Monitoring report of JI project "Reduction of Methane Emissions at Flanged, Threaded Joints and Shut-down Devices of OJSC "Kyivgas" Equipment»

Monitoring period: 01.01.2009 – 31.12.2009

Version: 02 as of 29.07.2010

Contents:

[1] Appendix A is given in electronic form

Section A. General project activity and monitoring information

A.1. Title of the project

“Reduction of Methane Emissions at Flanged, Threaded Joints and Shut-down Devices of OJSC “Kyivgas” Equipment»

A.2. Status of JI project

JI project “Reduction of Methane Emissions at Flanged, Threaded Joints and Shut-down Devices of OJSC “Kyivgas” Equipment» was determined by the Bureau Veritas Certification, determination report No. UKRAINE/0125/2010 as of 08.07.2010. The project was approved by the National Environmental Investment Agency of Ukraine (Letter of Approval No. 1121/23/7 as of 28.07.2010) and Federal Office for the Environment of Switzerland (Letter of Approval No. J294-0463 as of 23.07.2010).

A.3. Short description of the project activity

The following methane emission reductions were achieved as a result of rehabilitation of the flanged, threaded joints and shut-down devices conducted by OJSC “Kyivgas” in accordance with this project:

Reduction of methane emission during 2009, m3	**74 632 223,87**
Reduction of leakage during 2009, tCO_2equiv	**1 123 423,94**

A.4. Monitoring period

Commencement: 01.01.2009
Termination: 31.12.2009

A.5. Methodology applied for project activity

A.5.1. Baseline methodology

The methodology approved by the Clean Development Mechanism Executive Committee AM0023 version 3 dated 30.10.2009 **«Reduction of natural gas leaks at compressor or gas distribution stations of main gas lines»** (http://cdm.unfccc.int/UserManagement/FileStorage/JY2L0XEKMB3HD18T7RPO6ZSFCQINGA) with the more precise definition of the method for measurement of leakage volume and as stated in clause B.1 PDD version 03.

A.5.2. Monitoring methodology

For quantitative estimation and preparation for reporting on emission reduction on the ground of baseline and project's activity the approved methodology of monitoring conducting AM0023 was applied as stated above, with the more precise definition of the method for measurement of leakage volume and as stated in clause B.1 PDD version 03.

Indefiniteness of measurement method was taken into account in the course of making calculations as to GHG emission reductions (see section D of PDD version 03).

A.6. Status of implementation including time table for major project parts

No.	Arrangements	Quantity of units of performed works, pcs.	Commencement of building	Putting into operation
2009				
9	Rehabilitation, hermetization of equipment; measuring	7	May 2009	July 2009

Table 1. Status of implementation (in accordance with PDD version 03).

7 objects were rehabilitated and hermetized during 2009.
The list of rehabilitated objects is given in Annex A.

A.7. Possible deviations or revisions of PDD registered version

There are no significant deviations from PDD registered version. Deviation of emission reductions is 0,3% with respect to emission reduction units given in the registered version of PDD.

A.8. Possible deviations or revisions of registered monitoring plan

There are no deviations from registered monitoring plan.

A.9. Persons responsible for preparation and producing of monitoring report

The following employees of OJSC “Kyivgas” are responsible for monitoring report: - head of working team, acting chief executive officer – Gladkiy A.M., and Director of VEMA S.A. - Fabian Knodel.

Section B. Key monitoring activities

B.1.1. Applied equipment

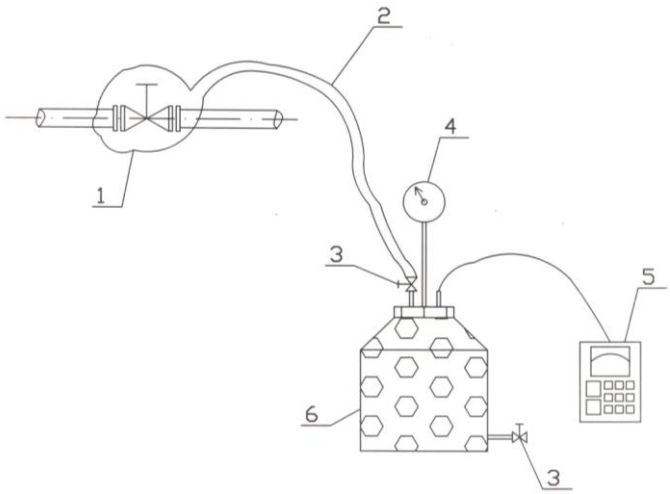
Control and monitoring system consists of three parts:

1) Measurements of methane leakage value before the rehabilitation (hermetization) of the object;
2) Measurements of methane leakage value after the rehabilitation (hermetization) of the object;
3) Archiving and processing of obtained results.

To measure leakage volume of natural gas it was decided to use the method based on the Calibrated Bag Technology described in the Approved baseline strategy AM0023 "**Reduction of natural gas leakage at compressor and gas distribution stations"**. One of the problems incurred by using this method is difficult accounting of the volume of the valves measurements are done on, and of the initial air volume upon determination of gas volume received in the bag.
A special plant was made to solve these problems. It is made on the basis of a plastic capacity of a certain volume (0,87 m^3), package, plastic hose and pressure gauge (see Picture 1). All junctions are sealed.

Picture. 1. Photo of a plant for quantitative measurement of methane leakage.

Scheme of plant is represented on Picture 2.



Picture. 2. Scheme of plant for quantitative measurement of methane leakage.

Signs:

1. Hermetic bag.
2. Hose.
3. Crane.
4. Pressure gauge.
5. Gas analyzer EX-TEC® SR5.
6. Hermetic tank.

Gas analyzer EX-TEC® SR5. To determine methane concentration in the sample a high-precision gas analyzer EX-TEC® SR5 is used.

- explosion-proof (CENELEC),
- gas detection upon control of pipeline networks (ppm range),
- gas detection at the internal installations (ppm range),
- alarm upon approaching the lower level of explosion (% UEG or Vol. %-range),

- measurement of concentration upon gas contamination and purging of lines (Vol. % range),
- measurement of concentration in probe aperture (Vol.%-range).

Relative error makes 10%, which conforms to EN 50054/57 Standard.

After detection and measurement of leaks appropriate repair of leaking areas will be done in flanged, threaded joints and shut-down devices, which will include both use of modern compacting materials and full replacement of worn equipment with new one.

B.1.2. Calibration procedure

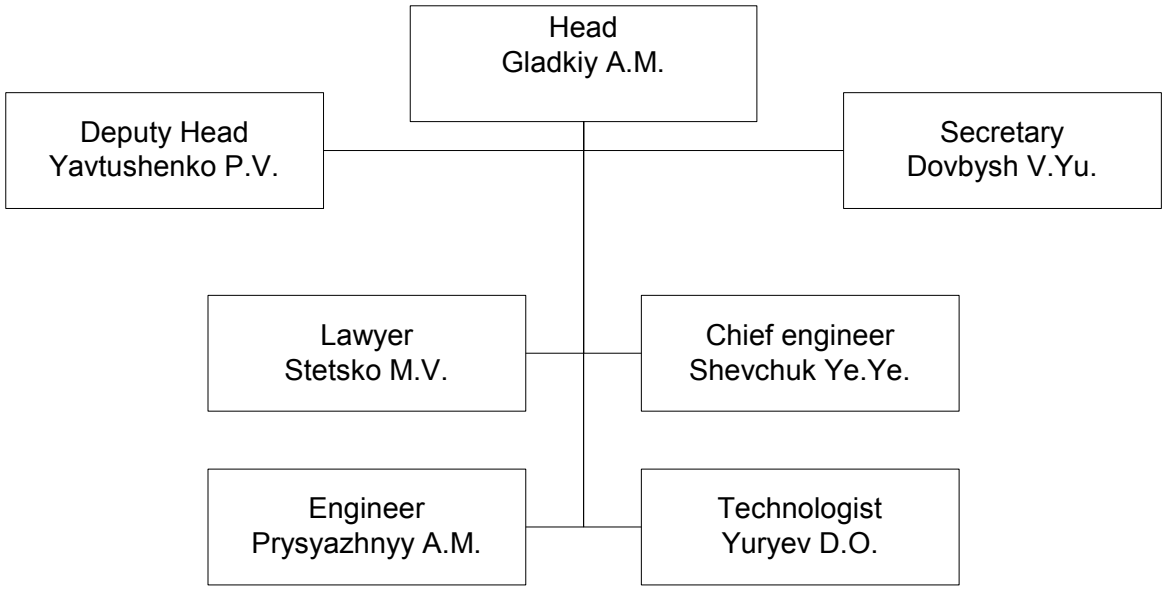
The only device used in the process of methane leakage monitoring is gas analyzer EX-TEC®. Calibration interval is 1 year.

The certificate confirming device's serviceability is issued as a result of calibration.

B.2. Data collection (accumulated data for the whole monitoring period).

B.2.1. The operational and management structure for the operator to implement monitoring plan.

Coordination of work of all departments and services of OJSC "Kyivgas" concerning project implementation is done by specially created Working team. Renewed composition of Working team is approved at meetings of Board of Management of OJSC "Kyivgas", minutes No. 15 as of 13.07.2010. The structure of Working team is shown on the Picture 3.



Picture 3. Structure of Working team.

Head of working team Gladkiy A.M. is responsible for general management of the project and coordination of all actions of the parties. Yuryev D.O. coordinates collection of all information provided for by monitoring plan, and makes all necessary calculations. Archiving of all received information in the result of measurements and settlements is done under guidance of Dovbysh V.Yu. The Deputy head of working team (Yavtushenko P.V.) on the basis of received information determines plan of measures under the Project and scope of resources required. Technical maintenance of the Project is carried out by Prysyazhnyy A.M. Legal support of the Project is carried out by Stetsko M.V.Technical supervisions of the project is conducted by Shevchuk Ye.Ye.

B.2.2. List of parameters applied in the course of calculation

Parameters applied for calculation are given below in the table 2.

Identification No.	Variable data	Source of data	Unit of data measurement	Form of data received	Comments
1. i	Serial number of bolt, cock, valve, flanged or threaded joint, where the gas leakage was detected, is eliminated and then checked	Measurement of leakage	Dimensionless	Electronic	Detected leakage is awarded with respective No. List of shut-down devices (valves, cocks, bolts), flanged and threaded joints is given in Appendix A. Check after repair is conducted.
2. T_i	Time	Results of inspection	Quantity of hour of operation of the equipment, wherein the leakage was detected within the year	Electronic	Quantity of hours pf the equipment operation during the year from the moment of its repair (replacement)

Identification No.	Variable data	Source of data	Unit of data measurement	Form of data received	Comments
3.	Date	Repair (rehabilitation) and monitoring (register) data	Date of repair (rehabilitation) and monitoring	Electronic	Date of reconstruction used together with the number of hours of equipment operation to determine general number of hours of operation Should leaks be repeated, it is taken the same as the date of last inspection which showed the absence of leakage
4. GWP_{CH4}	Global warming potential	IPCC	Tones of CO2 equiv.	Electronic	Project developer will conduct monitoring of any potential changes caused by global warming for methane, published by IPCC and approved by COP
5. $F_{CH4,i}$	Speed of leakage for each detected leakage	Leakage measurement	m3 CH4/year	Electronic	Calculated by means of the largest deviation from device's error (10% for gas analyzer)
6. t, P	Gas temperature and pressure	Data of measurements of glass mercury thermometer TL-4 and manometer «D-59H-100-1.0 6 kPa».	^{0}C and kPa	Electronic	Measured for determination of CH4 density Note: Notwithstanding measurements, many variants are not expected as pressure and temperature at different stations are taken constant
7. UR_i	Equipment uncertainty factor; measurement of leakage	Information provided by manufacturer and/or IPCC GPG	%	Electronic	Where possible, 95% confidence interval is evaluated; advice of management board given in section 6 2000 IPCC of GPG If manufacturer of equipment where leaks are measured specifies uncertainty range without specification of confidence internal, it can be taken 95%
8. *Vbag*	Reservoir capacity	Data of flow meter measurement	m^3	Electronic and paper	Reservoir is filled in with water. Amount of water measured by flow meter will be reservoir capacity Measurement showed that reservoir capacity is 0.87 m^3.

Identification No.	Variable data	Source of data	Unit of data measurement	Form of data received	Comments
9. $w_{sampleCH4,i}$	Methane concentration in sample	Data of gas analyzer EX-TEC® SR5 measurements	%	Electronic	Methane concentration in sample (in reservoir) of leak *i* is the difference between methane concentration in the beginning and in the end of measurement Concentration is measured with gas analyzer EX-TEC® SR5.
10. τ_i	Time during which methane concentration in reservoir reaches certain level	Data of measurements made by seconds counter« SOS pr-2b-2»	seconds	Electronic	Time during which methane concentration in reservoir reaches certain level is determined with stop-watch. Measurement starts from the moment the tap is opened on the tank cap and ends when methane concentration inside the reservoir reaches certain level.

Table 2. Parameters used in calculation of GHG emissions

B.2.3. Data as to leakages

There are no leakages in the course of project implementation (Methodology AM0023 doesn't provide for any leakages).

B.3. Data processing and archiving

All information will be processed and archived in electronic and/or paper form and will be kept till December 31, 2019.

B.4. Emergencies and technological breaches

There were no emergencies at gas distribution stations of OJSC "Kyivgas" in 2009.

B.5. Procedures for detection and liquidation of malfunctions at flanged, threaded joints and shut-down devices of OJSC "Kyivgas" equipment"

Detection, liquidation and registration of failures and emergencies at flanged, threaded joints and shut-down devices of OJSC "Kyivgas" equipment is carried out according to Safety rules of gas-supply systems of Ukraine.

B.6. External data (type, source, access)

External data are not used in the course of monitoring of methane emissions at gas-distribution stations of OJSC “Kyivgas”.

B.7. Error level of metering equipment

Relative error of gas analyzer EX-TEC® SR5 is 10%, meeting the standard EN 50054/57. The device is calibrated annually.

Section C. Quality assurance and quality control measures

C.1. Documented procedures and management plan

C.1.1. Roles and responsibilities

Management of the project is implemented by the acting chief executive director of OJSC "Kyivgas", Gladkiy A.M. He manages and coordinates the activities of all departments. Specially formed working team is responsible for collection and processing of the parameters.
Structure of data collection and project management is given in the Section B.2 of this Monitoring Report.

C.1.2. Trainings

There is no need to conduct trainings for operation with new equipment. All trainings related to the project were conducted by the equipment suppliers and their cost is included into the equipment cost.

C.2. Internal audits and control measures

Specially formed working team of OJSC "Kyivgas" ensures control of measurement of all necessary parameters provided for by the methane leakage monitoring plan.

C.3. Information about the indicators of project's social and environmental effect

The quality of gas supply of the region's population will be improved as a result of project implementation.
Also there will be decrease in natural gas losses and GHG emission reduction causing greenhouse effect and climate fluctuation.

Section D. Calculation of GHG emission reductions

D.1. Project emissions

Using the method for leakage volume measurement with the help of leak-proof tank, volume of methane leakage of one equipment unit can be calculated by the formula:

$F_{CH4,iP} = Vbag * w_{sampleCH4,i} * 3600 / \tau_i$, where (1)

$F_{CH4,P}$ - Methane leakage through leak point *i* through leakage element after reconstruction (m³/h);
Vbag - Volume of leak-proof tank for measurement (m³);
$w_{sampleCH4,i}$ - Concentration of methane in the leak sample *i* which is the difference of concentrations at the beginning and at the end of measurement (%);
τ_i - Average time of filling in the tank for leakage *i* after reconstruction (seconds)

Annual methane leakage is calculated by the formula:

$Q_{yP} = ConvFactor * \Sigma[F_{CH4P} * Ti,y * UR_i] * GWP_{CH4} * 0.9$, where (2)

QyP = Methane emissions for the period y, for rehabilitated equipment (tCO2eq).
ConvFactor = м³CH4 - tCH4 conversion ratio at the standard temperatures and pressure (0 °C and 101.3 kPa), it makes 0.0007168 tCH4/м³CH4
Uri = Factor taking into account uncertainty of measurement method (0,95%);
Ti,y = Time (in hours) for corresponding component i, during which it worked within the period of consideration (monitoring period) y;
GWPCH4 = Methane Global Warming Potential (21 tCO2eq/tCH4)
0.9= Equipment Error Factor.

Emissions generated after implementation of project arrangements are given in the Table 3.

Year	2009
Quantity of emissions, t CO2-eq.	70 692,65

Table 3. Project emissions tCO2eq.

D.2. Baseline emissions

Using the method for leakage volume measurement with the help of leak-proof tank, volume of methane leakage of one equipment unit can be calculated by the formula:

$F_{CH4,iB} = Vbag * w_{sampleCH4,i} * 3600 / \tau_i$, where (3)

$F_{CH4,B}$ - Methane leakage through component *i* due to leakage element before reconstruction (m³/h);
Vbag - Volume of leak-proof tank for measurement (m³);
$w_{sampleCH4,i}$ - Concentration of methane in the leak sample *i* which is the difference of concentrations at the beginning and at the end of measurement (%);
τ_i - Average time of filling in the tank for leakage *i* after reconstruction (seconds)

Annual methane leakage is calculated by the formula:

$Q_{yB} = ConvFactor * \Sigma[F_{CH4Y} * Ti,y * UR_i] * GWP_{CH4} * 0.9$, *where(4)*

QyB - Methane emissions for the period y, for equipment before the rehabilitation (tCO2eq)
ConvFactor - м³CH4 - tCH4 conversion ratio at the standard temperatures and pressure (0 °C and 101.3 kPa), it makes 0.0007168 tCH4/м³CH4
URi - Factor taking into account uncertainty of measurement method
Ti,y - Time (in hours) for corresponding component i, during which it worked within the period of consideration (monitoring period) y
GWPCH4 = Methane Global Warming Potential (21 tCO2eq/tCH4)
0.9= Equipment Error Factor.

Emissions which will be generated subject to absence of the rehabilitation arrangements are given in the Table 4.

Year	**2009**
Quantity of emissions, t CO2-eq.	1 194 116,59

Table 4. Baseline emissions tCO2eq.

D.3. Leakage

There is no leakage in the course of project implementation (Methodology AM0023 doesn't provide for leakage).

D.4. Emission reduction as a result of implementation for 2008.

Emission reduction as a result of project implementation shall be calculated as a difference in baseline and project emissions.
Quantity of emission reduction units (ERU), tCO_2eq:

$$ERU = \sum[Q_{yB} - Q_{yP}] \quad (5)$$

ERU– emission reduction units, t CO_2eq;
Q_{yP} – project emissions, t CO_2eq;
Q_{yB} – baseline emissions, t CO_2.eq

Table 5 contains the emission reductions as a result of project implementation.

Year	**2009**
Quantity of reducted emissions, t CO2-eq.	1 123 423,94

Table 5. Emission reductions tCO2eq.