

## 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.

## 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

M <sub>t</sub>	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, M<sub>s</sub>, 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 r <sup>2</sup>
B	area of the mid cylinder = 2 x π x r x h

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](http://www.ecma.info)

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