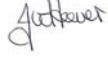


POLICY			
Policy Number	LM-P-019-08-09 - AirElimGantry	Compiled by:	J van den Heever
Effective Date	2009-08-28	Signature:	
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File name:	LM-P-019-08-09 - AirElimGantry	Signature:	

1. Scope

Use and compliance of air eliminators, air prevention systems and de-aerators installed in road and rail gantry volume measuring systems in petroleum distribution facilities.

2. Reference documents

Trade Metrology Act.
Trade Metrology Regulation 74, Part II.
OIML R 117-1: 2007 (E)

3. Background

Air eliminators and air prevention systems are found on road and rail gantry volume measuring systems to remove air, or prevent flow, in the event of air/gas being present.

These pipe lines are always filled with product due to operational requirements, and air/gas is normally not found in it. Air is only introduced during maintenance and stoppages due to breakdowns.

Some installers of these systems are of the opinion that air eliminators/air prevention systems must not be made a mandatory requirement.

De-aerators are more common in aviation fuel loading systems due to the intolerance of air, for safety reasons.

4. Policy

4.0 Requirements

Road and rail gantry volume measuring systems in petroleum distribution facilities, shall comply with the following requirements with regard to the elimination of air or gas.

The requirements have been extracted from OIML R 117-1: 2007 (E).

4.1 Terminology

4.1.1 Gas elimination device

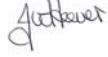
Device used to remove any air, gas, or vapor contained in the liquid. There are several different types of gas elimination devices, including gas separators, gas extractors, and special gas extractors.

4.1.1.1 Gas separator

Gas elimination device used for continuously separating, and removing, any mixed air or gases contained in the liquid.

4.1.1.2 Gas extractor

Gas elimination device used to extract air or gases accumulated in the supply line of the meter in the form of pockets that are no more than slightly mixed with the liquid.

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4.1.1.3 Special gas extractor

Gas elimination device that, like the gas separator but under less stringent operating conditions, continuously separates any air or gases contained in the liquid, and which automatically stops the flow of liquid if there is a risk of air or gases, accumulated in the form of pockets no more than slightly mixed with the liquid, entering the meter.

4.2 Elimination of air or gases

4.2.1 General requirements

Measuring systems shall incorporate a gas elimination device for the proper elimination of any air or undissolved gases which may be contained in the liquid before it enters the meter. In the case that neither air intake nor gas release will occur in the liquid upstream of the meter, a gas elimination device is not required.

The gas elimination device shall be suitable for the supply conditions and be arranged in such a way that the effect due to the influence of the air or gases on the measuring result does not exceed:

- 1 % for liquids of a viscosity exceeding 1 mPa·s (at 20 °C); or
- 0.5 % of the quantity measured for all other liquids.

However, it is not necessary for this effect to be less than 1 % of the minimum measured quantity.

The values specified in this section apply to the difference between:

- the meter errors with air intake or with gas, and
- the meter errors without air intake or gas.

Gas elimination devices shall be installed in accordance with the manufacturer's instructions.

4.2.2 Pumped flow

A gas separator shall be provided when, without prejudice of requirements in 4.2.4, the pressure at the pump inlet may, even momentarily, fall below either the atmospheric pressure or the saturated vapor pressure of the liquid, which can result in mixed air or gas.

If gaseous formations such as pockets liable to have a specific effect greater than 1 % of the minimum measured quantity can occur as well, this gas separator shall also be approved as a gas extractor.

Depending on the supply conditions, a special gas extractor can be used for that purpose if the risk of mixed air or gas is smaller than 5 % of the volume delivered at the maximum flowrate.

When applying this provision concerning gaseous formations, it is important to consider that:

- gaseous formations are likely to occur because of thermal contraction during shutdown periods, and
- air pockets are likely to be introduced into the pipework when the supply tank becomes empty.

A gas extractor is required when the pressure at the pump inlet is always greater than the atmospheric pressure and the saturated vapor pressure of the liquid, but gaseous formations liable to have a specific effect greater than 1 % of the minimum measured quantity can occur. When applying this provision, it is necessary to consider the situations concerning gaseous formations that were mentioned above.

POLICY

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No gas elimination device is required if the pressure at the pump inlet is always greater than the atmospheric pressure and the saturated vapor pressure of the liquid, and if any gaseous formation liable to have a specific effect greater than 1 % of the minimum measured quantity cannot form or enter the inlet pipework of the meter, whatever the conditions of use.

If the gas elimination device is installed below the level of the meter, a non-return valve shall be incorporated to prevent the pipework between the two components from emptying.

The loss of pressure caused by the flow of liquid between the gas elimination device and the meter shall be as small as possible.

If the pipework upstream of the meter incorporates several high points, it may be necessary to provide one or more automatic or manual evacuation devices.

4.2.3 Non-pumped flow

When a meter is supplied by gravity without use of a pump, and if the pressure of the liquid in all parts of the pipework upstream of the meter and in the meter itself is greater than the saturated vapor pressure of the liquid and the atmospheric pressure at metering conditions, a gas elimination device is not necessary.

If the pressure of the liquid is likely to be lower than the atmospheric pressure while remaining greater than the saturated vapor pressure, an appropriate automatic device shall prevent entry of air into the meter.

In other cases, an appropriate gas elimination device shall be provided.

If a meter is supplied under gas pressure, the measuring system shall be so constructed that release of gas dissolved in the liquid is avoided. An appropriate device shall prevent entry of gas into the meter.

In all circumstances, the pressure of the liquid between the meter and the transfer point shall be greater than the saturated vapor pressure of the liquid.

4.2.4 Viscous liquids

Since the effectiveness of gas elimination devices decreases as the viscosity of the liquids increases, these devices are not required for measuring liquids with a dynamic viscosity of more than 20 mPa·s at 20 °C.

In this case, it is necessary to make provisions to prevent entry of air. The pump shall be so arranged that the inlet pressure is always greater than the atmospheric pressure.

If it is not always possible to meet this condition, a device shall be provided to stop the flow of liquid automatically as soon as the inlet pressure falls below the atmospheric pressure. A pressure gauge shall be used to monitor this pressure. These provisions are not necessary if devices are provided which ensure that no air can enter through the joints in the sections of the pipework under reduced pressure and if the measuring system is so arranged that no air or dissolved gases will be released.

4.2.5 Gas removal pipe

The gas removal pipe of a gas elimination device shall not include a manually-controlled valve. However, if such a closing element is required for safety reasons, it shall be possible to ensure that the valve remains in the open position during operation by means of a sealing device or by means of a system interlock that would prevent further measurement upon valve closure.

POLICY			
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4.2.6 Anti-swirl device

If the supply tank of a measuring system is normally to be completely emptied, the outlet of the tank shall be fitted with an anti-swirl device, unless the measuring system incorporates a gas separator.

4.2.7 General provisions for gas elimination devices

4.2.7.1 The gas separated in a gas elimination device shall be evacuated automatically unless a device is provided which automatically either stops or sufficiently reduces the flow of liquid when there is a risk of air or gases entering the meter. In the case of shutdown, no measurement shall be possible unless the air or gases are automatically or manually eliminated.

4.2.7.2 The operational limits of a gas elimination device are as follows:

- the maximum flowrate(s) for one or more specified liquids,
- the maximum pressure (with no flow running) and minimum pressure (with liquid and without air intake while the pump is running at maximum flowrate) compatible with the correct operation of the gas elimination device, and
- the minimum measured quantity for which it is designed.

4.2.8 Special provisions applicable to gas separators

Within the error limits specified in 4.2.1, a gas separator shall ensure the elimination of air or gases mixed with the liquid. A gas separator designed for a maximum flowrate lower than or equal to 20 m³/h shall ensure the elimination of any proportion by volume of air or gases relative to the measured liquid. A gas separator designed for a maximum flowrate higher than 20 m³/h shall ensure the elimination of 30 % air or gases relative to the measured liquid (the volumes of air or gases are measured at atmospheric pressure in determining their percentages). The percentage is considered only when the meter is running at flow rates higher than the minimum flow rate (mean value during one minute).

Furthermore, when provided, the automatic gas elimination device must continue to operate at the maximum pressure fixed for the gas separator.

4.2.9 Special provisions applicable to gas extractors

A gas extractor shall, at the maximum flowrate of the measuring system, ensure the elimination of an air or gas pocket of a volume (measured at atmospheric pressure) at least equal to the minimum measured quantity with no resulting additional effect greater than 1 % of the minimum measured quantity.

A special gas extractor (capable of eliminating mixed gas and gas pockets), shall also be capable, at the system's maximum flowrate, of continuously separating a volume of air or gas mixed with the liquid equal to 5 % of the volume of liquid delivered (at the maximum flowrate) without the resulting additional effect exceeding the limits fixed in 4.2.1.

5. Note

This policy will be reviewed at the adoption of the revised SANS 1650, which will include the requirements of OIML R117-1: 2007 (E).