Environmental Science Research Laboratory

Brief Overview

The Environmental Science Research Laboratory investigates various environmental issues involving the electric power industry, from a local to a global scale, and aims at contributing to their solutions by developing countermeasure technologies.

Achievements by Research Theme

Assessment of Atmospheric Environment

[Objectives]

To develop a pioneering and rational impact assessment method which contributes to the conservation of the atmospheric environment and sustained development of the society.

[Principal Results]

- A wind tunnel experiment and a field experiment were conducted to clarify the impacts of air turbulence and heat on the diffusion of exhaust gas in an urban canyon and the interaction between the air flow and dispersed exhaust gas inside and outside an urban canyon was properly established. [V08030]
- The numerical model for safety analysis which was developed to predict the dispersion of exhaust gas was applied to several nuclear facilities with different reactor types, and the comparison with the wind tunnel experiment results showed the practical applicability of the numerical model. [V08046]

Assessment of Hydrospheric Environment

[Objectives]

To develop an assessment technique to solve various environmental problems at reservoirs, rivers and coastal areas for the purpose of achieving the efficient management and operation of power plants.

[Principal Results]

- A new model was developed to predict the occurrence of freshwater red tide, taking into consideration the swimming speed of red tide planktons at a reservoir. [V08024]
- The impacts on seaweed and fish by the turbid water discharged from a river, etc. were clarified in an experimental approach. [V08014]

Biotechnology

[Objectives]

To develop unique as well as competitive environmental conservation and remediation technologies using advanced biotechnology.

[Principal Results]

- A basic concept was presented for a system designed to reduce environmentally hazardous substances in waste water through the use of a composite microbial system and a process to apply this concept to the reduction of selenium in real waste water was proposed. [V08051]
- Candidate species for plantation biomass were selected and their ecology and productivity were clarified along with the characteristics of their oil (Fig. 1). [V08019; V08025; V08049]

Assessment of Biological Environment

[Objectives]

To develop a new ecosystem analysis method which is useful for efficient environmental measures for the electric power industry and a technology to control aquatic nuisance organisms at power facilities.

[Principal Results]

- A new scientific and rational method was developed to assess the impacts of the terrestrial ecosystem. This method was applied to ecosystem assessment at a real nuclear power plant and the findings were included in a preparatory environmental impact assessment paper. [V08043; V08044; V08045]
- Using genetic information on barnacles and golden mussels (Fig. 2), both of which are major sessile organisms observed near

coastal and hydroelectric power stations, a new method was developed to detect their quantities and the relationship between their modes of life and environmental factors was disclosed. [V08010; V08039]

Environmental Risk Management

[Objectives]

To develop support tools which are required for the management of the environmental risk of mercury and other trace substances.

[Principal Results]

- A new model was developed as an environmental risk assessment tool for substances discharged from thermal power plants to assess the exposure to 13 principal trace substances via the multiple routes of the atmosphere, soil and ocean and the health risk posed by these substances was assessed based on the latest risk information. [V08048]
- A risk message for inhalation exposure to heavy metals was prepared based on assessment of the intended receivers of such information and a new website called RISKMATEC was developed to assist risk communication. [V08032]

Assessment of Biological Effects of Electromagnetic Field

[Objectives]

To clarify (i) the effects of the intermediate frequency magnetic field on genes and reproduction using cells and laboratory animals and (ii) to clarify the toxicity mechanism by a novel health risk assessment system based on molecular biology.

[Principal Results]

- An exposure experiment using chick embryos revealed that an intermediate frequency magnetic field of 60 kHz does not affect either embryogenesis or organogenesis. [V08002]
- Exposure experiments using rats revealed that intermediate frequency magnetic fields at 20 kHz and 60 kHz do not have acute toxic effects. It was also revealed that an intermediate frequency magnetic field at 20 kHz does not affect either the fertility or embryogenesis of rat's fetuses. [V08011]

Fig.1 Bearing of tung tree anticipating as one of species for bio fuel production

Fig.2 Golden mussels growing of wall of waterway at hydroelectric power station