of environmental impact, as fine particulate matter (PM), heavy metals, micro-organic pollutants such dioxins and furans and others [5,8]. This risk is increased in small-medium companies, as they could have limited financial resources or an inadequate know-how in management and monitoring the right combustion process [11]

For these reasons, in the last years the EU has furthered a review of the regulations about the recovery and the reuse of the woody biomass rejects, which in Italy are regulated by the D.Lgs. 152/2006.

2. Legislation aspects

About biomass as fuel, a brief overview of USA and EU legislations is presented. They have the reduction of emissions of particulate matter (PM) as their primary goal. The data of maximum level of total PM allowed according to thermal power of the plant are reported in Table 1.

Table 1

State, Province, City or Country		Thermal power	Total PM [mg/m^3]
USA.	-	≤ 2.9 MW	n/a
		< 2.9 MW and < 8.8 MW	70
		≥ 8.8 MW	30
British Columbia (Canada)	-	≤ 3 MW	50
		> 3 MW	35
Europe	(existing plants)	< 500 MW	100
		≥ 500 MW	50
	(new plant)	≥ 50 MW and < 100 MW	50
		≥ 100 MW	30
Germany	-	All sizes	20
Switzerland	(as fuel)#	≤ 70 kW	n/a
		> 70 kW and ≤ 500 kW	50
		< 500 kW and ≤ 10 MW	20
		> 10 MW	10
	(as waste)*	> 350 kW	10

according to annex 5 section 3 par. 1 and annex 5 section 3 par. 2 lett. a) Ordonance against the atmospheric pollution

* according to annex 5 section 3 par. 2 lett. b) of the Ordonance

The EPA Office of Air Quality Planning and Standards (OAQPS) stated that biomass combustion has a significant influence on PM in the atmosphere. In 2011 the EPA issued the Clean Air Act pollution: the new regulations for PM are based on boiler power [12]. Most European countries have devolved their internal combustion legislation policies regarding PM emissions to existing standards and European directives [13]. Germany has gone further and will impose the most stringent emission limits among European countries (since

2015): the PM limit will be 20 mg/m^3 regardless of size or type of biomass fuel [14].

3. Italian Legislation

In 2006, the Italian Government reunited all the environmental laws into a unique document called D.Lgs. 152/2006 ''Legislations in environmental issues''. Even now, this regulation is in force and disciplines the waste and pollution emissions issues. In Table 2 the emission limit values of wood as fuel are reported according to annex 1, section V of D.Lgs. 152/2006.

Table 2

Pollutants	**Limit values [mg/Nm^3]**				
[MW]	>0.035 and ≤0.15	>0.15 and ≤3	>3 and ≤6	>6 and ≤20	>20
Total PM	200	100	30	30	30
Total Organic Carbon (TOC)	-	-	-	30	20 / 10#
Carbon Monoxide (CO)	-	350	300	250 / 150#	200 / 100#
Nitrogen Oxides (as NO_2)	-	500	500	400 / 300#	400 / 200#
Sulfur Oxides (as SO_2)	-	200	200	200	200

Limit values on 1 hourly basis, vol. O_2 11%, 0°C, 0.15 MPa and dry gas
= Daily average values

In order to evaluate the combustion plants, the D.Lgs. 152/2006 establishes if the plants are subject to waste regulation through the definition of the fuel used. In fact, the fuels, which are not in compliance with, annex X of section V of D.Lgs. 152/2006 or fuels defined as waste on the basis of section IV of the same Legislative Decree, are subject to the waste legislation. However, all the plants that generate emissions into the atmosphere above the stated thresholds must be authorized. The D.Lgs. 387/2003 states that the combustion of wood as fuel is permitted after the submission of a Unique Simplified Authorization, less restrictive than the case of wood as waste.

3.1. Wood biomass as combustibles

The annex X of section V of D.Lgs. 152/2006 describes the features of the fuels that can be used into plants/activities that generate

pollution emissions and into civil thermal plants. The last ones are defined as thermal plants where heat is exclusively used in residential or not buildings, for the heating or for the environment winter/summer conditioning system or for heating the water for personal use.

The wood biomasses fulfilling the features above mentioned are:

- vegetable material produced by exclusively mechanical, water washing or drying treatments of agricultural crops or agricultural crops non-dedicated;
- vegetable material produced by mechanical processing and treatments with air, steam or superheated water, also made up of virgin wood and bark, sawdust, shavings, chips, edgings and virgin wood logs, wood waste and virgin granules, pellets and waste virgin cork, blanks, not contaminated by pollutants.

If these materials are not a result from direct production process or fall in exclusions from the scope of the waste part of this decree, the possibility of using such biomass in accordance with the V section shall be subject to fulfilment of the requirements for the by-products.

The definition of by-product is (according to the Directive 2008/98/EC and transposed by D.Lgs.152/2006 in Italy) a substance or object, resulting from a production process, the primary aim of which is not the production of that item, and as being a by-product only if the following conditions are met:

- further use of the substance or object is certain;
- the substance or object can be used directly without any further processing other than normal industrial practice;
- the substance or object is produced as an integral part of a production process;
- further use is lawful, i.e. the substance or object fulfils all relevant product, environmental and health protection requirements for the specific use and will not lead to overall adverse environmental or human health impacts.
- Furthermore, other biomass materials which are not considered as waste, are: straw, mowing and pruning, as well as other agricultural or forestry natural non-hazardous material used in agriculture, forestry or for the production of energy from such biomass through processes or methods which do not harm the environment or put endanger human health.

3.2 Wood biomass as waste

The chemically treated wood is excluded from the category of fuels, as defined in annex X of section V of D.Lgs. 152/2006, and is assigned to the class of waste. Its energy recovery must be authorized and is regulated by DM 05/02/98.

The D.Lgs. 133/2005, which transposes European Directive 2000/76/CE, establishes the operating conditions and the emission limits for incineration and co-incineration plants. At art. 3 par. 1 lett. a) part. 4, the wood waste are excluded from the scope of the decree, except for those which may contain halogenated organic compounds or heavy metals or those classified as dangerous according to art. 2 par. 1 lett. b) (as a result of treatment with wood-preservatives or coating).

The limit values are presented in the Table 3 and 4, in accordance with the annex 1 of D. Lgs. 133/2005.

Table 3 reports the monitoring criteria and the emission limits of wood as waste, both according to annex 1 of the cited legislation.

Table 3

Continuous monitoring and recording	
O_2	yes
CO	yes
PM	yes
NO_x	yes
HCl	yes
TOC	yes
SO_2	yes
HF	yes
heavy metals and dioxine	to define
temperature in combustion chamber	≥ 850 °C

It follows

Limit values [mg/m^3]					
	d	30' (100%)	30' (97%)	h	8h
PM	10	30	10		
TOC	10	20	10		

HCl	10	60	10		
HF	1	4	2		
SO_2	50	200	50		
NO_x (as NO_2)	200	400	200		
Cd + Tl				0.05	
Hg				0.05	
Sb+As+Pb+Cr+Co+Cu+Mn+Ni+V)				0.5	
PCCD + PCCF (TEQ)					0.1 ng/m^3
IPA					0.01
CO	50	100			

Operating conditions: 273 K, 101,3 kPa, 11% O_2, dry gas
d = daily average values
30' = 30 minutes average values
h = 1 hour average values
8h = 8 hours average values

The D.Lgs. 152/2006 benefits the recovery of particular waste groups by the application of simplified procedures for new plants construction: presently, a Provincial authorization is needed, in place of a stricter examination by the Region.

The use of simplified procedures is allowed to the following wood waste groups:

- Waste from untreated-wood processing (annex 2 sub.1(4))
- Waste from treated-wood processing (annex 2 sub.1(6))

The emission limits for air pollutants into the air are set depending on the type of waste and plants, for example for treated-wood as reported in Table 4.

The concerned monitoring effort is clear. An issue recently opened concerns the possibility to define a sub-group of treated wood to be considered as a fuel when additives with no toxic characteristics make the operation of treatment. This is the reason why the Autonomous Province of Trento has financed a research, presently in progress.

Table 4

Continuous monitoring and recording	
O_2	yes
CO	yes

PM	only ≥ 6 MW				
NO_x	only ≥ 6 MW				
HCl	only ≥ 6 MW				
TOC	only ≥ 6 MW				
SO_2	only ≥ 6 MW				
HF	only ≥ 6 MW				
heavy metals and dioxine	to define				
temperature of gaseous effluent	yes				
Limit values [mg/m^3]					
	d	30' (100%)	30' (97%)	h	8h
PM	10	30	10	-	-
NO_x (as NO_2)	200	-	-	400	-
SO_2	50	200	50	-	-
TOC	10	20	10	-	-
HF	1	4	2	-	-
HCl	10	60	10	-	-
Cd + Tl	-	-	-	0.05	-
Hg	-	-	-	0.05	-
Sb+As+Pb+Cr+Co+Cu+Mn+Ni+V)	-	-	-	0.5	-
PCCD + PCCF (TEQ)	-	-	-	-	0.1 ng/m^3
IPA	-	-	-	-	0.01
CO	50	100	-	-	-

Operating conditions: 273 K, 101,3 kPa, 11% O2, dry gas
d = daily average values
30' = 30 minutes average values
h = 1 hour average values
8h = 8 hours average values

4. Conclusions

■ The treated-wood is a vast potential resource of energy recovery, in particular considering the EU target for increasing the diversification of energy sources by 2020. Additional analyses of pollutants release and an improved combustion control would be

welcomed to minimize the environmental impacts of the “treated-wood to energy” supply chain.

■ In Italy, the new definition of by-product (introduced by the D.Lgs. 152/2006) influences the classification of the material rejected from production processes leading to confusion about the right classification of the woody biomass destined for energy recovery. If the woody biomass is recognized as waste, fuel or by-product varies widely the authorization process and the management of the plant.

■ The Italian legislation on treated wood combustion imposes the same limit values and sampling procedures as those for a large incinerator. First of all, a wood processing industry cannot perform a near-steady combustion, unlike waste incinerator plants; secondly, a small company has not sufficient financial resources as its disposal. Basically, the current definition of “waste” issued by D.Lgs. 152/2006 guarantees the right function of environmental protection but may not clearly distinguish between products, by-products, secondary raw materials and waste; the future scenario may hold not homogeneous interpretations by local governments, responsible for authorisations and assessments.

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