

marcogaz

TECHNICAL ASSOCIATION
OF THE EUROPEAN NATURAL GAS INDUSTRY

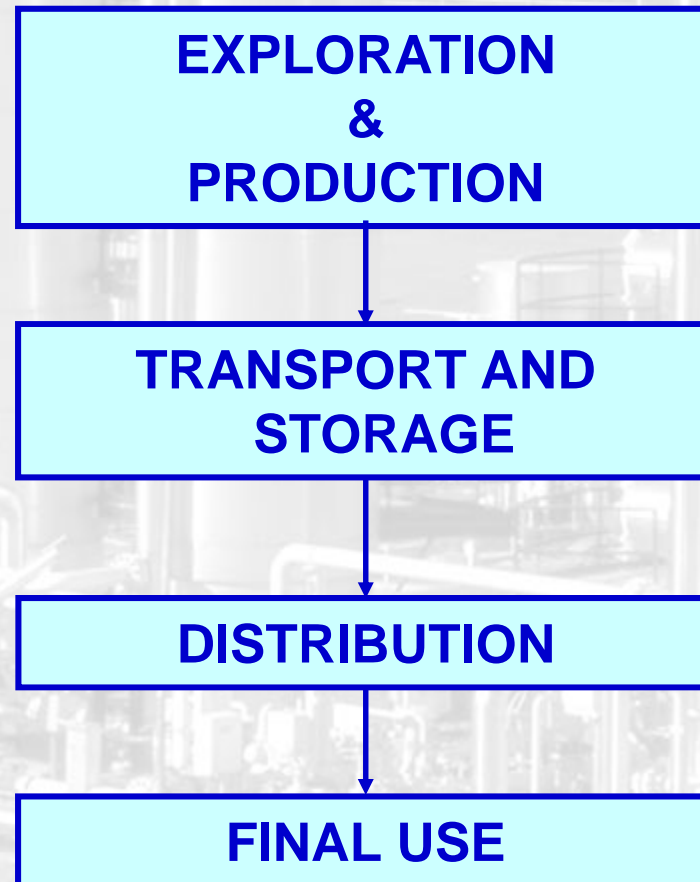
Development of a Eurogas-Marcogaz Methodology for Estimation of Methane Emissions

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European Forum Gas 2007
Paris, 12-13 September 2007

The Eurogas-Marcogaz Joint Group Environment Health and Safety has established a Working Group on Methane Emissions with the objective to work on methods and recommendations for evaluating methane emissions and on examination of practices and technologies to reduce emissions in the natural gas industry

NATURAL GAS SYSTEM



- Methane emissions occur during normal operations, routine maintenance and faults in the natural gas system
- Methane emissions from the natural gas sector in 2005 were about 7% of total methane emissions in Europe
- It has always been the policy of the gas industry to minimize the leakage and venting of natural gas and consequently, of its major component, methane, for safety, operational and economic reasons and now also because of environmental objectives

The emissions of methane from the gas chain during operation can be divided into four major categories

- Fugitive emissions
- Emissions from pneumatic devices
- Incomplete combustion emissions
- Vented emissions

- **Fugitive emissions**

Fugitive emissions are those from sealed and packed surfaces such as valve stem packings, flange gaskets, open end valves, lead joints

- **Emissions from pneumatic devices**

Pneumatic emissions are those deriving from valves used for pressure regulation and for isolation of pipeline sections opened or closed remotely for operating or safety reasons by pneumatic devices operated with gas

- **Incomplete combustion emissions**

Emissions of unburned methane in the exhaust gases of combustion plants

- **Vented Emissions**

- Maintenance vents

- Methane emissions from normal or planned maintenance and inspection controls where natural gas is released in the atmosphere from source points

- Flares

- Unburned methane where natural gas released is burned during normal operation

- Start up and shut down vents

- Vents during start up and shut down of equipments or during commissioning/decommissioning of pipes and equipments

There are emissions of methane from the gas chain during circumstances which are not normal operation

- Incident vents

Methane emissions from unplanned events. Experiences show that this is usually caused by failures of the system due to third party activity and external factors outside of the control of gas companies

Evaluation of methane emissions

The evaluation of methane emissions is difficult depending on:

- the high number of components of the gas system
- the relevant influence of operating procedures
- different, complex and costly methodologies for measurements

Methodology to estimate methane emissions

The way to calculate methane emissions is based on the use of emission factors and activity factors with the following equation

$$\text{Emission} = \Sigma (\text{Activity Factor} * \text{Emission Factor})$$

Eurogas-Marcogaz Methodology

Eurogas-Marcogaz has prepared a Methodology for estimating methane emissions to be used as a reference for the European gas industry

The Methodology has been developed taking into account methodologies presented in literature and practices of the different European Gas Companies

It is based on the use of ranges of emission factors for components and operations used by gas companies to estimate their emissions

Data required for the use of Methodology

- Activity Factors
- Emission Factors
- Emissions from vents
- Average methane content of natural gas

Activity Factors

Activity factors are the population of emitting equipments such as length of pipes, number and type of valves, number and type of pneumatic devices

The activity factors, because of the high number and types of emitting equipments in the gas chain, must be often estimated with a statistical approach, introducing a factor of uncertainty

The methodology indicate the most relevant activity factors of the different parts of the natural gas system

Activity factors for transmission systems

- Length of transmission pipes
- Number of valves with pneumatic operations
- Mechanical power of gas turbines
- Mechanical power of gas engines
- Number of blow down valves
- Number of metering and regulating stations
- Fuel gas consumption

Activity factors for distribution systems

Length of distribution lines

- Grey cast iron with lead joints
- Ductile cast iron
- Steel
- Steel with cathodic protection
- Steel without cathodic protection
- Plastic polyethylene
- Plasticv PVC

Number of service lines

Number of city gate and customer supply stations

Emission Factors

Emission factors are defined as the quantity of methane emitted from each emitting source and for each emitting event

Some emission factors can be evaluated on the basis of the characteristic of components, other are very difficult to be evaluated

Even in the case of using measurement techniques to evaluate emission factors, the high statistical variability of measurements and the limited number of sampling introduce a problem of not being statistically representative

The emission factors are strongly dependent on pipeline material, type of components, pressure level, maintenance, pipeline ageing

The disparity of the type of components, materials and pressure level among companies and countries limit the adoption of common emission factors and introduce a high level of uncertainty

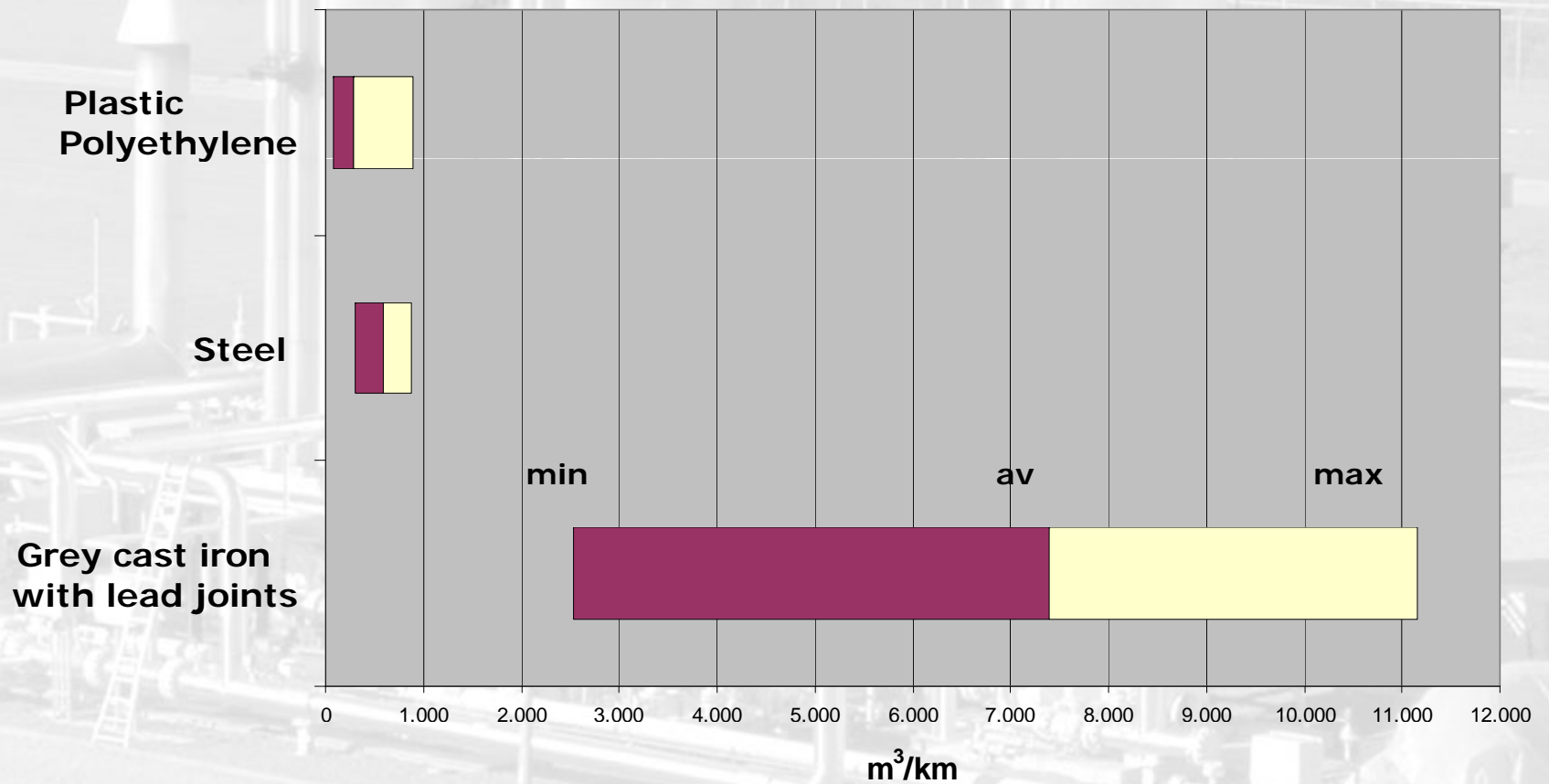
Emission factors can derive from:

- Measurement
- Estimation
- Literature

Specific emission factors for each company based on campaign measurements or other specific values should be used

If specific values are not available, the Methodology suggests a range of emission factors within which each company should choose its emission factors

NATURAL GAS EMISSION FACTORS FOR DISTRIBUTION SYSTEMS



A guideline for choosing emission factors has been prepared with a qualitative correlation between the most relevant parameters and emission factors

It was not possible to identify a quantitative correlation that would requires much more detailed information on components and characteristics of gas systems collected with detailed and expensive measurements by single companies

Examples of parameters that influence emission factors in distribution systems:

- Pressure
- Maintenance
- Monitoring – Leak detection
- Time to fix escapes
- Joint treatment
- Access
- Age of pipes
- Time of change to natural gas
- Soil condition
- Location (urban or rural)
- Service Lines
- Cathodic protection system

Emissions from vents

Vented emissions of natural gas and methane are not estimated by using activity factors and emission factors, but they are calculated case by case taking into account the geometrical volume of the section that is discharged and the pressure of the gas released

CONCLUSIONS

- Methane emissions from gas industry activity are low in comparison with emission from other anthropogenic sources
- The evaluation of methane emissions is a difficult task depending on the high numbers of components of the gas systems, the relevant influence of the type of components and operating procedures and different, complex and costly methodologies for measurements

CONCLUSIONS

- A Methodology for estimation of methane emissions has been developed by Eurogas-Marcogaz based on the use of activity factors and emission factors
- The Methodology indicates ranges of emission factors and allows to estimate methane emissions with different levels of accuracy depending on the availability of detailed information on activity factors and of specific emission factors
- The estimation of methane emissions is an important tool for measuring progress of the gas industry commitment to reduce methane emissions