

**Canadian Council of Ministers of the Environment**

***CANADA-WIDE STANDARDS***

*for*

***DIOXINS AND FURANS:***

***Iron Sintering Plants***

# CANADA-WIDE STANDARDS for Dioxins and Furans

## PREAMBLE

### Dioxins and Furans

Polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), commonly known as dioxins and furans, are toxic, persistent, bioaccumulative, and result predominantly from human activity. Due to their extraordinary environmental persistence and capacity to accumulate in biological tissues, dioxins and furans are slated for virtual elimination under the *Canadian Environmental Protection Act (CEPA)*, the federal *Toxic Substances Management Policy (TSMP)* and the Canadian Council of Ministers of the Environment's (CCME) *Policy for the Management of Toxic Substances (PMTS)*.

The presence of dioxins and furans in the Canadian environment can be attributed to three principal sources: point source discharges (to water, air and soil), contamination from *in situ* dioxins and furans, and loadings from long-range transboundary air pollution (LRTAP).

Canada has signed and ratified (December, 1998) the United Nations Economic Commission for Europe's (UNECE) Protocol on Persistent Organic Pollutants under the Convention on Long-Range Transboundary Air Pollution. This international Protocol has as its objective, "to control, reduce or eliminate discharges, emissions and losses of persistent organic pollutants (POPs)." As well as obligations for other specified POPs, it specifically obliges Parties "to reduce their emissions of dioxins, furans, polycyclic aromatic hydrocarbons (PAHs) and hexachlorobenzene (HCB) below their levels in 1990 (or an alternative year between 1985 and 1995)." The Iron and Steel sectors are included in this Protocol as "Major Stationary Sources" of these contaminants.

Dioxin and furan contamination found in soil, water, sediments, and tissues (*in situ* contamination), is the subject of national guidelines for dioxins and furans. These guidelines outline ambient or "alert levels" which may be used by jurisdictions as benchmarks for the management and monitoring of dioxins and furans already present in the environment.

Point source discharges to water have been the target of aggressive federal and provincial regulation, as well as industry innovation and change. Discharges of dioxins & furans to the aquatic environment reached non-measurable levels in 1995.

### Development of the Canada-wide Standard

The Canada-wide Standards process has focussed on anthropogenic sources that are releasing dioxins and furans to the atmosphere and soil in a continuous process.

In January 1999, the Federal/Provincial Task Force on Dioxins and Furans released the first *Dioxins and Furans and Hexachlorobenzene Inventory of Releases*, followed by a draft Update issued by Environment Canada in October 2000 and a revised Update published in February 2001. The latest Update documented the current understanding of anthropogenic sources in Canada releasing dioxins and furans. The *Inventory of Releases* and the Updates list emissions from over 20 sectors by province and territory, and provides national summaries for each sector.

Initial efforts have focused on atmospheric releases, the most complete component of the Inventory. Six priority sectors, varying from regional to national in scope, accounting for about 80% of national emissions in the 1999 inventory have been identified as priorities for early action. These are waste incineration (municipal solid waste, hazardous waste, sewage sludge and medical waste); burning salt laden wood in coastal pulp and paper boilers in British Columbia; residential wood combustion; iron sintering; electric arc furnace steel manufacturing; and conical municipal waste combustion in Newfoundland.

CCME has taken a CWS approach for priority sectors such as coastal pulp and paper boilers, waste incineration (municipal solid waste, biomedical waste, hazardous waste, sewage sludge incineration, conical waste combustion) , iron sintering and steel-making electric arc furnaces. Reductions from additional source sectors, many of which contribute very small amounts of dioxins and furans emissions, will continue to be pursued, through a variety of mechanisms including co-benefits resulting from other processes, action by individual jurisdictions, and public education.

Development of CWSs for dioxins and furans has taken into consideration environmental benefits, available technologies, socio-economic impacts, opportunities for pollution prevention and collateral benefits from reductions in other pollutants.

In recognition of the ultimate goal of virtual elimination, pollution prevention is being encouraged as the preferred method for avoiding the creation of dioxins or reducing releases to the environment.

Wherever possible, work on the dioxins and furans CWSs has been coordinated with other ongoing processes (e.g. Mercury CWS and the Strategic Options Process). A multi-pollutant approach will be carried forward to the remaining sectors while ensuring that dioxins and furans issues are addressed and that the ultimate goal of virtual elimination is kept clearly in mind. Opportunities for a multi-pollutant approach will also be pursued as part of the implementation of the Dioxins and Furans Canada-wide Standard.

During development of the inventory, it was realized that the data on dioxins and furans is limited. The information in the dioxins and furans inventory will be refined and updated on a regular basis through a variety of sources including the National Pollutants Release Inventory (NPRI) as a means of tracking progress and as a means of identifying any future sources of releases that must be addressed.

## **PART 1:**

### **Iron Sintering Plants**

#### Rationale for standard

Unique to Ontario, the sintering of iron-bearing steel mill secondary materials and ore results in an estimated annual release of 6.0 g TEQ/year to the atmosphere based on 1998 stack tests. This corresponds to 4 percent of the national total of dioxins and furans emissions documented in the 2001 inventory of releases prepared under the *Canadian Environmental Protection Act (CEPA)*. Currently, there is only one remaining iron sintering plant in Canada.

As a result of a plant closure and the conduct of source testing at the remaining sintering plant, estimated atmospheric releases of dioxins and furans have been reduced. The current estimate of total releases of dioxins and furans is 76% less than the 1990 estimate.

In a sintering plant, a feed mixture of fine fraction iron-rich mill secondary materials or ore and fluxing agents is fed onto a series of pallets mixed with a carbon source such as coke or coal. The carbon source combusts to provide heat to fuse the feed into a porous solid material suitable for use as feed for a blast furnace. A burner at the feed end of the sinter machine ignites the carbon in the mix on the pallets, and air is drawn down through the material. As the pallets move down the length of the machine, combustion proceeds down through the layer of material until the entire depth has been burned and fused, after which air continues to be drawn through the pallets to cool the fused product before its discharge from the product end of the machine.

The sinter product produced is a recycled feed to the blast furnace serving as a source of iron and flux, recaptured and ultimately reused in the making of steel.

Dioxins and furans emitted from iron sintering plants are believed to be created through the burning of the carbon source in the sinter bed in the presence of a metal catalyst and minute quantities of chlorine as chloride ion. There is adequate chloride ion present at an appropriate temperature to allow formation of dioxins and furans within the sinter bed. Particulate emissions result when fine material, especially material one micrometre or less in diameter, that was not fused in the process escapes with the air drawn through the sinter bed; dioxins and furans appear to be adsorbed to or condensed on these particles. In addition, dioxins and furans present in the gaseous state are carried into the exhaust system.

This standard sets out limits for dioxins and furans as well as expected emission levels for particulate matter which should be achieved when control technology designed to meet the dioxin and furan limits is employed. Particulate matter emission levels are addressed because there is believed to be a very close association of emissions of particulate matter and dioxins and furans. Taking into consideration this fact together with the direction from CCME to consider collateral benefits of other pollutants it was considered prudent to identify achievable emission levels for particulate matter associated with meeting the proposed dioxin and furan limits.

In addition, it should be noted that for the existing plant in Canada, 98% of the emitted particulate is less than 2.5 micrometres in diameter, and 93% less than 1 micrometre based on the 1998 stack tests. Stakeholders on the Multistakeholder Advisory Group engaged in the development process for this standard expressed strong concerns about the emission of primary fine particulate matter from the existing and any potential new sources.

#### Nature and application:

Because of the nature of sinter emissions, this Canada-wide Standard deals with two matters of interest: emission limits for dioxins and furans, and corresponding expected emission levels for particulate matter based on the predicted performance of technologies which can meet the emission limits.

The CWS for this sector consists of two components. The first component sets out numeric targets and timeframes for reducing emissions of dioxins and furans and expected commensurate reductions in particulate emissions from new and existing iron sintering plants of any size. Emission limits are expressed as a concentration in the exhaust gas exiting the stack of the facility. New or expanding facilities will be expected to comply immediately with the standard, and it will be up to individual jurisdictions to determine what constitutes a significant expansion to trigger the standard. It is believed that the limits for existing facilities are capable of being met using generally available technology. The emission limits, and testing and reporting requirements for the existing iron sintering plant are to be met by the end of the calendar years specified.

The second component sets out a process for further examining pollution prevention opportunities to prevent the creation of dioxins and furans.

#### Numeric Targets and Timeframe for Achieving Targets

Dioxins and furans are substances mandated for virtual elimination under the *Canadian Environmental Protection Act (CEPA)* and CCME's *Policy for the Management of Toxic Substances (PMTS)*. As such, the ultimate objective is to reduce the concentration of dioxins and furans in the exhaust to below the Level of Quantification [LOQ] (*CEPA*) or Limit of Measurable Concentration (CCME). The LOQ has been set at 32 pg/Rm<sup>3</sup> TEQ by Environment Canada. However, Canada-wide Standards are intended to make a significant step toward the achievement of virtual elimination, not necessarily to bring sources to that level at once. Based on analysis of the performance of available technologies for control of this source type, the following standards have been developed. These limits do not require correction for oxygen content.

#### New or Expanding Iron Sintering Plants

Dioxin and furan stack emissions shall be less than 200 pg/m<sup>3</sup> TEQ, and as a result of achieving this limit particulate emissions should correspond to a level of less than 20 mg/m<sup>3</sup> for new iron sintering plants constructed or existing plants expanding their production capacity after the effective date of this standard.

### Existing Iron Sintering Plants

- Phase 1: Dioxin and furan stack emissions shall be less than 1350 pg/m<sup>3</sup> TEQ, and as a result of achieving this limit particulate emissions should correspond to a level of less than 50 mg/m<sup>3</sup> for all existing iron sintering plants by 2002.
- Phase 2: In addition, dioxin and furan stack emissions shall be less than 500 pg/m<sup>3</sup> TEQ for all existing iron sintering plants by 2005. The Phase 1 particulate emission level would be expected to continue to be met.
- Phase 3: Dioxin and furan stack emissions shall be less than 200 pg/m<sup>3</sup> TEQ, and as a result of achieving this limit particulate emissions should correspond to a level of less than 20 mg/m<sup>3</sup> for all existing iron sintering plants by 2010.

### Anticipated Environmental Benefits

Based on the 1998 emission tests, this would result in reductions in stack emissions of dioxins and furans of 50% (to 3.0 grams TEQ/year) for Phase 1, 80% (to 1.2 grams TEQ/year) for Phase 2 and 90% (to 0.6 grams TEQ/year) for Phase 3. For particulate matter, the corresponding emission reductions would be expected to amount to 45% (to 105 tonnes/year from 190 tonnes/year based on 1998 stack test results) for Phase 1, a hold at 45% (105 tonnes/year) during Phase 2, and a reduction of 78% (to 42 tonnes/year from the 1998 estimate) as a result of Phase 3.

### Emissions Testing and Reporting

The standard for the existing iron sintering plant is set pending the acquisition of further test data on the performance of modification underway to the air pollution control system at the remaining existing facility. Recognizing the ultimate objective of virtual elimination as set out in the *Canadian Environmental Protection Act* and CCME's *Policy for the Management of Toxic Substances*, plant operators will voluntarily pursue further reductions in emissions during the period of the standard. Measures to be explored if necessary include physical and process modifications to prevent or reduce dioxin and furan formation as well as additional or alternative emission control upgrades and/or other pollution prevention measures.

The existing iron sintering plant covered by this standard shall be tested annually under conditions leading to maximum output to determine the level and estimated annual loading of dioxin and furan air emissions commencing the year in which this standard comes into effect. Testing and reporting shall be performed using methods and procedures acceptable to the responsible jurisdiction.

### Pollution Prevention Strategy:

Ministers recognize the contribution iron sintering makes as a recycling activity, making use of mill secondary materials to recover useful iron content and thus avoiding the landfill disposal of hundreds of thousands of tonnes of such materials every year, along with the environmental impacts such disposal would impose on surrounding communities. At the same time, Ministers note the need to ensure that a reasonable balance is struck between avoiding landfill disposal impacts and mitigating emissions to other media, particularly when addressing releases of substances subject to virtual elimination under *CEPA* or the CCME *PMTS*.

In addition to the continuing efforts of iron sintering plant operators to destroy or capture emissions of dioxins and furans, emphasis will be placed on identifying and implementing opportunities to prevent the creation of dioxins and furans as well as discharges of pollutants, especially emissions of particulate matter. For air pollutants, this will entail addressing both discharges through the main stack and from process fugitive emissions. The fate of dioxins and furans collected in the air pollution control system is also to be examined in terms of potential cross-media transfer concerns. As an initial action with shared responsibility by Ontario and Canada, strategies identifying opportunities to minimize iron sintering plant multimedia discharges of pollutants including particulate matter and dioxins and furans will be developed through a multi-stakeholder process by October 31, 2003 to provide a framework for continual progress towards the virtual elimination of dioxins and furans. It is expected that the preliminary process sampling work carried out by the existing plant and Ontario will serve as the basis for identification of additional pollutant minimization activities.

The range of issues to be addressed in developing the strategy could include:

- measures to capture and control fugitive emissions of particulate matter and other contaminants from the process equipment in order to further reduce the total loadings from the plant to the atmosphere;
- additional consideration of materials currently included in the feed mixture which may have the effect of causing elevated dioxin and furan levels in the exhaust gases from the plant;
- consideration of materials included in the feed mixtures which may have the effect of causing elevated mercury levels in the exhaust gases from iron-sintering plants, i.e., levels exceeding the detection limit as 1998 results were “non-detect”;
- consideration of alternative processes for the treatment of mill secondary materials to create materials suitable for use as blast furnace feed or other beneficial uses;
- discussion of additional and ongoing monitoring requirements for materials collected from the gas cleaning system and the east lagoon sludge; and
- consideration of the best management practices mandated when collecting, treating and/or disposing of materials recovered from the gas cleaning system.
- further assessment of the relationship between removal of particulate matter and dioxins and furans in the air pollution control system.

#### Review of the Standard

Starting in 2002, the standards for new, expanding and existing iron sintering plants will be thoroughly reviewed. This review is to be completed by December 31, 2003 and is to take place in a multi-stakeholder forum; options for revised emission limits as well as testing frequency are to be evaluated, along with further evaluation of the relationship between emissions of particulate matter and dioxins & furans. The review will take into account the results of the additional testing at the existing plant associated with implementing air pollution control modifications there. The review will also take into account any additional studies on dioxin and furan creation and opportunities to achieve virtual elimination and the examination of other pollution prevention opportunities.

## **PART 2:**

### Reporting on Progress:

Ministers will receive reports on progress in achieving the CWS by jurisdictions in Spring 2004 and Spring 2008. Ministers will ensure that a single public report is prepared and posted on the CCME web site for public access. The report in 2004 will reflect interim progress on achieving the CWSs. Progress on implementation of the numeric targets will be documented. The 2008 report will evaluate whether targets have been met. More details on reporting are available in Annex 1.

Each jurisdiction will detail the means of ensuring achievement of the CWS in a manner consistent with the typical or desired programs for the affected facility/sector, so as not to impose an unnecessary level of reporting duplication.

With a view to continuous improvement towards the goal of virtual elimination, an evaluation of the Dioxin and Furan Canada-wide Standards will be presented to Ministers in Spring 2006. The evaluation will consider new scientific, technical and economic information and provide an assessment of the need to develop the next set of CWS targets and timelines to continue progress toward virtual elimination.

### **ADMINISTRATION:**

Jurisdictions will review and renew Part 2 and Annex 1 five years from coming into effect.

Any party may withdraw from these Canada-wide Standards upon three month's notice.

This Canada-Wide Standard comes into effect for each jurisdiction on the date of signature by the jurisdiction.

# **Annex 1**

## **Dioxins and Furans CWS Reporting Framework**

### **Introduction**

Under the Harmonization Accord and its Canada-wide Environmental Standards Sub-Agreement, all jurisdictions are to report to the public and to Ministers on their progress towards achieving the CWSs for dioxins and furans.

This reporting framework is intended to provide a transparent and consistent mechanism for reporting by jurisdictions in a fashion which minimizes resource requirements for government and industry alike, while maximizing the availability of information on achievement of these standards.

The framework addresses:

- 1) frequency, timing and scope of reporting
- 2) guidance as to the means of determining compliance/achievement of the CWS
- 3) common measurement parameters for reporting purposes
- 4) data management and public reporting

### **Frequency, timing and scope of reporting**

The reporting schedule will be tied into assessing the performance of the governments in meeting the benchmarks and timelines relevant to the standards. A report in 2004 will provide a means for tracking interim progress and report on additional technical studies (e.g. technology feasibility and pollution prevention options for iron sintering sector). The 2008 report will indicate compliance with the standards for the coastal pulp and paper boiler, incineration and iron sintering sectors.

Jurisdictions will submit sectoral data for inclusion in the progress reports in a timely manner. To report on achievement of the CWS, a data report along with an assessment of progress will be compiled into a single report for Ministers and a public version will be posted on the CCME web site for public access.

Reports will be limited to information on those facilities which are subject to achievement and/or compliance with the Canada-wide Standards as endorsed by the Ministers of the Environment and as implemented variously by the responsible jurisdictions or industries. This information is intended to show compliance rates and performance characteristics in a manner which documents sectoral performance as well as jurisdictional performance. It is not intended to provide a facility-by-facility record of performance.

## **Means of determining compliance/achievement of the CWS**

The Canada-wide Standards for dioxins and furans lend themselves to achievement through voluntary action, or through compliance with regulated or legally enforceable limits. As such, it is necessary to provide some means to ensure that a level playing field exists so that the numeric value provided in the CWS is applied equally or similarly in each jurisdiction. One means to do this is to require identical compliance procedures, but this may require that some jurisdictions apply compliance procedures for dioxins and furans CWSs that are different than those used for locally determined or regulated parameters such as SO<sub>2</sub>, PM, ammonia, etc. An example is where the dioxins and furans CWS is expressed as the average of 3 stack tests, whereas a jurisdiction may normally utilize the median value of 3 tests to determine compliance.

In an effort to streamline implementation, each jurisdiction will determine the exact means of ensuring compliance/achievement in a manner consistent with the typical or desired programs for the affected facility/sector. It is anticipated that minor variations in jurisdictional requirements will result in minimal variation across the country, which is insignificant with respect to the overall reductions expected which range from 50-99% for various facilities.

## **Common measurement parameters for reporting purposes**

Each facility report will include specific measures corrected so as to be compatible and consistent for the purposes of public reporting. Dioxin and furan emissions must be corrected for the O<sub>2</sub> content of gases, to ensure compliance with the standards, except where noted otherwise.

While little confusion is likely to exist over the implementation of dioxins and furans CWSs for “greenfield” facilities, it is possible that significantly expanded or modified facilities can/should be considered as new for the purposes of achievement/compliance with the dioxins and furans CWS. It will be the responsibility of the jurisdictions to determine at which point a facility no longer qualifies as an “existing” facility and must conform to the standard for “new or expanded” facilities as a result of significant modifications/alterations to the facility operations or physical plant.

Jurisdictions must report measurements of individual dioxin and furan isomers that are below the detection limit in a consistent manner. These measurements should be reported as though they were present at the limit of detection, and TEQ values calculated appropriately using those substitutions.

Facilities will generally, unless otherwise stated in the standard, be required to perform stack tests at an annual frequency in order to demonstrate compliance. However, jurisdictions may vary the stack testing requirements for these facilities in cases where performance has been consistently demonstrated to be below the Level of Quantification (LOQ) as defined by Environment Canada. Where five years’ data has been accumulated with all results reported below the LOQ, the stack testing frequency may be revised to a biennial schedule so long as all subsequent test results remain below the LOQ. For the purpose of reporting emissions, the most recent stack test results available should be used. Jurisdictions have the responsibility of deciding whether to implement this variance for all, some or none of the source types subject to these standards.

## **Data management and public reporting**

Reports on achieving the CWSs will include a data report and a report on achievement of the standards. Sectoral and jurisdictional specific data will be supplied in a spreadsheet format to facilitate reporting. A consolidated report will be made available to all jurisdictions and to the Ministers, along with the draft public report, prior to formal release of the public report. The public report will be released upon approval by the Council of Ministers.

Jurisdictions will provide a report in spreadsheet format so that the data report and report on achievement can be prepared along with the public report for review and approval. Reports will be prepared and distributed to all jurisdictions prior to review by Ministers. Along with the report on achievement, a draft public report will be provided for review and consideration prior to the Ministers' meeting at which public release is anticipated. That public report will be posted to the CCME web site upon approval by the Ministers. Jurisdictions are encouraged to provide reference to the CCME web site and/or pointers in their own web sites in order to ensure a single location for dioxins and furans CWSs reporting should errors/miscalculations have to be corrected at some time.

In addition to the consolidated public reporting on dioxins and furans CWSs, jurisdictions must provide a contact for facility-specific information in the event that the public wishes to access compliance or achievement information. Such data will be supplied in a manner consistent with the normal data-reporting/compliance reporting procedures of the jurisdiction in question - the consolidated spreadsheet will not be made publicly available in that it may include proprietary (business) information.

**Canada-wide Standard for Dioxins and Furans:  
Iron Sintering Plants**

Signed by:

British Columbia	Honourable Joyce Murray
Alberta	Honourable Lorne Taylor
Saskatchewan	Honourable Buckley Belanger
Manitoba	Honourable Steve Ashton
Ontario	Honourable Chris Stockwell
Environment Canada	Honourable David Anderson
New Brunswick	Honourable Brenda Fowle
Nova Scotia	Honourable Ronald Russell
Prince Edward Island	Honourable Chester Gillan
Newfoundland and Labrador	Honourable Kevin Aylward Honourable Tom Lush
Yukon	Honourable Jim Kenyon
Northwest Territories	Honourable Jim Antoine
Nunavut	Honourable Olayuk Akesuk

Note: Québec has not endorsed the Canada-wide Accord on Environmental Harmonization or the Canada-wide Environmental Standards Sub-agreement.