Environmental Report 2021

Galantaterm, s.r.o. was established in the year 1995. Its main activity is utilization of geothermal water for production of heat and domestic hot water. As a heat producer it uses an environmentally friendly source of energy and provides cheaper heating and domestic hot water to a part of the town Galanta. For this purpose, it utilizes an alternative source of heat - geothermal water- by which it reduces the consumption of fossil fuels and reduces the emission of harmful and polluting substances into the air which would arise from burning gas and other fuels.

Galantaterm was the first company in Slovakia using geothermal energy for central heat supply-district heating. Despite the fact that utilization of this energy type was unconventional in our country, without any earlier experiences, the production of heat and domestic hot water has been running successfully and continuously, during a twenty-six-year-operation there have not been any serious problems of technical character, thus Galantaterm is a reliable partner for the consumers of heat and domestic hot water and provides services in full, according to the effective legal regulations and in compliance with the contracts concluded with the consumers.

The company has been monitoring the impact of its activity on environment very carefully. It includes monitoring of the natural source and monitoring of further manipulation with the used geothermal water. This activity is being performed by special employees of Galantaterm and by accredited laboratories. The collected data are included in the information systems of the company, and they reflect the impact of Galantaterm on environment reliably. Galantaterm, s.r.o. elaborates an internal environmental report every year. The report is focused on periodic updating of data on those components of environmental protection which are being monitored regularly, which are regarded to be the key components of air pollution and pollution of surface waters, and which have significant influence on the quality of air in our town. The main objective of the report is to present the results achieved by the company in the observed sphere of activity and to provide information to the shareholders, the bodies of the company and the public about impacts 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 constant.

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.

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 domestic hot 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°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 a100% 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 2021

In 2021, there were not any changes in the production process. As in previous years the main inputs into the process of heat production and preparation of domestic hot 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 both as heat-transfer fluid (after chemical treatment, as system water) circulating in the heating system and also for production of domestic hot water for the consumers. This water is heated up by the natural source of heat (geothermal water) by heat exchangers.

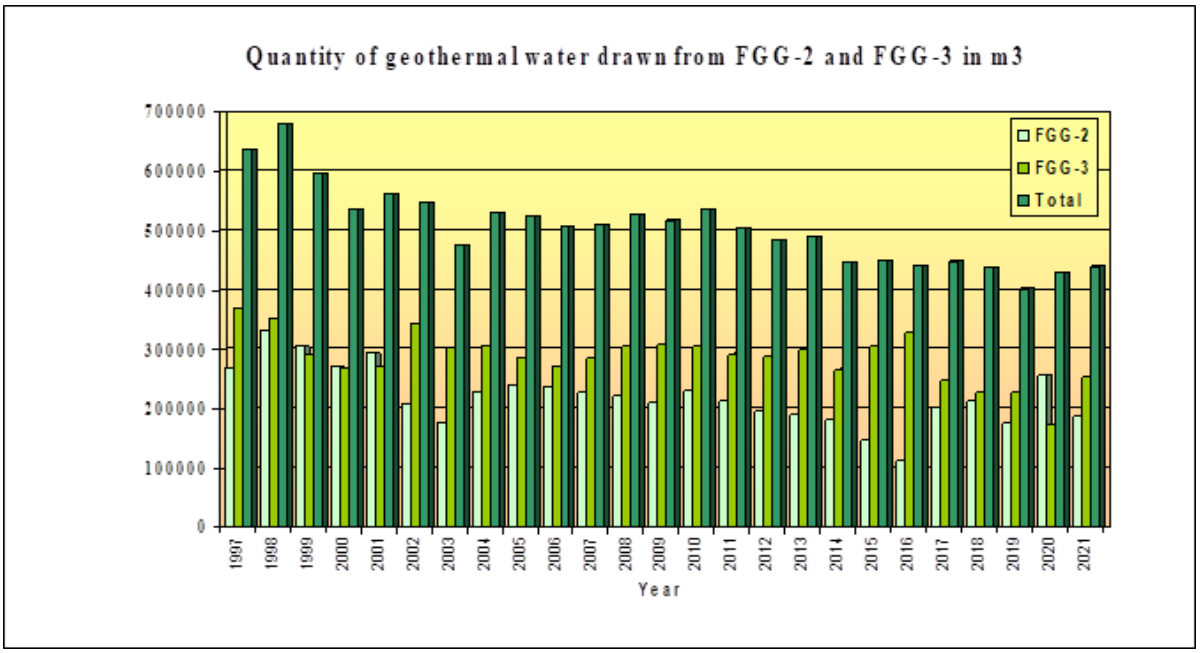
The production of heat and hot water is controlled by the control system consisting of autonomous regulators which drive the technological equipment of heat exchanger station and the wells and ensure the optimal heating according to equithermic curves.

Consumption of Geothermal Water

In 2021, the total volume of exploited **geothermal water** from the two wells was **440 104 m^3**. This volume is more (by 9 798 m ^{3}) than the volume consumed in the year 2020 (430 306 m^3).

Graph 1 shows exploitation of geothermal water from the wells FGG-2, FGG-3 in the period from 1997 to 2021.

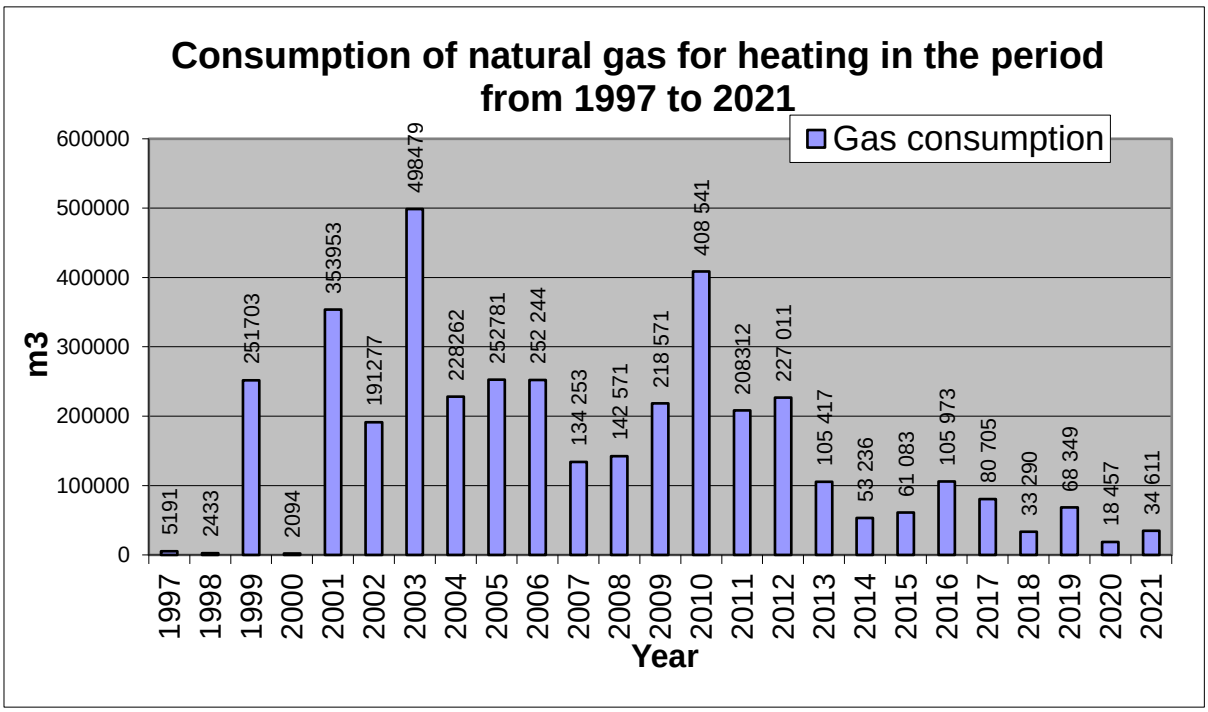
Graph 1



Consumption of Natural Gas

In **2021,** the company used **34 611 m^3** of **natural gas** for additional heating. This quantity shows an in**crease by 16 154 m^3** in comparison to the consumption of the year 2020 when **18 457 m^3** of natural gas was consumed. The higher gas consumption was caused by different weather conditions of compared years, in the observed heating period the outside temperatures were lower therefore more additional heating (by gas) was needed.

Graph 2 shows consumption of natural gas for additional heating in the period from 1997 to 2021



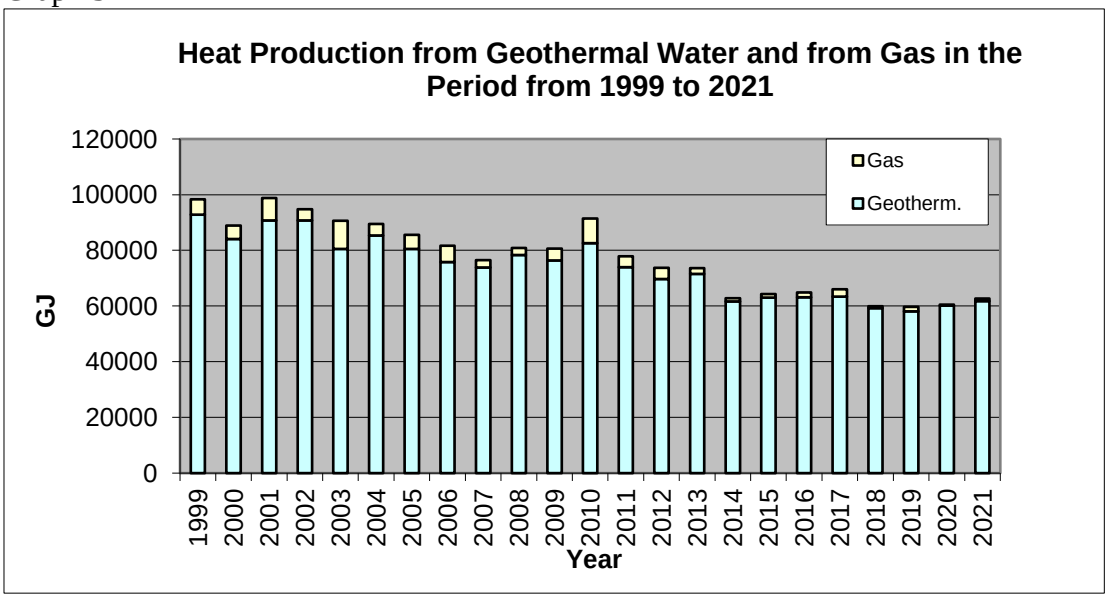
From the above quantities of geothermal water and natural gas **62 647 GJ** (17 401,94 MWh) **of energy** was produced. From that **61 774 GJ** (17 159,44 MWh) was gained **from geothermal water** and 873 **GJ** (242,50 MWh) was generated **from natural gas**.
Expressed in percentages: the **98.61** % of energy was produced from geothermal water and 1**.39** % from natural gas.
In 2020 the total of produced energy amounted to **60 468 GJ** (16 796,67 MWh), from that **60 115 GJ** (16 698,61 MWh) was produced from geothermal water and **353 GJ** (98,06 MWh) from natural gas. Expressed in percentages: the **99.42** % of energy was produced from geothermal water and **0.58** % from natural gas.

If we compare production data of the years 2020 and 2021, we can state that heat production in 2021 increased by 2 179 GJ (605.28 MWh). 1 659 GJ (460,83 MWh) more heat was produced from geothermal water and 520 GJ (144,44 MWh) more from natural gas. The reason for this increase was connection of new buildings to the central heat supply system.

In 2021 the heating season 2020/2021 ended on 28 May 2021 and a new heating season started on 21 September 2021.

Graph 3 shows the development of heat production from geothermal water and from natural gas in the period from 1999 to 2021:

Graph 3



Consumption of Drinking Water

In the year 2021, the company consumed **58 150.00 m^3 of drinking water**. From that **173.00 m^3** was chemically treated and used as system water circulating in the heating system and **57 977.00 m^3** was used for production of domestic hot water supplied to the consumers. In the year 2021 the company consumed less drinking water (by 1 203 m^3) than in the previous year.

Consumers

In 2021, company Galantaterm s.r.o. supplied heat and domestic hot water to the following management companies delivering it to consumers included in Table 1:

Table 1

No.	Management company/consumer	Delivery point - street, building
1.	BYSPRAV s r.o. (a housing company)	Česká 1437 Hodská 1645/71 Mierová 1431 Mierová 1434 Mierová 1436 Vodárenská 1546 Železničiarska 1423 Železničiarska 1441 Železničiarska 1442
2.	SBD Sládkovičovo and Galanta (a housing cooperative)	Česká 1428 Česká 1438 Mierová 1432 Mierová 1435 Mierová 1448 Mierová 1449 Švermova 1443 Železničiarska 1422 Železničiarska 1424 Železničiarska 1425 Železničiarska 1427 Železničiarska 1433 Železničiarska 1439 Železničiarska 1440
3.	Anna Hauková	Česká 1429 Švermova 1444
4.	TECHNOSPOL Slovakia, s.r.o.	Mierová 1430 Mierová 1447 Švermova 1445 Švermova 1446
5.	Contesta s.r.o.	Hodská 89-91
6.	FACILITY GROUP s r.o.	Hodská 93-95 Hodská 107-109 Hodská 119-121-123 K. Duchoňa 2429 K. Duchoňa 2439 K. Duchoňa 2438 K. Duchoňa 2437 K. Duchoňa 2436 K. Duchoňa 2435 K. Duchoňa 2434
7.	PATRIA - (retired people´s home Galanta)	Švermova 1457/16
8.	Basic school of Gejza Dusík	Mierová 1454/10
9.	Kindergarten – Óvoda	Česká 1453

No.	Management company/Consumer	Delivery point- street, building
10.	GASTROCENTRUM s r.o.	Železničiarska 1556
11	Pohoda seniorov s.r.o. (old people´s home)	Hodská 360
12.	V-STAV TRSTICE s.r.o.,(a construction company)	Hodská 2441
13.	Hospital of St.Lucas Galanta, a.s.	Hodská 373/38
14.	Regional Office of Public Heath	Hodská 2352/62
15.	Jozef Bugyi	Hodská 373
16.	TRIMONT SLOVAKIA s r.o.	Hodská 373
17.	Skyfit, s r.o. (a fitness centre)	Hodská 373 Hodská, Služobné byty
18.	KOI CARP SLOVAKIA s.r.o.	Hodská 68

In 2021 three new consumers were connected to the heating system, these are the two new residential buildings WEST in Karol Duchoň street no. 2434 and K.Duchoň street no. 2435 administered by the company Facility Group s.r.o. and the newly built multi-purpose residential building POHODA administered by the company V-STAV Trstice.

Supply of thermally used geothermal water to the consumer Galandia s.r.o. has been suspended due to ongoing reconstruction of the thermal centre.

Environmental Impact of Our Activity

The above-described combined method for production of heat and domestic hot water significantly reduces the environmental burden, but this environmentally friendly generation of heat also produces minimalised but measurable and regularly monitored pollutants in form of emissions which derive 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 2 shows the results of analyses of gases included in the geothermal water in the year 2021

Table 2

Well	FGG-2		FGG-3	
Date of sampling	6.5.2021	6.12.2021	6.5.2021	20.8.2021
Analysis No.	210510/007	211209/060443	210510/007	210824/004
Composition	% vol.	% vol.	% vol.	% vol.
Methane	27.01	27.08	49.49	44.56
Ethane	0.38	0.39	1.43	1.27
Propane	0.13	0.14	0.42	0.34
i-Butane	0.06	0.06	0.11	0.08
n-Butane	0.02	0.02	0.06	0.05
i-Pentane	0.02	0.02	0.03	0.02
n-Pentane	<0.01	0.01	0.01	0.01
Cont.of hydrocarbon > n-Pentane	0.03	0.03	0.03	0.02
Oxigen	0.37	0.36	0.21	0.20
Nitrogen	54.77	56.05	23.66	21.36
CO_2	17.20	15.84	24.55	32.09
Sulphur	0.1600	0.1100		

CO_2 Emissions from Geothermal Water in 2021

Emissions of CO_2 from geothermal water are calculated on the basis of water/gas ratio in the geothermal water, percentage of CO_2 in the gas and the quantity of geothermal water produced from the wells The volume of CO2 in geothermal water in the year 2021 is shown in Table 3.

Table 3

Well	FGG-2	FGG-3
Quantity of water (m³)	186614	253490
CO2 (vol. %)	16.520	28.32
Water/Gas ratio	0.069795	0.0556707
Average temp. (°C)	78.17	75.09
Volume of CO2 (t/y)	**3.28**	**6.15**

In the year 2021 the volume of **CO_2** emissions from geothermal water was **9.43 t/y**.

CO_2 Emissions from Natural Gas in the Year 2021

Emissions of CO_2 from natural gas are calculated by the formula:

Emission CO_2 [t/y] = consumed gas x **heat value** x **emission factor** x **oxidation factor**

Calculation of CO_2 emissions from natural gas in the period 1997 – 2021 (for Energycentre) is shown in Table 4.

Table 4

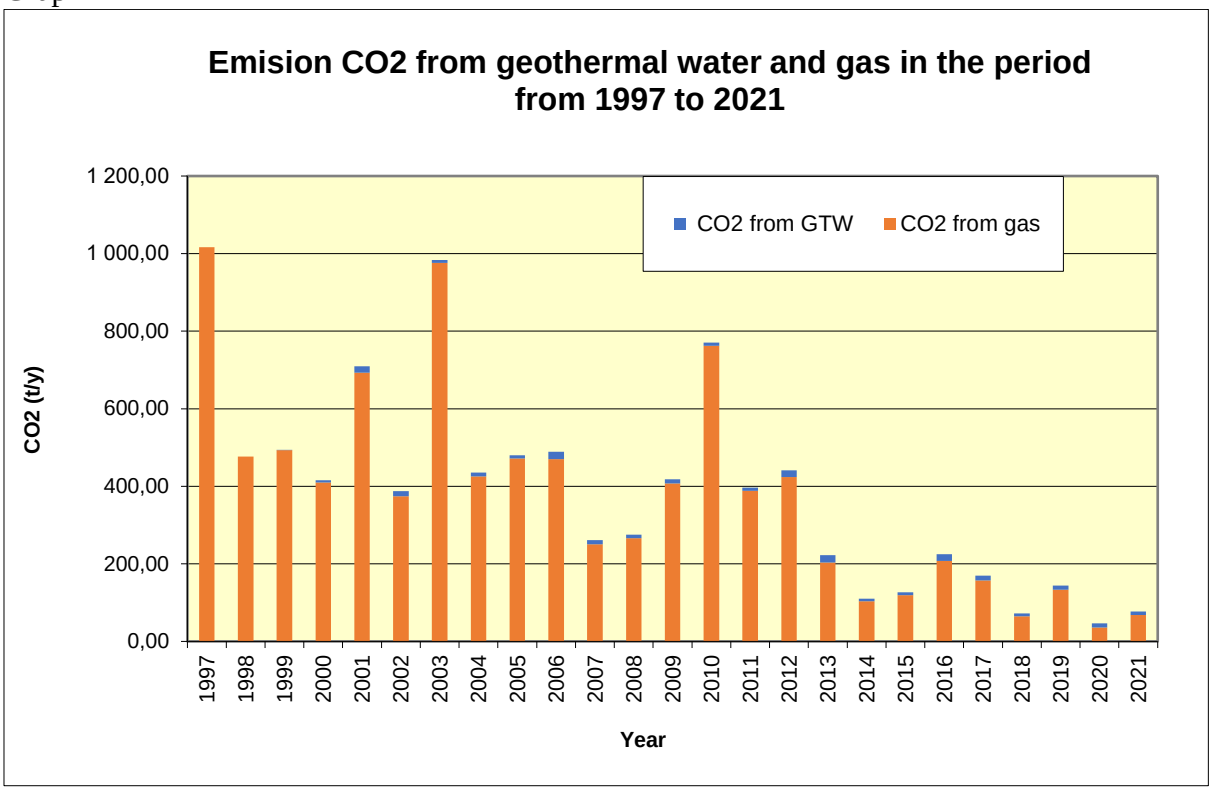
Year	Consumed gas. mill m³	Heat value MJ/m³	Emission factor tCO₂/TJ	Oxidation factor	Total CO_2 (t/y) Energycentre
1997	0.5191	33.411	58.92	0.995	1 016.78
1998	0.2433	33.411	58.92	0.995	476.56
1999	0.251703	33.411	58.92	0.995	493.02
2000	0.2094	33.411	58.92	0.995	410.16
2001	0.353953	33.411	58.92	0.995	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
2018	0.033290	34.8981	55.6758	1.00	64.6818
2019	0.068349	34.9374	55.6958	1.00	132.9981
2020	**0.018457**	**35.0157**	**55.7142**	**1.00**	**36.0072**
2021	**0,034611**	**34,9623**	**55,9233**	**1,00**	**67,6717**

The total of **CO_2** emissions from gas in the year 2021 was **67.671 t/y.**

The total of CO_2 emissions from the activity of Galantaterm s.r.o. Galanta was 77.10 t/y in 2021, from that 9.43 t/y was from geothermal water and 67.67 t/y from natural gas.

The development of CO_2 emissions from geothermal water and from gas in the period from 1997 to 2021 is shown in Graph 4.

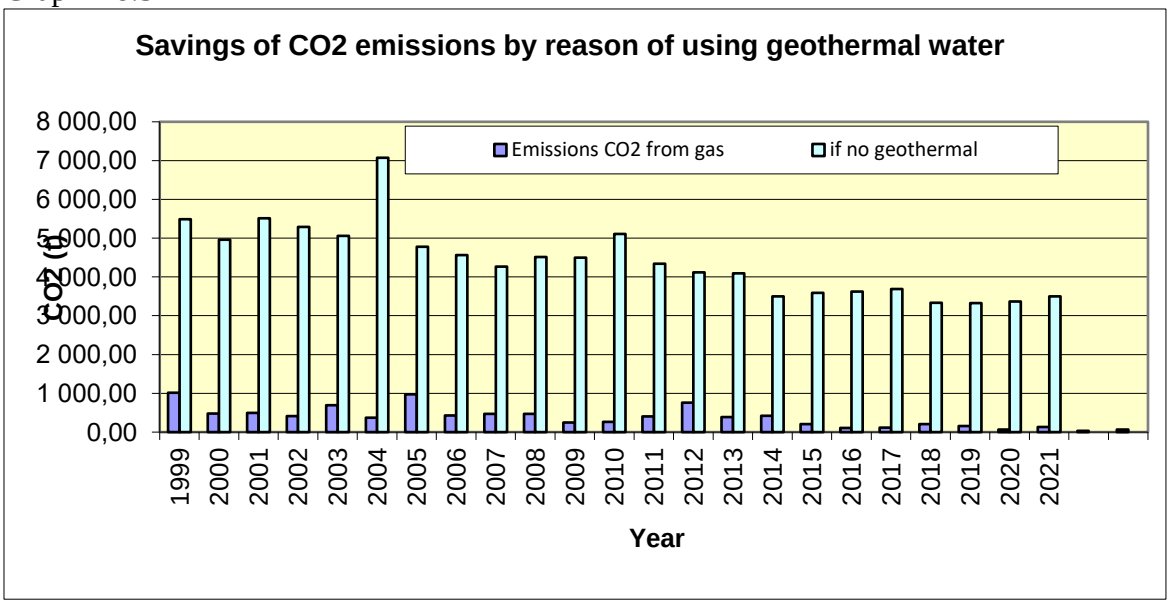
Graph 4



Savings of CO2 Emissions by Reason of Using Geothermal Water

The main source of CO_2 emissions in Galantaterm is natural gas used for additional heating if needed. Graph shows the actual volume of CO2 emissions from natural gas by the individual years. Emission of CO_2 would be much higher if geothermal water was not used, and all the volume of produced energy would be generated from natural gas as the graph shows. Savings by reason of producing the bulk of energy from geothermal water are on average above 3 000 -5 000 t/y.

Graph No.5



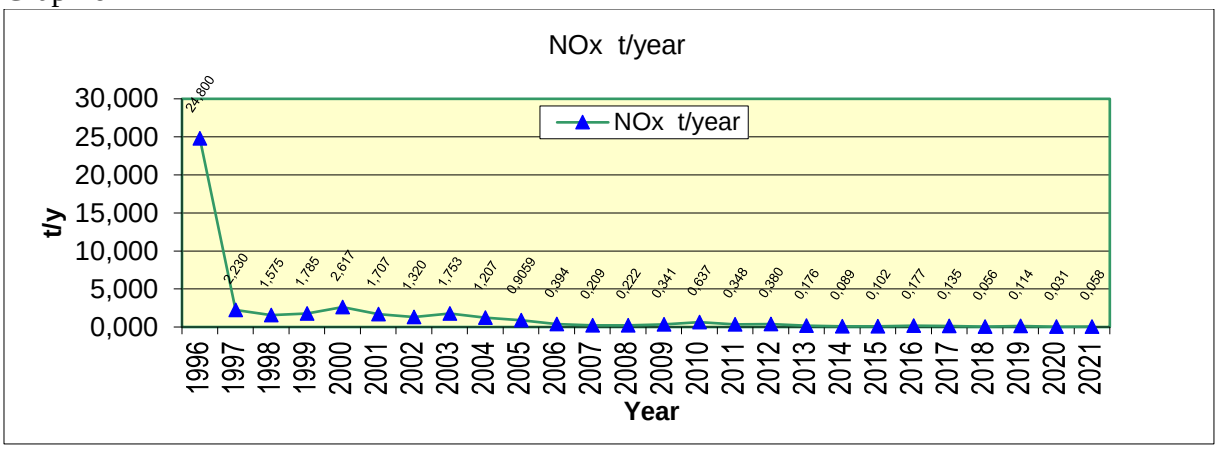
Other components of air pollution: NO_x, SO_2 and solid particles/dust (from natural gas):

Emissions of key pollutants deriving from our activity have been monitored and recorded since 1996/97 when, after commencement of geothermal heating, a significand reduction was achieved in emissions of CO2, NOx, SO2 and solid particles. From that time on, the emissions have constantly been on low, roughly the same level, but in 2021 a moderate increase was caused by using more natural gas for additional heating.

Development of NO_x Emissions

In 2021, the quantity of **NOx** emissions was **0.057870** t/y.
Graph 6 shows the development of NO_x emissions in the period from 1996 to 2021.

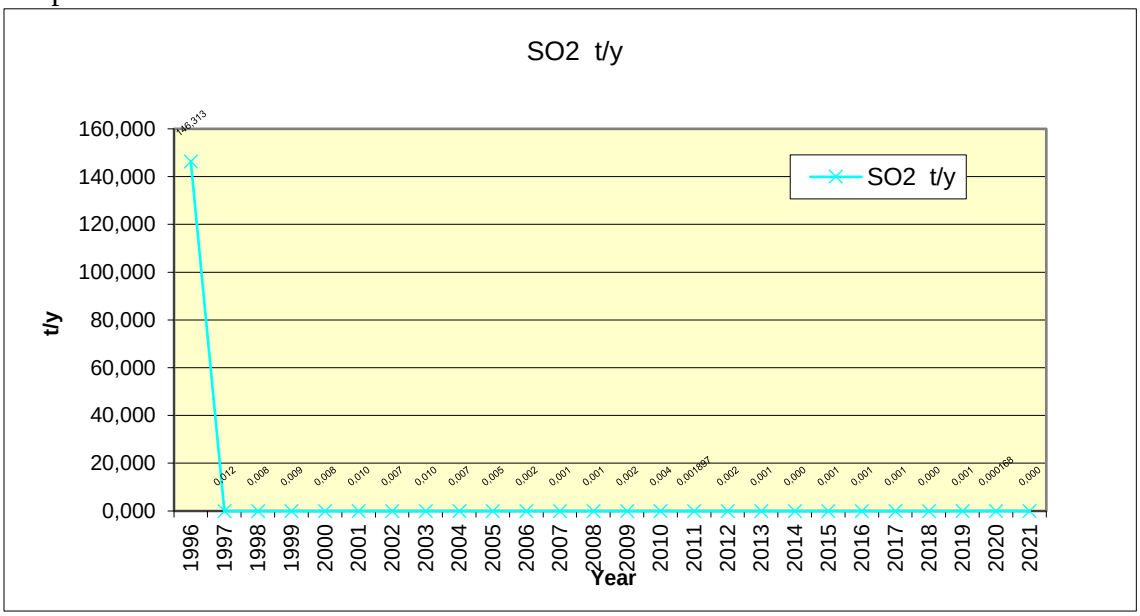
Graph 6



Development of SO_2 Emissions

In 2021, the quantity of **SO2** emissions was **0.000316** t/y.
Graph 7 shows the development of SO_2 emissions in the period from 1996 to 2021.

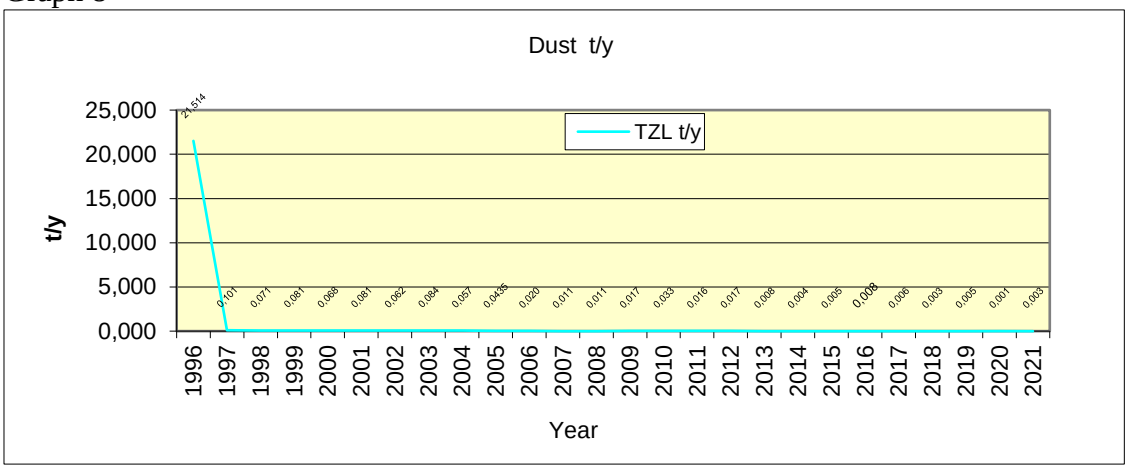
Graph 7



Solid Particles/Dust

In 2021, the quantity of **solid particles/dust** was **0.002630 t** /y.
Graph 8 shows emissions of solid particles in the period from 1996 to 2021.

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.
In 2021 inhibitor CRW85672 was used. Its active agent is imidazoline and it meets the requirements of EU regulations REACH.

Composition and dosage of this inhibitor is included in Table 5.

Table 5

Type	Sort of Material	Composition	Dosage
CRW 85672	Corrosion Inhibitor	Salts of imidazolines	
		Ethane – 1.2 diol	2.0 mg/l
		2-mercaptoethanol	
		Quaternary ammonium salts	

In 2021 the overall consumption of inhibitor CRW 85672 was 865 kg.

Treatment of System Water

The system water is softened by sodium chloride (NaCl) and treated by sodium sulphite Na_2SO_3 and sodium phosphate Na_3PO_4. The consumption of chemicals for treatment of system water in the year 2021 is shown in Table 6.

Table 6

Chemicals	Quantity (kg)
Na_3PO_4	5
Na_2SO_3	30
NaCl	325

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 used geothermal 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/Gl.

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_{105} (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 7 shows the values of used geothermal water discharged into the recipient in the year 2021:

Table 7

Measured parameter	Unit/Date of Protocol Issuing	08/04/2021	02/09/2021	02/11/2021	Concentration	Balance value
pH	-	7.18	7.14	7.18	6.50 – 8.50	-
DS at 105 °C	mg/l	4224	4544	4068	4600	3038.2 t/y