Summary in English

Editorial

Science and Technology: A Principle for the Next Step

Munekazu OHMI

The growth and sophistication of science and technology in the latter half of this century, while having been beneficial to our society, has produced difficult problems. The problems are multifarious, including effects of large-scale developments on environmental and ecological systems, disposal of chemical substances and wastes, effects of radiation on the human body, life control based on genetics, and changes in the human life style caused by advanced communication technologies. In addition, possible shortage of food and energy, and exhaustion of metallic and other resources will be of great concern in the 21st century.

Scientists and engineers, however, will remain enthusiastic in the search of new knowledge and in creation of new technology. Such new knowledge and technology includes what induces new risks along with what will be useful in solving above mentioned problems. The close relationship of science and technology with corporate and national interests and with socio-economic factors that vary in a complicated manner in the global scale makes control of their evolution difficult. Yet, as far as science and technology should contribute to physical and mental health of the humans, everyone associated with science and technology must have a piece of awe before the great Nature in order not to err.

Special Reports

PRTR: A New Method of Risk Management of Chemical Substances

Osami NAKASUGI

Increasingly multifarious and complex environmental risks of chemical substances has prompted their autonomous management. OECD recommends PRTR as a method of autonomous management of chemical substances. Japan is now practicing PRTR in a pilot scale, which requires reporting by the operators of the amount emitted into air, water and soil of the 178 selected substances of high environmental risk, as well as their amount transferred to disposal specialists, while the administration is responsible for estimating the amount of substances discharged by households and mobile sources.

Successful implementation of PRTR will depend on harmonization with measures taken by individual enterprises, improvement in data quality, and the use of reported data. While the Japanese pilot program is bound to publish overall data only but not data pertaining to individual facilities, the latter are necessary for satisfactory risk communication. Publication procedure will therefore be a major item to be studied.

The Fundamentals of Environment Law, a new principle of environmental protection, requires that each participant plays his/her own role in environmental protection. In this context, PRTR that solicits autonomous management will provide a useful tool for risk management of chemical substances. A cost-effective PRTR system will hopefully be developed on the basis of the pilot project.
Guidelines for Environment-Friendly Commodities

Hiroshi OHE

The eco-label supports "green purchase" of goods or services by emphasizing their environmental aspects.

The present paper reviews the definition and the ISO classification of eco-labels, and discusses the present situation of the Eco-Mark, a representative Japanese eco-label, the characteristics of the rapidly expanding green purchase networks (GPN), and implications of the eco-labels for consumers.

The Eco-Mark is based on the "Items Selection Table for Environmental Load Evaluation in Life Stages" associated with life cycle analysis. This table, although convenient, does not provide satisfactorily quantitative criteria. Moreover, the process of consensus formation in relevant working groups should be disclosed for better transparency of decisions on the guidelines.

The green purchase means preferred purchase of goods and services of low environmental loads. GPNs provide purchase guidelines and data books for individual commodities which define environmental aspects to be taken into account on purchase. The networks need further increase in membership and clearer definition of information targets.

Since no single eco-label system can be perfect, it is hoped to develop a label mix that comprises individual systems optimized for particular targets and products.

Changes in Social Consciousness and Changes in Duty of Care

Tetsuo NAITO

"Generally accepted ideas" represent moral criteria against which events in the modern society, based on such principles as liberalism, market principle and interdiction of abuse of rights, are judged by the public. An important element in this judgment is that on the fulfillment of the "duty of care" which obliges prediction and avoidance of undesired outcome of events.

With progress of science and technology, along with increased complexity of social and economic activities, what duty of care prohibits has been evolved from faults to causal events, then to harmful results; it is now interpreted as obliging the best possible effort to prevent any harmful event as far as one's ability and resources available permit. The level of responsibility has accordingly been shifting from that of a good manager to that of an occupational manager, then to that of a specialist.

On the other hand, ethical belief of the public is constantly changing according to changes in their scope and means of activities and in knowledge and experience, although it is based on a universal, unchanging fundament.

Such changes in watching duty and ethical belief is largely affected by progress of science and technology, changes in primordial experiences of people, and TV journalism. Neglecting these factors today may result in serious consequences.
Risk Management of Science and Technology: Aviation Safety

Isao KURODA

While aviation represents one of the most conspicuous technological achievements in the 20th century, its history is an incessant struggle against risk of flight. In comparison with early days of commercial jet transport, aviation safety has remarkably been improved today. Yet an aviation accident remains to be an event of major sociopsychological impact. The present paper discusses human factors, involved in 70% of air accidents, and improved design and manufacture of high-reliability hardware, as requirements for achieving an accident rate less than one in 10 million flight hours.

Articles

On the Contribution of Research and Development Activities to the Output of an Industrial Corporation: Part 11: Economical Aspects of Scale Effects

Kazuhiko NINOMIYA

Scale effects on profit of a manufacturing corporation in the optimized state were analyzed by making use of the simulation model proposed previously. The profit before tax of a manufacturing corporation in the optimized state has been reported before to reach its maximum after coinciding the lowest unit price of selling products with a certain theoretically defined value. The profit before tax thus maximized was further found herein to go through a maximum with increasing values of corporation scale, whereas the lowest unit price of selling products was found to go through a minimum with increasing value of corporation scale. The coordinates of the maximum and minimum were obtained as functions of a single parameter which depends essentially on the ratio of the amount of sales per capita to the amount of R&D expenditure per capita. Some of the assembly makers of large scale in Japan were estimated to position nearby the critical point where the scale effects on profit become negative.

Kazuhiko NINOMIYA

Balance among the sales-oriented, the profit-oriented and the technology-oriented styles of management in an industrial corporation was analyzed by making use of a simulation model and related information obtained previously. The R&D expenditure, the human and the material costs, which were identified to dominate specifically the technology-oriented, the sales-oriented and the profit-oriented styles of budget respectively, were first compared to find the ratios of both the R&D expenditure and the material costs to the human costs are dependent upon a single adjustable parameter, $\lambda$, the ratio of total amount of employees to that for R&D. $\lambda$ was then found to depend on the corporate scale in the optimized state of management defined previously. The $\lambda$ dependencies of those two ratios appeared to be mainly attributed to the difference in the scale effects built in the respective three managerial indices concerned.