

Environmental Impact of Gas Transportation

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1. Introduction (Gas Transit Transportation Infrastructure in Slovakia)

Transit pipeline was founded together with Czech part in 1970. The original intention was the transportation of gas amounting 28 bcm per year, to Eastern and Western Europe. Gradual construction of four transit pipelines provides a capacity for transportation of more than 72 bcm of gas per year. Four compressor stations take care of the transit needs: *Veľké Kapušany* (power 236 MW), *Joblov nad Turnou* (224 MW), *Veľké Zlievce* (253 MW) and *Ivanka pri Nitre* (224 MW). After the agreement on the split of Czech and Slovak Federative Republic, the *Slovenský plynárenský priemysel* took over the control in the Slovak transit system, and TRANSGAZ Division was created. This structural unit provided a complex management system for the area of production and maintenance. Beside this, the main trends are being monitored in the field of gas technologies, and in interacting branches, in order to upgrade technology and to suggest further strategic and developmental visions.

Beside 4 compressor stations, two other additional enterprises (in *Nitra* and *Rožňava*) support the operation and maintenance of transit gas pipeline and an enterprise in *Senica* is providing special services (special transportation, maintenance, implementation of investment projects) for the Division.

The top management bodies which control the transit system are sites in Bratislava (the seat of the TRANSGAZ Division) and Operational Unit in *Nitra*, which takes care of continuous monitoring of the operation and technological stability of a transit system.

2. Environmental Impact of a Transit System

Transit system as a result of a certain technical solution, has some environmental impact. Those are mostly controlled impacts, influencing the surrounding atmosphere, hydrosphere, pedosphere, biosphere and sociosphere as well. Currently the mitigation of these impacts takes place, in compliance with stipulations of nowadays effective legal norms in Slovak Republic. These issues are analyzed in a planned way by the section responsible for the technical review and supervision over the transit system and by its departments of ecology and chemistry.

The most strict criteria are applied in order to check the compliance with combustion products and noise emission and imission limits. The reason for this is the fact, that majority of turboengines (GT 750 - 6) are obsolete. Turbines of this type were constructed within different legislation context in 70-ties. The fact, that there is still compliance with limits even today, is due to thorough attitude of division the top management and also compressor stations staff, who keep turbines in a good shape. After the introduction of new legislation changes in Slovakia (in 1991) the basic modifications of burnings chambers were implemented, in order to comply with emission limits, both for NO_x and for CO. The limit in the case of NO_x is 300 mg/m³ and 10 mg/ m³ of combustion products for CO. The emissions volume (especially CO) has been recently

These emission volumes are emitted to the environment in the neighborhood of compressor stations. A project "Emissions analysis and the proposal of optimal monitoring in the neighborhood of transit pipeline compressor stations" was introduced in order to map this situation. The project was implemented by the leading organizations in Slovakia working in this field: Geophysical Institute of the Slovak Academy of Sciences, Department of Climatology at the MFF UK and Slovak Hydrometeorological Institute.

Emission measurements were, performed in the neighborhood of compressor stations from January through April. The measurements confirmed well proposed and implemented emission outputs. It was demonstrated, that even under the worst dispersion conditions, the combustion products dispersion

will be good enough, thanks to their high speed so that they will fall down on earth in low concentrations. Combustion products will be dispersed over a relatively wide area (see dispersion map).

Compressor stations irradiate into environment also noise. This problem was is a matter of big concern as well. Currently the anti-noise insulation of compressor stations' technological components is in its completion stage. Also in this case the measurements are taken permanently in order to measure noise irradiation around in the neighborhood of compressor stations (see dispersion map KS 2).

Technological design of compressor stations is the origin of other wastes (mostly oil-related). Amounts and the quality of this waste is continuously monitored, and it is liquidated in compliance with the existing legislation of the Slovak Republic. The quality of these activities is demonstrated by the fact, that no repressive measure was imposed upon transit system by the state control bodies in recent period.

Just as the issue of waste management is a matter of concern, die same is true for water management. This is done by measuring the quality of input and output water. In the case of output water we do the monitoring of mainly oil products. There are special chemical laboratories at each compressor station, which do the monitoring of the water quality, and test the water to measure the presence of oil products. They are equipped with measurement devices enabling necessary analysis. Laboratories also provide measurements for the linear part of the transit system.

In order to provide a system of environmental protection with a complex functionality, Division SLOVTRANGAZ has already in 1993. developed internal rules conceived as decrees and directives by the division director. These decrees were recently revised, in order to incorporate new legislation standards of the Slovak republic and they were issued as rules effective for the whole SPP.

3. Reconstruction and Refurbishing of a Transit System - Implementation of New Technologies, in order to Decrease Negative Environmental Impacts.

After many years of operation of transit system a substantial reconstruction and refurbishing is necessary. All activities related to this field are entail strict compliance with effective environmental legislation International (Environmental Impact Rules) are complied with as well. Reconstruction projects are implemented every year, and they amount to several billion Slovak crowns. I will mention several projects, which are directly linked to environmental issues

- The oldest operational units of the transit system compressor stations will be decommissioned (unit 1 and 2),

- New turbine halls will be constructed in *Velké Kapušany and Jablonov nad Turnou* to minimize NO_x and CO emissions,

- The whole transit system will be connected to on-line emissions and imissions monitoring system,

- The second round of burning chambers refurbishment will take place at compressor stations, in order to stabilize and minimize emissions in the air.

- The dangerous waste storages at transit system are currently under construction, in order to provide safe manipulation with this type of waste.

- Under completion is the construction and reconstruction of waste water management plants. Concerned sites are KS4 and operational units along the line. The issue of KS1, 2 and 3 water quality is currently matter of rigorous analysis and reconstruction of the system and construction of new water plants management will be necessary,

- The substantial reconstruction of the water distribution systems takes place in compressor stations,
- There is also on-going reconstruction of oil management space and related surroundings, in order to create oil-proof seal,
- Condenser tanks are being replaced in the whole transit system in order to comply with most strict safety parameters, regarding the possible leak of condensate into soil and underground waters.

4. The Role of gas Industry in Decreasing Emissions and Emissions in Slovakia

5 to 8 bcm of natural gas flows to Slovakia via transit pipeline each year. Compared to fossil fuels, gas contains much less of sulphur. After certain calculations, comparing the caloric value of coal (3 % sulphur content) and gas, we came to the overall situation in Slovakia, which is demonstrated on the three maps (data from 1994).

- (map 1) Sulphur dioxide emissions in t/km² (official data)
- (map 2) The overall potential emissions of sulphur dioxide in t/km² (official data and emissions from fossil fuel, supposing the natural gas is not used)
- (map 3) Potential growth of sulphur oxide pollution (in % , supposing the natural gas is not used)

The significance of gas and gas industry for environmental protection is self-evident when we look at these maps. The use of transit gas pipeline and interstate system of gas distribution provide conditions for a global decreasing of sulphur dioxide emissions, which has negative impacts on vegetation. decrees were recently revised, in order to incorporate new legislation standards of the Slovak republic and they were issued as rules effective for the whole SPP.

5. Prospective of Slovak Gas Industry and its Approximation to the EC Norms In Relation to Environmental Management

SPP, striving continuously to improve environmental management and to create management functionality compatible with other industrial companies especially in advanced member states of European Union, one of the major SPP tasks is the implementation of environmental management system (based on international standards). This leads to the leadership position of SPP among most advanced industrial companies, not only within Slovakia. The purpose was the permanent compliance with effective legislation, minimization of SPP enterprises and gas industry operation environmental impacts and conceptual solution of all problems of environmental character. The Slovak Office of Technical Standards has adopted the international ISO 14 001 standard, which will be implemented into our national system of standards. This standard will be adopted in all EU countries. This standard is closely connected to the EC Council Directive 1836/1993. This creates conditions within Europe, for a common platform, defining the principles of environmental management system for industrial entities, and for the whole EU system as well. We consider both documents (especially standard ISO 14 001, which will soon become an organic part of our system of standards) as something, which should be implemented into the management system within Š.p. SPP.

Should the enterprise decide to adopt the system basis for environmental management, the following should be defined and gradually implemented:

- internal environmental policy

- environmental planning
- environmental management system (organizational aspects)
- system of control and corrective measures
- evaluation approach for environmental management system

Many attributes, related to the implementation of this new system are already complied with by Division SLOVTRANSGAZ and by other SPP entities. However everything depends on the definition of requirements regarding compliance with standards, which in some cases could be nowadays more strict than those required by Slovak legislation.

SLOVTRANSGAZ and š. p. SPP are gradually preparing themselves for this system, The following stages are under development:

- environmentally oriented geographical information system on transit structure, which maps environmental risk sites in a complex way,
- creation of a unison information system for needs of ecologists involved with water management, which include issues of water management, emissions,
- auditing system
- training of the staff working in enterprise environmental projects

All these activities are aimed to minimize negative environmental impacts of our activities related to the continuous growth of transported gas volumes, up to die level of 90 bcm per year.