



ENVIRONMENTAL IMPACTS OF CARBON DIOXIDE AND DRY ICE PRODUCTION

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Prepared by WG-5 Environment

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Amendments to 111/16

Section	Change
4.6.2.3	Addition of noise sources
4.6.6.1	Addition of removal requirements
4.7.3	Addition of paragraph 'Noise'

Note: Significant technical changes from the previous edition are underlined

1 Introduction

This publication details the environmental impacts of carbon dioxide (CO₂) and dry ice plants and gives guidelines on how to reduce the impacts.

2 Scope and purpose

2.1 Scope

The publication concentrates on the environmental impacts of carbon dioxide and dry ice plant. This publication does not give specific advice on health and safety issues, which must be taken into account before undertaking any activity. On these issues the relevant EIGA publications, and or national legislation should be consulted for advice.

2.2 Purpose

This publication is intended to serve as a guide for carbon dioxide and dry ice plants to assist in putting in place a formal environmental management system that can be certified by an accredited 3rd party verifier. It also aims to provide a guide for operating managers for identifying and reducing the environmental impacts of these operations.

It also provides the basis for establishing the best available techniques for the purposes of the industrial emissions directive, see EC Directive 2010/75/EU, industrial emissions (*integrated pollution prevention and control*) [1]¹. This covers carbon dioxide and dry ice plants production, see Section 4.

3 Definitions

For the purposes of this publication, the following definitions apply:

3.1 Publications terminology

3.1.1 Shall

Indicates that the procedure is mandatory. It is used wherever the criterion for conformance to specific recommendations allows no deviation.

3.1.2 Should

Indicates that a procedure is recommended.

3.1.3 May and need not

Indicate that the procedure is optional.

3.1.4 Will

Is used only to indicate the future, not a degree of requirement.

3.1.5 Can

Indicates a possibility or ability.

¹ References are shown by bracketed numbers and are listed in order of appearance in the reference section

3.2 Technical definitions

3.2.1 Environmental aspect

These are elements of an organization's activities or products or services that can interact with the environment. For example, use of energy or transportation of products.

3.2.2 Environmental impact

Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects, see ISO 14001, *Environmental Management System* [2]. For example, the contamination of water with hazardous substances or the reduction of air emissions.

4 Carbon dioxide and dry ice production environmental impacts

Any industrial installation which carries out the activities listed in Annex I to the Industrial Emissions Directive must meet certain basic obligations [2]:

- preventive measures are taken against pollution;
- the Best Available Techniques (BAT) are applied;
- no significant pollution is caused;
- waste is reduced, recycled or disposed of in the manner which creates least pollution;
- energy efficiency is maximised;
- accidents are prevented and their impact limited; and
- sites are remediated when the activities come to an end.

4.1 General environmental aspects and impacts and links to other EIGA documents

This publication covers the environmental impact of carbon dioxide and dry ice production units. At the end of the publication, all these environmental impacts are summarised in Appendix A and B. There are several linked EIGA publications that provide more details on general environmental issues, legislation for the gas industry and operational good environmental practices. A list of these linked documents and their links to the ISO 14001 is provided in Appendix A [2]. Appendix C also shows which of these documents are relevant to carbon dioxide and dry ice plant operations.

4.2 Introduction

4.2.1 Production methods

This publication only describes the process to obtain pure and liquefied carbon dioxide from raw gas. There are many different alternatives, depending on the raw gas, for carbon dioxide production. The production process and associated plant is dependent on the concentration of carbon dioxide in the raw gas.

4.2.1.1 Chemical processes

A significant percentage (over 80%) of the carbon dioxide recovered in Europe by the gas industry is obtained from the waste gases of chemical processes. If not recovered, those gases are usually vented to atmosphere. Because of their high carbon dioxide concentration (over 98%) the process gases from the production of ammonia, steam methane reformers and ethylene oxide are preferred for the recovery of carbon dioxide. The waste gases from the chemical reaction of carbonates provide an alternative but relatively minor source of carbon dioxide.

4.2.1.2 Biological processes

The metabolism of yeast is an economical source of carbon dioxide, in particular, from the production of alcohol both for human consumption and industrial purposes. The relatively high capital investment necessary for the recovery of carbon dioxide from fermentation processes limits its use to a small