

ASPECTS OF ENVIRONMENT AND ECOLOGY IN TECHNICAL EDUCATION

* DR. L. N. MITTAL

** P. K. SINGLA

ABSTRACT

Out of 10 to 30 million life forms on earth, there is only one Species - Homo - Sapiens - the man, who can change the environment according to his needs. It is perhaps this ability of the man which has now posed a serious question as to how to plan his own future survival on the earth. During the hunter - gatherer stage of civilization, the total energy requirement of a person was 2000-4000 Kcal per day and this was obtainable entirely through the food chain and his own muscular energy for doing the work. Ever increasing population growth, coupled with energy intensive life style, have not only accelerated the consumption of limited exhaustable natural resources like water, crude oil, coal and minerals but have consistently been deteriorating the quality of all the three spheres of the earth i.e. soil, water and air. It is becoming increasingly evident that technological advancements have been largely made in pursuit of objectives which have created an adverse impact on the environment and to rectify the damage there is a felt need for change. A systems approach in which environmental considerations are integrated into the technical education process can bring about the much needed "change process" as the technicians, engineers and scientists are backbone of the industry who perform important functions right from management of shop floor and production to safety and quality control. Besides options of introducing components of environment in individual courses / subjects and introducing a special course in environment in various programmes, the paper suggests an approach consisting of combination of these two options. A separate degree or diploma programme in environment is not feasible due to limited scope of employment opportunities for such programmes. However, post-graduate or post - diploma with specialization in environment can be another feasible solution to tackle the problem. Technical institutions can act as "Change Agents" and by their own example become "Creditable Source of Information" and provide educational, consultancy, research and extension services to other organizations engaged in this endeavour of environmental / ecological protection. The paper also suggests guidelines for deciding contents of environmental awareness course and types of services technical institutes can provide to other government / non government organization

*Professor and Head, Curriculum Developments Centre.

**Assistant Professor - TTTI, Chandigarh.

to bring about desired change in attitudes of people and make them understand the role people can play in preserving harmony in environment and ecology.

1. INTRODUCTION :

Man and nature have always been antithetical. Man is the only animal on the earth who continuously tries to conquer nature. In all his inventions he has tampered and exploited it in order to satisfy his needs. During the agricultural revolution it was man, land and crops. In the industrial era it became man, machine and environment. The most dangerous is present relationship in which he has started tampering with the biological composition of species, through genetic engineering. In any production process there are four important components : raw materials, machines labour and power. Basically industries exist only because they have to maximize the profit and keep the production cost at the minimum. Production is no longer oriented towards fulfilling the needs of all. On the contrary, it promotes and feeds a consumer oriented society. Besides affecting the environment through the uptake of planned resources and delivery of aimed goods, devices, systems or designed environmental modifications, almost all production processes also result in a number of consequential side-effects on the environment, which were not planned, designed, or even thought of seriously by those involved into it. We produce certain goods inspite of world wide ban on them. We also produce and consume the deadliest pesticides and insecticides. It takes one whole generation to know the negative effect of a particular technol-

ogy. A proper cycle works in technology transfer. Technologies are invented in west; when it is felt that they are hazardous, they are transferred to less developed countries. So at every stage, one generation is sacrificed if a proper check is not kept on such transfer. Since liberalization, a free flow of such technology is being promoted. There is an urgent need to be more vigilant about such technology transfer. Disease due to natural or man caused epidemics can destabilize the life of the community or a country, which in turn could affect the state.

In fact, it is becoming increasingly evident that technological advancements have been largely made in pursuit of objectives which have created an adverse impact on the environment and to rectify the damage there is a felt need for change. It is but natural that the 'change process' should start from basic teaching and research which has generated a faulty technical knowledge base. Students entering into technical / engineering careers lack basic knowledge about impact of industrial processes on the environment, due to inaccessibility of science and technology, and the knowledge of which can enable our nation compete globally and still provide the country an atmosphere of sustainable development. A systems approach in which environmental considerations are integrated into the technical education process, instead of just building a facility and plugging the leaks on completion,

needs to be evolved for bridging the gaps.

2. ROLE OF TECHNICAL EDUCATION :

Technical education encompasses a wide spectrum, ranging from training of tradesmen and technician engineers at the one end and education of engineers and scientists at the other end. By the very nature of their profession technologists play a crucial role in the development process, and their professional activities impinge on the environment. Every engineer/technologist must, therefore, become aware that the environmental consideration can be "internalized" into the development process. Technician engineers and scientist engineers are the backbone of industry. They perform important functions right from management of raw material, shop, floor, production, repair and maintenance to quality and safety. Present scenario of fast developing industrialization, globalisation and mixing of old and new technological processes, create considerable problems of pollution to environment which engineers / technologists are not trained to deal with. Technical institutes have a definite role in creating awareness, developing analytical and problem-solving abilities in the students to enable them deal with issues related to environment and ecology. These institutes should also offer continuing education programmes in environmental pollution control for those who are already working in industry / field.

3. APPROACHES TO INTRODUCE COMPONENTS OF ENVIRONMENT

IN THE CURRICULA OF TECHNICAL EDUCATION PROGRAMMES :

In recent years, mankind's consciousness has been aroused very strongly about the need for environmental protection and ecological preservation. For any such programme to be successful, it is of utmost importance that the public is aware, not only of the problems and issues involved, but also of the role it can play in the environmental protection programmes. Along with the people's participation at the grass root levels, the formal environmental educational programmes need to be launched right from kindergarten through school to colleges and universities so as to develop relevant competencies in the students community to implement environmental protection related projects. The International Union of Conservation of Nature and Natural Resources (IUCN) in 1979 gave a universally accepted definition of environmental education as : "The process of recognizing values and clarifying concepts, in order to develop skills and attitudes, necessary to understand and appreciate the inter-relatedness of man, his culture and his biophysical surroundings. Environmental education also entails practice in decision making, and self formulation of a code of behaviour, about issues concerning environment quality".

Within the ambit of technical education, there is a dire need of education and training of technical students both at degree and diploma levels. This can be achieved by two methods : one is to introduce the components of environmental considerations in each and every course / subject, whether it is hydrau-

lics; aerospace; manufacturing process or power generation, with a constant stress on environmental impact of whatever theory or practice is being discussed. This can be done only in a very subtle way and this method needs the imaginative initiatives of the curriculum developers and teachers handling a particular course. The other method is to introduce a special course, common to all disciplines of engineering / technology at various levels. This course should give a bird's eye view of the whole field of development of "science and technology", and interaction of "science and technology" with society, as well as impact on the environment and ecology. The second method has an administrative advantage since it is a specialist course, and a few teachers can be trained to handle this course / subject completely. But on the other hand there is a very great danger that like so many other specialized subjects, this too would become "another subject", to be learnt, examined and passed without being assimilating its significance into the essential personality of the students. In fact a third method, combination of both of these approaches, would be ideal to achieve the desired impact in technical education. Full-fledged diploma or degree programmes in environmental engineering, wherever have been tried, has not find success and popularity in terms of employment potential or in terms of competence of the students in environment management. However, post-graduate or part-diploma programmes with specialization in environment can be experimented in different disciplines aiming at developing disci-

pline specific competencies to tackle problems related to protection of environment.

4. GENERAL GUIDELINES FOR DECIDING CONTENTS OF ENVIRONMENTAL AWARENESS COURSES :

The academic programmes / curricula of technical education at different levels may provide following contents of environment to develop necessary knowledge, skills and attitudes in the students relevant to their respective disciplines :

- current environment legislations
- causes of environmental degradation
- factors contributing to maintenance of healthy environment
- methods / techniques of environmental protection relevant to different disciplines / courses
- requirement and effectiveness of current environmental protection knowhow (technology and its applications)
- individual's role in environmental protection in one's on / off the work site
- importance and relevance of connection among sound safety practices, conservation and environmental protection
- environmental related projects such as effluent treatment plant for a particular industry; water treatment plant for a particular locality; design of low cost check dams; use of non-conventional sources of energy; energy auditing etc.
- current issues in environment and

ecology

- renewable sources of energy.

5. TECHNICAL INSTITUTIONS AS ENVIRONMENTAL CHANGE AGENTS :

Besides introducing the components of environment in the programme(s) / course(s), the technical institutes can act as "change agents" and as "credible sources of information". Technical institutes can undertake following actions in this regard :

- Assisting various government / non-government organizations in their environmental educational efforts and offer a forum for debate and sharing of information regarding environment and ecology.
- Offering modular part-time / full-time continuing education programmes dealing with environmental issues to alumni, industry and community opinion makers.
- Providing assistance to industry / field organization dealing with environmental problems in appropriate manner e.g. traffic agencies in vehicle emission testing; pollution control agencies in testing of effluents etc.
- Developing print / non-print instructional material incorporating environmental impacts in traditional subject areas for different levels of education.
- Identifying projects for students with environment and ecology as focus and publication of articles in journals / newspapers / other periodicals.
- Sharing of relevant information regarding environmental technology with medium and large corporates who may have their own education - cum - training cells.
- Creating awareness and assisting in developing / revising curricula of other faculties of education incorporating contents of environment.
- Diversifying and strengthening the community development works through projects such as promotion of vermiculture technology; low cost appropriate construction techniques using waste materials; low cost drains; water, health and sanitation etc.
- Establishing an environmental information network among education / technical educational institutions.
- Generating lists of experts and organization involved in environmental development protection works and publishing exhaustive directories.
- Setting up good examples through implementing efficient energy use; recycling of various wastes; greening the campus and such strategies which motivate the outsiders to take up similar steps in their own set-up.
- Participate in community panels, boards and committees that may deal with environmental impact issues such as the water commission; consumers forum; chambers of commerce; boards / corporation and various trades organizations.
- Instituting awards for unique environmental initiatives in the commu-

nity to motivate individuals / organizations and to get recognition from media.

6. CONCLUSIONS :

The present tendency of engineers, technologists and scientists is to look upon the environmental impact as an externally necessary evil, as something which is imposed from outside or as something which detracts from the technical perfection and economic viability of the project. This is the result of an imperfect understanding of the organic relationship between technology and the environment, or the absence of a systems approach to the problem. If technology is the method then the environment is the medium. Trying to optimize one without regard to the other can only result in an imperfect, or even a non-viable solutions. Technologists have to outgrow this compartmentalized approach. For this purpose, the technological problem-solvers, have to learn to ask more fundamental questions about the end use of technology, so that the real objectives can be understood and defined and they do not adopt ready made imported technological models. Such a systems approach will greatly widen the technological options and allow for more optimized solutions to real problems. Such a change of approach and attitudes, calls for a significant input at the educational level specially at the technical education level, as it has to play a role of an organic element in the production - consumption system. This

kind of input in the technical education system can be effected by one or both the methods : one is to introduce the element of environment in every course / subject and another is to have a special course / subject in environment, common to all disciplines of engineering / technology. Another approach of combination of these two methods is the best for integrating components of environment into curricula of various technical educational programmes. Over and above these functions, the technical education institutes should play a pioneering role of "Change Agents" by adopting the concepts like "Green College" a moment picking-up in some of the countries.

7. REFERENCES :

- Bhargwa M.; Mittal LN.; Jain AL, Environmental Education for Technical Engineers; Paper published in the Journal of Engineering Education, Vol. V. No.1; July, 1991.
- Development and the Environmental, Oxford University Press (1992).
- Likhi SK.; Singla PK.; Components Environmental Awareness Course in Technical Education; Paper presented during National Seminar of ISTE on Technical Education and the environment at IIT Kanpur; 16 - 17 January, 1993.
- Parikh KS.; An Operational and Measurable Definition of Sustainable Development Research, Bombay (1989).

★