Addenda to document ECE/TRANS/WP.15/AC.2/2017/43

Submitted by EBU and ESO
Addendum 1  Report inspection interval PO tanks – Tank Assist
Consultation Report

Case: Inspection interval barge's tanks
Propylene Oxide
Report number: 1721004/01
Date: 07th March 2017

Principal:
Chemgas Shipping B.V.,
Gedempte Zalmhaven 4G,
3011 BT, Rotterdam,
Netherlands.

Objective:
Study and report causes for increased inspection interval ADN cargo tanks involved in transport of Propylene Oxide.

TO WHOM IT MAY CONCERN

Propylene Oxide (UN 1280) is carried on inland waterways in Europe by barges regulated by European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN). In ADN 3.2 Table C, column 20, an additional requirement is enforced to the carriage of Propylene Oxide. Requirement 12 holds a number of requirements related specifically to Alkylene Oxides and more specific to Propylene Oxide. Requirement 12e stipulates a periodic inspection of cargo tanks engaged in dedicated transport of Propylene Oxide at intervals not exceeding 2.5 years.

Having studied international maritime conventions it looks ADN requirement 12 in total is more or less copied from the International Code for Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code) which also sourced the remark related to Propylene Oxide in the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code).

Obviously the International Maritime Organization's Maritime Safety Committee (MSC) had concerns at the time of adoption for increased corrosion rates of steel tanks engaged in dedicated transport of specifically Propylene Oxide.

According to ADN transport of Propylene Oxide requires a type 1 barge tank, an independent (stand alone) tank, which, practically, is only to be found on board type G barges. For good understanding we need to realize that the source of requirement 12, the IBC Code,
allows a type 2 gravity tank (tank part of vessel's construction) to carry Propylene Oxide. The gravity tank has only a design pressure of 0.07 MPa (700 mbar) which will in many situations be insufficient to withstand the combined Propylene Oxide and Nitrogen pressure in the tank's atmosphere. The IBC Code therefore stipulates that if the design pressure is less than 0.06 MPa, the vessel has to be equipped with a cooling system able to control the cargo temperature and the consequent vapour pressure sufficiently.

In that respect and in combination with an onboard cooling system, it was expected, and indeed equipped onboard vessels with dedicated Propylene Oxide tanks, that Owners would insulate these tanks where possible in order to minimize temperature increase of the cargo, saving fuel for the cooling equipment.

Presence of insulation, often containing metal oxides, fixed to the outside of the cargo tank in combination with condensed water (wet insulation) due to temperature differences between cooled Propylene Oxide and the atmosphere, typically in warmer climates, may cause increased corrosion of the outside of the steel cargo tank, although adjacent spaces to the cargo tank are purged to lower oxygen levels. Instead of thickness measurements on the outside of the tank where insulation would have to be removed, same measurements could be taken from the inside for which man entry would have to be made possible.

Since ADN requires a type 1 tank found on type G barges, temperature control is not required since type G barges are equipped with pressure tanks with a maximum working pressure of 1.58 MPa (15.8 bar) sufficient to withstand Propylene Oxide vapour pressures well above any temperature which can be practically expected. As a result these barges are not constructed with cooling equipment onboard and insulation applied to the cargo tanks. This means the concerns for MSC resulting in an increased inspection interval, are not founded for ADN barges.

Chemistry literature supplied by CEFIC and the Kirk-Othmer Encyclopedia of Chemical Technology also conclude Propylene Oxide has no corrosive properties to steel and the bond between the Oxygen atom and both Carbon atoms inside the Propylene Oxide molecule is
specifically strong that liberation of oxygen from the Propylene Oxide molecule is impossible under storage and transport conditions.

Increased oxidation of steel of barge's tanks inner hull is highly unlike if not impossible due to enforcement of decreased oxygen levels in the tank atmosphere in both loaded and empty condition. The mandatory 2% (vol.) limit is in practice lowered to 0.5% (vol.) and lower to even 0.05% (vol.) by charterers (see Annex 1/Dow Chemical specifications).

Information supplied by the same charterers like Shell, DOW and others also indicate the specifications of corrosive elements in Propylene Oxide are very low. At these levels no corrosion of steel barge's tanks can be expected with referred elements acting as oxidizers. We refer to Annex 1 of this document, DOW Chemical Sales Specification of Propylene Oxide where acidity, alkalinity and Chlorides are tested and proven to be at very low levels.

Dedicated transport of Propylene Oxide reduces chances of contamination with incompatible substances as documented ADN requirement 12b to zero while additional incompatible substances not carried as cargo and documented in the Wiley Guide to Chemical Incompatibilities such as clay-based absorbents and Magnesium Oxide present in mineral wool insulation are not present onboard ADN type G barges engaged in dedicated transport of Propylene Oxide.

Together with owners' report of inspections of barge's tanks engaged in dedicated transport of Propylene Oxide which don't report increased corrosion of the tanks' surface including presence of heavy rust deposits, we conclude the increased inspection interval of barge's tanks carrying Propylene Oxide is superfluous if mentioned tanks are not insulated, which is common practice not to insulate tanks on a type G barge.

Fred Burgmeijer,
Consultant Oil-, Chemical- and LPG transport,
TankAssist B.V.
Date Printed: 28 JUL 2004

SPECIFIED MATERIAL: 00006141-S  Effective: 29 JUN 2004
Supersedes: 21 DEC 1999

NAME: Propylene Oxide

MATERIAL DESCRIPTION:
  Color: colorless
  Odor: ether
  Appearance/Physical State: liquid

<table>
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<tr>
<th>TEST ITEM AND CONDITION</th>
<th>LIMIT</th>
<th>UNIT</th>
<th>METHOD</th>
<th>N</th>
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<td>ppm</td>
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<td>Alkalinity</td>
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<td>Appearance, clear/matter free</td>
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<td>Chlorides</td>
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<td>Color, Pt-Co</td>
<td>5 Max</td>
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<td>ASTM D5386</td>
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<td>Ethylene Oxide</td>
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<td>Water Content</td>
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<td>ASTM E203</td>
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</tbody>
</table>

Continued on Next Page
SPECIFIED MATERIAL: 00006141-S  Effective: 29 JUN 2004
NAME: Propylene.Oxide

TEST REQUIREMENTS (CONTINUED)

TEST REQUIREMENTS NOTES:
1. as potassium hydroxide
2. analyze only if acid high
3. as Cl, compare to standard.

SHELF LIFE

<table>
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<th>CONTAINER</th>
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<tr>
<td>Bulk</td>
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</table>

STORAGE:
Oxygen <0.05%

NOTES

1. DO NOT RETURN PRODUCT, for safety & security reasons, without prior consultation with a qualified Dow PO representative.

READ PRECAUTIONARY INFORMATION AND MATERIAL SAFETY SHEETS. THIS PRODUCT IS SHIPPED IN COMPLIANCE WITH APPLICABLE LAWS AND REGULATIONS REGARDING CLASSIFICATION, PACKAGING, SHIPPING AND LABELING.
Addendum 2  Inspection report and testing on cargo tanks of ex-Chemgas 17 – Manufacturer Siemerink
## Inspection and testing on cargo tanks ex-Chemgas 17

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<th>Purchaser</th>
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<td>Siemerink ref. no.</td>
<td>GT-5944</td>
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<tr>
<td>Siemerink doc. number</td>
<td>GT-5944-IT-1</td>
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### Revision History

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<th>Revision</th>
<th>Issue Date</th>
<th>Signed</th>
<th>Description / Changes</th>
<th>Reviewed By QA department Siemerink B.V.</th>
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<td>0</td>
<td>30-03-2017</td>
<td></td>
<td>For information</td>
<td>L. Koyen, QA-manager.</td>
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</table>
Introduction:
Related to a modification of the above mentioned cargo tanks an inspection to determine the general condition after 40 years of service has been made.

The actual wall thickness has been compared to the original thickness as mentioned on calculations from an earlier modification in 1996.

Furthermore, as part of the scope of modification works was adding a new nozzle, thus giving an opportunity to perform an examination of the material condition on the material that was cut out. The microstructures of the inside of the tank shell and the outside of the tank shell were compared.

Finally a global visual inspection was performed of the inside surface of the tanks.

Investigations:
The wall thickness was measured on each shell course on 4 locations after removal of the coating to expose the bare material.
Considering the original nominal wall thickness of 20.8 mm, all of the measured locations would still satisfy the common current day new plate thickness tolerance class A (-0.6/+1.3, EN 10029) i.e. a wall thickness between 20.2 and 22.1mm. See table 1-4 for the measured thicknesses. No wall thickness reduction is observed.

A micrographic specimen was prepared from the cut-out of one of the shell plates and it was examined on both the inside and outside of the shell plate. The inside of the tank showed an identical structure to the outside without any signs of negative effects from the cargo-medium and a similar structure as could be expected for new production plates of a comparable grade (See Element Materials Technology test report SIE012-17-03-25477-1)

The global inspection of the internal tank surface showed a similar surface condition throughout all the tanks with no sign of degradation of the surface either generally or locally. Please see images 1 through 3

Conclusion:
Based on the above data we can conclude that the stored cargo medium does not affect the tank material and all tanks are considered to be still in excellent condition and fit for extended use.
Image 1: inside of dome

Image 2: Shell and vacuuming
Image 3: Shell and sump
### Table 1: Wall thickness measured on tank 1 (mm)

<table>
<thead>
<tr>
<th></th>
<th>Measured 1 Head front</th>
<th>Measured 2 Head front</th>
<th>Average Head front</th>
<th>Measured 1 Head rear</th>
<th>Measured 2 Head rear</th>
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### Table 2: Wall thickness measured on tank 2 (mm)

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### Table 3: Wall thickness measured on tank 5 (mm)

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### Table 4: Wall thickness measured on tank 6 (mm)

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Date: 27-3-2017
Element report number: SIE012-17-03-25477-1
Customer reference: GT 5944

TEST REPORT

Item Description: Gastank 72.003.6_ ½ of ex-Chemgas 17.
Material type and grade: Carbon steel STE380
Identification on Sample: Reference number
Size: 150 x 15 x 20.8 mm
Condition: In use for the last 40 years.

Investigator/Author: S. Murton

MICROSTRUCTURE PHOTO REPORT

Inner surface

Structure: The microstructure of the inner surface showed a matrix of ferrite with pearlite. No deleterious constituents were observed in the cross-section.
outer surface

Structure: The microstructure of the outer surface showed a matrix of ferrite with pearlite. No deleterious constituents were observed in the cross-section.

Light microscope
- Direct
- Replica

Polishing method
- Mechanical
- Electrolytic

Etching method
- Chemical
- Electrolytic

Etching reagent: 3% Nital
Magnification: ca. 200x
Addendum 3  Class inspection report including cargo tank inspection data of mts Chubasco
All Cargo tanks, Ballast tanks and void spaces have been inspected.

Note: All sediment and mud from the ballast tanks and the void spaces has been removed and all tanks are very clean.
Also the cargo tanks are very clean.
Chainlocker, False Bottom and sides, coating is in good condition

Chain locker, Deck head

Chain locker, Chain

Fore peak, is dry space and nicely coated

Inspector/Inspecteur(s): Rien van de Velde

Date of report: 30-5-2017
Fore Peak, General view

Forward machinery space

Forward machinery space

Forward machinery space (sea chest)

Inspector/Inspecteur(s): Rien van de Velde
Level: 
Manufacturer/Fabrikant: 
Client/Klant: 
Cert. Authority/Keur instantie: 

Date of report: Rapport datum: 30-5-2017
**Forward Void space no 1 (Deck head), coating in good condition**

**Forward void space no 1 (Tank foundation and bottom plating) very clean**

**Forward void space no 1 (bottom plating)**

**Forward void space no 1 (Bottom web frames)**

<table>
<thead>
<tr>
<th>Inspector/Inspecteur(s)</th>
<th>Level</th>
<th>Manufacturer/Fabrikant</th>
<th>Client/Klant</th>
<th>Cert. Authority/Keur instantie</th>
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<tbody>
<tr>
<td>Rien van de Velde</td>
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</table>

Date of report: 30-5-2017
Middle void space (Deck head)

Middle void space (piping underneath the deck head)

Middle void space (Bottom view)

Middle void space (Cargo tank Foundation) very clean and in good condition

Inspector/Inspecteur(s): Rien van de Velde

Level: Manufacturer/Fabrikant: Client/Klant: Cert. Authority/Keur instantie:

Date of report: 30-5-2017
Aft void space (General view)

Aft void space (Bottom plating)

Aft void space (Bottom web frames)

Aft void space (Cargo tank Fundation)

Inspector/Inspecteur(s): Rien van de Velde

Manufacturer/Fabrikant:

Client/Klant:

Cert. Authority/Keur instantie:

Date of report: 30-5-2017

Rapport datum: Date: Datum:

Date: Datum:

Date: Datum:
Water Ballast tank no 1, Portside (Web frame)

Water Ballast tank no 1, Portside (Deck head)

Water Ballast tank no 1, Portside (Bottom plating)

Water Ballast tank no 1, Portside (Bell mouth and suction line)

Inspector/Inspecteur(s): Rien van de Velde

Manufacturer/Fabrikant:

Client/Klant:

Cert. Authority/Keur instantie:

Date of report: 30-5-2017

Rapport datum:
Water Ballast tank no 2, Portside (Transverse bulkhead)

Water Ballast tank no 2, Portside (Web frame)

Water Ballast tank no 2, Portside (Bottom plating)
Water Ballast tank no 3, Portside

Water Ballast tank no 3, Portside (Bottom valve)

Water Ballast tank no 3, Portside (Webframes)

Water Ballast tank no 3, Portside (General view on bottom)

Inspector/Inspecteur(s): Rien van de Velde

Level: Manufacturer/Fabrikant: Client/Klant: Cert. Authority/Keur instantie:

Date of report: 30-5-2017

Rapport datum: Date: Datum:

Date: Datum:
Water Ballast tank no 1, Starboardside (Bellmouth)

Water Ballast tank no 1, Starboardside (General view)

Water Ballast tank no 1, Starboardside (Bottom plug)
Water Ballast tank no 2, Starboardside (Web frames)

Water Ballast tank no 2, Starboardside (Bottom plating)

Water Ballast tank no 2, Starboardside (transverse bulkhead)

Inspector/Inspecteur(s): Rien van de Velde
Manufacturer/Fabrikant: 
Client/Klant: 
Cert. Authority/Keur instantie: 

Date of report: 30-5-2017
Rapport datum: 
Date: 
Datum: 
Date: 
Datum: 
Date: 
Datum:
Water Ballast tank no 3, Starboardside (Bottom valve)

Water Ballast tank no 3, Starboardside (Previous bottom opening)

Water Ballast tank no 3, Starboardside (Web frames)

Water Ballast tank no 3, Starboardside (Deck head)

Inspector/Inspecteur(s):
Rien van de Velde

Level:

Manufacturer/Fabrikant:

Client/Klant:

Cert. Authority/Keur instantie:

Date of report:
Rapport datum: 30-5-2017

Date:
Datum:

Date:
Datum:

Date:
Datum:
Aft Peak Tank

Aft Peak Tank

Aft Peak Tank

Aft Peak Tank

Inspector/Inspecteur(s): Rien van de Velde
Level: Manufacturer/Fabrikant: Client/Klant: Cert. Authority/Keur instantie:

Date of report: 30-5-2017
Main deck

Cargo tank

Cargo tank

Cargo tank

Inspector/Inspecteur(s): Rien van de Velde

Date of report: 30-5-2017
Addendum 4  Statement Bureau Veritas: Class Rules and material diminution
ATTESTATION NO. DPO/2017/0064

Issued within the scope of Bureau Veritas Marine & Offshore Division General Conditions

Type of Ship : Type G tanker  
Name of Ship : Rene 19  
Register Number : 909T12

The carriage of dangerous goods on inland waters is regulated through the requirements set out in the European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN). Within these requirements, the transport of Propylene Oxide (UN1280) requires the vessel to be of G-type (Gas carrier). In accordance with regulation 9.3.1.8.1, such vessels are required to be built and maintained under survey of a recognised classification society in accordance with the rules established by that classification society for its highest class.

The requirements of Bureau Veritas for inland vessels are set out in NR 217, Rules for the Classification of Inland Navigation Vessels. Part A, chapter 2, Section 2 regulates the surveys and their scope. For tankers, the required surveys are the class renewal survey and the intermediate survey. Internal examination of pressure vessels such as the cargo tanks of type G tankers are only required as part of the renewal survey.

The undersigned, F. Kersbergen, Manager Statutory Affairs, Dutch Plan Approval Office, acting within the scope of the General Conditions of Bureau Veritas Marine & Offshore Division, which regulate the interventions of this Society

Hereewith declares

During the surveys of the above mentioned vessel, Bureau Veritas has found no deviations in the structure of the cargo tanks or the presence of heavy rust deposits.

In witness thereof, and with all due reservations, this Attestation is issued for the ends and purposes to which it was designed.

[Signature]

Rotterdam, 19th of May 2017

Frank Kersbergen
Manager Statutory Affairs

The latest published Rules of the Bureau Veritas Marine & Offshore Division and the General Conditions therein are applicable.

Any person not a party to the contract pursuant to which this document is delivered may not assert a claim against Bureau Veritas for any liability arising out of errors or omissions which may be contained in said document, or for errors of judgment, fault or negligence committed by personnel of the Society or of its Agents in the establishment or issuance of this document, and in connection with any activities for which it may provide.