

Abstract: The aim of the study was to assess the efficiency of soil cleanup from petroleum products, whose concentrations in the dry mass ranged from approx. 70 mg/kg to as much as approx. 3,000 mg/kg. In order to remove those specific, troublesome and nuisance-causing contaminants, use was made of the prism method consisting in the bioaugmentation of the prism. The prism was inoculated using an original biopreparation, which contained autochthonous bacteria of the species *Stenotrophomonas maltophilia* and *Pseudomonas putida*, isolated from the contaminated soil. The technical appliances used made it possible to aerate the soil, spread biogens and microorganisms, and control moisture content. The course of the bioremediation process was monitored by analyzing the physicochemical and microbiological parameters of the soil and those of the leachate from the prism. The process itself proceeded in three stages: preliminary (I), bioremediation (II) and aftertreatment (III). Stage (I) occurred in the winter season, under conditions of limited oxygen availability and low soil temperature. At that stage, in spite of the disadvantageous conditions for microorganism growth, the removal of petroleum products from the soil varied from approx. 30 mg/kg to approx. 2500 mg/kg, which depended on the initial content of these pollutants in the soil being biodegraded. The bioremediation process was the most intense in the spring and summer seasons (stage II), which were characterized by enhanced growth and enhanced degrading activity of the soil bacteria in the whole cross-section of the prism. The decrease in the organic carbon concentration in the soil observed at the end of stage II exerted a limiting effect on microorganism growth, thus contributing to a rapid reduction in the number of bacteria. There was also a concomitant decrease in the degrading activity of the microorganisms: the value of the dehydrogenase activity of the soil averaged 12.7 $\mu\text{gTF/g}\cdot 24\text{ h}$. During stage II of the bioremediation process the content of petroleum products in the soil was reduced to approx. 50 mg/kg on average. The aftertreatment of the prism (stage III) was performed in the autumn season and consisted in the consecutive stripping of the surface layer, where the content of petroleum products was minimal. This enabled a gradual uncovering of the lower prism layers (those with limited oxygen availability) and their aftertreatment. Upon termination of stage III of the bioremediation process, the content of petroleum products in the soil ranged from approx. 2 mg/kg to approx. 20 mg/kg. The study has demonstrated that the technology applied was environment-friendly and safe, and that the continuous water recirculation in the prism–bioreactor system enabled the aftertreatment of the leachates from the prism to the level desired.

Keywords: Petroleum products, soil, decontamination, bioremediation, prism method, inoculant, *Stenotrophomonas maltophilia*, *Pseudomonas putida*.