ULLIT

PRESENTATION

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Our aims

To offer reliable and safe energy storage systems for transport and safety markets.
To propose an ecological and sustainable alternative.

Our key position

An international reference in the production of innovative tanks type IV.
One among world's leader in the compressed hydrogen storage at 700 bar and more.

Our products

Only Type IV cylinders are fully wrapped with an epoxy matrix and « all composite » one.

Stored gases : **Natural gas** *(Méthan)*
Industrial gas *(Argon, Helium, nitrogen, neutral gases,etc.)*
Breathable compressed air
Hydrogen *(fuel cell cars, electrical power generators)*

Our applications

Automotive (NGV – Hydrogen 350 & 700 b)
Fire brigade, Safety sub-contactors
Aeronautics – Marine
Industries

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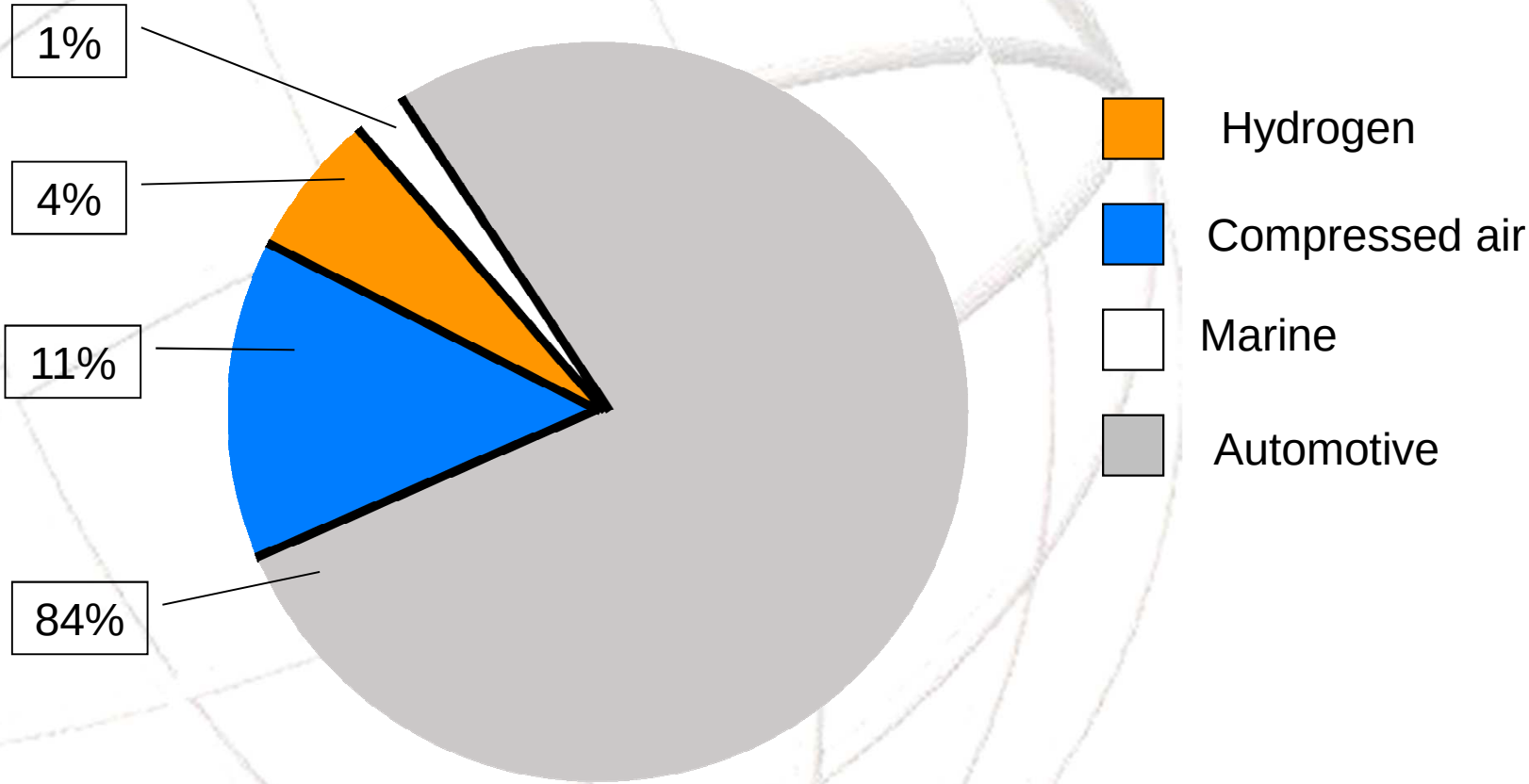
ULLIT PRESENTATION

our activities during 2013/2014



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Our history

1983	Creation by C. Hembert
1992	Installation in la Châtre (36) – 2400 m²
1995	French Homologation of type IV "Ullit" technology
1997	ISO 11439 Homologation (international)
2003	ECE R110 European regulation
1995-2007	Markets in automotive industry and safety
2007-2008	Ullit proposes a H2 cylinder (STORHY project)
2009	Transfer of the plant to Diors (36) – 7 600 m²
2010-2012	Gas transport market & international sales network
2014-2015	EN12245:2009+A1:2011 & TPED Homologation for Hydrogen Cylinder

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Our company chart

Listening customer	To bring an expertise in the field of high pressure storage. Partnership and assistance.
Engineering	To provide full services for storage. Training of the users.
Quality and safety	Saftey is a key word to the customer : ➢ quality control at each stage of the production. ➢ Safety of employees : zero accident in 2014.
Human ressources	Develop key competences and promote poly-competences.
Production capacity	Improved by a unique production site. Cost reduction for better ratio quality / price.
After sales service and Maintenance	Fast assistance all over the world. Suggest preventive actions.

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Our certifications

Hydrogen	EC 79/2009 – May 2010, EN 12245:2009+A1:2011 & 2010/35/EU (TPED).
Natural gas	ISO 11439 and ECE R110 certified by TÜV Saarland, Germany.
Compressed air	97/23 EC (PED).
Industrial gases	97/23 EC (PED), 2010/35/EU (TPED), EN 12245.
Other	DM-T/P n° 27835 (France).
Quality management	ISO 9001 V.2008.

Important dates

1995(September)	DM-T/P n° 27835 : Certification by the French Ministry of Industry.
1997	ISO 11439 : Certification by TÜV Saarland of Ullit cylinders.
1998	ISO 9002 V.1994 : Certification in Quality assurance commitment.
2003	ISO 9001 V.2000 : Certification in Quality management commitment. ECE R110 : Certification according to European regulation for vehicles powered by CNG (Compressed Natural Gas).
2005-2006	97/23 EC (PED) : Certification according to European regulation for pressure vessels.
2009	ISO 9001 V.2008 : Certification in Quality assurance commitment.
2014-2015	EN 12245:2009-A1:2011 : European Approval of manufacturing for cylinder type IV. 2010/35/EU (TPED). ADR 2015 : European Approval for international transport of dangerous goods on the road.

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ULLIT PRODUCTS

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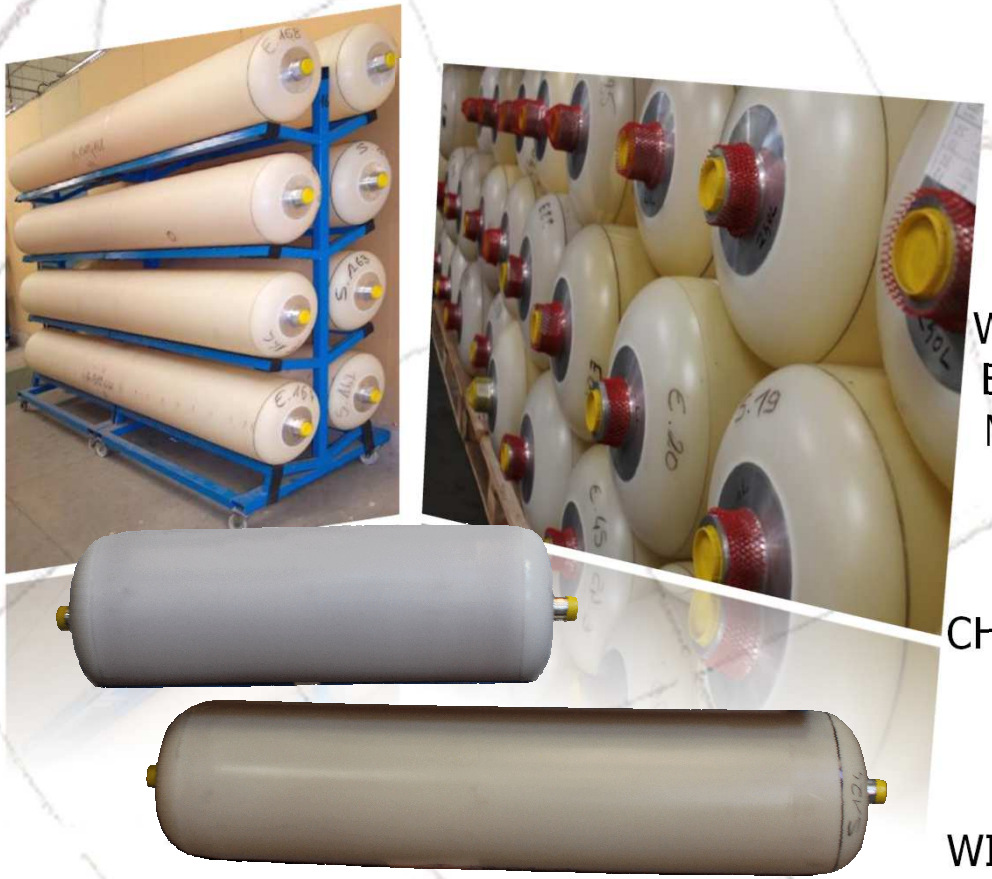
ULLIT type IV cylinders

Seamless thermoplastic liner fully wrapped by high strength fibre in a resin epoxy matrix.

State of the art

Type IV	Polymer liner fully wrapped with fibre in a thermosetting matrix.
Type III	Metallic liner fully wrapped with fibre in a thermosetting matrix.
Type II	Metallic liner hoop wrapped with fibre in a thermossetting or thermoplastic matrix.
Type I	All metal cylinders (in aluminium or steel).

LINER



SEAMLESS THERMOPLASTIC LINERS

NEITHER INTERNAL NOR EXTERNAL CORROSION - NO FATIGUE

WORLDWIDE PATENTED MOLECULAR LINK BETWEEN THE POLYMERIC INTERIOR and METAL BOSSES **PREVENTS LEAK 100% GAS PROOF.**

PERMEABILITY CHECKED by CHROMOTOGRAPHY **CLOSE TO ZERO**, OVER 28 DAYS at 250 Bar (3,600 PSI) CNG PRESSURE.

WITHSTAND **100,000 CYCLING at 250 Bar (3,600 PSI) WITHOUT FAILURE NOR LEAKAGE.**

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CYLINDER

HIGH PERFORMANCE WINDING PROCESS

Winding of 2 tanks 310 litres

Worldwide Patented:

Licence Claude Leon Hembert

CAPABILITY OF MANUFACTURING TANKS
Length: up to 3 200 mm
Diameter: up to 900 mm
Water capacity: up to 1 500 litres

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Performances

3 à 3,5 times lighter at 200 bar pressure and up to **10 times lighter** at 700 bar.

No corrosion neither internal nor external.

No reduction on vehicle loading capacity.

No permanent **deformation.**

Safety

No early wear due to excess of weight.

Better stability in driving.

Economics

Significant **reduction in consumption** (10 to 12% less).

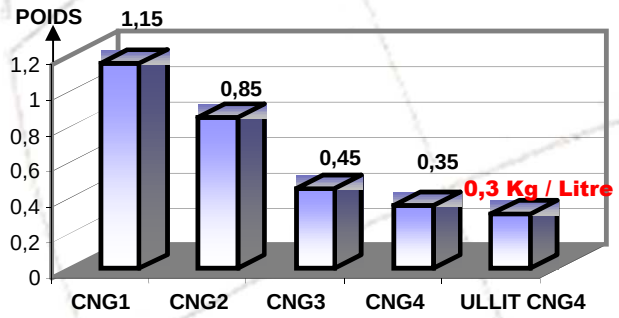
No cycling fatigue more than 100 000 refuellings without failure.

Tires wear : 50 % less.

Sustainability : brake systems and shock absorbers last twice.

Important costs saved during exploitation of vehicles.

Efficiency of Ullit cylinders compared with competitors.



Ullit offers the highest performance in terms of weight per liter.

Ullit offers the highest performance in terms of cycling resistance.

100 000 cycles	**Type IV ULLIT – life : 20 years – undergoes 100 000 cycles without leak nor burst and keeps the same burst factor at the end of the cycling.**
30 000 cycles	**type I steel – bursts after approx. 30 000 cycles.**
20 000 cycles	**type II – steel hoop wrapped cylinder glass fibre / polyester matrix – bursts after approx. 20 000 cycles.**
15 000 cycles	**type III – aluminium cylinder fully wrapped with carbon / epoxy matrix - life : 15 years - fails after 15 000 to 20 000 cycles.**

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Field of Activities of ULLIT company

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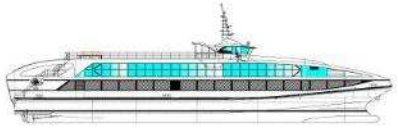
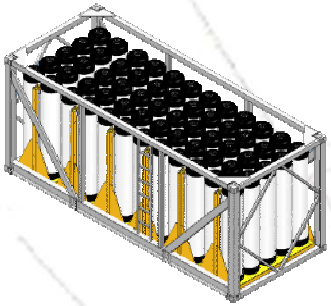
ACTIVITIES OF THE COMPANY

CAR	BUS	TRUCK	FERRY



TRANSPORT & DISTRIBUTION	INDUSTRY & MARINE	SCBA	FIRE EXTINGUISHING SYSTEMS



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Hydrogen Storage - 350 bar – 700 bar working pressure

EXCELLENCE TECHNOLOGY for HYDROGEN CYLINDERS

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ACTIVITIES OF THE COMPANY

Hydrogen Storage – Cylinder's features

FEATURES

Design requirements according to European Integrated Hydrogen Project (EIHP II)

- Inner lightweight plastic liner
- Working pressure: 700 bar
- Dimensions: ø 300 x length 900 mm
- Volume: 36 litres
- Weight : 30 Kg
- Neck size: 1" 1/8-12UNF-2B & M25x2

TEST STORHY

Hydrogen permeation test :

Cylinder 22 litres - 200 bar : 15,5 cc/l/h

Cylinder 36 litres – 350 bar & 700 bar :

< 1cc per liter per hour

Fast filling compatibility demonstrated
Enhanced gravimetric storage density
=> 5.4% for 36 litres cylinder.

ACTIVITIES OF THE COMPANY

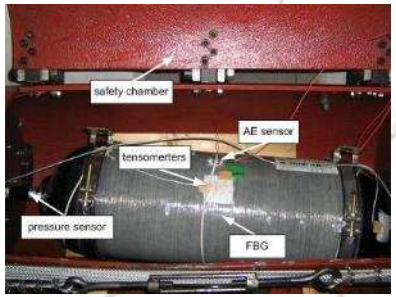
Hydrogen Storage - Cycling tests

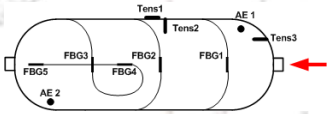
BURST PRESSURE
1705 Bar

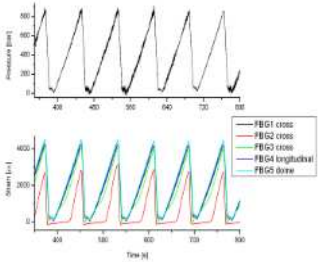
After 3 years of development, POLYSTOCK's program, has given very good results :

- **<u>22 L- 350 bar cylinders</u> :** **61 000 cycles from 20 to 499 bar**
  neither failure nor leakage.
- **<u>36 L- 350 bar cylinders</u> :** **20 000 cycles from 20 to 438 bar**
  neither failure nor leakage / burst result : 956 bar
- **<u>36 L- 700 bar cylinders</u> :** **15 000 cycles from 20 to 875 bar**
  neither failure nor leakage.

Burst resistance > 2.35

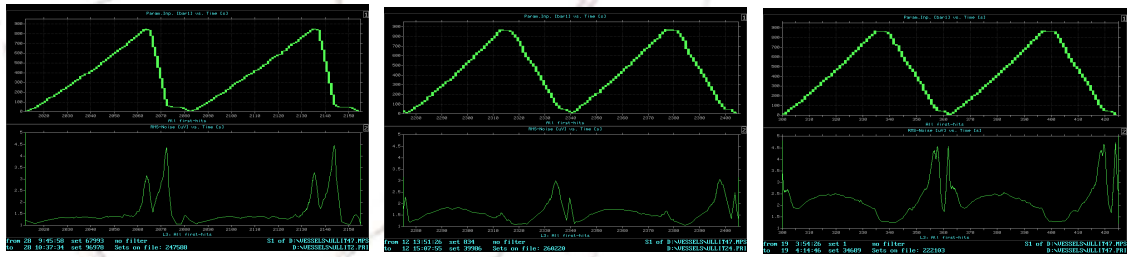






<u>Cycling Test Results</u>:

After 15 000 cycles from 20 to 875 bar, there was no visible defect in the liner and **neither leakage nor failure.**



Wrocław University of Technology

Pressure (upper graphs) and RMS signal from acoustic emission sensors (bottom graphs) at different moments of the experiment

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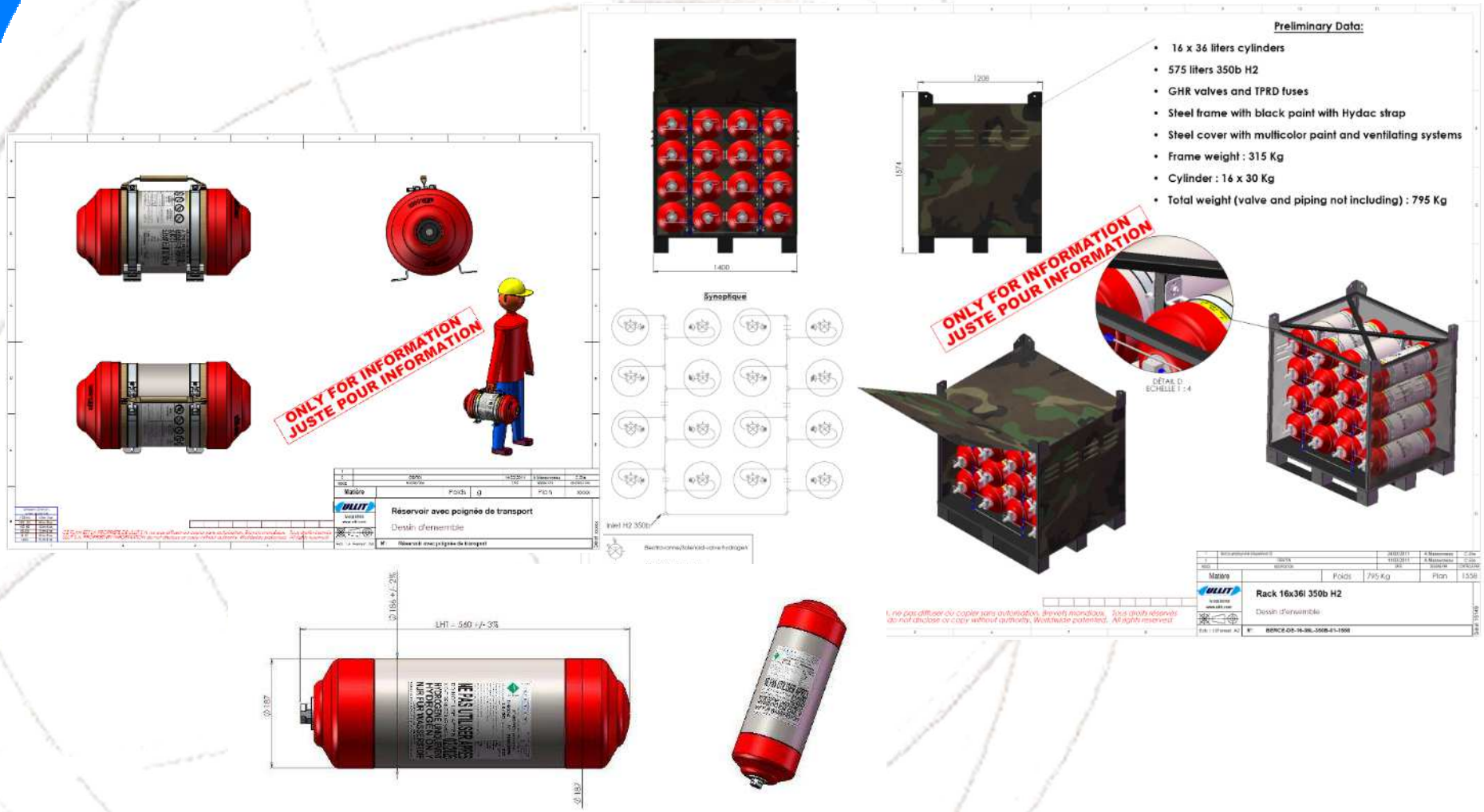
ACTIVITIES OF THE COMPANY

Hydrogen Storage – Cylinders and package



PATENTS & LICENCE :
CLAUDE L. HEMBERT

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ACTIVITIES OF THE COMPANY

Hydrogen transportation – Cylinders and package

Working pressure :
700 Bar

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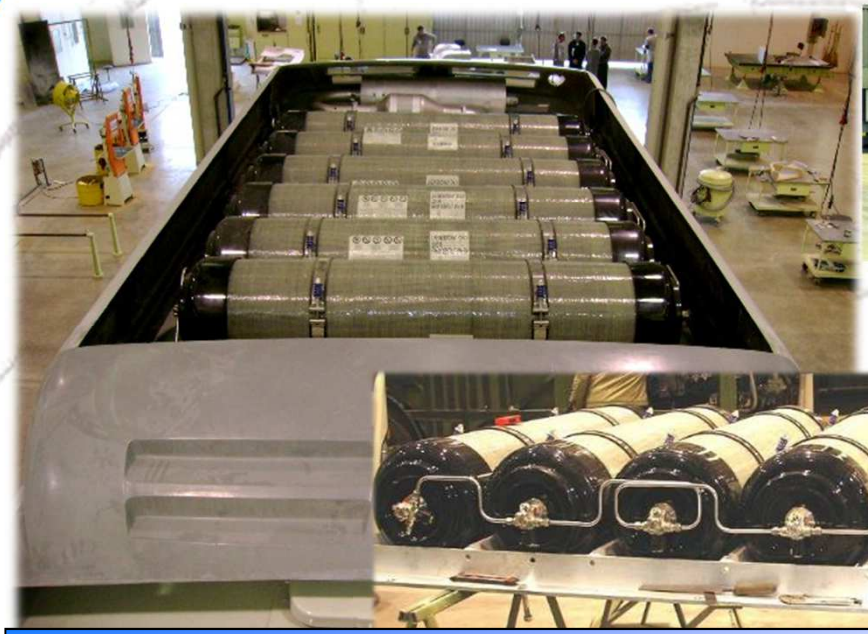
ACTIVITIES OF THE COMPANY

Bus application



There are more than 5 000 buses equipped with ULLIT cylinders in Europe and overseas.

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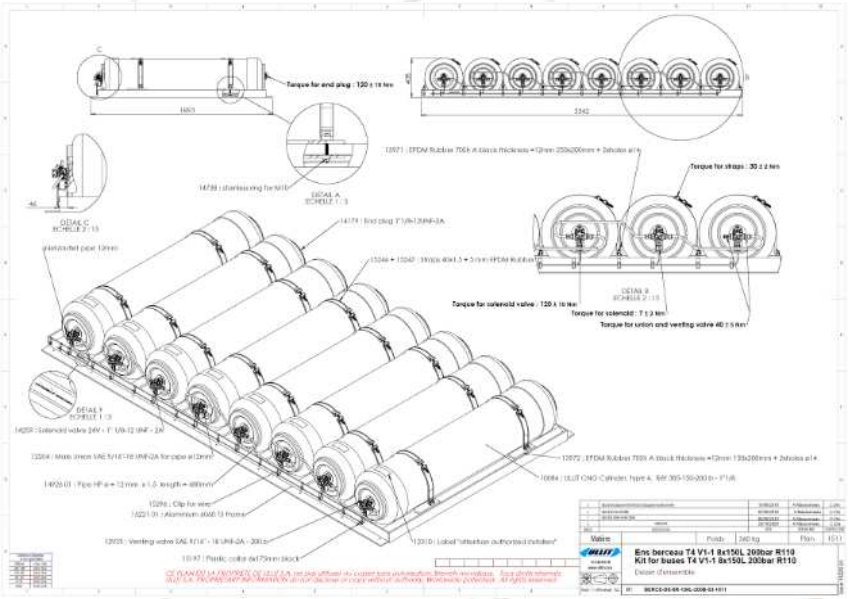
8x150 Litres kit (10x150 available)

Frame features		
Total capacity (8 x 150 l)	≈ **1 200 litres**	(≈ 75 611 Cu. in.)
Weight of the 8 cylinders (200 bar)	≈ **415 kg**	(≈ 910 Lb)
Weight of the frame with accessories	≈ **145 kg**	(≈ 320 Lb)
TOTAL WEIGHT	≈ 560 kg	(≈ 1 200 Lb)
TOTAL GAS CAPACITY	≈ 12 500 Scf	(355 m³)



Cylinders characteristics		
Water capacity :	**150 L**	**9 150 Cu. In.**
Working pressure :	**200 or 240 bar**	**at + 15° C**
Max filling pressure :	**260 or 312 bar**	**at + 15° C**
Test pressure :	**300 or 360 bar**	
Diameter :	**388 or 392 mm**	**15.35 In.**
Length :	**3255 mm**	**66 In.**
Weight :	**52 or 55 Kg**	**113 Lb**
Life :	**20 years (100 000 refuellings)**	

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ACTIVITIES OF THE COMPANY

Bus application – 8 x 150 Litres kit

- Total water capacity = 1 200 L = 290 Nm^3 of gas at 200 bar.
- Total weight = 560 Kg (for same capacity with steel cylinders, weight = 1 660 kg).
- Aluminium Frame ➔ **no corrosion**.
- ECE R110 approval
- **Highest Safety Level** ➔ with 16 fuses in case of fire (2 per cylinder).
- **Easy piping system with pipes without welding**. (stainless steel 316L).
- Disconnecting and emptying of the cylinder for maintenance is possible thanks to independent manual valve on each cylinder.

Many configuration are possible for all kind of buses.
Also available in different storage capacities, from **2 to 10 cylinders and from 130 Litres to 150 Litres.**
Available in complete package or in kit with cylinders and accessories, without frame.

- **Filling panel** ➔ **Panel available with NGV1 or NGV2 receptacle.**

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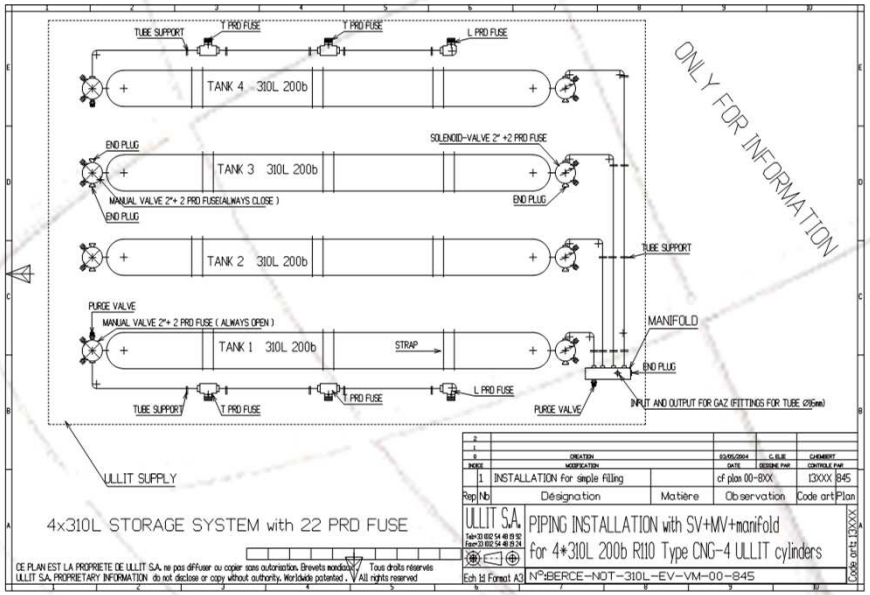
4x310 Litres kit

Frame features		
Total capacity (4 x 310 l)	≈ 1 240 litres	(≈ 75 611 Cu. In.)
Weight of the 4 cylinders (200 bar)	≈ 400 kg	(≈ 880 Lb)
Weight of the frame with accessories	≈ 160 kg	(≈ 352 Lb)
TOTAL WEIGHT	≈ 560 kg	(≈ 1 200 Lb)
TOTAL GAS CAPACITY	≈ 12 915 Scf	(366 m³)



Cylinders characteristics		
Water capacity :	310 L	18 902 Cu. In.
Working pressure :	200 or 240 bar	at + 15° C
Max filling pressure :	260 or 312 bar	at + 15° C
Test pressure :	300 or 360 bar	
Diameter :	388 or 392 mm	15.35 In.
Length :	1685 mm	128 In.
Weight :	100 or 105 Kg	209 Lb
Life :	20 years (100 000 refuellings)	

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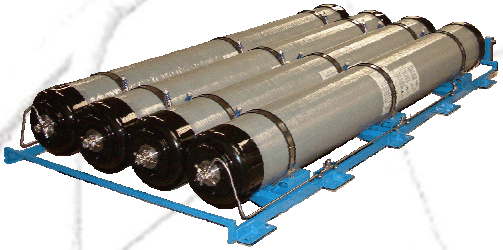
ACTIVITIES OF THE COMPANY

Bus application – 4 x 310 Litres kit



- Total water capacity = 1 240 Litres = 298 Nm^3 of gas at 200 bar.
- Total weight = 560 Kg (for same capacity with steel cylinders, weight = 1 660 kg).
- **ECE R110 approval**
- **Highest Safety Level with 22 fuses in case of fire.**
- **Easy piping system with pipes without welding**. (stainless steel 316L).
- **Easy connection through the manifold.**
- Disconnecting and emptying of the cylinder for maintenance is possible thanks to independent manual valve on each cylinder.

Many configuration are possible for all kind of buses.
Also available in different storage capacities, from **2 to 4 cylinders and from 190 Litres to 310 Litres.**
Available in complete package or in kit with cylinders and accessories, without frame.

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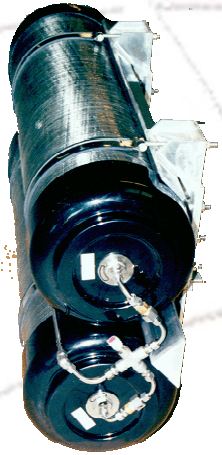
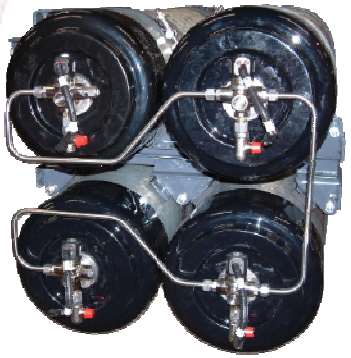
ACTIVITIES OF THE COMPANY

Truck application





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Car application

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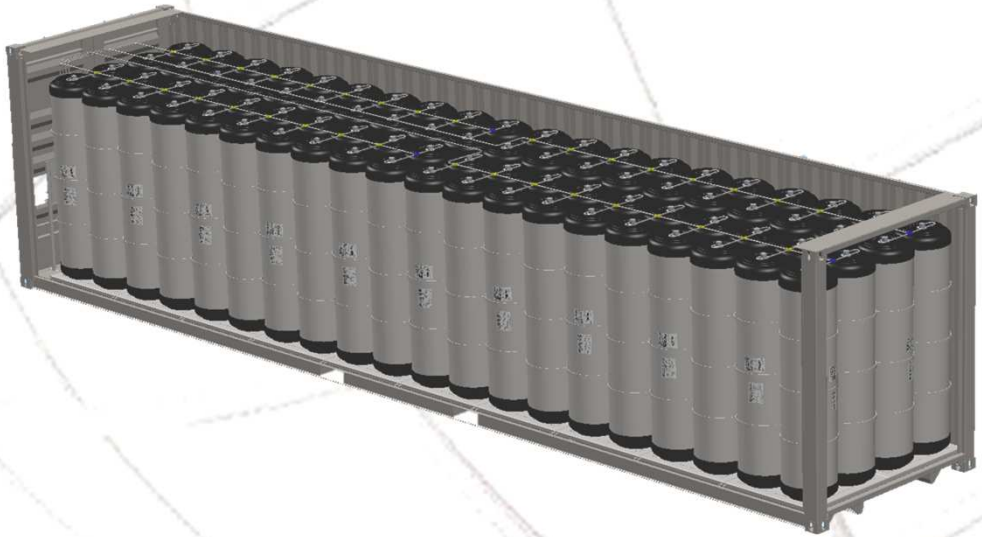
Gas transportation

TECHNICAL DATA

- **Container type ISO standard in 10', 20' or 40' high cube** (2896 mm).
- **Working pressure : 250 bar, 300 bar, 500 bar or higher pressure upon request.**
- **Cylinders approved according to 2010/35/UE (TPED); Complete system approved according to ADR 2015.**

ADVANTAGES

- **Reduced weight - Less wear - Modular system for trucks trailers, boats…**
- **Easy maintenance : vertical position of cylinders with 2 openings (to clean and drain cylinders).**
- **Easy shipment thanks to standard container twist-locks "ISO 661".**



Container 40' type 1AAA 40 000 Litres – 250 bar
Container 40' type 1AAA 12 192 x 2 438 x 2 896mm (High Cube Open top) 123 x 320 litres cylinders Cylinders : 123 x 115 Kg Total weight (without gas) : 17 950 Kg

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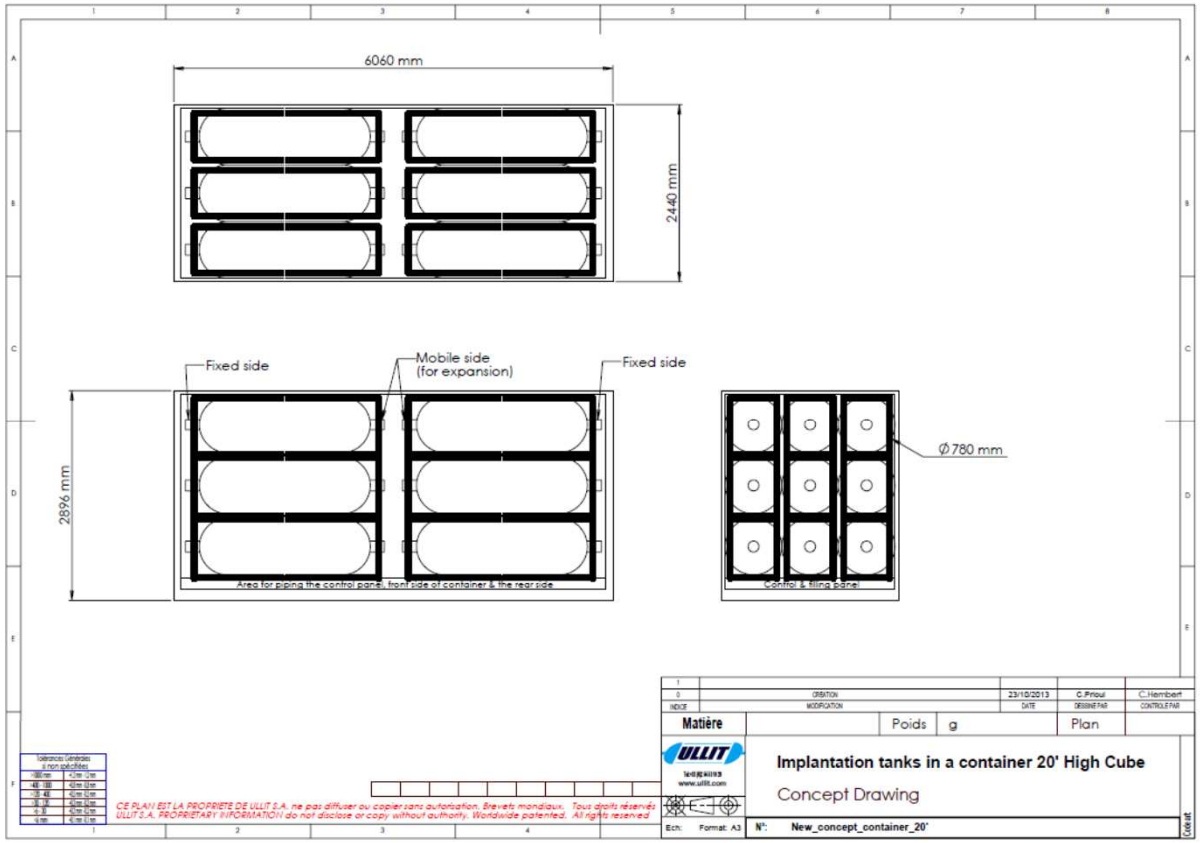
New Gas Container for transportation in developpment



Container 20' type 1AAA 18 000 Litres 250bar
Container 20' type 1AAA **6 058 x 2 438 x 2 896mm** **(High Cube open top)** **18 x 1 000 litres cylinders** **Cylinder : 18 x 315 Kg** **Total weight (without gas) : 9 700 Kg**

Advantages :

- Reduced quantity of valves.
- Reduced quantity of piping.
- Reduces of the global weight.
- Easiest internal inspection.

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ACTIVITIES OF THE COMPANY

Ferry-boat application

In 2008, ULLIT equipped a ferry boat powered by dual fuel (diesel + natural gas).

The high pressure storage consisted in 20 cylinders.

Each cylinder had a capacity of 310 litres at 240 bar.

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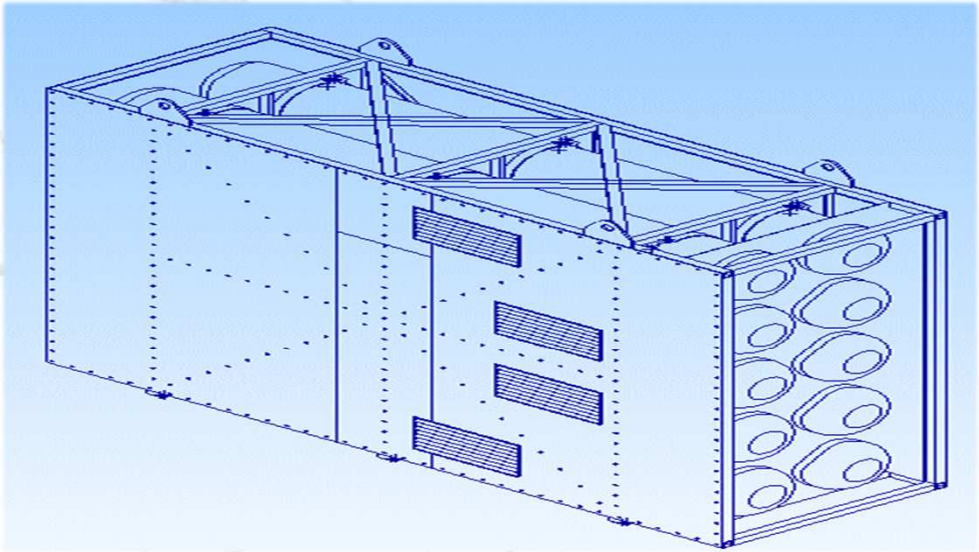
Ferry-boat application



The choice for ULLIT cylinders
was mainly based
on **ultra light weight** (0,33 Kg/litre)
compared with other competitors.

Three other important parameters are :

- No corrosion material.
- Long lasting.
- 100 000 refuellings with same performance.

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ACTIVITIES OF THE COMPANY

Breathable air cylinder

UNLIMITED LIFE

- According to PED **97/23/EC**
- Approval **CE 0036** by TÜV

- Thread port : M18x1.5
- Working pressure : 300 bar at 15°C
- Max. service pressure : 354 bar at 65°C
- Pressure test : 506bar
- Service temperature : - 40°C to +65°C

Available in different capacities from 1,7 litres to 9 litres.

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ACTIVITIES OF THE COMPANY

Fire protection system - Impulse water gun

Cylinder 1,7 litres

- **Pi approval** according to **2010/35/EU (TPED)**
- Approval **CE 0034** by TÜV

- Working pressure : 300 bar at 15°C
- Thread port : M18x1.5

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ACTIVITIES OF THE COMPANY

Fire protection system - marine & industry Application

Many applications in **Industry, offshore** or **Marine.**

Fast and efficient extinguisher system,
environnementally neutral.

ULTRA LIGHT - **NO CORROSION**
(stainless steel end boss 316L for marine application)

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REFERENCES OF THE COMPANY

Gaz de France	(tests benchs)
RENAULT	(cars)
VOLKSWAGEN	(cars)
PEUGEOT-CITROEN	(cars)
FIAT	(cars)
MERCEDES BENZ-EVOBUS	(bus)
RENAULT BUS	(bus)
HEULIEZ BUS	(bus)
EKOBUS	(bus)
IKARUSBUS	(bus)
VAN HOOL	(bus)
SOLARIS BUS	(bus)
POLSKIE Autobusy	(bus)
BUSSCAR	(bus)
HOLZER	(cars)

SOR	(bus)
RVI	(trucks)
IVECO	(trucks)
SCANIA	(trucks & bus)
ADVANCED FUELS TECHNOLOGY	(trucks)
HARDSTAFF GROUP	(trucks)
C.E.A	(H2 700 bar)
AIR LIQUID	(H2 350, 525 & 700 bar)
GHR	(H2 700 bar)
H2 LOGIC	(H2 700 bar)
IFEX	(fire fighting systems)
MARIOFF	(fire fighting systems)
MSA	(breathable air bottles)
SAGEM	(aerospace)
BAUER COMPRESSEURS	(industrial air bottles)
SNECMA	(H2 350 bar)

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