

# **Environmental Report 2018**

Company Galantaterm s.r.o. elaborates an internal environmental report every year in order to provide information to the shareholders, the bodies of the company and the public about influence of the company's activities on environment.

The report is based upon the reports of previous years. It contains some essential data on the company as shareholders' structure, technology of production, inputs into production process, these data did not change in the observed period, the operating schedule and technical operational parameters of equipment also remained stable. However, the report periodically updates data on those components of environmental protection which are being monitored regularly and which are regarded to be the key components of air pollution and pollution of surface waters. The data used in this report are included in information systems of the company, they were collected by the employees of the company and provided by accredited laboratories. The data reflect the impacts of company's activity on the environment reliably.

## **Foundation and Shareholders of the Company**

The founders and first shareholders of Galantaterm s.r.o. were the Municipality of Galanta, Slovenský plynárenský priemysel a. s., Bratislava (Slovak Gas Industry), Orkuveita Reykjavíkur, Iceland, Slovgeoterm, a.s. Bratislava and Nordic Environment Financial Corporation (NEFCO) Helsinki. The company was founded in 1995 and at that time it was the first company in Slovakia using geothermal energy for district heating by central heat supply.

From the foundation of the company we have registered two changes in the owners' structure. In 2007 NEFCO sold its shares to the Municipality of Galanta.

In 2014, the initial shareholder Slovenský plynárenský priemysel a.s. (SPP, a.s.) transferred its shares to its 100% daughter company SPP Infrastructure a.s.

This change did not have any influence on the portion of ownership.

Municipality of Galanta is the majority shareholder with 77.50% of shares, the other shareholders are: SPP Infrastructure a.s. Bratislava with 17.50% of shares, Orkuveita Reykjavíkur, Reykjavík, Iceland with 4.50% of shares and Slovgeoterm, a.s. Bratislava with 0.50% of shares.

## **Short Description of the Company's Activity**

For production of heat and hot tap water Galantaterm s.r.o. utilizes a local, low-emission source: geothermal water. The company uses combined method of heat production. The main source of heat is geothermal water and a less volume of natural gas is used for additional heating if required. The company has been operating two geothermal wells (FGG- 2 and FGG-3) of the depth 2 101 and 2 102 m which serve as primary sources of energy. Their heat potential covers the heat demand until  $-2^{\circ}\text{C}$  of outside temperature. In case of lower temperatures, the needed energy is supplied by the reserve/auxiliary source of heat – a peak-load gas boiler plant. It consists of four hot water boilers fuelled by natural gas. The gas boilers also serve as a 100% reserve in cases when the production from geothermal wells is stopped for some reason.

The production of geothermal water from the wells is controlled by a computer according to the actual need of heat. The geothermal water is exploited by pumps and is conducted from the wells into a separation station where it is degassed, and the sand particles are separated. After that it is conducted to the heat exchanger station of the Energycentre by a pre-insulated pipeline. The geothermal heat exchanger station is the basic station for transferring the heat energy of geothermal water into the distribution system of secondary circuit. The geothermal water is

conducted into a collector and goes through a system of counter-current plate heat exchangers and gradually transfers heat energy into the individual heating systems of the housing estate Sever and Hospital of St. Lucas Galanta.

The thermally used geothermal is discharged into the reservoir of Hydroelectric Power Plant Kráľová through a pumping station at Kaskady

## Heat Production in the Year 2018

In 2018, there were not any changes in the production process. As in the previous years the main inputs into the process of heat production and preparation of hot tap water were geothermal water from the wells FGG-2, FGG-3, drinking water supplied by the company Západoslovenská vodárenská spoločnosť and natural gas supplied by SPP a.s.

The drinking water is used as heat-transfer fluid (after chemical treatment, as system water) circulating in the heating system and for production of domestic hot water for the consumers.

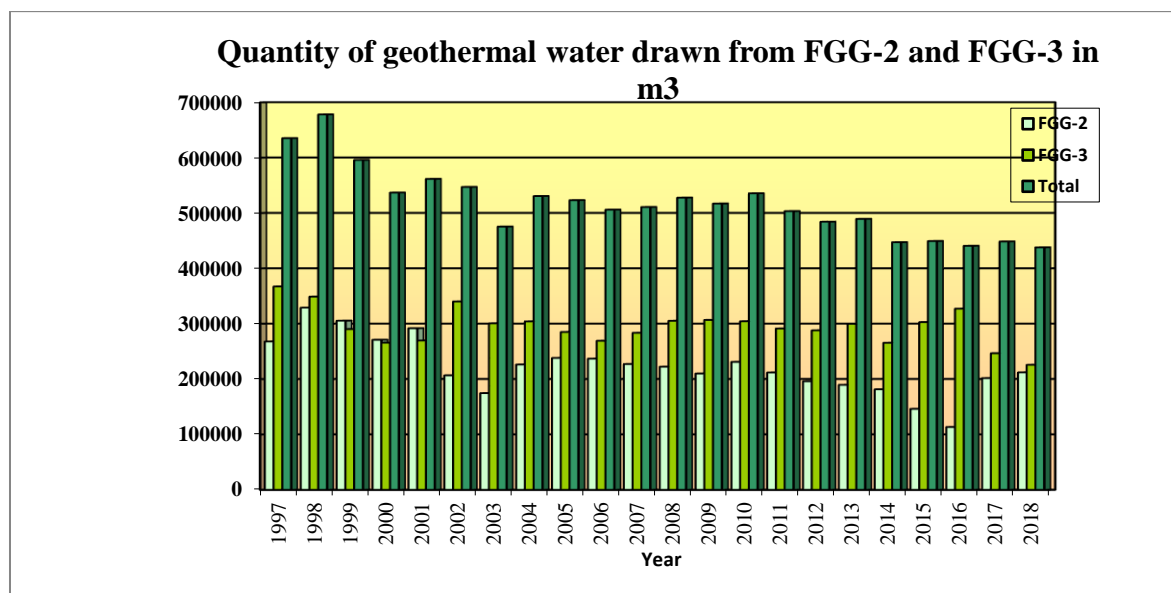
This water is heated by the natural source of heat (geothermal water) by heat exchangers.

The production of heat and hot water is controlled by the control system consisting of autonomous regulators which drive the technological equipment of heat exchanger station and the wells and ensure the optimal heating according to equithermic curves.

## Consumption of Geothermal Water

In 2018, the total volume of exploited **geothermal water** from the two wells was **437 961 m<sup>3</sup>**. This volume is less (by 10 717 m<sup>3</sup>) than the volume consumed in the year 2017 (448 678 m<sup>3</sup>). Graph 1 shows exploitation of geothermal water from the wells FGG-2, FGG-3 in the period from 1997 to 2018.

Graph1



Licence for exploitation of geothermal water from the wells FGG-2, FGG-3 (reference number KÚ ŽP, O, RF, RE/215/350/96/An) was issued by the Regional Environmental Office Trnava on 18 November 1996.

To the date 31 December 2018 the licence had to be reconciled with the amended legislation, with Act No. 364/2004 on Waters Coll. and with Public Notice of the Ministry of Environment No. 51/2008. The new licence was subject to an additional hydrogeologic research and

elaboration of a final report with calculation of groundwater volumes. The *Final Report with Calculation of the Volume of Geothermal Water in the wells FGG-2, FGG-3* was submitted to the Ministry of Environment of the SR and then approved by the Commission for Approval of Groundwater Quantities by which the requirements of the law were met. The Ministry of Environment issued *Decision on Approval of the Final Report with Calculation of Groundwater Quantities* (Ser. No.: 352/2018, Reg. No.: 65453/2018) on 19 December 2018.

On the basis of above Decision, the Environmental Department of District Office Trnava issued a new licence for exploitation of geothermal waters from the wells FGG-2, FGG-3 for energetic purposes (reference number OU-TT-OSZP-2019/006176/GI) as follows:

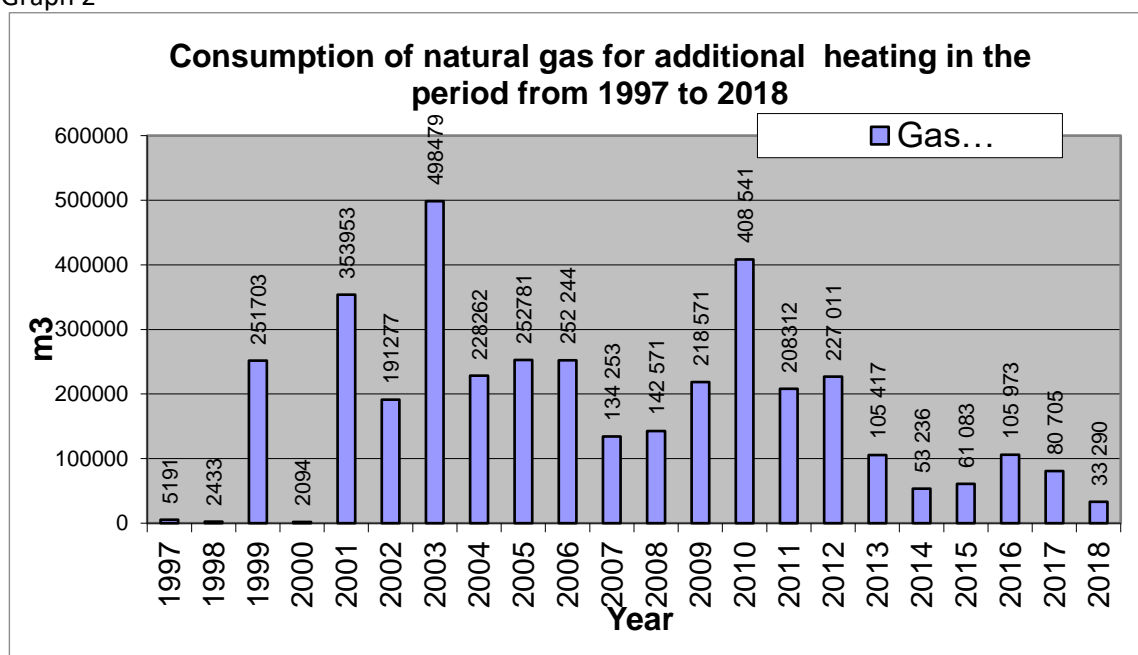
- **In heating period**, the total exploitable quantity of geothermal water (jointly from FGG-2 and FGG-3) is **27.2 l/s** (2 350.08 m<sup>3</sup> per day)
- **In summer period**, the total exploitable quantity of geothermal water (jointly from FGG-2 and FGG-3) is **8.71 l/s** (752.544 m<sup>3</sup> per day).

### Consumption of Natural Gas

In **2018**, the company used **33 290 m<sup>3</sup>** of **natural gas** for additional heating. This quantity shows a **decrease by 47 415 m<sup>3</sup>** in comparison to the consumption of the year 2017 when **80 705 m<sup>3</sup>** of natural gas was consumed.

Graph 2 shows consumption of natural gas for additional heating in the period from 1997 to 2018.

Graph 2



From the above quantities of geothermal water and natural gas **59 933 GJ** (16 648.06 MWh) **of energy** was produced. From that **59 198 GJ** (16 443.89 MWh) was generated **from geothermal water** and **735 GJ** (204.17 MWh) was gained **from natural gas**.

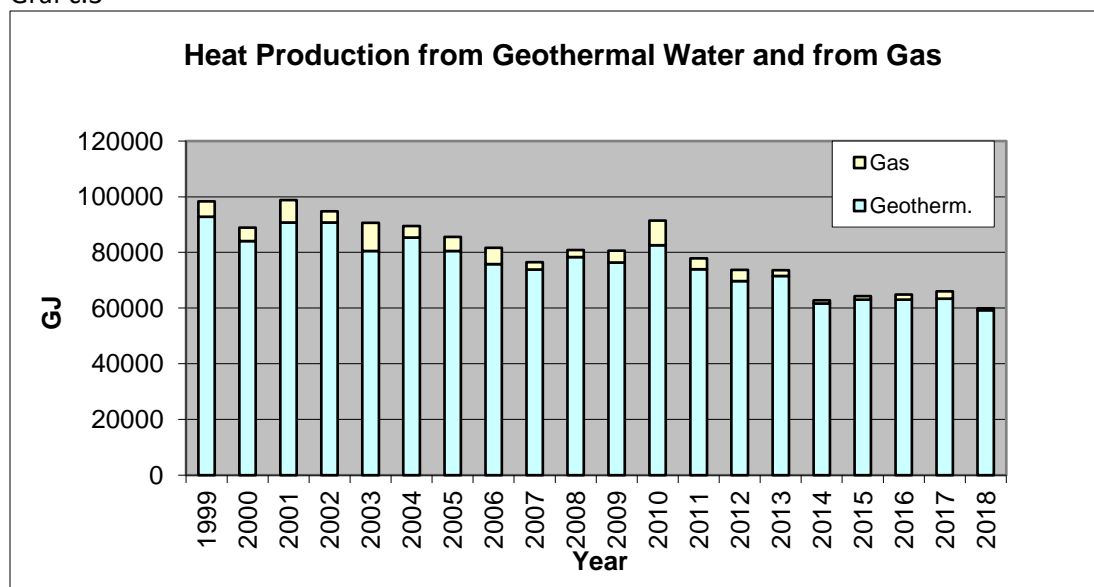
Expressed in percentages: the **98.77 %** of energy was produced from geothermal water and **1.23 %** from natural gas.

If we compare production data of the years 2017 and 2018, we can state that the heat production in 2018 decreased by 6 142 GJ (1 706. 11 MWh). 4 147 GJ less heat was produced from geothermal water and 1 995 GJ less heat from natural gas.

The remarkable decrease in production and sale of heat was caused by several factors. One of them is the fact that in previous years a complete refurbishment of residential buildings was being performed at the housing estate Sever which included the change of windows, external insulation of the buildings, replacement of inner distributors of heat and hot water, installation of thermostatic valves, hydraulic regulation of inner distributors of heat and hot water. This reconstruction resulted in reduction of energy performance of residential buildings. Further on, in 2017 complete reconstruction of horizontal distributors of central heat supply was performed. After it the heat loss in distributors has decreased by 6%. The specific consumption of hot water decreased by 9% as compared to the preceding year. Finally, the reduction in heat production was caused by milder winter. In 2018 the heating season ended on 12 April 2018 and started on 16 October 2019. In long term view the year 2018 was extremely warm.

Graph 3 shows the development of heat production from geothermal water and from natural gas in the period from 1999 to 2018

Graf č.3



### Consumption of Drinking Water

In the year 2018, the company consumed **54 291.00 m<sup>3</sup> of drinking water**. From that 126.00 m<sup>3</sup> was chemically treated and used as system water circulating in the heating system and **54 165.00 m<sup>3</sup>** was used for production of hot tap water supplied to the consumers.

### Consumers

**In 2018, we had the following consumers:**

Bysprav s.r.o. Galanta (a housing company)

Technospol Slovakia s.r.o.

Anna Hauková

Gastrocentrum s.r.o

Materská škola – Óvoda Sever (a kindergarten)

Hospital of St. Lucas in Galanta a.s.

Patria –Retired People’s Home in Galanta

Regional Office of Public Health, Galanta  
 SBD Sládkovičovo a Galanta (a housing cooperative)  
 Pohoda seniorov s.r.o. (an old people's home)  
 Basic School of Gejza Dusík, Galanta  
 KOI CARP SLOVAKIA s.r.o.  
 Facility Group (administrator of residential buildings)  
 Contesta spol. s r.o (administrator of residential buildings)  
 Skyfit s.r.o. Duba Juraj (a fitness centre)  
 Jozef Bugyi  
 TRIMONT Slovakia s.r.o.  
 Kaskády s.r.o  
 Supply of thermally used geothermal water to Galandia s.r.o. is suspended due to temporary cessation of its operation.

## **Environmental Impact of Our Activity**

One of the main objectives of establishment of our company was the reduction of old environmental burdens but this ecological way of heat production also produces minimalised but measurable and carefully monitored pollution of the air which derives from two sources: from geothermal water and from natural gas.

### **Emissions from Geothermal Water**

Gases included in the geothermal water are eliminated in separation tanks. Their analyses are performed twice a year, one analysis is made in summer period, when the production of geothermal water is lower, and one analysis is carried out during the main heating season in winter.

Table 1 shows the results of analyses of gases included in the geothermal water in the year 2018.

Table 1

<b>Well</b>	<b>FGG-2</b>		<b>FGG-3</b>	
<b>Date of sampling</b>	<b>02.03.2018</b>	<b>02.03.2018</b>	<b>31.07.2018</b>	
<b>Analysis No.</b>	<b>180307/009</b>	<b>180307/009</b>	<b>180802/008</b>	
<b>Composition</b>		<b>% vol.</b>	<b>% vol.</b>	
Methane	26.40	51.49	52.44	
Ethane	0.37	1.43	1.61	
Propane	0.16	0.55	0.48	
i-Butane	0.07	0.15	0.1	
n-Butane	0.03	0.08	0.06	
i-Pentane	0.03	0.04	0.02	
n-Pentane	0.01	0.01	0.01	
Cont.of hydrocarbon > n-Pentane	0.03	0.02	0.0300	
Oxygen	0.35	0.22	0.19	
Nitrogen	61.02	31.53	22.22	
<b>CO2</b>	<b>11.53</b>	<b>14.48</b>	<b>22.84</b>	
Sulphur			0.04	

## CO<sub>2</sub> Emissions from Geothermal Water in 2018

Emissions of CO<sub>2</sub> from geothermal water are calculated on the on the basis of water/gas ratio in the geothermal water, percentage of CO<sub>2</sub> in the gas and the quantity of geothermal water produced from the wells. (Table2) The volume of CO<sub>2</sub> in geothermal water in the year 2018 is shown in Table 2.

Table No.2

Well	FGG-2	FGG-3
Quantity of water (m <sup>3</sup> )	212144	225817
CO <sub>2</sub> (vol. %)	11.53	18.66
Water/Gas ration	0.07304734	0.0666749
Average temp. (°C)	78.14	74.27
Volume of CO <sub>2</sub> (t/y)	<b>2.59</b>	<b>4.74</b>

In the year 2018 CO<sub>2</sub> emissions from geothermal water amounted to **7.33 t/y**.

## CO<sub>2</sub> Emissions from Natural Gas in the Year 2018

Emissions of CO<sub>2</sub> from natural gas are calculated by the formula:

$$\text{Emission CO}_2 \text{ [t/y]} = \text{consumed gas} \times \text{heat value} \times \text{emission factor} \times \text{oxidation factor}$$

Calculation of CO<sub>2</sub> emissions from natural gas in the period 1997 – 2018 (for Energycentre) is shown in Table 3.

Table 3

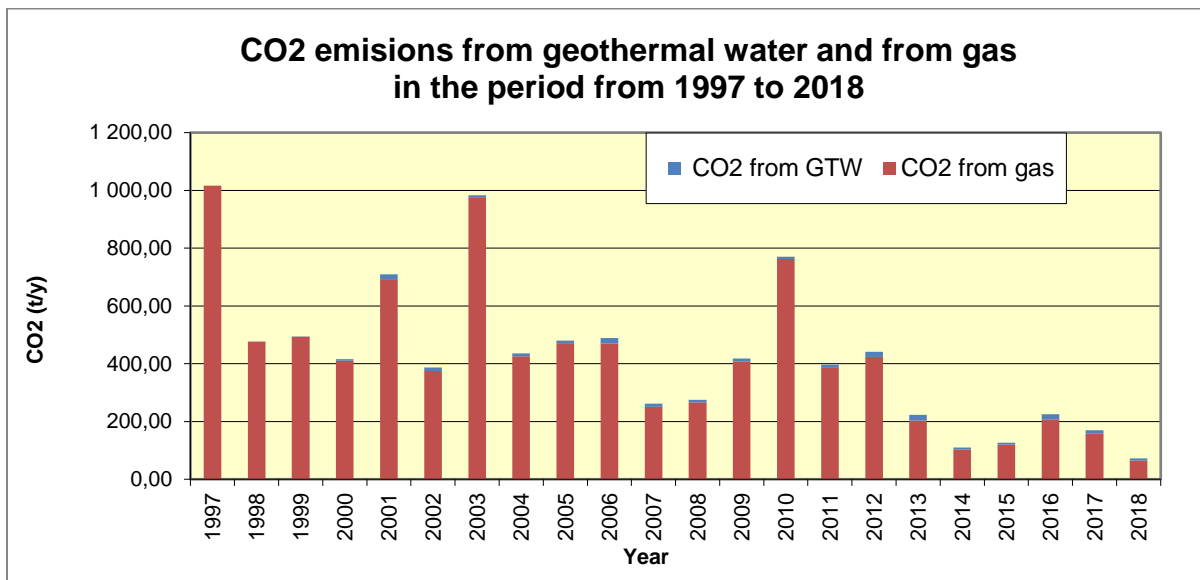
Year	Consumed gas mill m <sup>3</sup>	Heat value MJ/m <sup>3</sup>	Emission factor tCO <sub>2</sub> /TJ	Oxidation factor	Total CO <sub>2</sub> (t/y) Energycentre
1997	0.5191	33.411	58.92	0.995	1 016.78
1998	0.2433	33.411	58.92	0.995	476.56
1999	0.251703	33.411	58.92	0.995	493.02
2000	0.2094	33.411	58.92	0.995	410.16
2001	0.353953	33.411	58.92	0.995	693.3
2002	0.191277	33.411	58.92	0.995	374.66
2003	0.498479	33.411	58.92	0.995	976.39
2004	0.228262	33.411	56.1	0.995	425.71
2005	0.252781	33.411	56.1	0.995	471.43
2006	0.252 244	33.411	56.1	0.995	470.42
2007	0.134 253	33.441	56.1	0.995	250.37
2008	0.142 571	33.441	56.1	0.995	266.13
2009	0.218 571	33.441	56.1	0.995	407.62
2010	0.408 541	33.441	56.1	0.995	762.61
2011	0.208312	33.441	56.1	0.995	388.48
2012	0.227011	33.441	56.1	0.995	423.45
2013	0.105417	34.686	55.53	1.00	203.05
2014	0.053236	34.85	55.76	1.00	103.45
2015	0.061083	35.0541	55.7483	1.00	119.37
2016	0.089664	35.0778	55.7810	1.00	207.35
2017	0.080705	34.9548	55.7810	1.00	157.3597
<b>2018</b>	<b>0.033290</b>	<b>34.8981</b>	<b>55.6758</b>	<b>1.00</b>	<b>64.6818</b>

The total of CO<sub>2</sub> emissions from gas in the year 2018 was **64.6818 t/y**.

**The total of CO<sub>2</sub> emissions from the activity of Galantaterm s.r.o. Galanta was 72.0118 t/y in 2018, from that 7.33 t/y was from geothermal water and 64.6818 t/y from natural gas.**

The development of CO<sub>2</sub> emissions from 1997 to 2018 is shown in Graph 4.

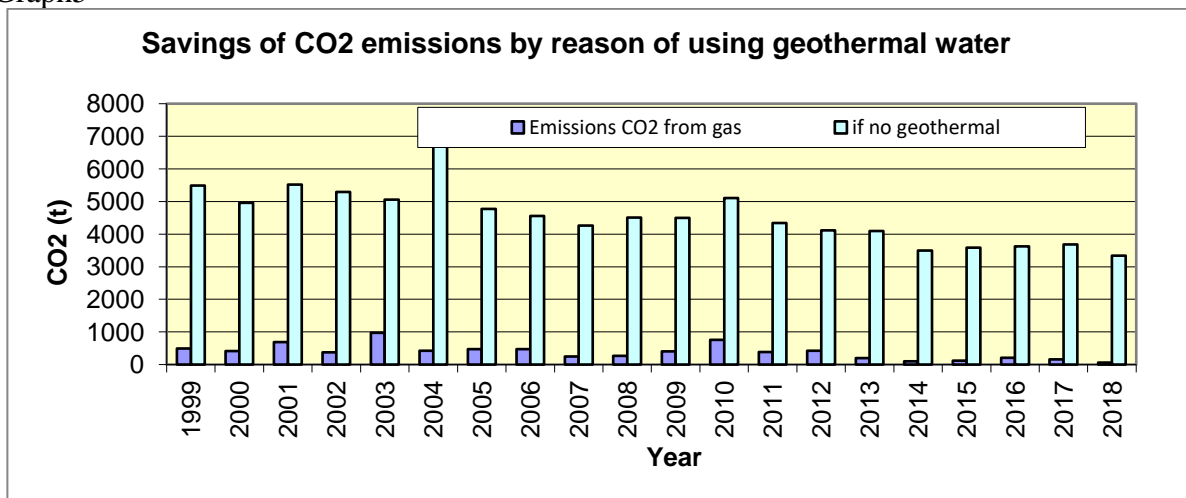
Graph No.4



**Savings of CO<sub>2</sub> Emissions by Reason of Using Geothermal Water**

The main source of CO<sub>2</sub> emissions in Galantaterm is natural gas used for additional heating if needed. Graph shows the actual volume of CO<sub>2</sub> emissions from natural gas by the individual years. Emission of CO<sub>2</sub> would be much higher if geothermal water was not used and all the volume of produced energy would be generated from natural gas Savings by reason of producing the bulk of energy from geothermal water are on average above 3 300 -5 000 t/y.

Graph5



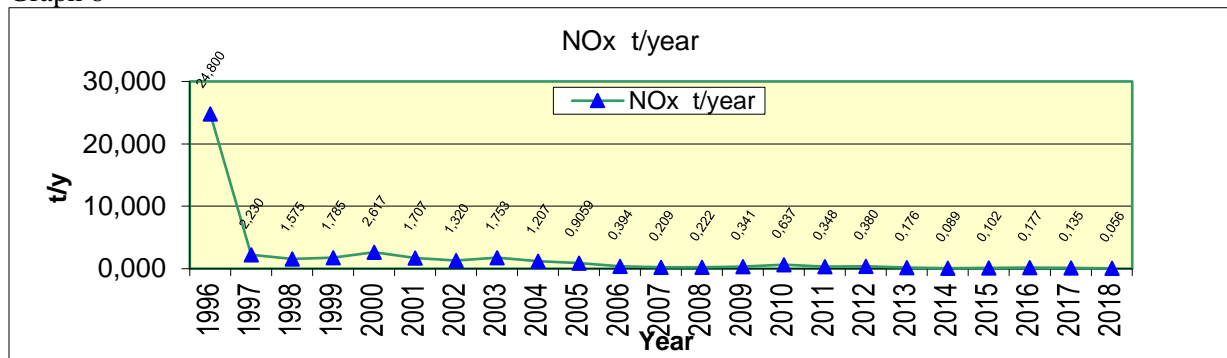
## Other components of air pollution: NO<sub>x</sub>, SO<sub>2</sub> and solid particles/dust (from natural gas):

### Development of NO<sub>x</sub> Emissions

In 2018, the quantity of NO<sub>x</sub> emissions was **0.055661 t/y**.

Graph 6 shows the development of NO<sub>x</sub> emissions in the period from 1996 to 2018

Graph 6

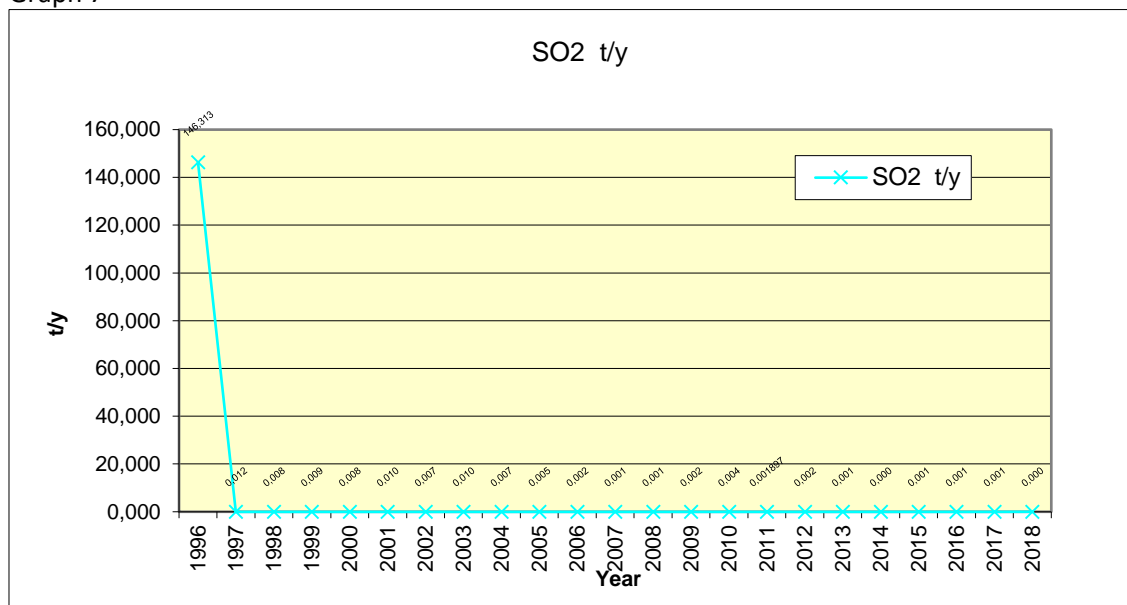


### Development of SO<sub>2</sub> Emissions

In 2018, the quantity of SO<sub>2</sub> emissions was **0.000304 t/y**.

Graph 7 shows the development of SO<sub>2</sub> emissions in the period from 1996 to 2018.

Graph 7



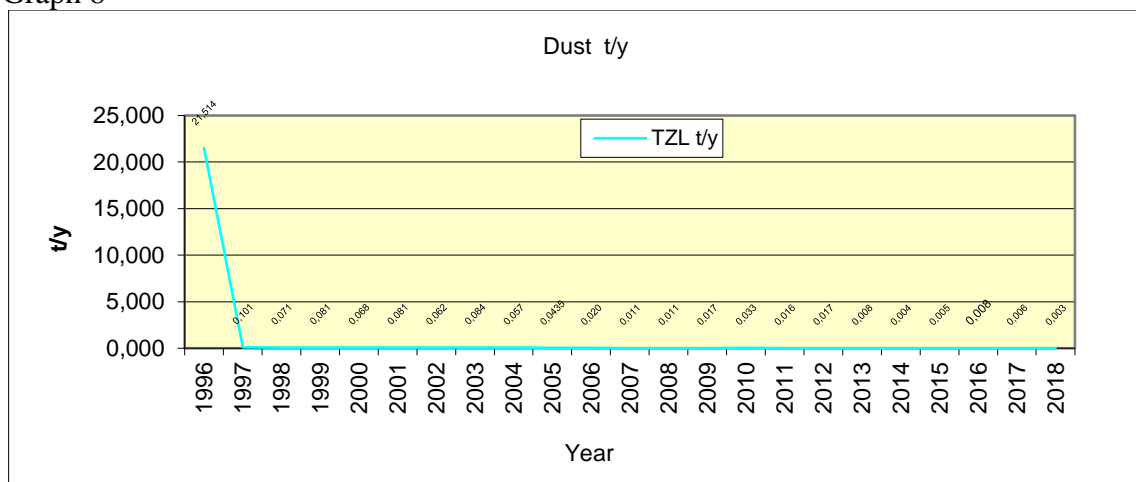


## Solid Particles/Dust

In 2018, the quantity of **solid particles/dust** was **0.002530 t /y**.

Graph 8 shows emissions of solid particles in the period from 1996 to 2018

Graph 8



## **Treatment of Geothermal and System Water**

### Geothermal Water

Before its utilization for energetic purposes the geothermal water is treated with inhibitor of corrosion and scaling. Inhibitor CRW 80010 is not produced any more, it was substituted by inhibitor of corrosion CRW85218. The composition, dosage and the total consumption of this inhibitor is included in Table 4.

Table 4

Type	Sort of Material	Composition	Dosage
CRW 85218	Corrosion Inhibitor	salts of imidazolines (soli imidazolínu)	2 mg/l
		methanol (metanol)	
		2-mercaptoethanol (2-merkaptóetanol)	
		quaternary ammonium salts (kvartérne amóniové soli)	

The overall consumption of inhibitor CRW85218 in the year 2018 was 870 kg

### Treatment of System Water

The system water is softened by sodium chloride (NaCl) and treated by sodium sulphite Na<sub>2</sub>SO<sub>3</sub> and sodium phosphate Na<sub>3</sub>PO<sub>4</sub>. The consumption of chemicals for treatment of system water in the year 2018 is shown in Table 5.

Table 5

Chemicals	Quantity (kg)
Na <sub>3</sub> PO <sub>4</sub>	5
Na <sub>2</sub> SO <sub>3</sub>	25
NaCl	200

## Thermally Used Geothermal Water

After its utilization in Energycentre the thermally used geothermal water is discharged into the reservoir of Hydroelectric Power station Kráľová.

For this purpose, a pumping station was erected including two pumps for pumping the water over the dam.

In the year 2014, an outlet facility was built into the water course Derňa at the intersection of road Galanta – Kolónia on the right side of the flow. This facility serves as an emergency outlet of geothermal water from discharge pipeline (only for provisional, short-time employment in case of failure or shortage of electricity in the pumping station). The above measures secure the reliable, effective, ecological and environmentally friendly disposal of used geothermal water.

Discharge of used geothermal water was permitted by Environmental Department of the District Office Trnava, in Decision No. OU-TT-OSZP-2015/036146/GI.

According to this permission the following characteristic indicators have to be monitored in the samples taken from behind the heat exchangers in Energycentre:

pH (6.5 - 8.5)

DS<sub>105</sub> (4 600 mg/l)

The measurements are made by accredited laboratories.

The periodicity of measurements is 3 times a year, twice in the heating period and once in summer period. The results of these measurements are submitted to the competent body of state water administration once a year.

This regulation is fully respected and observed by the company.

Table 6 shows the values of used geothermal water discharged into the recipient measured in the year 2018:

Table 6

Measured parameter	Unit/Date	06/03/2018	18/07/2018	29/11/2018	Concentration	Balance value
pH	-	7.30	7.27	7.44	6.50-8.50	-
DS at 105 °C	mg/l	4130	4570	4030	4600	3038.2 t/year

## Planting of Trees

In 2017 the company performed complete reconstruction of distribution system of central heat supply at the housing estate Sever in Galanta. Within this project the old distribution pipeline of heat and hot tap water was replaced by a new one.

Excavation work related to the project required cutting out 33 trees a part of which was planted in the protective zone of the pipeline contrary to Act No. 657/2004 Coll. on Heat Energy which bans planting perennials in the protective zone (article 36, section 7, letter b/). Felling of trees was permitted by Environmental Department of the District Office in Galanta.

Municipality of Galanta, as the competent authority of state administration in environmental matters, obliged the company to perform replacement planting of 100 trees the species and the places of which were also specified by the Municipal Office. The replacement planting was performed in September 2018.