

WATER, AIR AND CLIMATE CHANGE BRANCH

AIR QUALITY CODES, CRITERIA AND MORE

Sulphur Recovery Criteria for Natural Gas Processing Plants

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Foreword

The criteria contained in this document have been developed and approved pursuant to the provisions of the [Environmental Management Act](#) and they are to be incorporated, in accordance with the policies and procedures of the ministry, as standards in permits issued under the act.

These criteria replace the sulphur recovery criteria for natural gas processing plants in Section 2.3.2 and Table II "Pollution Control Objectives for the Chemical and Petroleum Industries of British Columbia, 1974".

1. Definitions

Major modification — means any plant modification which increases the permitted plant emission rate by 25 percent or greater, or any substantial process modification made after these criteria take effect.

Plant — means a sour natural gas processing plant.

Plant inlet sulphur rate — means the tonnes per calendar day (t/d) of sulphur entering the plant.

Sulphur — means elemental sulphur and the sulphur contained within all sulphur compounds.

2. Applicability

These criteria are effective April 1, 1994 for all new plants and those undergoing major modifications. All plants which commenced operation prior to April 1, 1994 will be required to meet these limits by a date which will be specified in writing by a Regional Environmental Protection Manager.

These criteria may be modified in those cases where:

1. the costs incurred for existing plants to meet the limits are deemed excessive by the Regional Environmental Protection Manager, or
2. based on an environmental assessment, the Regional Environmental Protection Manager feels that more stringent standards are required to protect the environment or human health.

Sulphur recovery is required for all plants where the plant inlet sulphur rate is:

1. 2 t/d of sulphur or more, or
2. less than 2 t/d of sulphur if ambient air quality guidelines for sulphur compounds are not met.

The sulphur recovery criteria will also apply to any oil and gas production facilities which use sour gas as a fuel and have air emissions from the combusted fuel equal to or greater than 2 t/d of sulphur.

These sulphur recovery criteria are ministry policy for setting minimum standards in waste management permits.

3. Natural Gas Plant Sulphur Recovery Criteria

The sulphur recovery criteria are listed in [Table 1](#). The percentage of sulphur recovery shall be calculated and reported each calendar month on a three month rolling average basis. The 3 month rolling average must be greater than or equal to the sulphur recovery criteria. The three month rolling average will be calculated from the total weight of sulphur produced at the plant, the total weight of sulphur emitted from the stacks as recorded by the required continuous emission monitors, and the total of any other emissions of sulphur from the sour gas processing (e.g. flare) in the last three months as follows:

$$\text{Ravg} = [W_p / (W_p + W_s + W_d)] * 100$$

where Ravg = 3 month rolling average sulphur recovery (%)

Wp = total weight of sulphur produced in the previous 3 months (tonnes)

Ws = total weight of sulphur emitted through the incinerator stack in the previous 3 months (tonnes)

Wd = total weight of sulphur emitted through the plant flare system in the previous 3 months (tonnes)

4. Ambient Air Quality

The ambient air quality guidelines for H₂S and SO₂ as specified in Appendix I - Table VII of the "Pollution Control Objectives for the Chemical and Petroleum Industries of British Columbia, 1974" must also be met. The Regional Environmental Protection Manager may specify more stringent permit requirements than the criteria set out in [Table 1](#) if site specific conditions dictate.

5. Implementation Guide

(a) New Plants

The plant inlet sulphur rate for the purpose of applying these criteria is the maximum value as determined from design information submitted with the application.

(b) Plants Undergoing Modifications

If a permittee proposes a substantial plant modification or increase in the permitted emission rate by more than 25%, then the revised sulphur recovery criteria are to be applied when the plant's permit is updated to accommodate the increased emission rate.

The sulphur emission rate to be used for evaluating whether or not an expansion is major is the sulphur emitted from the incinerator stack. The base to judge the 25% increase against is the plant's permitted emission rate prior to modification.

(c) Existing Plants

The criteria are to be applied to existing plants as per [Section 2](#). In cases where the current permitted sulphur recovery is more stringent than the recovery set out in [Table 1](#), the permitted sulphur recovery will remain at the current value.

The timetable for upgrading could also be affected by the future viability of a plant. If the permittee commits to decommissioning a plant by a specified future date, then the criteria may not be applied to that plant.

Table 1: Sulphur Recovery Criteria for Natural Gas Plants

Plant Inlet Sulphur Rate (t/d)	Minimum Sulphur Recovery (1) (%)	Technology (2)
< 2	0	N/A
2 - < 10	89.7	2 stage Claus unit

10 - < 50	95.9	3 stage Claus unit
50 - < 2000	98.2 - 98.5 (3)	2 - 3 stage sub-dewpoint Claus unit
2000 +	99.5	2 - 3 stage Claus + selective absorption tail gas unit

Notes:

(1) The minimum sulphur recovery criteria will be decreased in cases of poor acid gas quality (i.e. where the mole percentage of H₂S in the acid gas feed stream from the amine unit or equivalent is less than 40%). The minimum sulphur recovery will be decreased by 0.068% for every 1.0 mole % H₂S that the acid gas feed stream has less than 40 mole % H₂S. The Regional Environmental Protection Manager may on occasion require operations which qualify for this relaxation to conduct sulphur recovery technology evaluations to explore if reducing or removing the relaxation is reasonable.

(2) Technologies are cited as examples of technology which typically could meet these requirements and are not intended as requirements or recommendations.

(3) For plant sizes 50 - < 2000 t/d, % sulphur recovery required = $98.2 + 0.187[\log_{10}(\text{plant size}/50)]$.