BRITISH COLUMBIA | Ministry of Environment

FACTSHEET
AIR EMISSIONS

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Biomass-Fired Electrical Power Generation

Under the *Environmental Management Act* (EMA), all high-risk, and some medium-risk, industrial operations in British Columbia are required to have government authorization[1] prior to discharging emissions or waste to the environment. These authorizations are legally enforceable and are subject to pollution preventing conditions and criteria. Authorizations for new, or significantly modified, power generating facilities are developed based on the Ministry's Guideline for Emissions from Biomass-Fired Electrical Power Generation.

The purpose of this document is to summarize key emissions information contained in the Ministry's Guideline for Emissions from Biomass-Fired Electrical Power Generation.

What is the guideline used for?

Guidelines provide assistance to directors, appointed under EMA, when preparing and issuing authorizations for industrial facilities.

What is Biomass?

Biomass refers to forest fibre products including wood, logs, branches, tree stumps, sawdust, wood chips, bark and wood pellets, but does not include any paper or products treated with paint or glue. British Columbia has a large biomass resource which includes trees killed by mountain pine beetles.

How are emissions produced by this process?

Air emissions are produced during the combustion of biomass, most commonly in boilers and gasification systems.

What are the emissions limits?

The Guideline for Emissions from Biomass-Fired Electrical Power Generation outlines limits for Total Particulate Matter (TPM), as well as Dioxin / Furan Toxic Equivalents in the event that salt-laden wood is combusted.

The guideline is based on best achievable technology standards and describes requirements for new and significantly modified existing facilities.

New Facilities

The guideline states that all new facilities are required to install control technologies that will at a minimum meet the emissions limits listed in Table 1.

Existing Facilities

The guideline states that existing facilities that have undergone significant modifications are expected to meet the applicable monitoring and control requirements listed in Table 1. Existing biomass-fired facilities that have not been significantly modified may continue to operate in accordance with the limits of their current permit.

[1] Authorizations may include permits, approvals, operational certificates or regulations. For more information on waste discharge authorizations, see: http://www.env.gov.bc.ca/epd/waste_discharge_auth/index.htm

When has a facility been "significantly modified"?

A facility has been significantly modified if it has undergone a physical or operational change resulting in an increase of 10% or more in the volume of discharge or the total amount of any contaminant released to the environment, based on authorized values.

What is Total Particulate Matter (TPM)?

Particulate matter refers to tiny solid or liquid particles that float in the air. TPM consists of filterable and condensable particulate matter, of which only filterable material is of concern in this application. Filterable particulate matter includes all PM_{10} and $PM_{2.5}$ emissions, where PM_{10} and $PM_{2.5}$ are comprised of particulate matter with aerodynamic diameters less than 10 and 2.5 micrometers respectively.

What is Opacity?

Opacity is a measure of the impenetrability of a medium to light. The visible emissions plume discharged by a facility into the environment can be quantified by either a qualified observer or with in-stack continuous emission monitoring equipment. Opacity is usually expressed in percentage (%). Plume opacity is not used as a fine measurement tool but is indicative of the quality of operation of a facility, principally with respect to particulate management.

What are Dioxins / Furans and Toxic Equivalents?

Dioxins and Furans are the common names for a group of toxic chemicals that may be formed during combustion processes. The concept of toxic equivalents (TEQ) has been developed in order to simplify regulatory controls, due to the significantly varying toxicity of the constituents of this group. Dioxins / Furans have been found to be very resistant to environmental degradation and as a result have high potential for bioaccumulation in humans and wildlife.

Why are these emissions limited?

TPM emissions are limited because they can have negative impacts on local air quality and human health. $PM_{2.5}$ is known to cause aggravation of respiratory and cardiovascular disease, reduced lung function, increased respiratory symptoms and premature death. TPM also impairs visibility, affects climate and can damage and/or discolour structures and property.[2]

Dioxin / Furan Toxic Equivalents are limited because they are characterized as likely human carcinogens, with the potential to cause negative effects in very small doses. Dioxins and furans have the potential to produce a range of effects on humans including: skin disorders, liver problems, immunosuppression, developmental alterations, and certain types of cancers.[3]

What is the frequency of monitoring?

The monitoring frequency is listed in Table 1. Monitoring must be in accordance with the British Columbia Field Sampling Manual – For Continuous Monitoring and the Collection of Air, Air-Emissions, Water, Waste Water, Soil, Sediment and Biological Samples.[4]

Are there other considerations?

The information contained in the Ministry's guideline documents are just one of the main pieces of information taken into consideration by the director when approving an authorization. Additional sources of information considered by the director may include environmental impact assessments, local air shed plans, other guidelines, and stakeholder input. The director also has the authority to impose emission standards other than those that are recommended in these types of guidelines.

[2] More information on how air quality affects human health can be found in the State of the Air Report 2010 at: http://www.bc.lung.ca/airquality/documents/StateOfTheAir2010webrevised.pdf

[3] More information on how Dioxins / Furans affect human health can be found on Health Canada's website at: http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/environ/dioxin-eng.php

[4] The British Columbia Field Sampling Manual can be found at: http://www.env.gov.bc.ca/epd/wamr/labsys/field_man_pdfs/fld_man_03.pdf

Table 1 Emissions Limits for New Biomass-Fired Electrical Power Generation

Size[a]	Parameter	Limit	Units[b]	Monitoring[d]
< 25 MW (electrical output)	Total Particulate[c]	50	mg/m^3	Annual
	Opacity[e]	-	%	Daily
	Dioxin / Furan TEQ[f]	100	$picograms/m^3$	Annual
≥ 25 MW (electrical output)	Total Particulate[c]	20	mg/m^3	Twice per year
	Opacity[e]	-	%	Continuous
	Dioxin / Furan TEQ[f]	100	$picograms/m^3$	Annual

NOTES:

[(a)] Total cumulative output of all new biomass fired units at a facility
[(b)] Concentrations measured at standard conditions of 20°C, 101.3 kPa, dry gas and 8% O_2
[(c)] Total limits are for filterable particulate only. For new units, an operator would be required to undertake baseline monitoring (stack testing) within six months of start up and annually thereafter.
[(d)] Monitoring must be in accordance with the British Columbia Field Sampling Manual.
[(e)] Opacity monitoring is recommended for operational monitoring purposes. It is not typically required for compliance purposes.
[(f)] Monitoring is required only if salt-laden wood is burned.

For more information contact the Environmental Standards Branch at: eqb@Victoria1.gov.bc.ca,

or, consult our website at http://www.env.gov.bc.ca/epd/industrial/pulp_paper_lumber/wood_fired.htm.