TECHNICAL BULLETIN

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Recommended Method for the Determination of Hydrocarbons in Gas Cylinders

This Technical Bulletin is a revision of Technical Bulletin 05 published in 2012 and is aligned with the publication WI 001 of the ECMA [1].

The Technical Bulletin describes the method for the determination of non-volatile hydrocarbons in metallic gas cylinders and metallic liners of composite cylinders. The acceptance criteria are not given, these should be agreed with the cylinder manufacturer.

Sampling

The sample cylinder shall be taken out of the production flow after final cleaning (shot blasting and / or washing). Prior to testing the cylinder should be visually checked to ensure that all surfaces are free from visible deposits, loose debris and are dry.

Test Equipment

- calibrated balance with mg resolution
- glass beakers 1 litre
- Glass funnel
- Pipette 100 ml
- Glass evaporating basin
- Measuring glass
- Glass siphon
- Filter apparatus

All equipment should be suitable for the used solvent and well cleaned and rinsed with pure solvent.

Solvent

The solvent to use is fresh Dichloromethane.

Precautions should be taken because dichloromethane has some toxicity. Therefore, it is important, that a Safety Datasheet is provided to the persons that come in contact with this chemical.

Note: The use of dichloromethane generates hydrogen if the cylinder or liner is made of aluminium alloy. For such cylinders the use of another non-chlorinated solvent could be considered.

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Method

a) 20 ml of the solvent per liter cylinder volume is poured into the standing cylinder through a glass funnel. A minimum of 200 ml should be used;

b) The cylinder is plugged with a clean solvent resistant plug and rolled horizontally for 2 minutes;

c) Suspend the cylinder vertically, neck downwards, for 1 minute with occasional agitation;

d) Stand the cylinder on its base for 2 minutes with occasional agitation;

e) The solvent can be siphoned out of the cylinder, or the cylinder can be drained into a clean glass beaker;

f) The solvent is filtered through a filter with a micro porosity of 5 μm into another clean glass beaker. Make sure to use a filter that does not collect the hydrocarbons;

g) 100 ± 2 ml of the solvent is taken with a pipette and released into a weighed clean glass evaporating basin;

h) The pipette is rinsed with approximately 10 ml of unused fresh solvent, which is also released into the glass evaporating basin;

i) The solvent is allowed to evaporate to complete dryness and the glass evaporating basin is then weighed again.

Results

The total amount of non-volatile hydrocarbons in the cylinder is then calculated as:

$$M_t = \frac{V}{v} * m$$

where

Mt	total amount in mg of non-volatile hydrocarbons
m	weight difference of the glass evaporating basin before (i.e. clean and empty) and after solvent evaporation
V	total volume of solvent in ml recovered from the cylinder and siphoned or drained into the clean glass beaker at step e)
v	100 ml solvent poured at step g) onto the glass evaporating basin

The amount of non-volatile hydrocarbons per square meter cylinder surface, Ms, is calculated as:

$$M_s = \frac{M_t}{A + B + C}$$

where

A	area of cylinder top approximated as a sphere i.e. ½ x 4 x π x r2
B	area of the mid cylinder =2 x π x r x h

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C	area of cylinder bottom depending on base shape
r	cylinder inner radius
h	height of the cylindrical part of the cylinder

References

[1] European Cylinder Makers Association www.ecma.info

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