Through the **ORCA®** branding of Pennel's Chlorosulfonated polyethylene and Polychloroprene coated fabrics, the label is now recognized worldwide as the first choice by professionals of the inflatable boating industry.

More than one million inflatable boats have been produced with **ORCA®** fabrics over the past 40 years.

ORCA® fabrics most remarkable characteristics are:

Ultra Violet light resistance:
the external Chlorosulfonated polyethylene coating of all ORCA® fabrics, offered in a rainbow of colors,
provides for exceptional UV protection against ageing and discoloration.

Fire resistance:
ORCA® products, all rubber-based, retain all of their properties, even when accidentally exposed to heat.

Mechanical resistance:
The combination of a high tensile textile and outstanding layers of coating, gives ORCA® the highest level of mechanical strength.

Abrasion resistance:
The chemical formulation of the exterior Chlorosulfonated polyethylene coating gives ORCA® fabrics excellent protection from abrasion.

Hydrocarbon resistance:
The inherent properties of all ORCA® fabrics is such that they can be used in applications for anti-pollution barriers and oil-spill recovery.

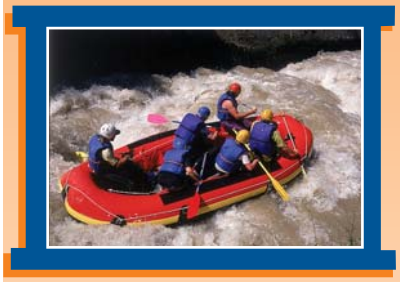
Tube repairs:
Used to make an airtight chamber, ORCA® is easily repaired by a simple cold-gluing process.

Resistance to extreme conditions: ORCA® products have been developed for leisure, professional and military applications, meeting the strictest of requirements for safe navigation in the most extreme conditions.

ORCA® fabrics are particularly appreciated in markets where quality and design are dominant factors, thanks to reliability, ease to work with and the wide range of colors available.

ORCA®

Pennel & Flipo
France



Orca® Coated Fabric

QUALITY

RELIABILITY

DURABILITY

The high technology component of your inflatable boat

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TÜV CERT
ISO 9001:2000
Certificat : 01 100 047006

CONTENT

ISO 9001:2000
Certificat : 01 100 047006

1- ORCA® FABRICS FOR INFLATABLE BOATS

Over the past 50 years, the inflatable boat has evolved from essentially a military vessel to a primary choice of transportation for leisure boaters and professionals alike. This evolution would not have been possible without a revolutionary improvement in materials and inflatable boat design.

There have been some spectacular advances in the construction of coated fabrics: for example, the development of such synthetic fibers as polyamide or polyester for increased strength and durability.

The coatings, which protect the textile and ensure air-tightness, have also seen equally significant advances: progressing from natural rubber (sensitive to ageing) to synthetic Polychloroprene and Chlorosulfonated polyethylene rubbers. These coatings are now the industry standard for inflatables worldwide.

PENNEL & FLIPO has been the industry LEADER in the development of these new coated fabrics, customized for inflatable boats. There are three principles that drive this development:

QUALITY - RELIABILITY - DURABILITY

The **QUALITY** is the result of Pennel's continuous attention to the quality controls of its products. Every linear meter of **ORCA®** fabric has an embedded code, located on the Polychloroprene side, in order to ensure traceability. **ORCA®** fabrics are recognized worldwide by such prestigious QUALITY organizations as RINA, MCA, Bureau Veritas.

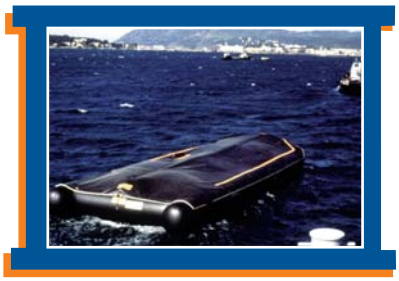
The **RELIABILITY** is achieved through the perfection of the multi-layer surfacing and the optimization of properties which result in **ORCA®** fabric's very high safety record in the field.

The **DURABILITY** results from the mastery of the chemistry of polymers and their components. Special formulations of Chlorosulfonated polyethylene, developed by Pennel's laboratory, give exceptional properties to the coating to endure attacks from external sources: UV, heat, cold, hydrolysis, hydrocarbons and abrasion.

*CSM : chlorosulfonated Polyethylene

6- ORCA® COLOR CHART BY PRODUCT CODE

	ORCA® 215 PES 1100 dtex 800 gr/m²	ORCA® 820 PES 1100 dtex 1050 gr/m²	ORCA® 828 PES 1100 dtex 1300 gr/m²	ORCA® 866 PES 1670 dtex 1500 gr/m²
Ice White	X	X	X	X
Arctic Grey	X	X	X	X
Light Grey	X	X	X	X
Neptune Grey	X	X	X	X
Military Grey			X	X
Black	X	X	X	X
Yellow Colorado			X	X
Yellow SunFlower			X	X
Orange Phebus			X	X
Orange Sylvano			X	X
Stromboli Red			X	X
Vesuve Red			X	X
Army Green			X	X
Italia Green			X	
Caraibe Green			X	
Cream			X	X
Ivory			X	X
Colonial			X	
Alpin Blue			X	
Ibiza Blue			X	
Ocean Blue			X	X
Dark Blue			X	
Military Grey Fabric Impression			X	



The gluing process can be generally described as follows:

All areas to be glued must be roughened (sanded) and cleaned (solvent) prior to applying glue.

The overlap of each seam is usually 2 to 4 cm.

The application of an inside tape to the overlap is necessary to avoid leaks.

Two thin layers of glue must be applied to the fabric surface (following the glue manufacturer's instructions) before assembling: excess glue is just as harmful as not enough.

The glue must dry until tacky, then the assembly can take place by joining the two pieces of fabric together, pressing or rolling them with specialized tools that will not damage the fabric. It is generally suggested that the glue should be allowed to dry (cure) for a period of 48 to 72 hours before inflation.

Any excess glue on the seams should be removed by rubbing with a piece of crepe or equivalent (discolors in the sun). Cured items can be unglued, with the help of a hot air gun. Reassembly of these pieces will be more difficult.

▼ C- ACCESSORIES

Accessories for inflatable boats made of **ORCA®** Chlorosulfonated polyethylene and Polychloroprene fabrics are normally made of Polychloroprene or alcryl® (registered trademark of Dupont de Nemours).

Other materials can be glued to **ORCA®** fabrics; however in some cases, special care must be taken in order to avoid color migration or fabric deterioration.

For example, accessories made from PVC can migrate into the Chlorosulfonated polyethylene. Attention should be paid to accessories that come into contact with the boat when folded. Always consult with the accessory manufacturer.

▼ D- MAINTENANCE

In all cases, it is best to wash with soapy water, diluted bleach or with **ORCA®** Nautical Finish.

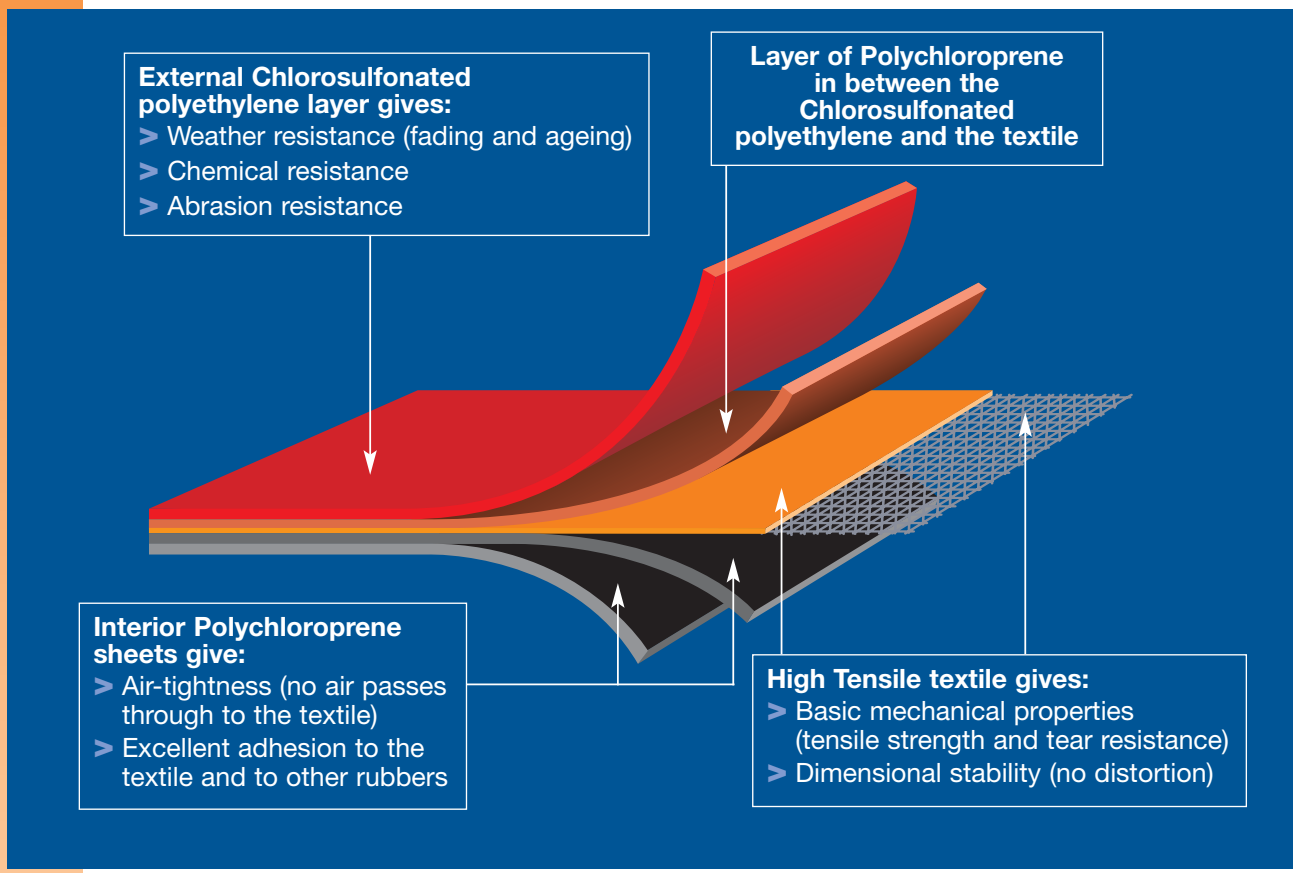
Exceptionally, a solvent of Methyl Ethyl Keton can be used to clean difficult stains. However, care must be taken, as it is toxic and not environmentally friendly.

Finishing products, such as silicones or waxes, are not recommended.

2- ORCA® CSM COATED FABRICS: Product Composition.

Four layers of calendered sheets offer:

> Guaranteed air-tightness (no porosity)
> Optimal adhesion of rubbers



3- MAIN CHARACTERISTICS OF ORCA® FABRICS

▼ Assembly properties

> Suppleness
> Cold gluing,
> High modulus

▼ Usage properties

> High modulus
> Mechanical strength (tensile & tear)
> Adhesion
> Low and high temperature resistance
> Air-tightness

▼ Life expectancy properties

> Resistance to mechanical & hydraulic abrasion
> Resistance to weather, ozone & humidity
> Resistance to chemical agents
> 5-year contractual warranty

Sales Advantages

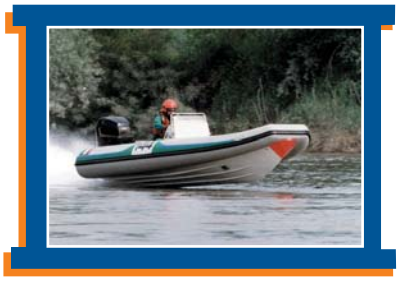
> Range of colors
> Range of products for a multitude of applications
> Quality control (3 levels with rigorous final inspection)
> High-quality raw materials (textiles, elastomers)

Traceability

> All raw materials can be traced to source
> 5-year contractual warranty

4- DURABILITY OF ORCA® FABRICS FOR INFLATABLE BOATS: PRINCIPAL CAUSES OF AGEING

(Remarkable results obtained on ORCA®'s fabric, reference # 828)



HEAT RESISTANCE

Test: 7 days at 70°C

Results: - no variation in tensile strength
- no porosity.

WEATHER RESISTANCE

Test: 5-years exposure (Mediterranean coast)

Results: polyester based fabrics: max. variation 5% tensile, no porosity

RESISTANCE TO HYDROCARBONS

Test: immersion 72 hours at 40°C

1) CRUDE OIL

Results:
- max. swelling: 25%
- Min. residual adhesion: 1,8 daN/cm
- Low temperature resistance: minimum –20°C
- No porosity.

2) ASTM n° 1 OIL

Results: Max. swelling: 5%
Min. residual adhesion: 3daN/cm
Low temperature resistance: minimum – 20°C
No porosity

3) ASTM n°2 OIL

Results :
- max. swelling : 15%
- Min. residual adhesion : 2 daN/cm
- Low temperature resistance : minimum –20°C
- No porosity.

5- SUGGESTED USE OF ORCA® FABRICS

The following information is to be used as a general guideline, is not comprehensive in its scope and is not intended to be interpreted as the optimal manner for using **ORCA®** fabrics. It is a summary of observations from our customers who produce inflatable boats.

A – PATTERNS

A designer or a Naval Architect generates patterns through modeling. This step is rather complex, as it must account for the elasticity of textiles and the resultant stretching of the material after its first inflation. It can also minimize the "twist" of certain designs by optimizing the precision of the cut and the alignment of the threads (an inevitable distortion that exists between the warp and the weft of the textile).

ORCA® fabrics present only a slight weft distortion that can easily be corrected through proper pattern design.

We strongly suggest that you use the same roll of material (**ORCA®** fabric control number) to make one boat as slight color variations may occur. This will also permit you to easily trace the origin of the fabric of each boat, which is an essential element in protecting your rights under the 5-year contractual warranty offered by Pennel.

B- GLUING

ORCA® fabrics are world renowned for their ease of assembly: cold-gluing.

Choice of glue: It is best to use a glue with a polychloroprene-rubber base that has an isocyanate stainless hardener. The dosage of ingredients for mixing, conditions for gluing (temperature, humidity), shelf and pot-life and the quantity of glue for application should be provided by the manufacturer of the glue.