Industrial technology transfer in Asia and the Pacific

by E.E. Fowler*

For ten years the Regional Co-operative Agreement for research, development and training related to nuclear science and technology (RCA) has brought together work of the IAEA and Member States in Asia and the Pacific. Current RCA projects concern health care, food and agriculture, hydrology, and industry – areas of great importance to participating Member States.** Each of the nine projects emphasizes the use of well-developed nuclear technologies to improve the standard of living in the region.

Applied research and development in areas of common interest to RCA Member States are promoted through these co-operative projects. Successful results are shared among participants. The industrial project, funded by the UNDP*** and executed by the IAEA, aims to expand and accelerate the uses of isotopes and radiation technology in five fields of industrial application. The industrial project is currently the largest project under the RCA: almost all parties to the agreement participate. Planned expenditures for the seven-year project total about US $12 500 000 (including UNDP funds and Government contributions).

Like other projects under the RCA, the industrial project will serve the pressing economic and social needs of the Asia and Pacific region. It can serve as a model to be followed by other regions of the world.

Specifically, the industrial project involves technology transfer in five carefully selected fields of proven economic merit:

- Industrial tracer applications
- Non-destructive testing
- Nucleonics control systems
- Radiation processing
- Nuclear instruments maintenance.

Experience in industrialized countries over the past 20 to 30 years has fully established technology readiness in each of the areas of interest. Based upon this experience, capital investments can be recovered in less than two years in many industries.

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** Governments participating in this regional UNDP Project are Australia, Bangladesh, India, Indonesia, Japan, Republic of Korea, Malaysia, Pakistan, Philippines, Singapore, Sri Lanka and Thailand.

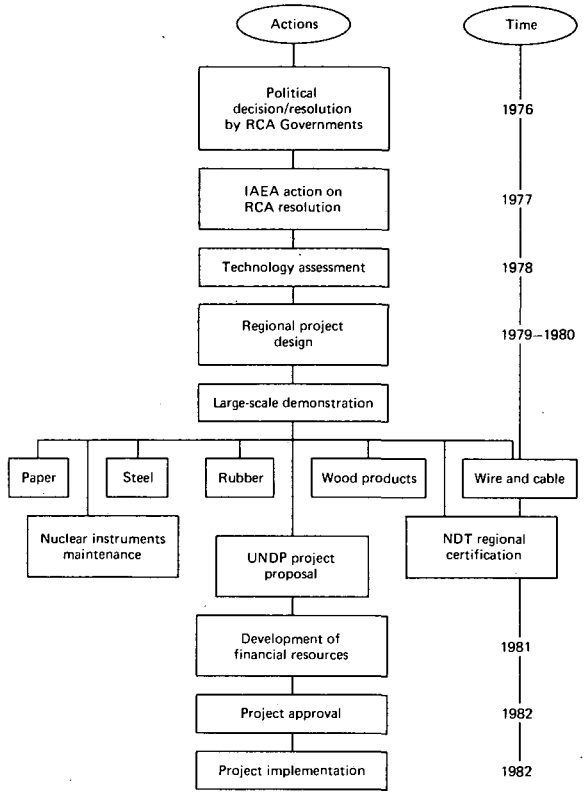
*** United Nations Development Programme.

Savings through modern technology

As the developing countries in Asia and the Pacific industrialize, they need to introduce modern technology in production and manufacturing to increase efficiency and to benefit the regional economy. The current energy shortage, environmental pollution, and increasing concern about the availability of raw materials have had a serious impact on industrial operations worldwide. This situation adversely affects newly emerging industries in developing countries in the region. Accordingly, the introduction of modern technology – with concomitant savings in raw materials and energy along with protection of the environment – is essential to continuing growth and productivity. This is the motivation for this regional project which is designed to integrate modern nuclear technology in industries to yield economic and social benefits.

Expanded use of isotopes and radiation technology by industries is supported by a regional 'network system' of established national technology centres and their resources. More specifically, the project will create economic gains over the next five to ten years and lay the foundation for long-term economic benefits in the region. This will be done by increasing the use of modern nuclear technology in base industries which contribute to the economy of the region. In addition, the use of established nuclear technology to yield better quality control, higher productivity, and lower manufacturing costs will improve the competitiveness of manufactured products in world markets. Other benefits include savings in both local and imported raw materials through the use of highly efficient nucleonics process-control technology in high-consumption industries. Use of radiation processes in industry will produce savings in electricity as high energy-consuming thermal processes are replaced.

The project aims to introduce isotopes and radiation technology selectively through special training, workshops, and demonstrations in base industries of major economic importance to the region. These industries include minerals, paper, rubber, steel, petrochemicals, and fertilizers. Demonstrations made under the project can be used as models for identical or similar plant operation elsewhere. The project also gives assistance in building the required infrastructure necessary for technology transfer. Required data and information on technical, economic, and commercial opportunities



Industrial technology transfer project within the Regional Co-operative Agreement.

essential to decisions on the part of industry and Government are compiled. Promotional activities encourage full industrial participation.

The project is designed to promote co-operation among the developing countries of the region and to optimize, through a network system, the use of resources both from developing countries and developed countries. National centres and institutes as well as industrial plants and factories for large-scale demonstrations form the regional network for project work.

Using the RCA network system mentioned above, the project will achieve its objectives in regional manpower development through special training courses, workshops, on-the-job training, fellowships, and seminars. Large-scale demonstrations of isotopes and radiation technology using industrial plants and factories as well as near commercial-scale pilot plants facilitate technology transfer and support project aims. Full industrial participation, including financial contribution, are integrated into research, development, and training efforts. Co-operation among countries in the region thus includes co-ordination of regional activities in supply of locally manufactured nuclear equipment and facilities, marketing and economic studies, information exchange on industrial applications and non-destructive testing (NDT) qualification and certification according to international standards.

Launching the industrial project

Because of the size and technical complexities of the regional project proposal, UNDP concluded in 1980 that detailed analyses and definition of technical, economic, and commercial opportunities for industrial technology transfer, and level of Governments' participation were required before a final decision could be made. Accordingly, a UNDP Preparatory Assistance Project was initiated for this purpose on 1 August 1980 and was completed on 31 March 1982.

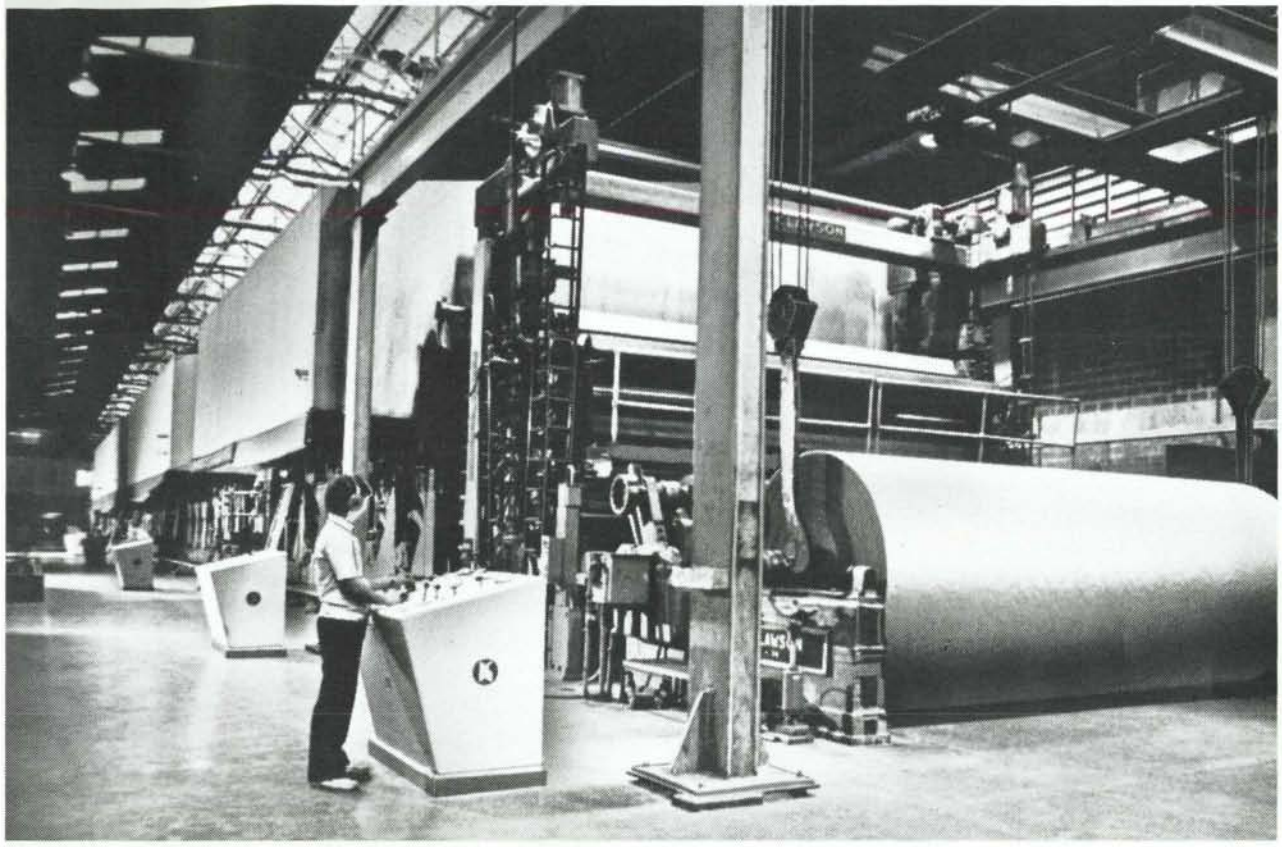
The preparatory assistance provided for a complete assessment of technical, economic, and commercial opportunities for isotopes and radiation technology transfer to major industrial segments in developing RCA countries. The assessment made particular reference to rubber, plastics, wood products, paper, steel, tin, wire and cable manufacture, and related process industries. Special attention was also given to establishing that all technology transfers to be undertaken were regional in character. Other preparatory efforts concerned negotiations with RCA countries to achieve their participation and financial contributions to the project. Ultimately, these analyses and negociations led to a detailed project document proposal, work plan, and budget which were presented to UNDP.

Various expert groups including an IAEA technical mission worked together in this complex assessment. The resulting technology assessments demonstrated conclusively that industries in developing countries in the

The industrial project financial plan

Year	Expenditures (US $)
1979	13 535
1980	123 798
1981	2 294 032
1982	2 886 279
1983	2 986 585
1984	1 802 759
1985	1 394 606
1986	764 064
1987	196 755
	12 462 413

Source	Contributions (US $)	Share
Governments	6 427 457	52%
UNDP	4 381 516	35%
Industry	1 653 440	13%
Total	12 462 413	100%



Training and large-scale demonstrations using a nucleonics control system for paper manufacture at the Siam Kraft Paper Company, Ban Pong, Thailand, are part of the RCA industrial project.

Asian-Pacific region can achieve significant economic and social gains by accelerating and broadening the use of isotopes and radiation technology. These conclusions in concert with related RCA Government priorities provided the impetus for the regional industrial project.

Future benefits

Due to the diversity among industries and due to differing levels of technology development among RCA countries, the industrial project will yield outputs which vary in intensity and impact. Common to all initiatives proposed is the expectation of direct transfer of developed modern technology with proven socio-economic benefit to regional industries. It is to be recognized that all industrial nations have required some 25 years and the expenditure of many hundreds of millions of dollars in research, development, and application to achieve their present level of isotopes and radiation use in industry. The merit of this RCA project is that it can, with moderate investment, capitalize on substantial prior investment of money and effort by highly developed countries to achieve most of the same benefits with considerably less expenditure of time and money.

Economy and efficiency in the use of limited resources – manpower, facilities and equipment, as well as developed technology – can be expanded through the existing regional network system in the twelve Governments in Asia and the Pacific participating in this project.

Because this project is designed to integrate modern technologies into industries in developing countries, development of both industrial infrastructure and manpower are vital. Demonstrations, expert services, fellowships, workshops, regional training courses, and on-the-job training form important components of manpower development.

During the term of the project a nucleus of trained manpower, both technical and managerial, can be established at a level sufficient to support moderate technology transfer and technology applications in regional industries. This same cadre of trained manpower can be expected to upgrade country infrastructures and to provide most of the training to meet continuing regional training requirements in the technology areas of interest to the project.

The design and selection of sub-projects focus primarily on manufacturing industries in which the practice and use of isotopes and radiation technology have become well established in industrialized countries. Industries chosen for demonstration and application are important in terms of indigenous raw materials, regional demands for manufactured products, and for the export trade.

Large-scale demonstrations using nucleonics systems will be carried out in the following base industries: fertilizer production in India; petroleum production in Singapore; rubber and wood products in Indonesia; paper manufacture in Thailand; steel manufacture in India; and minerals benefaction in the Philippines.

Development of natural resources

Many of the countries of the region are rich in natural resources such as oil, wood products, rubber, and minerals. Productive use of nuclear technology can benefit the increased development of these resources both for regional use and for export to world markets. For example, the economic importance of rubber to India, Indonesia, Malaysia, Sri Lanka, and Thailand is substantial. In 1980 quantities produced were approximately 1.3 million tons in Malaysia, 920 000 tons in Indonesia, 68 000 tons in the Philippines, 140 000 tons in Sri Lanka and 160 000 tons in India — a total of more than 2.5 million tons. World demand in 1980 was approximately 6 million tons. About 90 per cent of the rubber produced is exported from the region in raw form after preliminary treatment, and these countries subsequently have to import finished rubber products. The acceptance of radiation vulcanization technology in this case has the potential for creating integrated industries from raw materials to finished products, thereby increasing employment and improving world trade. Similarly, the finishing of wood products such as plywood and particle board by radiation surface-treatment can upgrade the export value and marketability of these products. Improvements and advances in exploration and processing in the minerals industries using nucleonics systems can improve recovery technology as well as reduce processing losses.

The developing countries of Asia and the Pacific are taking progressive steps to convert from largely agricultural to agro-industrial economies. Obstacles to achieving increased industrialization include inadequate infrastructure, the absence of trained manpower, insufficient management skills, and insufficient ability to develop or put in place modern technology in industry. Positive measures along a broad front are required to remove these impediments to increased industrialization. This project represents one form of positive assistance and as such is an example of technical co-operation among developing countries, the kind of assistance which is a major aim of the IAEA and UNDP, and a goal of the project.

The sub-project on mineral exploration, mining, and processing includes advanced training and in-plant demonstrations. At the Benguet Corporation in the Philippines, a nucleonics control system for copper benefaction cuts costs and improves production.