



**EXPERIENCE OF NON-ASBESTOS GASKETS
ON LIQUID AND DRY CHLORINE GAS SERVICE**

GEST 94/216

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EURO CHLOR PUBLICATION

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Euro Chlor

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- improve awareness and understanding of the contribution that chlorine chemistry has made to the thousands of products, which have improved our health, nutrition, standard of living and quality of life;
- maintain open and timely dialogue with regulators, politicians, scientists, the media and other interested stakeholders in the debate on chlorine;
- ensure our industry contributes actively to any public, regulatory or scientific debate and provides balanced and objective science-based information to help answer questions about chlorine and its derivatives;
- promote the best safety, health and environmental practices in the manufacture, handling and use of chlor-alkali products in order to assist our members in achieving continuous improvements (*Responsible Care*).

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RESPONSIBLE CARE IN ACTION

Chlorine is essential in the chemical industry and consequently there is a need for chlorine to be produced, stored, transported and used. The chlorine industry has co-operated over many years to ensure the well-being of its employees, local communities and the wider environment. This document is one in a series which the European producers, acting through Euro Chlor, have drawn up to promote continuous improvement in the general standards of health, safety and the environment associated with chlorine manufacture in the spirit of *Responsible Care*.

The recommendations, techniques and standards presented in these documents are based on the experiences and best practices adopted by member companies of Euro Chlor at their date of issue. They should be taken into account in the operation of existing processes and in the design of new installations. They are in no way intended as a substitute for the relevant national or international regulations which should be fully complied with.

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This edition of the document has been drawn up by the Safety Working Group to whom all suggestions concerning possible revision should be addressed through the offices of Euro Chlor.

Summary of the Main Modifications in this version

| Section | Nature |
|------------|--|
| 2 | Alineas 3 and 4 are added |
| 2.1 | Only the reference of the gasket is maintained; remarks on composition are deleted |
| All tables | The number of years of experience is changed into the year where the experience began. |
| 3.1 | The reference Siem Supranite PGAC F was added |
| 3.3 | The reference Sigraflex WS 3862 was added |

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1. INTRODUCTION

This publication summarises the experience to date where non-asbestos gaskets have been found to give reliable service on liquid chlorine and dry chlorine gas applications.

Gaskets made from compressed asbestos fibres (CAF) have been used very successfully for many years for liquid chlorine and dry chlorine gas applications and the material had become the automatic choice within the chlorine industry. However in recent years concerns have been expressed over possible health risks from asbestos. Directive 99 77 EC imposes a ban on all new uses and installations of asbestos (excluding electrolytic diaphragms) no later than 1st January 2005. However, Member States have the freedom to introduce a ban at an earlier date, if they choose. (Asbestos components already in service prior to any implementation date may remain in service until the end of their service life). As a result, a number of alternative materials have been tried on liquid- and dry chlorine gas applications. Whilst CAF is still the material which can be recommended with total technical confidence, the experience of other materials is growing.

The document contains information which has come principally from Euro Chlor member companies, although account has also been taken of information collected by the Chlorine Institute in USA. The range of pressure and temperature conditions under which the various materials have been used is not so great as with CAF and, since it is based primarily on practical experience in working plants rather than on controlled experiments in laboratory conditions or on theoretical engineering considerations, the limits quoted should be taken as a guide rather than being treated as accurately defined. The guideline deliberately covers only materials which have been used successfully by several companies for at least 2 years. It is recognized that individual companies may have good experience with materials not covered in this guideline, or with a wider range of operating conditions. It is not suggested that their experience is not valid or that they need to change to materials which are covered. It simply illustrates the fact that this is an area where experience is still being gained, as companies continue to experiment with alternative materials.

The publication will be up-dated periodically to take account of new information as it becomes available.

2. GENERAL REMARKS

The data on the experience with non-asbestos gaskets are summarized in the following table.

The given ranges for temperatures and pressures (absolute) are reported operating values. The gasket materials themselves can stand higher temperatures in accordance with to the manufacturer's information.

Specific attention has to be paid for mounting the gaskets in accordance with manufacturer's instructions.

The gasket thickness is dependant on temperature, pressure, size.

Some general remarks are accompanying this table.

2.1. *PTFE*

- The gasket thickness varies between 1.6 and 2.0 mm.

2.2. *ARAMIDE FIBRE*

- The gasket thickness is standard 2.0 mm.
- The gasket thickness is at least 3.0 mm for gaskets with a steel jacket.

2.3. *CARBON FIBRE*

- The gasket thickness is standard 2.0 mm.
- The gasket thickness is at least 3.0 mm for gaskets with a steel foil bordered to the smaller diameter.

A list of the main non asbestos gasket manufacturers appears in the *GEST 94/216 A - Experience of Non-Asbestos Gaskets on Liquid and Dry Chlorine Gas Service – Supplier's references.*

3. NON-ASBESTOS GASKETS ON LIQUID CHLORINE AND DRY CHLORINE GAS SERVICE

3.1. PTFE

| Type | Make | Medium | Bolting Assembly | Temperature Range (°C) | Pressure Range (bars abs.) | Diameter (mm) | Experience since | Remarks |
|--------------------------|---|---|------------------------------------|------------------------|----------------------------|---------------|------------------|---------|
| PTFE | PTFE pure | Liquid Cl ₂ | Tongue & groove | - 20 to 50 | 0.9 to 13 | 25 to 250 | 1980 | |
| | PTFE pure | Dry Cl ₂ gas | Tongue & groove | - 20 to 50 | 0.9 to 13 | to 500 | 1980 | |
| | Gylon 3500 –fawn* | Liquid Cl ₂ | Tongue & groove Male and female | -35 to 30 | 1 to 16 | 25 to 500 | 1996 | |
| | Gylon 3500 –fawn* | Dry Cl ₂ gas | Raised face Tongue & groove | - 35 to 100 | 1 to 5 | 25 to 500 | 1990 | |
| | Gylon 3504 –blue* | Dry Cl ₂ gas | Flat | 70 to 95 | 1 to 5 | 20 to 350 | 1997 | |
| | | Liquid Cl ₂ | Flat | - 35 to 10 | up to 15 | 25 to 250 | 1990 | |
| | Gylon 3510 –white* | Liquid Cl ₂ and Dry Cl ₂ gas | Raised face | - 35 to 120 | 1 to 14 | 25 to 600 | 1998 | |
| | Gylon 3545* | Liquid Cl ₂ | Flat | 0 to 40 | up to 13 | to 500 | 1995 | |
| | Siem Supranite PGAC | Liquid Cl ₂ and Dry Cl ₂ gas | Flat Tongue & groove | - 35 to 100 | 1 to 16 | 25 to 500 | 1995 | |
| Siem Supranite PGAC F | Liquid Cl ₂ and Dry Cl ₂ gas | Tongue & groove | -15 to 90 | 1 to 19 | 25 to 250 | 2000 | | |

* Gylon is trademark of Garlock.

NON-ASBESTOS GASKETS ON LIQUID CHLORINE AND DRY CHLORINE GAS SERVICE (continued)

3.2. ARAMIDE FIBRE

| Type | Make | Medium | Bolting Assembly | Temperature Range (°C) | Pressure Range (bars abs.) | Diameter (mm) | Experience since | Remarks |
|----------------|---|--|------------------|------------------------|----------------------------|---------------|------------------|---|
| ARAMIDE FIBRE* | Permanite AF2200 | Liquid Cl ₂ and Dry Cl ₂ gas | Raised face | 0 to 60 | 1 to 10 | | 1996 | |
| | Klinger Sil C 4400 | Liquid Cl ₂ Dry Cl ₂ gas | Tongue & groove | - 34 to 30 | 0.9 to 15 | 25 to 100 | 1993 | |
| | Klinger Sil C 4400 With stainless steel Jacket | Dry Cl ₂ gas | Flat | 0 to 60 | 1 to 4 | 25 to 500 | 1995 | Thickness at least 3 mm |
| | Reinz AFM 34 | Liquid Cl ₂ | Tongue & groove | - 34 to 100 | 0.8 to 10 | 25 to 150 | 1995 | Attention has to be paid to the condition of the flanges (smooth and parallel surfaces) |
| | | Dry Cl ₂ gas | Raised face | - 34 to 100 | 0.8 to 12 | up to 700 | 1995 | |
| | Permanite 2200 black Supranite 2200 | Liquid Cl ₂ and Dry Cl ₂ gas | Flat | 0 to 40 | up to 13 | 25 to 250 | 1995 | |
| | Chesterton 196 | Liquid Cl ₂ and Dry Cl ₂ gas | Flat | 0 to 40 | up to 13 | 25 to 250 | 1995 | |

* Aramide fibre: only pH above 3 is allowed.

NON-ASBESTOS GASKETS ON LIQUID CHLORINE AND DRY CHLORINE GAS SERVICE (continued)

3.3. CARBON FIBRE

| Type | Make | Medium | Bolting Assembly | Temperature Range (°C) | Pressure Range (bars abs.) | Diameter (mm) | Experience since | Remarks |
|--|--|--|-------------------------|---|----------------------------|---------------|-----------------------------|---|
| CARBON FIBRE | Klinger Sil C 4500 | Dry Cl ₂ gas | Tongue & groove | - 34 to 60 | 0.9 to 15 | 25 to 500 | 1995 | e.g. railtanker manhole flange |
| | Klinger Sil C 4500 With stainless steel foil bordered to the smaller diameter | Liquid Cl ₂ Dry Cl ₂ gas Rail tankers | Flat Raised face | Liq = - 20 to 20 Gas = - 20 to 80 R.T.= - 20 to 40 | 1 to 13.5 | 50 | 1994 | Applied for railtankers |
| | Klinger Sil C 4500 (graphite) | Liquid Cl ₂ Dry Cl ₂ gas Sulphuric acid 96-98% | Tongue & groove Flat | Liq = - 30 to 30 Gas = - 30 to 20 Acid = - 30 to 30 | 1 to 20 | 25 to 500 | 1995 | Applied for railtankers |
| | Klinger Sil C 4500 | Dry Cl ₂ gas Sulphuric acid 96-98% | Flat | - 20 to 30 | 1 to 2 | up to 150 | 1994 | Good results on the sulphuric acid system of the chlorine gas drying tower. |
| Graphite with perforated stainless steel sheet | Sigraflex WS 3862 | Liquid Cl ₂ Dry Cl ₂ gas | Tongue & groove Flat | -34 to 90 | 0 to 20 | 15 to 600 | 1990 1997 for rail tanks | Pay attention the assembly |

* trademark SGL group

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