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Institutions

Power behind the refineries

The country's premier research lab in petroleum-related technology has done yeoman service to the industry, but still faces a funds crunch

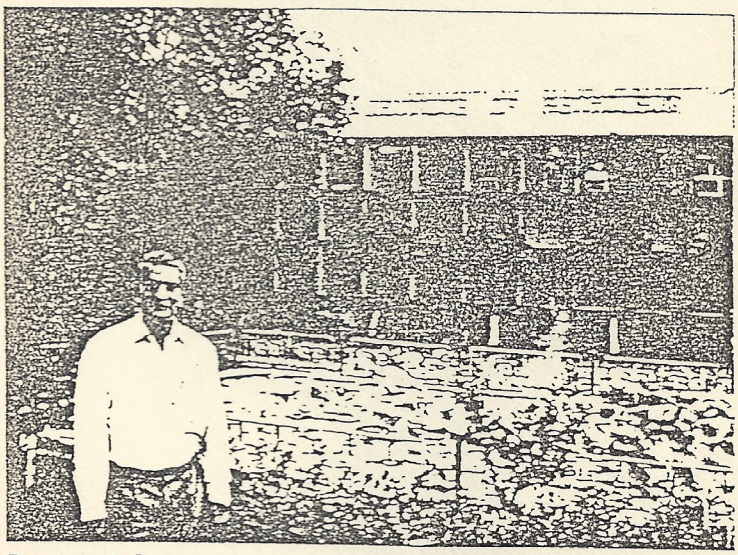
The 80-acre tea garden and fruit orchards at the picturesque Himalayan foothills provide an eye-pleasing setting for the country's premier petrochemicals and refinery research organisation, the Indian Institute of Petroleum (IIP).

The institute, located just five km from the bustling Dehra Dun town, has without much fanfare been providing know-how for several years to the industry, in the process taking on world leaders in petroleum refining technology. The institute tops the list of government laboratories whose work has been commercialised. Sixteen processes developed by IIP are in commercial use and 22 commercial units are in operation processing nearly 2.5 million tonnes of various refining streams, accounting for a total value of around Rs1,700 crore annually — no mean achievement.

The earliest and still the largest research institution to certify crude oil for the refineries, IIP first shot into prominence when it transferred a technology package to BPCL, Bombay, in 1986 for aromatic extraction of benzene and toluene, challenging the world monopoly of UOP Inc. In fact, a reluctant BPCL had to be prevailed upon to test the Indian technology by the charismatic Lavraj Kumar, who was then petroleum secretary.

For its second order, the institute needed no official patronage as the BPCL experiment was a runaway success and the company established capacities of 98,000 tonnes for benzene and 18,000 tonnes for toluene. IIP competed against a global tender and won its second customer in Cochin Refineries Limited (CRL) for similar capacities for the two products. There has been no dearth of orders since. "Both our customers are highly satisfied with our process and are recommending us to others," says a beaming Dr T.S.R. Prasada Rao, director of IIP.

"For research laboratories, the main problem is getting commercial references. Someone has to take the risk first," says Dr H.R. Bhojwani, head of the technology utilisation division of the Council for Scientific and Industrial Research (CSIR), under which IIP operates. CSIR regards IIP has one of the top five laboratories in its fold and included a number of IIP technologies under the first set of CSIR technologies being offered for commercial exploitation.



Photos: A. Thothathri Kannan

Prasada Rao is pleased with the industry's response

With two companies having endorsed the technology, the going is smooth now. "Currently we are in the final stages of negotiating with National Aromatics Limited, a SPIC joint venture and Haldia Petrochemicals for transferring the technology," says Dr Prasada Rao. The institute has also been able to upgrade the technology package since. The technology and process package was developed by IIP. Engineers India Limited (EIL) worked on plant and machinery design, and together the two public-sector institutions executed the turnkey contracts.

The next major break came within two years when IIP technology for making food-grade hexane was accepted once again by BPCL and later by MRL, Madras. Both the companies have set up 25,000-tonne capacity plants. The process, using the state-of-the-art N-methyl pyrrolidone (NMP) as a solvent, replaced phenol and furfral from the earlier-generation plants. "NMP as a solvent is getting popular only now the world over. In effect, the new plants coming up in the country can skip the other two generations of technology and use the new process," says Dr K.S. Jauri, head, industrial liaison, at IIP. In lubricants manufacture, NMP has been found highly effective, resulting in new demand for IIP technology. For instance, IOC has tied up with IIP for changeover of phenol to NMP at the Barauni lubes refinery. Both BPCL and MRL are also finalising plans for using IIP technology for their new lubes manufacturing plants.

The institute also hit the headlines recently for challenging Du Pont in developing an environment-friendly and energy-efficient process for production of polymer-grade adipic acid. The technology is being marketed worldwide by Lummus Crest of the US.

The institute set up in Delhi in 1959 and later shifted to Dehra Dun in 1962, was meant to support the entry of public-sector companies in hydrocarbon processing and application. The field then was exclusively controlled by the international oil majors and when the process of nationalisation started, IIP did pioneering work in absorbing technologies and transferring them to the Indian refineries. In crude evaluation, for instance, before the institute became active Indian companies were sending crude abroad for testing at a phenomenal cost. Against a mere Rs50,000 charged by the institute, the companies were shelling out $40,000 per evaluation at that time.

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The institute was also involved in developing ISI standards for the refineries sector and also training refinery personnel in new technologies. "Training activity still forms a major segment of the institute's work", says Dr Jauri. IIP is confident that as and when the Bureau of Indian Standards decides to notify ISO 9000 standards, it could provide the necessary support to BIS.

The institute also successfully transferred technology for removal of paraffins in the Haldia refinery of IOC, and a capacity of 70,000 tonnes has been created. The institute has been doing pioneering research in the emerging area of absorptive separation to reduce the benzene and sulphur content to the barest minimum in petrochemical and food grade hexane. "At present, nearly 3,000 tonnes of petrochemical-grade hexane are being imported at a cost of Rs.20,000 a tonne, which can be completely replaced using the new process," says Jauri.

A key to the recent successes of the institute is its industry orientation rather than pure research, much before the parent organisation, CSIR woke up to the realities of the changing environment and started insisting on a similar approach for its member laboratories. Being a person from industry, Rao who came to IIP from IPCL four years ago has been able to steer the institute on the path of applied research. "The emphasis is to involve industry and we even started holding annual contact seminars with industry. The first was held in Bombay in 1992, and the second in Madras this April also proved to be equally popular," says Dr Rao.

"There is a conscious policy to take up application-oriented research along with involving outside agencies right from the ideas stage," says Dr Jauri. This would give a clear focus to research and also ensure a firm commitment from the industry to take up the technology for commercial use.

For instance, in the catalytic conversion area where the institute has marked impressive results, working closely with IPCL, MRL and IOC, the institute was able to develop new catalytic reforming processes. The bimetallic reforming catalyst jointly developed with IPCL is considered a major breakthrough and the technology is now being jointly propagated by the world-renowned *Institut de France du Petrole*, which was hitherto supplying reforming catalysts.

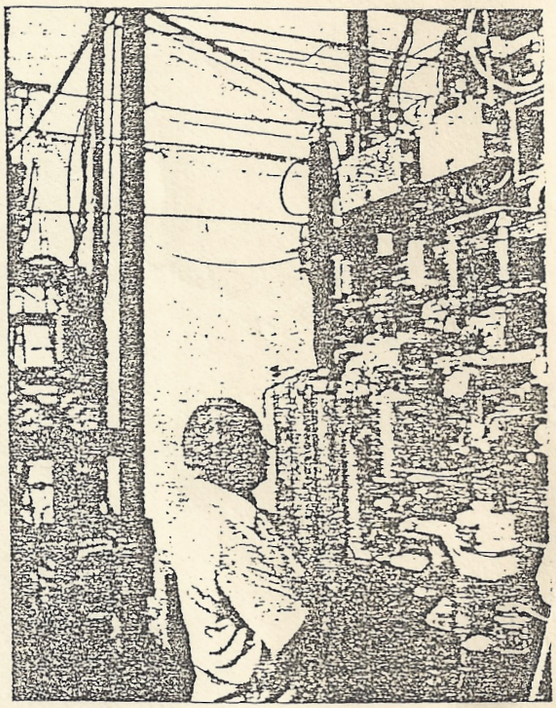
As a natural extension, the institute has been working with IFP and EIL in developing a catalytic regenerative reformer (CCR) for the proposed Panipat refinery of IOC.

Despite a host of technologies on the block and some already operating well in the field, the lab is suffering owing to incorrect pricing, lack of freedom to seek its own resources and to some extent owing to wrong priorities. For instance, a significant amount of the institute's time and resources has been diverted to automobile pollution studies and the use of alternative fuels to run internal combustion engines. Likewise, considerable time and money is being spent on rural and household technologies such as hurricane lamps, kerosene stoves, LPG burners, etc.

"These technologies draw attention away from the institute's real work, which should be in refinery, crude evaluation and related fields and drag the institute into avoidable controversies," says a senior CSIR scientist. The institute is at present pitted against NEERI in a controversial project to produce an expensive catalytic convertor for cars, to reduce auto pollution. Besides, funds are always a major problem with IIP, as with any other national laboratory which depends on CSIR doles.

The lab needs anything upwards of Rs100 crore, while the promise of even the Rs9 crore grant from OIDB, representing user industry interests, is causing quite a ripple among the scientific establishment. The OIDB grant will be essentially used for upgrading the laboratory facilities and spurring new research in emerging fields such as zeolite-based catalysts, hydro treating of crude, alternative fuels sources such as Jojoba petrocrop and alcohol, bio-technology etc.

"The search for alternative fuels is crucial, and an institute working in fossil fuels area is best suited for research in alternatives," says Dr Prasada Rao. In petrocrop for instance, a considerable amount of work has been done though essentially this remains at the laboratory level. Future research projects will depend heavily on external funding, which will also decide the type of research the institute gets involved in, says Dr Jauri. At present, the institute is generating close to 30 per cent of its resources internally, a percentage laid down by the Dr Mashelkar committee on financing research in national laboratories. "With the increase in IIP activities in recent years, to take this percentage to at least 50 per cent in the next few years would need a herculean effort and a lot of industry support," says Prasada Rao. But for oil companies flush with funds and with the sector opening up, this should pose no problem.



The aromatic extraction research unit of IIP

Aromatic extraction	BPCL	80,000
	CRL	70,000
Foodgrade Hexane	BPCL	25,000
	MRL	25,000
Bimetallic catalyst	MRL	90,000
Lube oil	65cos	20,000
Dewaxing	IOC	72,000
Delayed coking	BRPL	5,00,000

Source: IIP, Dehra Dun

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