06-096 DEPARTMENT OF ENVIRONMENTAL PROTECTION

# Chapter 124: TOTAL REDUCED SULFUR CONTROL FROM KRAFT PULP MILLS

SUMMARY: This regulation establishes emission standards for total reduced sulfur (TRS) from existing Kraft pulp mills.

**1. Scope/Applicability**

**A.** This regulation applies in all ambient air quality control regions in the State of Maine.

**B.** The provisions of this Chapter apply to TRS emissions from processes that occur in Kraft pulp mills.

**C.** Unless otherwise indicated, any reference in this Chapter to provisions of the Code of Federal Regulations is to that version of the regulation in effect as of July 1, 1998.

Kraft pulp mills may also be subject to the Environmental Protection Agency's (EPA's) New Source Performance Standard (NSPS) for Kraft Pulp Mills (40 CFR Part 60, Subpart BB).

**2. Definitions**

**A. Alternative TRS control system.** “Alternative TRS control system” means alternative technologies (such as an air stripper or scrubber) used to remove TRS compounds from wastewater, gas streams or condensates.

1. **Black liquor solids.** “Black liquor solids” means the dry weight of the solids, which enter the recovery furnace in the black liquor.
2. **Brownstock washer system.** "Brownstock washer system" means brownstock washers and associated equipment used to wash the pulp following the digester system and prior to the bleaching system or oxygen delignification system.
3. **Digester system.** "Digester system" means each continuous digester or each batch digester used for the chemical treatment of wood or non-wood fibers at a Kraft pulp mill. The digester system equipment includes associated flash tank(s), blow tank(s), blow heat recovery accumulator(s), relief gas condenser(s), and pre-hydrolysis units preceding the brownstock washer system.

**E. Evaporator system.** "Evaporator system" means all equipment associated with increasing the solids content and/or concentrating spent cooking liquor from the brownstock washer system including pre-evaporators, multi-effect evaporators, concentrators, and vacuum systems, as well as associated condensers, hotwells and any other equipment serving the same function as those previously listed.

**F. High volume, low concentration or HVLC collection system.** "High volume, low concentration or HVLC collection system" means a system which collects and conveys TRS gases to a control device from equipment that could include, but is not limited to, the brownstock washer systems, oxygen delignification systems, any tertiary digester flash tanks, and any miscellaneous sources requiring TRS to be controlled.

**G. Kraft pulp mill.** "Kraft pulp mill" means any stationary source which produces pulp from wood by cooking (digesting) wood chips in white liquor (a water solution of sodium hydroxide and sodium sulfide) at elevated temperature and pressure. Regeneration of the cooking chemicals through a recovery process is part of the Kraft pulp mill.

**H. Lime kiln.** "Lime kiln" means a unit used to calcine lime mud, a process which consists primarily of converting calcium carbonate into quicklime, which is calcium oxide.

**I. Low volume, high concentration or LVHC collection system.** "Low volume, high concentration or LVHC collection system" means a system which collects and conveys TRS gases to a control device from equipment that could include, but is not limited to, the digester system, turpentine recovery system, evaporator systems, and any miscellaneous sources requiring TRS to be controlled.

**J. Miscellaneous sources.** "Miscellaneous sources" means sources of TRS which are not controlled but emit TRS at levels greater than 0.75 pounds per hour on a continuous basis under normal operations. Continuous means occurring for more than a two (2)-hour period. Miscellaneous sources may include, but not be limited to, knotters, screens, deckers, oxygen delignification systems, liquor storage tanks and chip bins.

**K. Recovery furnace.** "Recovery furnace" means an enclosed combustion device where concentrated black liquor is burned to recover sodium and sulfur and to produce steam for energy recovery.

**L. Smelt dissolving tank.** "Smelt dissolving tank" means a vessel used for dissolving the smelt collected from the recovery furnace.

**M. Steam stripper collection system.** "Steam stripper collection system" means a system which collects TRS off-gas from a steam stripper (including associated stripper feed tanks, condensers, or heat exchangers) and conveys the TRS gases to a designated control device. The steam stripper collection system also includes all equipment associated with a methanol rectification process including rectifiers, condensers, decanters, and storage tanks.

**N. Total reduced sulfur (TRS).** "Total reduced sulfur (TRS)" means the sum of the sulfur compounds hydrogen sulfide, methyl mercaptan, dimethyl sulfide, and dimethyl disulfide, that are released during the Kraft pulping operation and measured by EPA Reference Method 16, 16A, or 16B in Appendix A of 40 CFR Part 60.

**O. Twelve (12)-hour block average.** "Twelve (12)-hour block average" means the discrete average of a twelve (12)‑hour period from midnight to noon, and from noon to midnight or any other discrete twelve (12)-hour block average period approved by the Department fora particular source as specified in the source’s air emission license.

**P*.* Venting of TRS.** "Venting of TRS" means the direct release of gases which contain TRS to the atmosphere in excess of 0.75 pounds per hour or five (5) ppm from any LVHC, HVLC, steam stripper collection system, or alternative TRS control system or associated equipment when such sources are in operation. Venting of TRS shall not include equipment leaks such as leaks around flanges, valves, and covers of quantities less than 0.1 lbs/hr.

**Q. Waste water treatment system.** "Waste water treatment system" means the system that treats process wastewater from the facility, which includes primary clarifiers, secondary clarifiers, polishing ponds, aeration lagoons and sludge press areas of the mill.

**R. Wet-bottom electrostatic precipitator (wet-bottom ESP).** "Wet‑bottom electrostatic precipitator (wet-bottom ESP)" means an electrostatic precipitator where the particulate matter is removed from the bottom of the device with the use of black liquor.

**3. Standards**

**A.** Unless otherwise specified in this rule, no owner or operator subject to this Chapter shall discharge into the atmosphere any gases which contain TRS in excess of 0.75 pounds per hour or five (5) parts per million (ppm) by volume dry basis on a twelve (12)-hour block average basis, and which are from a LVHC system, or after the dates in Section 3(D), 3(E), and 3(L), from HVLC systems, steam stripper collection systems or alternative TRS control systems unless at least one of the following conditions is met:

(1) The gases are combusted in a lime kiln subject to the provisions ofSection 3(K) and Section 4(A)of this Chapter, and the requirements of 40 CFR Section 60.283(a)(5), as applicable; or

(2) The gases are combusted in a recovery furnace subject to the provisions of Section 3(H), 3(I), and Section 4(A) of this Chapter, and the requirements of 40 CFR Sections 60.283(a)(2) or (a)(3), as applicable; or

(3) The gases are combusted in an incinerator, boiler, or other device subject to the provisions of Section 4(B), and are subjected to a minimum temperature of 1200oF for at least 0.5 seconds.

**B.** The LVHC collection system shall have a primary control strategy and a backup control strategy. Both strategies shall meet the requirements of this Chapter.

**C.** No owner or operator subject to this Chapter shall allow venting of TRS from the LVHC or associated equipment that is required to be controlled which:

(1) exceeds 40 minutes in duration; or

(2) contributes to an aggregate TRS venting of more than 1.0% of quarterly operating time.

**D.** Owners and operators subject to this Chapter shall collect and control TRS emissions greater than 0.75 pounds per hour from the brownstock washer system as to meet the conditions of Section 3(A) by April 17, 2007. Sources which propose replacing a brownstock washer line with a new system will have until the MACT standard compliance date to meet the conditions in Section 3(A) of this Chapter.

**E.** By April 17, 2007, each HVLC collection system subject to this Chapter shall maintain a 96% collection and control uptime based on quarterly brownstock washer system operating time on a total mass weighted basis.

**F.** Each steam stripper collection system or alternative TRS control system, that is not part of an HVLC system, subject to this Chapter shall maintain a 99% collection and control of TRS gases when operating based on quarterly system operating time.

**G.** By April 15, 2001, each Kraft pulp mill subject to this Chapter shall maintain a written preventative maintenance program for their respective TRS gas collection systems.

**H.** No owner or operator subject to this Chapter shall discharge into the atmosphere, any gases which contain TRS in excess of five (5) ppm by volume dry basis, corrected to eight (8)% oxygen on a twelve (12)-hour block average basis, and which are from a Kraft recovery furnace, unless equipped with a wet bottom ESP using black liquor.

**I.** No owner or operator subject to this Chapter shall discharge into the atmosphere any gases which contain TRS in excess of fifteen (15) ppm by volume dry basis, corrected to eight (8)% oxygen on a twelve (12)-hour block average basis, and which are from any Kraft recovery furnace with a wet‑bottom ESP employing black liquor.

**J.** No owner or operator subject to this Chapter shall discharge into the atmosphere from any smelt dissolving tank, any gases which contain TRS in excess of 0.033 lb./ton black liquor solids as H2S.

**K.** No owner or operator subject to this Chapter shall discharge into the atmosphere, any gases which contain TRS in excess of twenty (20) ppm by volume dry basis, corrected to ten (10)% oxygen on a twelve (12)-hour block average basis, and which are from any lime kiln.

1. By January 1, 2004 each Kraft pulp mill facility shall submit for approval by the Department a Best Practical Treatment (as defined in 38 M.R.S.A. §§582 (5-A) and 590 (3)) analysis for control of TRS from miscellaneous sources and for the facility's waste water treatment system. Implementation of this Best Practical Treatment shall occur no later than July 1, 2007.

**M**. By January 1, 2002, each Kraft pulp mill facility shall submit to the Department an inventory of TRS sources with emission levels greater than 0.5 lbs/hr.

**4. Monitoring of Emissions and Operations.** Any owner or operator subject to this Chapter must install, calibrate, maintain, and operate monitors, and perform stack tests, in accordance with the following requirements:

**A.** For any lime kiln or recovery furnace, a continuous emissions monitoring system to monitor and record the concentration of TRS emissions on a dry basis and the percent of oxygen by volume on a dry basis in the gases discharged into the atmosphere. These systems must be located downstream of the control device(s), and the spans of these continuous emissions monitoring system(s) must be set as follows:

(1) For TRS, a concentration of thirty (30) or fifty (50) ppm for the TRS continuous monitoring system on any lime kiln or Kraft recovery furnace; and

(2) At twenty (20)% oxygen for the continuous oxygen monitoring system, or such other concentration as may be approved by the Department for a particular source as specified in the source’s air emission license.

**B.** For any incinerator, or boiler with a maximum designed heat input of less than 50 million BTUs per hour, a monitoring device which continuously measures and records the combustion temperature which ensures TRS incineration of the LVHC, HVLC and steam stripper collection systems. The monitoring device must be accurate within ± one (1)% of the temperature being measured and must achieve 95% uptime based on quarterly incineration time;

**C.** For any smelt dissolving tank, stack testing must be performed at least once every two calendar years to demonstrate compliance with the smelt dissolving tank TRS emission rate as specified in Section 3(J) of this Chapter;

**D.** All continuous emission monitoring systems installed and operated pursuant to this section to monitor the concentration of TRS emissions and the percent oxygen by volume shall meet the sampling and performance criteria of 40 CFR Section 60.13 and the Performance Specifications 5 and 3, respectively, of 40 CFR Part 60, Appendix B and Chapter 117 of the Department Regulations; and

**E.** The Department and EPA may, on a case by case basis, consider alternative compliance methods for monitoring TRS emissions, such as Predictive Emission Monitoring Systems (PEMS). An approved alternative method shall be specified in the source’s air emission license.

**5. Recordkeeping and Reporting**

**A**.Except when the conditions of Sections 3(A)(3) or 3(J) of this Chapter are met, any owner or operator subject to this Chapter shall perform the following recordkeeping and reporting requirements:

(1) For each recovery furnace or lime kiln, calculate and record on a daily basis, twelve (12)‑hour block average TRS concentrations for the two (2) periods of each operating day. Each twelve (12)‑hour block average shall be determined as the arithmetic mean of the appropriate twelve (12) contiguous one (1)‑hour average TRS concentrations provided by each continuous emissions monitoring system installed pursuant to Section 4(A) and (D);

(2) For each recovery furnace or lime kiln, calculate and record on a daily basis twelve (12)‑hour block average oxygen concentrations for the two (2) consecutive periods of each operating day. These twelve (12)‑hour block averages must correspond to the twelve (12)‑hour block average TRS concentrations under Section 5(A)(1) of this Chapter and shall be determined as an arithmetic mean of the appropriate twelve (12) contiguous one (1)‑hour average oxygen concentrations provided by each continuous emissions monitoring system installed pursuant to Section 4(A), and (D); and

(3) All concentrations of TRS required to be measured from lime kilns, incinerators, or other combustion devices shall be corrected to ten (10)% oxygen by volume and those concentrations from recovery furnaces shall be corrected to eight (8)% oxygen by volume. These corrections shall be made in the following manner:

corr = meas x (21 ‑ X) /(21 ‑ Y)

Where: corr = The concentration corrected for oxygen.

meas = The concentration uncorrected for oxygen.

X = The volumetric oxygen concentration in percentage to be corrected to eight (8)% for recovery furnaces and ten (10)% for lime kilns, incinerators, or other combustion devices.

Y = The measured twelve (12)‑hour block average volumetric oxygen concentration; and

**B.** Any owner or operator subject to this Chapter must report verbally, in writing or via facsimile to the Department, on the next State working day:

(1) any venting of TRS to the atmosphere from the LVHC or steam stripper collection system of longer than fifteen (15) minutes; and

(2) any venting of TRS to the atmosphere from the HVLC system of longer than four (4) hours.

**C.** Any owner or operator subject to this Chapter must submit to the Department quarterly reports which contain the following:

(1) For any recovery furnace, TRS emissions in concentrations corrected to eight (8)% oxygen by volume dry basis for each twelve (12)-hour block average in a quarter which exceeds either license limits or the emission standards of Section 3(H) or 3(I);

(2) For any lime kiln, TRS emissions in concentrations corrected to ten (10)% oxygen by volume dry basis for each twelve (12)-hour block average in a quarter which exceeds either license limits or the emission standards of Section 3(K);

(3) The total number of twelve (12)-hour block averaging periods in the quarter, which include periods of start up, shutdown or malfunction, but exclude periods when the facility is not operating. The following periods of excess emissions are not a violation of this Chapter:

(a) For any recovery furnace, the first two twelve (12)-hour block averages in a quarter which exceed either license limits or the emission standards of Section 3(H) or 3(I);

(b) For any lime kiln, the first four twelve (12)-hour block averages in a quarter which exceed either license limits or the emission standards of Section 3(K);

(4) Where the requirements of Section 3(A)(3) of this Chapter apply, all periods in excess of five (5) minutes and their duration during which the combustion temperature at the point where 0.5 second retention time occurs is less than 1200oF;

(5) All venting of TRS from the LVHC system or associated equipment that exceeds 40 minutes in duration;

(6) All venting of TRS from the LVHC system or associated equipment for greater than one (1) minute which contributes to an aggregate TRS venting of more than one (1)% of quarterly operating time;

(7) All events of venting of TRS from the LVHC system of greater than fifteen (15) minutes when the aggregate TRS venting exceeds 0.5% of quarterly operating time. For each event include an explanation of the cause of the event and action taken to prevent similar events from occurring in the future;

(8) All venting of TRS from the HVLC system greater than one (1) minute in duration when the sum of all venting occurrences are in excess of four (4)% of the quarterly brownstock washer operating time on a total mass weighted basis;

(9) All venting of TRS from the steam stripper collection system or alternative TRS control system, that is not part of an HVLC system, greater than one (1) minute in duration when the sum of all venting occurrences is in excess of one (1)% of the quarterly steam stripper collection system or alternative TRS control system operating time;

(10) All continuous emissions monitor downtimes as specified by Chapter 117; and

(11) All temperature monitoring device downtimes in excess of five (5)% downtime based on the quarterly incineration time of the combustion source.

**6. Test Methods**

**A.** For the purpose of determining compliance with Section 3 of this Chapter, the following EPA Reference Methods from Appendix A of 40 CFR Part 60 and Chapter 117 shall be used:

(1) Method 16 or, at the discretion of the owner or operator, Method 16A or, Method 16B as approved by the Department, for the concentration of TRS;

(2) Method 3 for gas analysis; and

(3) When determining compliance with Section 3(J) of this Chapter, the owner or operator of a system subject to this Chapter must use the results of Method 2, Method 16, Method 16A, Method 16B and the black liquor solids feed rate in the following equation to determine the TRS emission rate on an equivalent H2S basis.

E=(CTRS) (F) (Qsd)/BLS

Where: E=mass of TRS emitted per unit of black liquor solids (g/kg) or (lb./ton).

CTRS= average combined concentrations of TRS (ppm), as determined by Method 16, 16A or 16B during the test period.

F=0.001417 g H2S/m3 ppm for metric units.

=0.08844 x 10‑6 lb. H2S/ft3ppm for English units.

Qsd= dry volumetric stack gas flow rate (dscm/hr or dscf/hr), corrected to standard conditions.

BLS= black liquor solids feed rate (kg/hr or ton/hr).

**B.** All concentrations of TRS required to be measured by this section from lime kilns, incinerators, or other combustion devices shall be corrected to ten (10)% oxygen by volume and those concentrations from recovery furnaces shall be corrected to eight (8)% oxygen by volume. These corrections shall be made in the manner specified in Section 5(A)(3) of this Chapter.

**C.** The Department and EPA may approve equivalent test methods.

1. **Compliance**

Compliance with this Chapter, except where otherwise specified herein, shall be met no later than January 8, 1991.

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