

**APPROVED**

**Deputy General Director of**

**Finance and Economics**

**Mr. Zaborskiy Alexey**

# **MONITORING REPORT**

## **SF<sub>6</sub> destruction at JSC HaloPolymer Perm**

**Version 2.0**

**6 December 2011**

**Monitoring period:**

**01.01.2009–31.12.2009**

**Project operator: HaloPolymer Perm JSC**

## REFERENCE

1	Project Introduction .....	3
1.1	Monitoring period .....	3
1.2	Emission reductions for the monitoring period.....	3
1.3	Comments .....	3
2	General project activity .....	3
2.1	Title of the project.....	3
2.2	Sectoral scope: .....	3
2.3	Crediting period .....	3
2.4	Location of the project.....	3
2.5	Short description of the project (quoted from the PDD version 6.0) .....	3
2.6	Status of the project implementation .....	4
2.7	Deviations or revisions to the PDD and the monitoring plan: .....	4
2.8	Contact information on project participants responsible for the monitoring report .....	4
3	Monitoring plan and results of the project monitoring .....	5
3.1	Monitoring plan.....	5
3.1.1	Methodological approach .....	5
3.1.2	Monitored parameters in the project .....	5
3.1.3	QA/QC for the project monitoring .....	11
3.1.4	Calculation of GHG emission reductions .....	16
3.2	Actual data received from the enterprise for the monitoring report .....	
4	Results of GHG emission reductions calculation .....	
4.1	Project emission calculation.....	
4.2	Project leakage calculation .....	
4.3	Baseline emission calculation.....	
4.4	The emission reductions of the project: .....	
5	Environmental impact .....	20
5.1	Impact on the air .....	20
5.2	Wastewater and their impact.....	20
5.3	Wastes and their impact .....	20
5.4	Control of pollutant emissions .....	21

## 1 PROJECT INTRODUCTION

This Monitoring report summarizes operation of the JI project "SF<sub>6</sub> destruction at JSC HaloPolymer Perm" and is aimed at calculation of the emission reductions achieved by the project activity during the period covered by this report.

### 1.1 Monitoring period

01 January 2009 0:00 to 31 December 2009 23:59.

### 1.2 Emission reductions for the monitoring period

Current report takes into account CO<sub>2</sub> emission reduction generated during the Monitoring period. Detailed calculations are to be found in subsection 3.1.4.

**The actual generation of ERUs for the monitoring period is 2 059 529 tons CO<sub>2eq</sub>.**

**Table 1. Emission reductions in 2008-2009**

Periods	Emission reductions, tCO <sub>2eq</sub>
01/01/2008 – 31/12/2008	2 347 724
01/01/2009 – 31/12/2010	2 059 009

### 1.3 Comments

This is the second monitoring report since the determination of the project. The report is prepared in accordance with the determined project design documentation (PDD) "SF<sub>6</sub> destruction at JSC "HaloPolymer Perm" Version 6 dated 02 November 2011. All the data are collected and emission reductions calculation is made in accordance with the procedures described in Section D "Monitoring Plan" of the determined PDD.

On September 15, 2011 the Government of the Russian Federation adopted a resolution # 780 "On Measures for the Implementation of Article 6 of the Kyoto Protocol to the UN Framework Convention on Climate Change". This document approves Regulations on the implementation of article 6 of the Kyoto Protocol. According to paragraph 2 of the Resolution, the projects will be approved by the Ministry of Economic Development of the Russian Federation.

In accordance with the law of the Russian Federation applicable to the implementation of JI projects, the Project can be approved after a positive opinion is given by the Accredited Independent Entity.

## 2 GENERAL PROJECT ACTIVITY

### 2.1 Title of the project

SF<sub>6</sub> destruction at JSC "HaloPolymer Perm"

### 2.2 Sectoral scope:

Sector 11: Fugitive emissions from production and consumption of halocarbons and sulphur hexafluoride.

### 2.3 Crediting period

01 January 2008 – 31 December 2012

### 2.4 Location of the project

The considered project is located in Perm, Perm Krai, Russia. The city is administrative center of the Perm Krai. It was founded in 1723. The population is 991 500 people. "HaloPolymer Perm" is a large enterprise and significant employer in the region.

### 2.5 Short description of the project (quoted from the PDD version 6.0)

The aim of the project is to destruct SF<sub>6</sub> waste streams contributing thus to the improvement of environment situation in Perm-city and to reduction of GHG emissions. SF<sub>6</sub> is a GHG gas with a high global warming potential (GWP) that is 23 900 tons of CO<sub>2</sub> equivalent per one ton of SF<sub>6</sub>.

*Situation existing prior to the starting date of the project (quoted from the PDD Section A.2)*

SF<sub>6</sub> production line was put into operation in 1982. During the process a considerable part of sulphur hexafluoride (approximately 20% of SF<sub>6</sub> output) is lost as emissions at rectification columns.

The enterprise has relevant experience of fluorine organic compounds (FOC) destruction. Thermal destruction unit for fluorine organic compounds was installed at the plant and have been successfully operated since 1987. All equipment and technology are certified in compliance with the Russian standards and meet all applicable environmental requirements.

In the absence of the legislative and economic incentives to utilize (or destruct) wastes of SF<sub>6</sub> production the plant would continue to emit the SF<sub>6</sub> containing gaseous wastes in the atmosphere. This situation is the baseline scenario.

Realization of the proposed project activity is implemented under the second stage of modernization of the thermal destruction unit (TDU) and leads to destruction of SF<sub>6</sub> waste streams at the FOC thermal destruction unit and includes the following measures:

- Installation of stillage residue receiver;
- Installation of blowing-off transmission line from SF<sub>6</sub> production to thermal destruction unit with installation of receiver;
- Installation of measuring and control equipment.

For destruction of wastes in TDU the natural gas is directed in the TDU. SF<sub>6</sub> is utilized along with the gaseous wastes of HCFC-22 and monomer-4 production, but in a separate furnace unit of TDU. The technology and equipment for the project are developed by a domestic special-purpose institute and are certified in conformity with the norms of the Russian Federation and meet all environment protection requirements.

## 2.6 Status of the project implementation

The PDD v.6.0 for the current project was submitted to Bureau Veritas Certification Rus<sup>1</sup> (hereinafter AIE) for determination in September 2011. In course of the determination the PDD was amended and as a result the final version 6.0 was issued 02 November 2011. A positive expert opinion was received for the PDD v.6.0<sup>2</sup>. The final version 6.0 of the PDD describes the project in full details. The destruction process had been started from 01.01.2008. The date of the first emission reductions is 01 January 2008.

The project was implemented as it is described in the final version 6.0 of the PDD. The starting date of the project is 01/11/2007, date when the installation of the project equipment started. The date when the project became operational is 01/01/2008. The implementation of the project fully corresponds to the implementation schedule presented in the PDD v6.0.

The SF<sub>6</sub> destruction project had been carried out under the second stage of the TDU modernization and included implementation of the following measures:

- Installation of stillage residue receiver;
- Installation of blowing-off transmission line from SF<sub>6</sub> production to thermal destruction unit with installation of receiver;
- Installation of measuring and control equipment.

Currently all actions according to the project are totally completed.

- Stillage residue receiver was commissioned according to the Certificate of acceptance in operation.
- Blowing-off transmission line was commissioned according to the Certificate of acceptance in operation.
- Receiver for waste collection was commissioned according to the Certificate of acceptance in operation.

All equipment had been successfully installed and is fully operational. Project data is being gathered continuously since 01.01.08.

## 2.7 Deviations or revisions to the PDD and the monitoring plan:

There are no deviations to the final version 6.0 of the PDD or to the established monitoring plan.

## 2.8 Contact information on project participants responsible for the monitoring report

### **Contact person on project participants:**

*Project operator and investor:*

HaloPolymer Perm JSC, Russian Federation, 614113 Perm, Lasvinskaya str., 98

Pavel Boyko, General director

Tel.: +7 342 250 61 52, [info@halopolymer-perm.com](mailto:info@halopolymer-perm.com)

<sup>1</sup> Bureau Veritas Certification Rus is an Accredited Independent Entity (AIE)

<sup>2</sup> Positive expert opinion together with the Determination report has been provided to verifiers.

Tel.: +7 342 250 61 52, [www.halopolymer.com](http://www.halopolymer.com)

*Holding company:*

HaloPolymer, Russian Federation, 123056 Moscow, Leningradskiy av., 31A bldg. 1

Igor Kuznetsov, Project director

Tel: +7 495 725 4400, [i.kuznetsov@halopolymer.com](mailto:i.kuznetsov@halopolymer.com)

Tel: +7 495 725 4400, [www.halopolymer.com](http://www.halopolymer.com)

March 9, 2011 the extraordinary general meeting of shareholders JSC "Halogen" decided to change the brand name of a legal entity and the approval of the charter in the new edition. March 17, 2011 to the Unified State Register of Legal Entities entry was made to change the brand name of "Halogen" on "HaloPolymer Perm" and re-charter in the new edition. Changing the name is not a reorganization, not alter the rights and responsibilities of the entity. Occurring in the text of the Report of the name of the investor "Halogen" and "HaloPolymer Perm" are considered equal.

### **3 MONITORING PLAN AND RESULTS OF THE PROJECT MONITORING**

#### **3.1 Monitoring plan**

##### **3.1.1 Methodological approach**

###### **3.1.1.1 Baseline methodology**

The baseline was developed in compliance with the "Guidance on criteria for baseline setting and monitoring"<sup>3</sup>. The project developer uses JI specific approach, but definitely coordinating it with the requirements set forth in Decision 9/CMP.1, Annex B "Criteria for baseline setting and monitoring"<sup>4</sup>

###### **3.1.1.2 Monitoring methodology**

Selection of monitoring approach was made in compliance with the "Guidance on criteria for baseline setting and monitoring" version 03 and requirements of the Decision 9/CMP.1, Appendix B "Criteria for baseline setting and monitoring". The project developer used JI specific approach for establishing the monitoring. The monitoring plan data should be stored for at least 2 years after the end of the crediting period and after the last ERU tranche under the project.

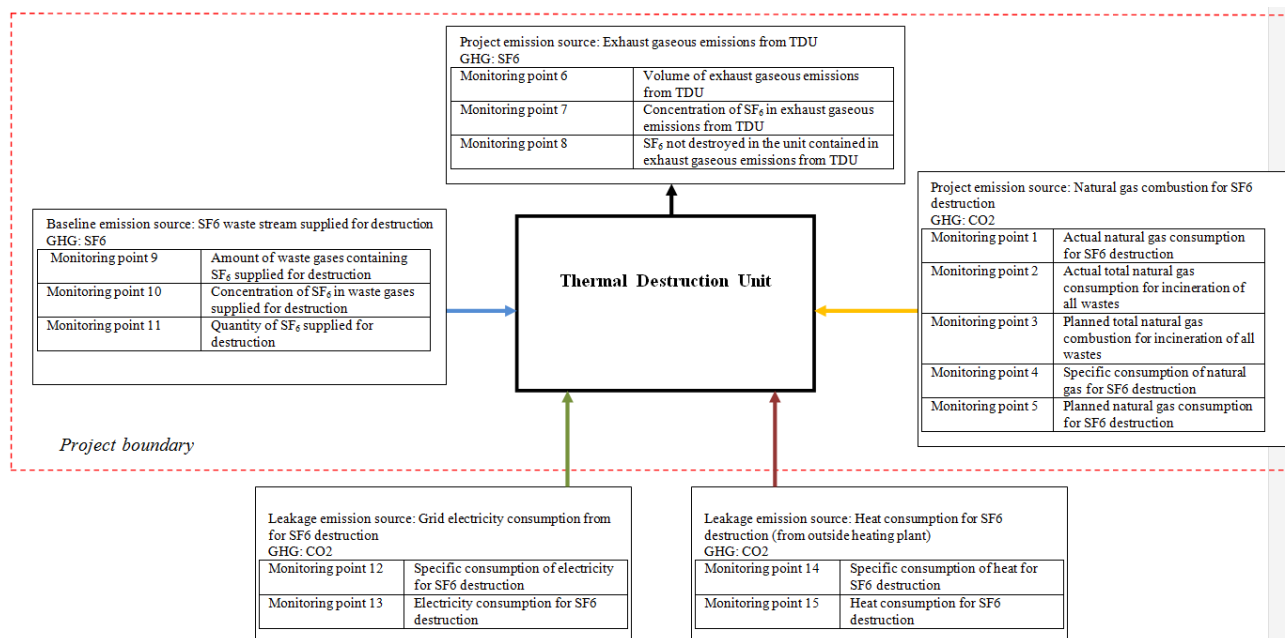
###### **3.1.2 Monitored parameters in the project**

Project boundaries and monitoring points are in the diagram below:

---

<sup>3</sup> Guidance on criteria for baseline setting and monitoring (version 03), JISC

<sup>4</sup> Report of the Conference of the parties serving as the meeting of the Parties to the Kyoto Protocol on its first session, held at Montreal from 28 November to 10 December 2005. Decision 9/CMP.1 Guidelines for the implementation of Article 6 of the Kyoto protocol. Appendix B Criteria for baseline setting and monitoring. p.12-13.



#### Provision of conservatism

1. The measurement of amount of SF<sub>6</sub> waste supplied for destruction is made by two down-in-line stationary mass flow meters installed on the inlet pipelines to the destruction unit. The readings are automatically collected, stored and processed by Automated Process Control System (APCS). The APCS automatically calculates the conservative value of the SF<sub>6</sub> waste supplied for destruction based on the readings from two down-in-line mass flow meters.
2. The measurement of natural gas consumption is carried out since the start of operation of Kyoto project and is common for both HFC-23 and SF<sub>6</sub> destruction process. Actually the consumption of natural gas has been already taken into account in HFC-23 project and consecutive monitoring reports. But for conservatism sake the same values of natural gas consumption are also applied for SF<sub>6</sub> destruction project.
3. As prescribed in the paragraph 18 of Guidance on criteria for baseline setting and monitoring (Version 03) "Project participants must undertake an assessment of the potential leakage of the proposed JI project and explain which sources of leakage are to be calculated, and which can be neglected. All sources of leakage that are included shall be quantified and a procedure for an ex ante estimate shall be provided. Only those emission sources that account for, on average per year over the crediting period, more than 1 per cent of the difference between project and baseline emissions, or which exceed an amount of 2,000 tonnes of CO<sub>2</sub> equivalent, whichever is lower, shall be included. The leakage assessment provided below shows that these emissions are less than 1% of the difference between project and baseline emissions. Nevertheless those emissions will be taken in to account in the monitoring to be conservative.
4. When assessing CO<sub>2</sub> emission factor from heat consumption, it is assumed that the heat efficiency of a combined heat and power plant is 40% . However, according to a scientific article published by Novosibirsk State Technical University the heat production efficiency of CHPP is 54,7%<sup>5</sup>. But we take 40% to be more conservative.

#### 3.1.2.1 GHG gases and source

The following GHG gases and their sources are considered in the monitoring plan (Please see the Table 2 below)

**Table 2. GHG gases and their sources**

Source	GHG gas
Baseline emission source: Waste SF <sub>6</sub> emissions that were avoided as a result of the project realization	SF <sub>6</sub>
Project emission source: SF <sub>6</sub> emissions that were not destroyed in TDU	SF <sub>6</sub>
Project emission source: Emissions from natural gas combustion for destruction process	CO <sub>2</sub>
Leakage source: Consumption of electricity for SF <sub>6</sub> destruction	CO <sub>2</sub>
Leakage source: Consumption of heat for SF <sub>6</sub> destruction	CO <sub>2</sub>

<sup>5</sup> [http://www.esco-ecosys.ru/2010\\_3/art040.pdf](http://www.esco-ecosys.ru/2010_3/art040.pdf). See Fig. 4.8 "Energy flows of split and combined process" on page 59.

3.1.2.2 Data to be collected according to the monitoring plan (Please see the Table 3):

**Table 3. Data to be collected**

<b>ID number</b>	<b>Data variable</b>	<b>Source of data</b>	<b>Data unit</b>	<b>Measured (m), calculated (c), estimated (e)</b>	<b>Recording frequency</b>	<b>Proportion of data to be monitored</b>	<b>How will the data be archived? (electronic/paper)</b>	<b>Comment</b>
<b>1. <math>FC_{NG,SF_6y\_fact}</math></b>	<i>Actual natural gas consumption for SF<sub>6</sub> destruction process over a reporting period y</i>	<i>See formula D.1.-2</i>	$m^3$	<i>c</i>	<i>monthly</i>	<i>100%</i>	<i>Electronic/paper</i>	<i>Actual natural gas consumption is determined each month on a basis of the planned norm of natural gas consumption for GHG gas destruction and taken in into account overconsumption or saving of natural gas supplied in TDU over a past month.</i>
<b>2. <math>FC_{NGy\_total}</math></b>	<i>Total measured consumption of the natural gas for destruction of all wastes incinerated in TDU over a reporting period y</i>	<i>Mass flow meter</i>	$m^3$	<i>m</i>	<i>monthly</i>	<i>100%</i>	<i>Electronic/paper</i>	<i>Apart from GHG gases (HFC-23 and SF<sub>6</sub>) also wastes from other production facilities are incinerated in TDU. Only the total natural gas supplied in TDU for destruction of all wastes is measured by volume flow meter.</i>
<b>3. <math>FC_{NG\_total\_plan}</math></b>	<i>Estimated total consumption of the natural gas for destruction of all wastes incinerated in TDU over a reporting period y</i>	<i>Calculation provided by the production manager of the shop 26.</i>	$M3$	<i>c</i>	<i>Monthly</i>	<i>100%</i>	<i>Electronic/paper</i>	<i>Production manager of the shop 26 (where TDU is installed) estimates each month the planned volume of natural gas consumed for destruction of all wastes. For this he multiplies the quantity of an incinerated waste by a planned norm of natural gas consumption to destruct the waste.</i>
<b>4. <math>SFC_{NG,SF_6}</math></b>	<i>Specific</i>	<i>The planned</i>	<i>Ths</i>	<i>c</i>	<i>Yearly</i>	<i>100%</i>	<i>Electronic/paper</i>	<i>Planned norms are</i>

ID number	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
	<i>consumption of natural gas for destruction of SF<sub>6</sub></i>	<i>norm of natural gas consumption for destruction of GHG gases</i>	<i>m<sup>3</sup>/t</i>					<i>established on yearly basis by Technical Department and approved by Chief Engineer (subject to reconsideration depending on actual gas consumption norms over the year past). The actual consumption norms are calculated each month according to the Method of calculation of natural gas consumption for combustion of separate waste types approved by Chief Engineer of JSC Halogen on 29/08/08.</i>
<b>5. FC<sub>NG,SF6,y_plan</sub></b>	<i>The planned natural gas consumption for SF<sub>6</sub> destruction over a reporting period y</i>	<i>Formula D1.- 4</i>	<i>m<sup>3</sup></i>	<i>c</i>	<i>monthly</i>	<i>100%</i>	<i>Electronic/paper</i>	<i>See PDD section D 1.1.2.</i>
<b>6. q<sub>NDy</sub></b>	<i>Volume of exhaust gaseous emissions from destruction unit over a reporting period y</i>	<i>Mobile flow meter</i>	<i>m<sup>3</sup></i>	<i>m</i>	<i>Weekly</i>	<i>100%</i>	<i>Electronic/paper</i>	<i>Measurement of effluent gases from the destruction unit is made by analytical method. For that purpose the speed of effluent gas is measured weekly by portable flow meter. The measurements are documented and summary reports are archived during 10 years. Measurements are used for calculation of effluent gases volume (average</i>



ID number	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/paper)	Comment
								<i>effluent gas speed for a period is multiplied by area of the venting pipe and length of period).</i>
<b>7. <math>w_{SF_6,ND} y</math></b>	<i>Concentration of SF<sub>6</sub> in gaseous emissions from destruction unit over a reporting period y</i>	<i>Chromatograph</i>	<i>mg/m<sup>3</sup></i>	<i>m</i>	<i>Weekly</i>	<i>100%</i>	<i>Electronic/paper</i>	<i>Measurement of SF<sub>6</sub> concentration in effluent gases are performed by laboratory weekly based on the gas samples from the venting pipe after destruction unit. Gas samples are analyzed based on approved methods, measurements are made by chromatographs.</i>
<b>8. <math>ND_{SF_6} y</math></b>	<i>Quantity of SF<sub>6</sub> not destroyed in the unit during the reporting period y</i>	<i>Formula D.1-2</i>	<i>t</i>	<i>C</i>	<i>Quarterly</i>	<i>100%</i>	<i>Electronic/paper</i>	<i>See PDD section D 1.1.2.</i>
<b>9. <math>q_{SF_6} y</math></b>	<i>Amount of waste gases containing SF<sub>6</sub> supplied for destruction</i>	<i>two mass flow meter</i>	<i>Kg</i>	<i>m</i>	<i>Monthly (continues measurement)</i>	<i>100%</i>	<i>Electronic/paper</i>	<i>Measured directly before thermal destruction unit. Monthly data is the sum of the accumulated data.</i>
<b>10. <math>w_{SF_6,P},Y</math></b>	<i>Concentration of SF<sub>6</sub> in waste gases supplied for destruction</i>	<i>Chromatograph</i>	<i>%</i>	<i>m</i>	<i>Weekly</i>	<i>100%</i>	<i>Electronic/paper</i>	<i>Measured once per day</i>
<b>11. <math>Q_{SF_6} y</math></b>	<i>Quantity of SF<sub>6</sub> supplied for destruction in the unit</i>	<i>Formula D1-7</i>	<i>t</i>	<i>c</i>	<i>Quarterly</i>	<i>100%</i>	<i>Electronic/paper</i>	<i>See PDD subsection D 1.1.4</i>

ID number	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
<b>12. SEC<sub>ELEC,y</sub></b>	<b>Specific electricity consumption for SF<sub>6</sub> destruction</b>	<i>Planned electricity consumption norm for destruction of GHG gases</i>	<i>MWh/t</i>	<i>c</i>	<i>Yearly</i>	<i>100%</i>	<i>Electronic/paper</i>	<i>For determining electricity consumption the planned consumption norm is applied at the JSC "HaloPolymer Perm". Planned norms are established on yearly basis for the next year by Technical Department and approved by Chief Engineer (subject to reconsideration depending on actual electricity consumption over the year past).</i>
<b>13. EC<sub>y</sub></b>	<b>Electricity consumption for SF<sub>6</sub> destruction</b>	<i>Data on monitoring of TDU operation in 2008-2010.</i>	<i>MWh</i>	<i>c</i>	<i>Monthly</i>	<i>100%</i>	<i>Electronic/paper</i>	<i>Electricity consumption for SF<sub>6</sub> destruction is calculated by the project manager of the shop 26 and checked by the head of Technical Department</i>
<b>14. SHC<sub>HEAT,y</sub></b>	<b>Specific heat consumption for SF<sub>6</sub> destruction</b>	<i>Planned norm of heat consumption norm for destruction of GHG gases</i>	<i>GJ/t</i>	<i>c</i>	<i>Yearly</i>	<i>100%</i>	<i>Electronic/paper</i>	<i>For determining heat consumption the planned consumption norm is applied at the JSC "HaloPolymer Perm". Planned norms are established on yearly basis by Technical Department and approved by Chief Engineer (subject to reconsideration depending on actual heat consumption over the year past).</i>
<b>15. HC<sub>y</sub></b>	<b>Heat</b>	<i>Data on</i>	<i>GJ</i>	<i>c</i>	<i>Yearly</i>	<i>100%</i>	<i>Electronic/paper</i>	<i>Heat consumption for SF<sub>6</sub></i>

ID number	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
	<b>consumption for SF<sub>6</sub> destruction</b>	monitoring of TDU operation in 2008-2010.						destruction is calculated at Technical Department

### 3.1.3 QA/QC for the project monitoring

**Table 4. QA/QC for the project monitoring**

Data	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
<b>FC<sub>NG,SF<sub>6</sub>y_fact</sub></b>	low	Actual natural gas consumption for SF <sub>6</sub> destruction is estimated with the use of approved consumption norms taking into account actual overconsumption or saving of natural gas over the past months. The calculation is provided each month by the production manager of shop 26 according to the Method of calculation of natural gas consumption for combustion of separate waste types approved by Chief Engineer of JSC Halogen on 29/08/08. The calculation checked and analyzed against the natural consumption in previous periods by the head of Technical Department.
<b>FC<sub>NGy_total</sub></b>	low	Flow meter consisting of standard diaphragm DKS-06-80-A/B-1, differential pressure gage AIP-20-ДД and gas corrector SPG-762. Recalibration interval for the standard diaphragm is 5 years; for differential pressure gage is 2 years and for gas corrector is 4 years. Recalibration is provided by the Department of Chief Metrologist of JSC "HaloPolymer Perm".
<b>FC<sub>NG_total_plan</sub></b>	low	Estimation of total consumption of the natural gas for destruction of all wastes incinerated in TDU is provided with the use of approved consumption norms taking into account actual overconsumption or saving of natural gas over the past months. The calculation is provided each month by the production manager of shop 26 according to the Method of calculation of natural gas consumption for combustion of separate waste types approved by Chief Engineer of JSC Halogen on 29/08/08. The calculation checked and analysed against the natural consumption in previous periods by the head of Technical Department.
<b>SFC<sub>NG,SF<sub>6</sub></sub></b>	low	Planned norms are established on yearly basis by Technical Department and approved by Chief Engineer (subject to reconsideration depending on actual gas consumption norms over the year past).
<b>q_NDy</b>	low	The measurement is provided by portable flow meter TESTO according to Quantitative Chemical Analysis of Air. Procedure of measurement of SF <sub>6</sub> mass concentration in the air of the working zone and in the industrial emissions by gas-chromatographic method. # 469-00-2010 signed by Chief Metrologist and approved by Chief Engineer dd 19/03/2010. The calibration is provided yearly by Perm Centre for Standardization, Metrology and Certification.

<b>Data</b>	<b>Uncertainty level of data (high/medium/low)</b>	<b>Explain QA/QC procedures planned for these data, or why such procedures are not necessary.</b>
<b><i>W<sub>SF6,ND y</sub></i></b>	<i>low</i>	<i>Chromatograph LKhM-80 is used. The calibration is provided yearly by Perm Centre for Standardization, Metrology and Certification according to the calibration method. Cross-checked with the previous chromatograph analysis is provided.</i>
<b><i>q<sub>SF6 y</sub></i></b>	<i>low</i>	<i>According to QMS, the measurement, processing and storage of data on utilization of SF6 waste streams in TDU is carried out by the Automated Process Control System, namely "APCS of SF6 waste stream utilization". The APCS is established on a base of a programme-technical complex (PTC): SCADA-system "Cascade" (Cheboksary, Russia) and of a multifunctional microprocessor controller "Contrast" KP-500. SF6 waste streams are measured with two on-line mass flow meters PROMASS 83F15. Data from mass flow meters over two parallel channels come in modules of communication device with object (CDO), which are included in the set the "Contrast" KP-500 controller. Having been processed the information is channeled in the work stations. Failure-tolerance of the system and data safety are guaranteed by two work stations (main and standby) working in a "hot" backup mode. Relative error of PROMASS Flow meter is 0,1%. Recalibration interval of mass flow meters is 4 years. Recalibration is provided by laboratory of the company "Endress+Hauser Flowtec AG" Quantity of SF6 not destroyed in the unit during the reporting period is determined each month with application of data (ID-4 and ID-5) that measured with checked and calibrated instruments.</i>
<b><i>W<sub>SF6,PJ,y</sub></i></b>	<i>low</i>	<i>Sampling of SF6 waste stream for determination of SF6 concentration is carried out according to the approved procedure M14UK2011 "Procedure of measurements of mass shares of oxygen, nitrogen, tetrafluormethane and sulphur hexafluoride in SF6 wastes by chromatographic method". Measurements are provided by 2 chromatographs (Cristallux-4000M ) according Recalibration interval is 4 years. The calibration is provided yearly by Perm Centre for Standardization, Metrology and Certification.</i>
<b><i>Q<sub>SF6 y</sub></i></b>	<i>low</i>	<i>Quantity of SF6 supplied for destruction is determined each month with application of data (ID-7 and ID-8) that measured with checked and calibrated instruments.</i>
<b><i>SEC<sub>ELEC,y</sub></i></b>	<i>low</i>	<i>For determining electricity consumption the planned consumption norm is applied at the JSC "HaloPolymer Perm". Planned norms are established on yearly basis for the next year by Technical Department and approved by Chief Engineer (subject to reconsideration depending on actual electricity consumption over the year past).</i>
<b><i>EC,y</i></b>	<i>low</i>	<i>Electricity consumption for SF6 destruction is calculated by the project manager of the shop 26 and checked by the head of Technical Department against the electricity consumption over the previous months. If considerable distortion is found the reason of that is analyzed in order to eliminate.</i>
<b><i>SHC<sub>HEAT,y</sub></i></b>	<i>low</i>	<i>For determining heat consumption the planned consumption norm is applied at the JSC "HaloPolymer Perm". Planned norms are established on yearly basis by Technical Department and approved by Chief Engineer (subject to reconsideration depending on actual heat consumption over the year past).</i>
<b><i>HC,y</i></b>	<i>low</i>	<i>Heat consumption for SF6 destruction is calculated by the project manager of the shop 26 and checked by the head of Technical Department against the electricity consumption over the previous months. If considerable distortion is found the reason of that is analyzed in order to eliminate.</i>

### 3.1.3.1 Personnel training

Training of workers and maintenance qualification upgrade for personnel has been made during the project realization.

The personnel of SPPM responsible for the boiler operation was trained by the specialists of base project equipment supplier in order to secure proper operation of the project equipment.

### 3.1.3.2 The operational and management structure applied in order to implement the monitoring plan

All aspects of organizational and management structure of monitoring plan of SF<sub>6</sub> destruction project are in compliance with the effective Quality Management Standard "Procedure of process organization for destruction of SF<sub>6</sub> " adopted at JSC "HaloPolymer Perm". Under the QMS, the head of Technical Department (TD) is a key focal point at the plant responsible for gathering of relevant parameters and submission of input monitoring data for elaborating a monitoring report. According to QMS the information addressed to him is coming from the following sources:

1. SF<sub>6</sub> waste streams. These data is supplied, daily and weekly, from the engineer-technologist of the shop 22 at which SF<sub>6</sub> is produced:
  - The engineer-technologist prepares and prints out daily reports on SF<sub>6</sub> waste streams with a by-hour breakdown in accord with the adopted form<sup>6</sup>.
  - The engineer-technologist prepares and prints out monthly reports on SF<sub>6</sub> waste streams with a by-day breakdown in accord with the adopted form<sup>7</sup>.The head of TD checks and signs the reports.
2. SF<sub>6</sub> concentration in waste streams. These data is provided from Quality Management Laboratory. Sampling of SF<sub>6</sub> waste streams at the inlet of TDU is carried out by technological service of the shop according to a schedule of analytical control. Under analysis two parallel evaluations are carried out (two chromatograms are recorded, calculated and printed out). Lab assistant fills in a chromatogram certificate that indicates a position, the date and time of sampling and surname of an operator<sup>8</sup>. At the end of analysis each file of chromatogram must be automatically stored in appropriate data base of a personal computer that services the chromatograph. A printed out protocol must include filled chromatogram certificate, chromatogram's curve and the table of peaks with calculation results. Printed out copies are attached in the special file. The head of QM Laboratory controls the accuracy of analysis and the results. Based on monthly data the head of QM Laboratory prepares a report on SF<sub>6</sub> mass concentration (%) in a waste stream for all sampling points with attachment of the results of analysis and calculated average monthly concentration. The report is checked and signed by the head of the shop.
3. SF<sub>6</sub> quantity and concentration in waste streams not destroyed in TDU. These data are provided from the head of air service laboratory. Initial information on analysis of SF<sub>6</sub> concentration in exhaust gases and measuring velocity of exhaust gas stream are prepared by the lab assistant and are registered with the log. Further on the lab engineer prepares weekly and monthly reports on analysis of SF<sub>6</sub> concentration and calculation of exhaust emissions and submits reports to the head of air service laboratory for approval.
4. Time of operation work of TDU. The head of shop 26 (in this shop the thermal destruction unit is installed) provides approved monthly reports to the head of TD. This data is supplied from the production manager of the shop who gathers information from the automated control system.
5. Natural gas consumption for SF<sub>6</sub> destruction. This information is submitted from the production manager of the shop 26. The initial data on measurement of total natural gas consumption is gathered and processed by the engineer-planimetrist. The results are provided to the chief metrologist who approves and send them to the production manager of the shop 26. The production manager of the shop 26 calculates each month the planned total natural gas consumption and actual natural gas consumption for destruction of SF<sub>6</sub>.

<sup>6</sup> See form in the PDD Annex 3. Monitoring Plan

<sup>7</sup> See form in the PDD Annex 3. Monitoring Plan

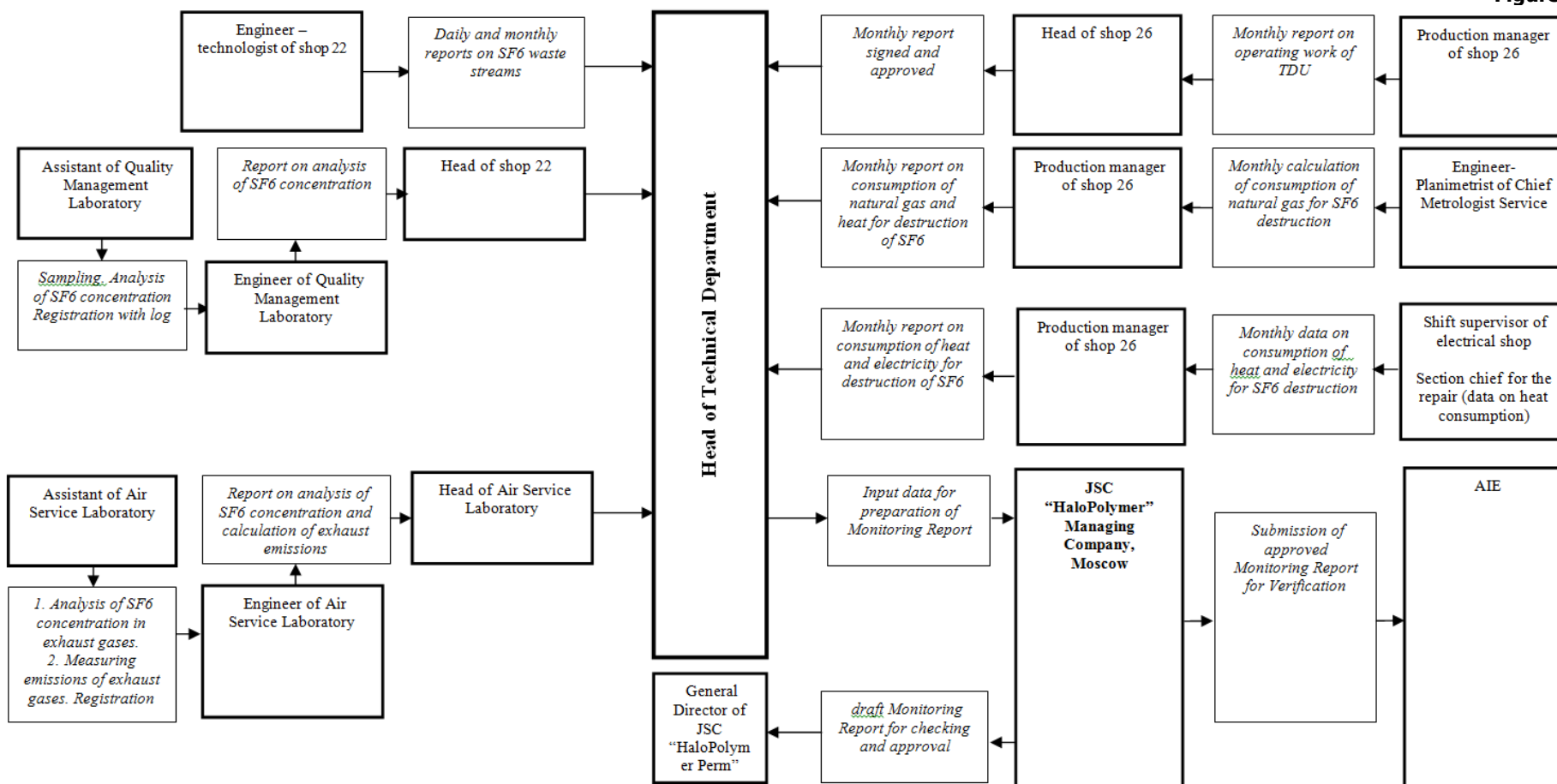
<sup>8</sup> See the form in PDD Annex 3. Monitoring Plan.

6. Electricity and heat consumption for SF<sub>6</sub> destruction. This information provided monthly to the head of Technical Department by the production manager of the shop 26. The production manager calculates the monthly heat and electricity consumption multiplying the SF<sub>6</sub> waste quantity supplied for destruction by the planned consumption norm of heat or electricity.

Finally the head of TD processes the gathered information and submits it to a managing company, JSC "HaloPolymer", Moscow. Based on the input data the draft Monitoring Report is prepared and submitted it back to JSC "HaloPolymer Perm" for approval by the General Director. The approved MR is submitted by JSC "HaloPolymer" to AIE for verification. Further on the organizational chart of the monitoring for SF<sub>6</sub> destruction project is provided.

### 3.1.3.3 Organizational chart of the monitoring for SF<sub>6</sub> destruction project

**Figure 1**



Calculations of emission reductions will be prepared by specialists of JSC "HaloPolymer" in the end of each reporting period. All data will be stored in paper and electronically at least for two years after the last ERU tranche under the project.

### 3.1.4 Calculation of GHG emission reductions

#### GHG project emissions during reporting period of 2009, tCO<sub>2</sub>e:

$$PE_y = ND\_SF_6_y * GWPSF_6 + FC_{NG,SF_6y\_fact} * CF_{NG} * EF_{CO_2,NG} * 10^{-6} \quad (3.1.-1)$$

Where

ND\_SF<sub>6</sub><sub>y</sub> is the quantity of SF<sub>6</sub> not destroyed in the unit during the reporting period y, t;

GWP SF<sub>6</sub> is the Global Warming Potential (GWP) for SF<sub>6</sub>, t CO<sub>2</sub>e/t SF<sub>6</sub>. The approved GWP value for SF<sub>6</sub> is 23 900 t CO<sub>2</sub>e/t SF<sub>6</sub> for the first commitment period under the Kyoto Protocol.

FC<sub>NG,SF<sub>6</sub>y\\_fact</sub> is the actual natural gas consumption for SF<sub>6</sub> destruction process over a reporting period y, m<sup>3</sup>;

$$FC_{NG,SF_6,y\_fact} = FC_{NG,SF_6,y\_plan} * FC_{NGy\_total\_measured} / FC_{NGy\_total\_plan} \quad (3.1.-2)$$

FC<sub>NG\_total measured</sub> is the measured total consumption of natural gas for destruction of all wastes incinerated in the TDU over a reporting period y, m<sup>3</sup>;

FC<sub>NG\_total plan</sub> - is the planned total consumption of natural gas for destruction of all wastes incinerated in the TDU, over a reporting period y m<sup>3</sup>. The estimate of the planned total consumption is provided by the production manager of the shop 26.

FC<sub>NG,SF<sub>6</sub>y\\_plan</sub> is the planned natural gas consumption for SF<sub>6</sub> destruction process over a reporting period y, m<sup>3</sup>

$$FC_{NG,SF_6,y\_plan} = 0,001 * q\_SF_6_y * SFC_{NG/SF_6\_plan} \quad (3.1.-3)$$

SFC<sub>NG/SF<sub>6</sub></sub> is specific natural gas consumption for destruction of SF<sub>6</sub>; as SFC<sub>NG/SF<sub>6</sub></sub> the planned norm of natural gas consumption for destruction of GHG gases is assumed to be conservative, ths m<sup>3</sup>/t;

q\_SF<sub>6</sub><sub>y</sub> is the amount of waste gases containing SF<sub>6</sub> supplied for destruction over a reporting period y, kg

CF<sub>NG</sub> – conversion-to-energy units factor for natural gas, equals to 33,812 TJ/mln m<sup>3</sup>; <sup>9</sup>

EF<sub>CO<sub>2</sub>,NG</sub> – CO<sub>2</sub> emission factor for the natural gas combustion, equals to 56,1 tCO<sub>2</sub>/TJ;

**Table 5. Calculated CO2 project emissions associated with natural gas combustion for SF6 destruction**

#	Item	Designation	Units	2009
1	SF6 waste stream supplied for destruction	q_SF6y	kg	92415
2	Specific fuel consumption for SF6 destruction process	SFC,y	ths m3/t	1,08
3	Natural gas consumption for destruction process	FC <sub>NGy</sub>	m3	100022
6	Conversion to energy units factor for natural gas	CF <sub>NG</sub>	TJ/mln m3	33,812
7	CO2 emission factor for the natural gas combustion	EF <sub>CO<sub>2</sub>/NG</sub>	tCO <sub>2</sub> /TJ	56,100
8	Project emissions due to natural gas consumption	PE <sub>CO<sub>2</sub>/NG</sub>	tCO <sub>2</sub> e	190

<sup>9</sup> This value is taken from National Report on Cadaster of Anthropogenic Emissions from Sources and Absorption by Sinks of Greenhouse Gases Not Regulated by Montreal Protocol for 1990-2009. Part 1. Moscow, 2011. Table 3.5, page 38.



$$ND\_SF_{6y} = q\_ND_y * w_{SF6,NDy} * 10^{-9} \quad (3.1-4)$$

$q\_ND_y$  is the volume of exhaust gaseous emissions from destruction unit over a reporting period  $y$ , m<sup>3</sup>;

$w_{SF6,NDy}$  – is the mass concentration of SF<sub>6</sub> in gaseous emissions from destruction unit, mg/m<sup>3</sup>

**Table 6. Calculated SF<sub>6</sub> project emissions, in tons of CO<sub>2</sub> equivalent**

#	Item	Designation	Unit	2009
1	Volume of gaseous emissions from destruction unit	$q\_NDy$	m <sup>3</sup>	17006454
2	Concentration of SF <sub>6</sub> in gaseous emissions from destruction unit	$w_{GE}$	mg/m <sup>3</sup>	0,1
3	Global Warming Potential for SF <sub>6</sub>	$GWP_{SF6}$	tCO <sub>2</sub> /tSF <sub>6</sub>	23900
4	Quantity of SF <sub>6</sub> not destroyed in the unit during	$PE_{ND}$	tSF <sub>6</sub>	0,002
			tCO <sub>2</sub> e	40,645

**Table 7. Total GHG project emissions**

#	Item	Designation	Units	2009
1.	Quantity of SF <sub>6</sub> not destroyed in the unit during	$PE_{ND}$	tCO <sub>2</sub> e	41
2.	CO <sub>2</sub> project emissions from natural gas combustion	$PE_{CO2,NG}$	tCO <sub>2</sub> e	190
3.	Total project emissions	$PE$	tCO <sub>2</sub> e	230

**GHG baseline emissions during the reporting period of 2009, tCO<sub>2</sub>e:**

$$BE_y = Q\_SF_{6y} * GWPSF_{6y} \quad (3.1.-5)$$

Where

$Q\_SF_{6y}$  is the quantity of SF<sub>6</sub> supplied for destruction in the unit during the reporting period  $y$ , tSF<sub>6</sub>

$$Q\_SF_{6y} = 0,001 * q\_SF_{6y} * w_{SF6,y} * 10^{-2} \quad (3.1.-6)$$

$q\_SF_{6y}$  is the amount of waste gases containing SF<sub>6</sub> supplied for destruction, kg;

$w_{SF6,y}$  is the concentration of SF<sub>6</sub> in waste gases supplied for destruction, %.

**Table 8. Calculated baseline emissions, in tonnes of CO<sub>2</sub> equivalent**

#	Item	Designation	Unit	2009
1.	Amount of waste gases containing SF <sub>6</sub> supplied for destruction	q_SF6y	kg	92415
2.	Average concentration of SF <sub>6</sub> in waste gases supplied for destruction <sup>10</sup>	W_SF6y	%	93,23
3.	Quantity of SF <sub>6</sub> supplied for destruction in the unit	Q_SF6y	t	86
4.	Global Warming Potential for SF <sub>6</sub>	GWP_SF6	tCO <sub>2</sub> e/tSF <sub>6</sub>	23900
5.	Baseline emissions	BEy	tCO <sub>2</sub> e	2059529

### Leakage CO<sub>2</sub> emissions associated with grid electricity supply for SF<sub>6</sub> destruction

Such emissions are determined according to the formula:

$$LE_{ELEC,y} = ECy * EF_{CO_2,ELEC,y} * 10^{-3} \quad (3.1.-7)$$

Where

ECy is consumption of the electricity for destruction of SF<sub>6</sub>, MWh;

$$ECy = SEC_{ELEC,y} * q_{SF6,y} \quad (3.1-8)$$

SEC<sub>ELEC,y</sub> - is the specific electricity consumption for SF<sub>6</sub> destruction, MWh/t<sup>11</sup>;

q\_SF6,y - the amount of waste gases containing SF<sub>6</sub> supplied for destruction the reporting period y, t;

**Table 9. CO<sub>2</sub> emissions due to electricity consumption for destruction of SF<sub>6</sub>**

#	Item	Designation	Unit	2009
1.	Amount of waste gases containing SF <sub>6</sub> supplied for destruction <sup>12</sup>	q_SF6y	kg	92415
2.	Specific electricity consumption for SF <sub>6</sub> destruction	SEC <sub>ELEC,y</sub>	MWh/t	4,47
3.	Electricity consumption	EC,y	MWh	413,000
4.	CO <sub>2</sub> emission factor for grid electricity <sup>13</sup>	EF <sub>CO<sub>2</sub>,ELEC, y</sub>	tCO <sub>2</sub> /MWh	0,631
5.	CO <sub>2</sub> emissions due to electricity consumption for destruction of SF <sub>6</sub>	LE <sub>ELEC,y</sub>	tCO <sub>2</sub>	260,60

<sup>10</sup> Document "Summary monitoring data" prepared by Technical Department of JSC "HaloPolymer Perm" is available on the auditors' request

<sup>11</sup> The planned consumption norms of energy resources adopted at JSC "HaloPolymer Perm" is available on auditors' request

<sup>12</sup> Information source: actual data of monitoring of SF<sub>6</sub> destruction in 2008-2010 and forecast for 2011-2012 provided by JSC "HaloPolymer Perm"

<sup>13</sup> Information source: European Bank for Reconstruction and Development. Baseline Study. Development of the electricity carbon emission factors for Russia. 09 Sept. 2010. Table 5-2. CO<sub>2</sub> emission factors for Demand Side for Russian Federation.

2. *Leakage CO<sub>2</sub> emissions associated with heat supply for SF<sub>6</sub> destruction.*

$$LE_{HEAT,y} = HC_y * EF_{CO_2,NG} * 10^{-3}; \quad (3.1-9)$$

HC<sub>y</sub> is the consumption of the heat for destruction unit, GJ;

$$HC_y = SHC_{r,HEAT,y} * q_{SF6,y} \quad (3.1-10)$$

SHC<sub>r,HEAT,y</sub> - is the specific heat consumption for SF<sub>6</sub> destruction, GJ/t<sup>14</sup>;

EF<sub>CO<sub>2</sub>,NG</sub> – CO<sub>2</sub> emission factor for heat consumption tCO<sub>2</sub>/TJ. This factor equal to 140,3 tCO<sub>2</sub>/TJ and is determined by division of CO<sub>2</sub> emission factor for the natural gas<sup>15</sup> (56,1 tCO<sub>2</sub> – the value is taken from 2006 IPCC Guidelines for National GHG Inventories) in 0,4 (heat efficiency of a combined heat and power plant ).

**Table 10. CO<sub>2</sub> emissions due to heat consumption for destruction of SF<sub>6</sub>**

#	Item	Designation	Unit	2009
1	Amount of waste gases containing SF <sub>6</sub> supplied for destruction	q_SF6y	kg	92415
2	Specific heat consumption for SF <sub>6</sub> destruction	SHC <sub>r,HEAT,y</sub>	GJ/t	2,20
3	Heat consumption	HC <sub>y</sub>	GJ	203,441
4	CO <sub>2</sub> emission factor for heat consumption	EF <sub>CO<sub>2</sub>,HEAT,y</sub>	tCO <sub>2</sub> /TJ	140,3
5	CO <sub>2</sub> emissions due to heat consumption for destruction of SF <sub>6</sub>	LE <sub>HEAT,y</sub>	tCO <sub>2</sub>	28,53

**Total leakage CO<sub>2</sub> emissions**

$$LE_y = LE_{ELEC,y} + LE_{HEAT,y} \quad (3.1-11)$$

**Table 11. Total leakage emissions in 2009**

Total leakage emissions	LE <sub>y</sub>	tCO <sub>2</sub>	289
-------------------------	-----------------	------------------	-----

**Emission reductions during the reporting period of 2009 in t CO<sub>2</sub>e are calculated as follows:**

$$ER_y = BE_y - PE_y - LE_y \quad (3.1-12)$$

**Table 12. Emission reductions in 2009**

Project emissions (tonnes of CO <sub>2</sub> equivalent)	Leakage (tonnes of CO <sub>2</sub> equivalent)	Baseline emissions (tonnes of CO <sub>2</sub> equivalent)	Emission reductions (tonnes of CO <sub>2</sub> equivalent)
230	289	2 059 529	2 059 009

<sup>14</sup> The planned consumption norms of energy resources adopted at JSC "HaloPolymer Perm" is available on auditors' request

<sup>15</sup> Main type of fuel for heat and power plants in Perm krai.

#### **4 ENVIRONMENTAL IMPACT**

The environmental work is conducted by the enterprise in the area of air protection, protection of water, recycling of wastes. HaloPolymer Perm fully obeys all requirements of Russian legislation on the environmental protection.

HaloPolymer Perm regularly makes payments for negative impact on the environment. The company has been developed and agreed with authorities in the prescribed manner:

- Design of limits of maximum permitted emissions;
- Design of limits of permitted emissions in water bodies;
- Design of limits of wastes generation and disposal.

Monitoring compliance with environmental protection legislation is implemented in the course of inspections and audits conducted by inspecting agencies and HaloPolymer Perm department of environmental protection.

Article 32 of the Federal Law on Environmental protection #7-FZ prescribes that: "Environmental impact assessment is conducted for economic and other projects, which may directly or indirectly influence the state of the environment, irrespective of ownership type of the subjects of economic and other activities."

##### **4.1 Impact on the air**

As a result of thermal destruction there is no increase in the amounts of sulfur hexafluoride emissions into the atmosphere is going to happen. The degree of purification of the main component (SF<sub>6</sub>) is not lower than 99.99%, the content of sulfur hexafluoride in the exhaust gases from the unit below the sensitivity of the method (less than 0.1 mg/m<sup>3</sup>).

##### **4.2 Wastewater and their impact**

During destruction of sulfur hexafluoride in the thermal destruction unit an additional volume of wastewater containing salts of NaCl and Na<sub>2</sub>SO<sub>4</sub> is produced. The total discharge of harmful substances in the water body (reservoir Votkinskoye) does not exceed the established limits.

##### **4.3 Wastes and their impact**

Solid wastes, which are additionally formed during sulfur hexafluoride destruction, are the chemical sludge of the wastewater treatment plant at the neutralization station. They are accumulated at the sludge storage.

On the basis the environment impact assessment due to the project implementation the followings findings can be set as follows:

- The project envisages the creation of the installation of high technical level that guarantees safety for its ecological environment;
- The installation will be provided by qualified personnel with experience with similar chemicals and waste;
- The project provides for conservation measures that reduce to the minimum possible negative impact on the environment (emission coefficient of purification of the gas mixture is 99.99%, the formation of liquid and solid industrial wastes within the established limits and permits).

The technical solutions under the proposed project will reduce its environmental impacts and have the following effects:

- Compliance with environmental requirements, reduction of emissions of air pollutants
- Prevention of pollution of water basins above the applicable environmental standards
- Prevention of pollution of territory, surface and ground waters, provided that the requirements for industrial waste storage, disposal and utilization are met.

Moreover, due to the project, the greenhouse gas emissions of JSC "HaloPolymer Perm" will be significantly reduced.

In 2008 the Company voluntarily addressed Western Ural Department of the Federal Service on Environmental, Technology and Nuclear Supervision (RosTechNadzor) with a proposal to set Maximal Permissible Emission on SF<sub>6</sub>. In 2009 RosTechNadzor established such MPE in the amount of 18,703 tonnes of SF<sub>6</sub>. The calculation of project emissions of not destroyed SF<sub>6</sub> in 2009 demonstrates an insignificant level of SF<sub>6</sub> emissions which equals to 0,002

tSF<sub>6</sub> that is far less than the set MPE level.

#### 4.4 Control of pollutant emissions

On the ground of Time Schedule for MPE Compliance Control on emission sources of JSC "HaloPolymer Perm" approved by Chief Engineer and by a Volga regional office of Federal State Agency "Center of Laboratory Analysis and Technical Measurements" the plant's air service laboratory implements the control for atmospheric pollutant emissions. The thermal destruction unit is registered as a source # 478. Gaseous effluents of HCl, HF, and NO<sub>x</sub> are regularly measured on this source. Consolidated amount of atmospheric pollutant emissions is included in the annual report 2-TP (air), which is submitted to Federal Service for Nature Management (Rosprirodnadzor). Additionally to the control program implemented by JSC "HaloPolymer Perm" the Bashkir Republican Scientific-Research Environmental Center monitors dioxins emissions with periodicity of 2 times in a year. Over the period of implementation of SF<sub>6</sub> destruction project there have not been incidents associated with exceeding of consolidated annual pollutant emissions.