

ENVIRONMENTAL MONITORING - MERCURY CONCENTRATION IN AMBIENT AIR AND HARES AT GTP MOLVE AREA

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Abstract

The present study, as part of a comprehensive monitoring of the eco-system, was aimed at establishing a relationship between mercury concentration in ambient air and tissues of wild animals in the vicinity of the natural gas processing plant - GTP Molve, Croatia. The study presents a part of results of mercury concentration measurements in hares present in the wider area around GTP Molve. The results indicate that concentrations are within normal levels. Mean mercury concentration values found in hares' muscle, liver, kidney and brain tissues recorded in 1999 were lower than those recorded during 1995 and 1990. Mercury concentration measurements in ambient air and in hare's tissues demonstrate small but constant decline in concentration values. Achieved results point to the need of further research in order to investigate correlations between particular values so as to be able to make adequate conclusions.

Key words: natural gas, mercury, monitoring, air, hares

Mercury Control during Natural Gas Processing

The natural gas recovered and produced from deep wells at Podravina gas fields (Molve, Kalinovac and Stari Gradac), Croatia, along with a large number of other harmful substances - impurities (CO₂, H₂S, RSH etc.), contains a relatively high level of mercury ¹.

The pollution hazards on the Podravina natural gas fields have been brought to a minimal level since an efficient, closed mercury removal system (GTP Molve) has been constructed (Figure 1).

The mercury control program includes both fully effective technologies for mercury removal from natural gas and the original methodology of mercury measurement in the processes and environment within and surrounding the plant ².

Air monitoring is frequently required at natural gas plant sites because of the potential for release of airborne contaminants and in response to regulatory compliance and/or community issues. An adequate monitoring, similar to the program designed and applied at INA-Naftaplin's process plant is essential for evaluation of working environment condition ³. It extends to the whole eco-system in order to scan and determine the extent of mercury influence, but also helps in organization and preparation activities in the process itself. Namely, results of accurate monitoring serve as an early warning, showing possible functional or process damage that could have an adverse effect on mercury removal unit performance, resulting finally with hazard to working and living environment ⁴. Therefore, the sampling and metering procedure involved, along with the very area of gas treatment plants as the potential source of pollution, 5 other selected significant locations (control stations), encompassing those plants in an approximate distance of 500 to 1500 meters, Figure 2. All metering stations are located out of urban locations, with village Molve (2 km) as closest populated area.

Along with measurements of mercury concentration in ambient air at the GTP Molve area, monitoring of the eco-system was carried out by the large team of scientists and government institutions. Monitoring included investigation of:

1. Meteorological and climate conditions
2. Chemical pollution
3. Radioactivity
4. Water quality
5. Agro-ecological testing
6. Microbiological testing
7. Forage quality
8. Quality of forest eco-systems
9. Monitoring of wild animals

Results and discussion

Mercury concentration measurements in ambient air around the production and process plants demonstrated the presence of elevated mercury concentrations⁵. As can be seen in Table 1., mercury was detected at levels well below worker exposure standards and a typical ambient air quality toxic standard. However, these anomalies are of a local nature, which may not be harmful to humans or to the environment, and their values are usually below the maximum allowable levels (in Croatia exposure standards are set at a maximum 50 µg/m³ for working area).

The study also presents a part of results of mercury concentration measurements in tissues of wild animals present in the wider area around GTP Molve. The results indicate that concentrations are within normal levels.

Mean mercury concentration values found in rabbits' muscle, liver, kidney (Figure 3) and brain tissues recorded in 1999 were lower than those recorded during 1995 and 1990. The difference is not statistically notable, however it shows continual declining trend in all examined tissues. Measurement results are presented in the tables.

Similar measurements in Germany⁶ indicated mean mercury concentration in rabbit organs (muscle – 0.007, liver – 0.034, kidney – 0.060 µg/g). In different regions of Poland⁷ mean mercury concentrations in rabbit liver ranged from 0.05-0.12 µg/g and in kidneys from 0.10-0.19 µg/g. The concentration values in rabbit kidneys in Czech Republic (0,1µg/g)⁸ are similar to those obtained in our research⁹.

Conclusion

Exposure to heavy metals such as mercury is of an immediate environmental concern.

The pollution hazards on the Podravina natural gas fields have been brought to a minimal level since an efficient, closed mercury removal system has been constructed and put into operation in 1993.

All findings of mercury pollution control procedures carried out for more than a decade confirm that the monitoring and control program applied in natural gas production and processing area, was designed and implemented properly and that it achieved its ultimate objective - to prevent mercury from entering into human and natural environment.

Mercury concentration measurements in ambient air and in rabbit tissues demonstrate small but constant decline in concentration values. Achieved results point to the need of further research in order to investigate correlations between particular values so as to be able to make adequate conclusions.

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Table 1. Mercury concentrations in the ambient air at GTP Molve

YEARS	1995-97	1999.
No. of measurements	171	48
MINIMAL concentration ng Hg/m ³	0,1	1
MAXIMAL concentration ng Hg/m ³	56,2	20
AVERAGE ng Hg/m ³	10,6	6,6

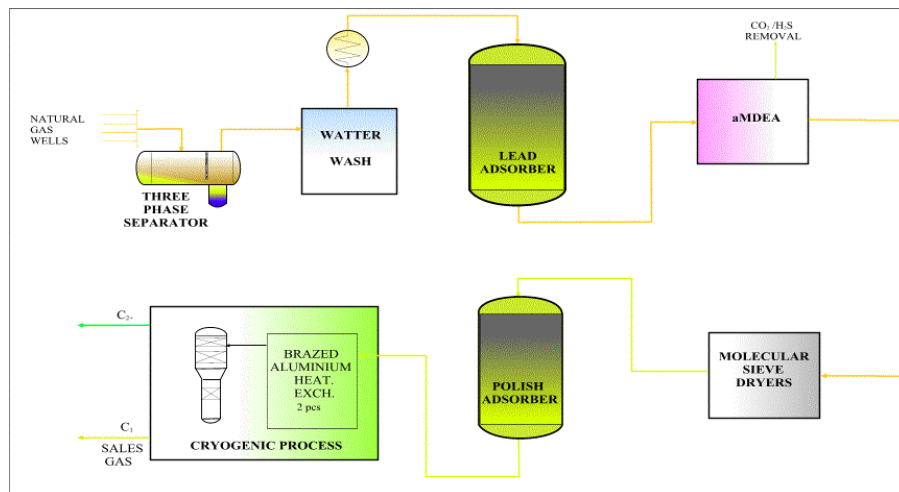


Figure 1. GTP Molve III – block scheme

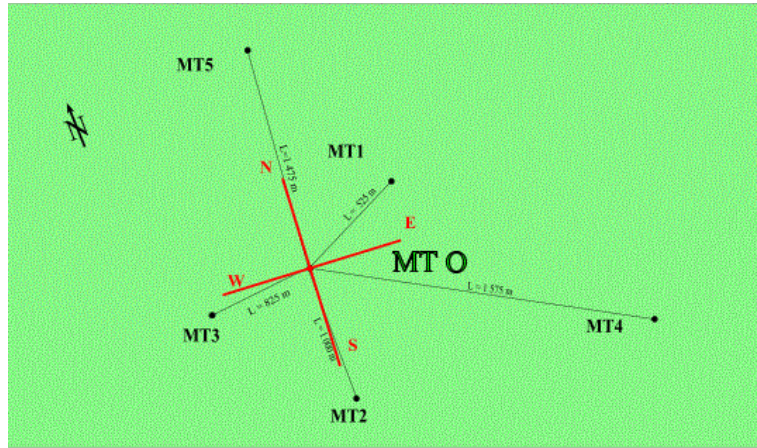


Figure 2. Additional metering stations located out of urban locations, with village Molve (2 km) as closest populated area.

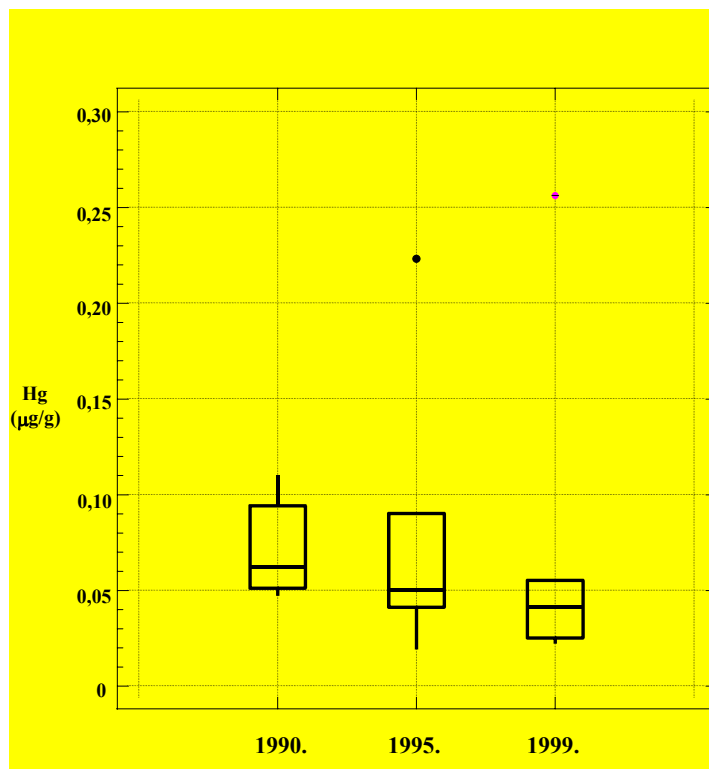


Figure 3. Median concentration values found in hares kidney