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Please check  
Additional Info.  
# 12706-N

Freeman, Cheryl

**From:** Ola.Johnsrud@ragasco.com  
**Sent:** Monday, May 05, 2003 10:05 AM  
**To:** Freeman, Cheryl  
**Cc:** jneumann@jnshh.com; Rune.Ulekleiv@ragasco.com; Trond-Inge.Flonas@ragasco.com  
**Subject:** SV: RAGASCO exemption - comments?

RSAA-2001-9731-4

 Brosjyre2002Teknisk1.jpg  
 Brosjyre2002Teknisk5.jpg  
 Brosjyre2002Teknisk10.jpg  
 Public - Permiation models.xls...

Dear Cheryl,

(Some problems with sendeing the first one - please, just delete it and keep this as your original...)

Please, find enclosed the modified permeability document as required for putting into the public part of the exemption report. Basically, we would like to have all documentation handled confidential, but I understand this is not possible - please, keep as much as possible within your organization. It would be good if the documents enclosed cover the necessary public information.

The following main documents are submitted so far ;

- \* Top drawings (confidential - please find public and updated versions enclosed)
- \* Total set of drawings (confidential - not to be put public)
- \* Test matrix covering all approval tests from the TÜV approval (confidential - not to be put public)
- \* Quality Assurance Program Plan (confidential - not to be put public)
- \* Permeability document (confidential - see new document enclosed to be put public)
- \* More? (confidential - not to be put public)

<<Brosjyre2002Teknisk1.jpg>> <<Brosjyre2002Teknisk5kg.jpg>>  
<<Brosjyre2002Teknisk10kg.jpg>>

<<Public - Permiation models.xls>>

Please, don't hesitate to call me or John for more details.

Best regards Ola  
 bRAGASCO AS  
 Box 50, N-2831 RAUFOSS, Norway  
 Direct phone: +47 6115 2923  
 Company ph: +47 6115 1600  
 Fax: +47 6115 1835  
 mailto:ola.johnsrud@ragasco.com  
 http://www.ragasco.com

2003-05-11 10:00

> -----Opprinnelig melding-----  
 > Fra: Johnsrud, Ola  
 > Sendt: 11. april 2003 16:06  
 > Til: Cheryl West Freeman (E-post)  
 > Kopi: John Neumann (E-post)  
 > Emne: RAGASCO exemption - comments?  
 >

> Dear Cheryl,  
 > Just wondering about the status on the RAGASCO exemption. Would it be  
 > possible for RAGASCO to review and comment upon it before the final text  
 > is approved? We would very much appreciate a preliminary copy/draft for  
 > this purpose - obviously we are a little curios at this time.  
 >

> I wish you a nice eastern!  
>  
> Best regards Ola  
>  
> RAGASCO AS  
> Box 50, N-2831 RAUFOSSE, Norway  
> Direct phone: +47 6115 2923  
> Company ph: +47 6115 1600  
> Fax: +47 6115 1835  
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*The Ragasco LPG cylinder is made of non-metallic composite materials and consists of three different layers. The thermoplastic single-piece liner is the gas barrier. Outside the liner is the composite layer, which is reinforced by continuous fibreglass and resin. The outer casing provides impact protection for both the pressure vessel and the valve.*

***An investment in the Ragasco composite cylinder will:***

- *Give you a marketing tool to expand your customer base*
- *Allow you to profile your company and build your brand image by using tailored colours and your own logo*
- *Create customer loyalty*
- *Lower maintenance costs*
- *Reduce transportation costs*

***The main user advantages are:***

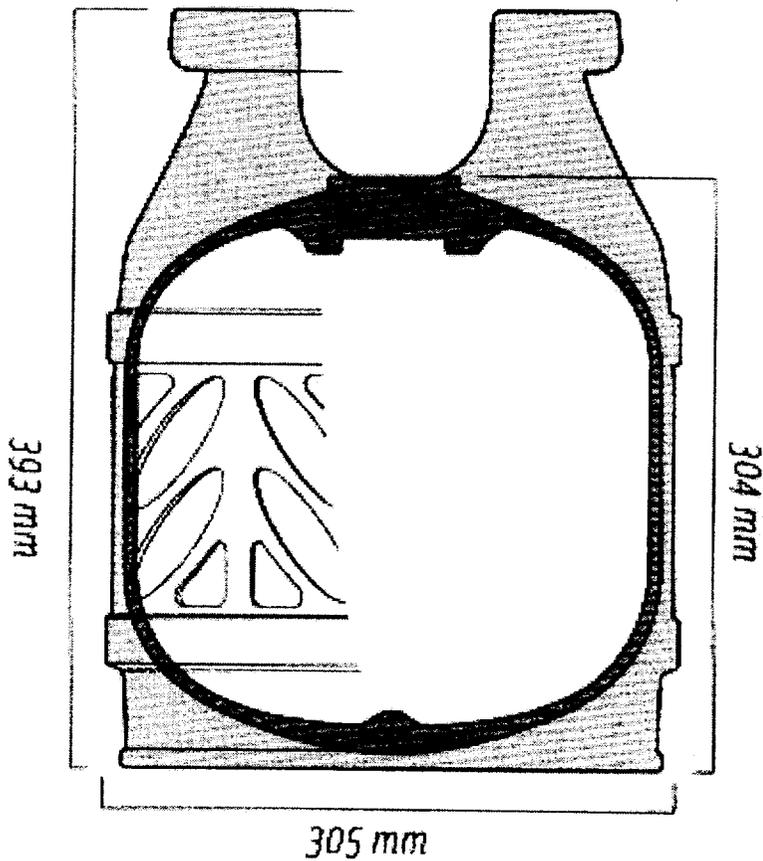
- *Light weight and easy handling*
- *Visible gas level*
- *Attractive design*

***Safety advantages:***

- *Corrosion-free*
- *Outstanding behaviour in fire*
- *Impact protection of the valve*

*Ragasco has one of the most advanced production lines within the industry. All manufacturing processes are fully automated and quality control is an integrated part of the production.*

*The cylinder is  $\pi$ -marked in accordance with TPED and is designed in compliance with the standard EN 12245 Transportable Gas Cylinders – Fully Wrapped Composite Cylinders.*



**Product data**

Propane capacity 5 kg

Butane capacity 6 kg

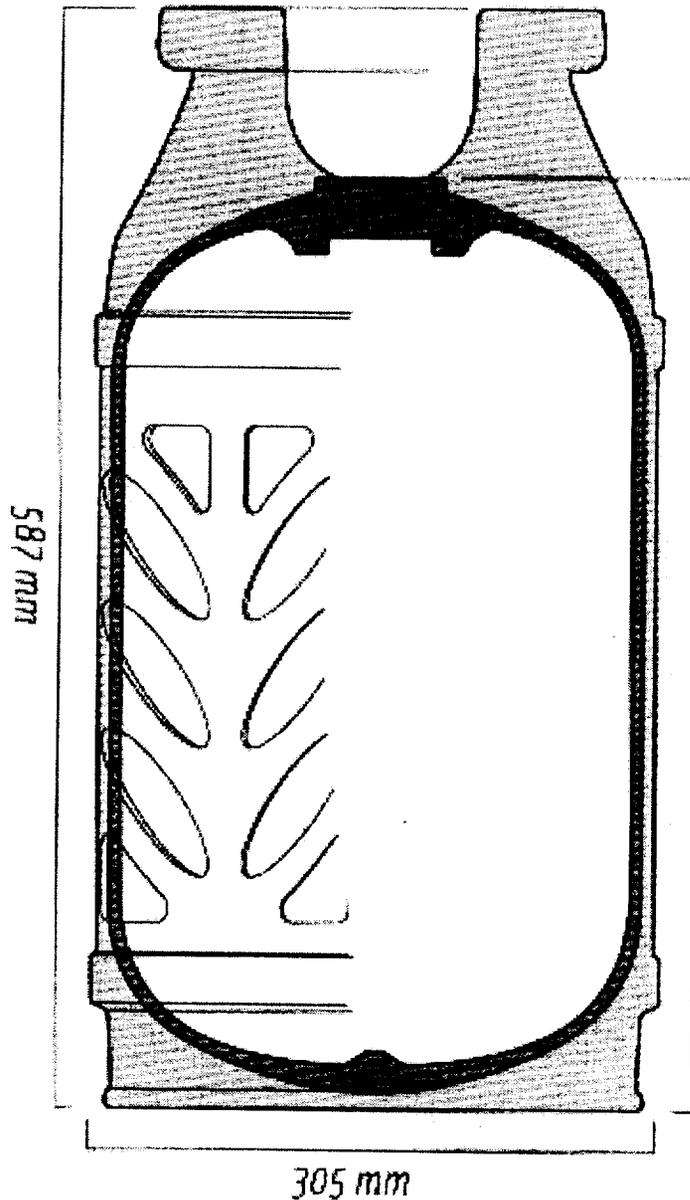
Water capacity 12.2 L

Empty weight ex valve 4.2 kg

Length (L) 393 mm

Diameter (D) 305 mm

Height to boss (H) 304 mm



**Product data**

Propane capacity 10 kg

Butane capacity 12 kg

Water capacity 23.8 L

Empty weight ex valve 6.3 kg

Length (L) 587 mm

Diameter (D) 305 mm

Height to boss (H) 499 mm

**This document is free for public comments**

**The document is based on earlier correspondence and meetings 2003-01-21 and-23 between DOT/Free**

### **Conclusion**

There is theoretical probability for having a combustible mixture even with permeability rates way below the 10 estimated in sheet "Probability" less than  $1 \times 10^{-11}$  (the probability to be hit on the ground by a crashing plane <http://www.npga.org/public/articles/details.html?id=582>). Models show that draining due to temperature change hole in the bottom of a closet will drain LPG due to gravity, and the rate will increase with the content adding up the differential pressure is so low that the hole must have a diameter on more than 10-100mm to prevent build

A certain level of safety is accepted already, ea allowing valves to leak 260g/y (15cm<sup>3</sup>/h) and similar limits to o probability for a combustible mixture, but this increase seems to be negligible. The chance of being involved ( $10^{-7}$ ) while the permeability related accident has less than  $10^{-11}$  probability. Even if permeability goes up s incidents will not increase significantly because the probability for it to happen will decrease.

As far as we know, there has never been incidents caused by failure or permeation for a LPG type 4 cylinder a areas.

### **Details**

#### **Situations in question:**

- \* Situations to evaluate are (1) storage in the trunk of a car, (2) in a closed cabinet inside a house, (3) professio
- \* Temperatures when modelling a trunk or similar: Variation along a sinus curve with extreme temperature 54g
- \* Temperatures when modelling a closed cabinet inside a house: Variation along a sinus curve, max temperatu
- \* Basically, the situations should show very low or no probability combustible mixtures.
- \* Air circulation from opening doors, temperature changes, no perfect sealing of the space aso shall be evalua

#### **Estimated probability a fatal result for the three cases;**

- (1) Storage in the trunk of a car:  $>1 \times 10^{-12}$
- (2) Storage in a closed cabinet in a house:  $>1 \times 10^{-11}$
- (3) Storage during professional transportation:  $>1 \times 10^{-16}$

**DOT/Freeman-Toughery-Reeves and RAG/Neumann-Johnsrud.**

elow the 103g/y limit. Still the probability for an accident is very low -  
hing plane is calculated to  $3,7 \times 10^{-7}$  - see  
ture changes are only in the range of 1-5% of the permeability limit. A  
nt adding up at the bottom. Still, due to low density of LPG gas phase,  
event build up of LPG.

r limits to other equipment. The permeability will increase the  
g involved in an LPG-accident is the same as for being hit by a plane  
y goes up somewhat (100-500g/y), the total probability of fatal

4 cylinder after >2millions service years in Europe, also in warm

3) professional transportation in trucks.  
erature 54grC/130dgrF and average temperature 38dgrC/100dgrF.  
x temperature 38dgrC/100dgrF, average 28dgrC/80dgrF.

I be evaluated to make realistic models

<b>Factors\probability</b>	<b>Car parked in sun</b>	<b>Closet in house</b>	<b>Storage during professional transport</b>
Probability for the situation to happen	0.0001	0.001	0.0001
Permeability > 100g/y	0.01	0.00001	0.01
Drain from the space smaller than LPG loss	0.1	0.9	0.001
No attention for a long period	0.001	0.1	0.0001
Do not smell the loose LPG before presenting ign.source	0.0001	0.001	0.0001
The total amount of loose gas has critical energy level	0.95	0.95	0.95
There is oxygen involved	0.95	0.95	0.95
Ignition source present	0.01	0.01	0.001
<b>Probability for critical incident</b>	<b>9.025E-13</b>	<b>8.1225E-12</b>	<b>9.025E-17</b>

**Try with your own numbers.....**

Probability for situation to happen			
Permeability > 100g/y			
Drain from the space smaller than LPG loss			
No attention for a long period			
Do not smell the loose LPG before presenting ign.source			
The total amount of loose gas has critical energy level			
There is oxygen involved			
Ignition source present			
<b>Probability for critical incident</b>	<b>0</b>	<b>0</b>	<b>0</b>