

Utilization of energy stores
in the mound nests of red wood ants

INIS-mf--14796

M.Ivask, A.-J.Martin

The caloric content of functionally different worker groups of red wood ants was examined in 1983-1984 in the ant reservation "Akste". The lowest caloric content, $18.97...24.20 \text{ kJ}\cdot\text{g}^{-1}$, occurred in ants collected from their routes. It was higher, $24.42...25.36 \text{ kJ}\cdot\text{g}^{-1}$, in the ants (nurses) taken from brood chambers. The highest caloric content, $25.01...33.13 \text{ kJ}\cdot\text{g}^{-1}$ was observed in the store ants from the underground hibernation chambers. With ageing, the caloric content in ants decreases, i.e. from the first step of age polyetism (store ants) up to the oldest outside workers with the lowest calority. The higher calority of the individuals transported from interchange routes ($25.30 \pm 0.19 \text{ kJ}\cdot\text{g}^{-1}$) as compared with that of outside workers ($21.56 \pm 0.48 \text{ kJ}\cdot\text{g}^{-1}$) of the same nest shows the possibilities to diminish the differences between various nests in supercolonies. It quarantees better food and microclimate conditions for the brood in weaker colonies.

EE 96 0000 6

ENVIRONMENTAL IMPACT OF ENERGY SYSTEMS
IN LITHUANIA

Vidmantas Junkauskas, Vaclovas Miškis
Institute for Physical and Engineering Problems of Energy Research,
Lithuanian Academy of Sciences

With an essential economy reconstruction Lithuania faces also serious environmental problems. The main environmental burdens now are caused by the functioning industries, the energy systems and transport. The Lithuanian environment protection department claims that there are more than 2 mln tons of various emissions into the atmosphere due to fossil fuel burning. More than 75% of this amount are the emissions from various vehicles and the rest is the emissions from industry and power plants. The number of polluting plants exceeds 40 thousand. All these plants produce about 2 mln tons of pollutants, but the greater part of them are caught by cleaning equipments. The rest (about 20%) is emitted directly into the atmosphere. The total amount of emission from industry and power plants in 1989 was 431 thousand tons. The main share of the emission was sulphur dioxide (about 44 %).

the carbon oxide (23 %), nitrogen oxides (10 %), hydrocarbons (8 %), hard particles (9 %) and other liquid and gas emission (5 %). The existing cleaning equipments remove at the best 96 % of hard particles. About 75 % of hydrocarbons, and 40 % of carbon oxide are also removed. But only about 13 % of nitrogen oxides and 5 % of sulphur dioxide are suppressed.

Among stationary polluters the most harmful are power plants and boilers. They contribute more than 1/3 of all the emissions into the atmosphere. The sulphur dioxide share from these sources in 1988 was 137 thousand tons, i.e. more than 65 % of all the sulphur dioxide emitted. The emissions of nitrogen oxides were 24,000 tons (about 55 % of total).

Most of the power plants and boilers are huge and powerful, which enables a more efficient burning of fossil fuel. The main fuel is a heavy fuel oil containing more than 2 % of sulphur. It causes huge concentrations of emissions. Only the main power plant in Elektrenai, with the capacity of 1,800 MW, burns about 2 mln tons of the heavy fuel oil per year. The emissions caused by it contain more than 80,000 tons of sulphur dioxide, 13,000 tons of nitrogen oxides, 1200 tons of hard particles and other toxic products of combustion. A serious negative impact on the north-western region of Lithuania is posed the Mažeikiai refinery. Its emission into the atmosphere contains about 25,000 tons of hydrocarbons, 15,000 tons of sulphur dioxide, 5,000 tons of other liquid- and gas pollutants. The maximum permitted emissions of bensol, phenol, formaldehyde and other toxic gases are also exceeded.

The emissions of sulphur dioxide and nitrogen oxides produce acid rains. The average acidity of precipitation in Lithuania is pH 4.7. Negative impacts of acid rain are felt by forests, lakes, soils, and even buildings.

The non-homogenous distribution of power and industrial plants cause very different contamination in Lithuania (Fig. 1). The most contaminated areas are the cities: Kaunas, Jonava, Mažeikiai; dangerous pollution levels are in Vilnius, Klaipeda, Elektrenai and Kedainiai. The total contaminated area constitutes about one third of all the area.

The new power plants - Ignalina nuclear power station (capacity 2,500 MW) and Kaišiadorys pumped storage power station (planned capacity 1,600 MW) - seem to be less dangerous to the environment. However, there are two RBMK-type reactors (like in Chernobyl, but even more powerful) operating in Ignalina. The design imperfections of these reactors cause real danger of accidents. Geologists have found tectonic cracks - a possible reason for earthquakes of up to 7 grades by the Richter scale. Also, seriously injured is the largest Lithuanian lake which is cooling the reactors. Waste heat emissions from a nuclear power plant are 1.5-1.7 times higher than from a thermopower plant of the same capacity. So the lake is overheated, some kinds of fish are starving and vanishing. Very serious is the public discontent and fear for this station. In order to guarantee normal operation of the station and to calm people the scientific stations for seismic research and radioactivity monitoring

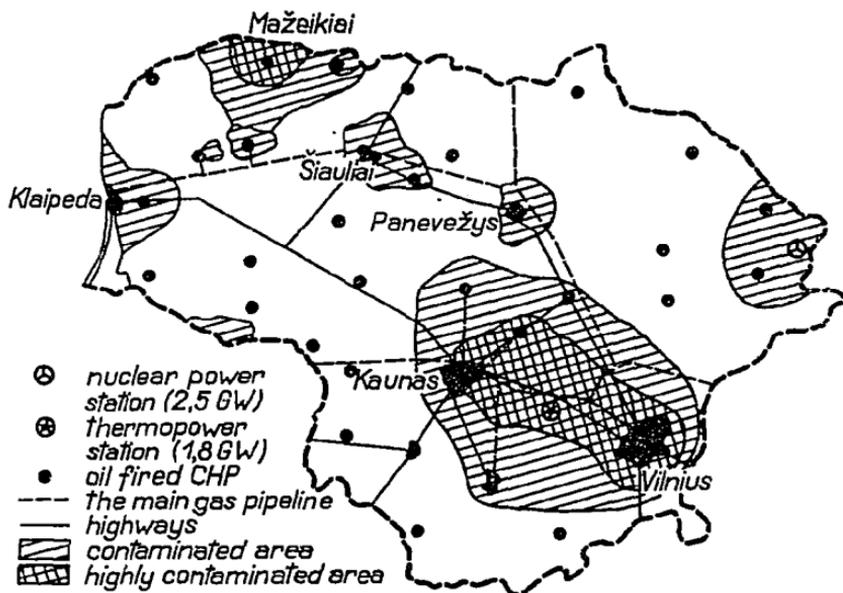


Figure 1. The map of the main environmental impacts in Lithuania.

are to be introduced.

The need for a pumped storage power station near Kaunas was grounded on the development plan of energy systems for all the north-west region of the USSR. Several nuclear power plants were planned to be built in this region: in Byelorussia and in Latvia to increase the Ignalina's plant capacity up to 6-9 GW. The construction of a combined heat and power nuclear plant near Minsk was started. It would have decreased the possibility of manoeuvring and to create a huge redundancy of power at night. But after the failure of the nuclear power program in the USSR the huge station turned out to be unnecessary. The possible impact of the station on the artificial lake near Kaunas, which will be used as the lower basin, causes public discontent. Fluctuations of the level will increase erosion of the banks, damage recreation sites, bring silts with heavy metals to the rest of the river Nemunas, which is already very heavily polluted. Thanks to the public opinion and the changed situation in energy systems, the planned capacity of the station was halved, but a serious ecological research is still needed. At first only two turbines will be engaged and environmental impacts for the plant will be analysed (the main problem - moving of heavy metals from the bottom of the artificial lake).

An improvement of environmental situation in Lithuania is possible with the planned increase of natural gas supply from the USSR. The main pipeline Minsk-Vilnius has already been built, but will the gas exploration in the Yamal peninsula be successful? If not, the technologies for reducing sulphur and nitrogen emissions from oil are badly needed. The best thing to do would be to introduce desulphurization in the oil refinery. If such technologies are not made available or if they are too expensive, then desulphurization of effluent gases in power plants and boilers is urgently needed.

FENOOLIREOSTUS-EESTIS JA FENOOLIDE SORTSIOON

I.Johannes, A.Ignat, I.Zabellevits, L.Mölder
TA Keemia Instituut

Inimtegevuse toimet keskkonnas hajutatavatest kahjulikest ainetest ühed ohtlikumad on fenoolsed ühendid (fenooli LPK - 0,001 mg/l). Fenoolid tekivad paljudes tehnoloogilistes protsessides, eriti tahkekütuse (sealhulgas ka kukersiitse põlevkivi) töötlemisel ja põletamisel.

Uusaldusväärsed andmed fenoolireostuse ulatuse ja allikate kohta Eestis puuduvad. Samuti on ebaselge fenoolide keskkonnas hajumise ja degradatsiooni dünaamika.

Suurimad keskkonna reostajad fenoolidega on põlevkiveemiaettevõtted, kuid fenooli satub süstemaatilisel keskkonda ka katlakütuste, määrdeõlide ja hüdroolide, sünteetiliste liimide jm. vabu või hüdroloüüsvates ühendites seotud fenooli sisaldavate toodetega. Kaugeltki välistatud pole ekstreemolukordadest tingitud ühekordsed fenoolide heitmed keskkonda aherainepuistangute-, kaevandus- ja rabatulekahjudel.

Vastupidi laialt levinud arvamusele ei satu põlevkiveemiaettevõtetest suurem osa fenooli keskkonda mitte tehnoloogiliste heitvete, vaid nn. tuhamägede vetega. Tehnoloogilised heitveed läbivad enne suunamist süvalasu kaudu Soome lahte biopuhastusseadmeid. Tuhamägedelt allavalguvad vihma- ja lumesulamisveed, samuti tuhamägede pumbatavad reoveed lähevad aga ilma puhastamata Kohtla jõe kaudu Purtsu jõkke ning kannavad endas lõviosa reostusest (u. 650 t fenooli aastas, sealhulgas u. 230 t lenduvaid fenooli).

Fenoolide liikumine keskkonnas sõltub oluliselt sellest, kuidas neid seotakse või pestakse välja kivimitest, poolkoksi, tuhast jm. tahketest materjalidest, mis on fenoolidega reostatud.