

Twining Project “Strengthening the capacities of the Bureau of Metrology for internal market integration”

Twining ref. MK 12 IPA EC 01 16 TWL



A Project funded by the European Union and Implemented and led by CMI

FIXED STORAGE TANKS AND LEVEL GAUGES IN LEGAL METROLOGY

Jindřich Bílek

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FIXED STORAGE TANKS

There is no international regulations (like e.g. MID) in the field of Fixed storage tanks. Fixed storage tanks can be subjected to national metrological regulation.

Fixed storage tanks are subjected to metrological control in Czech Republic in case that they are used for measuring of volume.

There exist international recommendations and standards (e.g. OIML R71, ISO 7507).



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FIXED STORAGE TANKS

Fixed storage tanks subjected to metrological control in Czech Republic

- | | |
|--|-----------------|
| <input type="checkbox"/> Cooling and storage tanks for milk | <i>4 years</i> |
| <input type="checkbox"/> Wooden barrels | <i>5 years</i> |
| <input type="checkbox"/> Concrete and brick storage tanks | <i>no limit</i> |
| <input type="checkbox"/> Barrels and tanks made of other materials | <i>10years</i> |



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FIXED STORAGE TANKS

National regulation of fixed storage tanks in Czech Republic is based on the recommendation of OIML R 71.

Fixed storage tanks are not subjected to type approval but only to initial and subsequent verifications.



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FIXED STORAGE TANKS

Storage tanks can be sort according to following points of view:

Volume

(smaller than 100 m³, bigger than 100 m³)

Shape

(vertical/horizontal cylindrical, spherical...)

Usage

(floating roof, open, closed, high pressure...)



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FIXED STORAGE TANKS

Storage tanks can be sort according to following points of view:

Emplacement

(underground, overground)

Level measurement

(one mark or full volume, sight glass with scale, measuring rod, automatic level gauge)



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FIXED STORAGE TANKS

Verification procedure for fixed storage tanks in Czech Republic – volume determination

Geometrical method

Tanks with regular shape without deformation and nominal volume more 50 m³

This method is in Czech Republic performed by authorized metrological body



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FIXED STORAGE TANKS

Verification procedure for fixed storage tanks in Czech Republic – volume determination

Volumetric method (using flow meter or vessels)

Tanks with nominal volume to 100 m³, underground tanks and tanks with shape not suitable for geometrical method.

This method is performed by CMI and AMBs.



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FIXED STORAGE TANKS

Output of the procedure of volume measurement is calibration table of the tank that transform length measurement (scale, tape, automatic level gauge...) to volume measurement.



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AUTOMATIC LEVEL GAUGES

There is no international regulations (like e.g. MID) in the field of automatic level gauges. Automatic level gauges can be subjected to national metrological regulation.

Level gauges are subjected to metrological control in Czech Republic.

There is international OIML recommendation that can be followed (OIML R85).



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AUTOMATIC LEVEL GAUGES

- **Automatic level gauges have to undergo type approval procedure in Czech Republic.**
- **Type approval procedure is based on recommendation of OIML R85.**
- **At this moment it is also possible to make type approval of automatic level gauge based on OIML certificate of conformity issued by OIML issuing authority.**



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AUTOMATIC LEVEL GAUGES

- **Automatic level gauges under legal metrology control are mostly used at big storage tanks (geometrical method of volume determination) for crude oil and liquid fuels in Czech Republic.**
- **Majority of „smaller“ fixed storage tanks use a measuring rod or a sight glass with a scale.**



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AUTOMATIC LEVEL GAUGES

- **At this moment automatic level gauges at petrol stations are not used for legal purposes and do not undergo metrology control (type approval, verification...) in Czech Republic.**



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AUTOMATIC LEVEL GAUGES

- **Verification of automatic level is performed in one or two stages in Czech Republic.**
- **The length of verification interval are 2 years.**



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AUTOMATIC LEVEL GAUGES

- **One stage verification is performed directly on the place of installation using tape and compare the indication of tape and automatic level gauge.**
- **The MPE is 4 mm (in accordance with OIML R85)**
- **After one stage verification has to follow two stage verification.**



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AUTOMATIC LEVEL GAUGES

- **When two stage verification takes place then the first stage is carried out in laboratory and second stage in the place of installation.**
- **The MPE for laboratory tests is 1 mm (in accordance with OIML R85)**



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AUTOMATIC LEVEL GAUGES

- **The laboratory tests are:**
 - accuracy test**
 - hysteresis test (if applicable)**
 - discrimination test (if applicable)**
- **It is necessary to set actual value of level during the installation.**



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AUTOMATIC LEVEL GAUGES

Mostly used types of automatic level gauges under legal control in Czech Republic.

- **Servo level gauges (material reserves of crude oil)**
- **Radar level gauges (storage tanks for fuels - Čepro)**
- **Magnetostrictive level gauges**
- **Guided radar level gauges**



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AUTOMATIC LEVEL GAUGES

- **Our institute keeps a vertical testing facility for level gauges with range up to 10 m.**
- **It has been designed for purposes of calibration verification and certification of the level gauges (e.g. radar, servo, ultrasonic or float level gauges).**



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AUTOMATIC LEVEL GAUGES

- **As the distance between the level gauge and level (or reflection plate) can be adjusted automatically using a step motor, it is possible to perform testing in automatic mode (using hart, modbus or current loop communication).**
- **The standard expanded uncertainty is 0,16 mm at reference conditions.**



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Thank you for your attention!



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