Indian Petrochemicals saves costs, gains competitiveness and employee commitment with ISO 14001-based EMS

Indian Petrochemicals Corporation Limited (IPCL), established by the Indian Government in 1969 and recently acquired by the Reliance industry group, has pioneered the development of the petrochemicals sector in India. It is also recognized for its safety and environmental concerns. The authors, IPCL executives, outline the company's approach to environmental protection, encompassing ISO 14001 certification of its Nagothane complex leading to cost savings, raised competitiveness, and company-wide employee commitment to resource conservation and pollution control.

Indian Petrochemicals Corporation Limited (IPCL)[1] manufactures and markets polymers, synthetic fibres, intermediate chemicals, catalysts and other petrochemicals-based products. It was founded by the Indian Government in 1969, at a time when the private sector was not mature enough to undertake this business where investments were very high, technologies were guarded, and local markets not well developed.

The company pioneered the development of the petrochemicals sector in India and is recognized for its capabilities in petrochemical technology absorption, market development, research, good corporate citizenship, and for its safety and environmental concerns.

In 1990, IPCL was rated first in performance among petrochemicals manufacturers worldwide by United Kingdom-based industry journal *Chemical Insight*. The company is also noted for its environmental policies and commitment to the concept of sustainable development. Environmental protection has been incorporated in all stages of evolution of its major Maharashtra Gas Cracker Complex (MGCC) at Nagothane in the Raigad district of Maharashtra State, which achieved ISO 14001 certification in 2000.

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IPCL-MGCC has been recognized by the Indian Government and several non-governmental institutions for

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its outstanding contribution to environmental conservation, signified by the Dr. R. J. Rathi Environmental Protection Award, the Maharashtra State Government Vanashree Award, and the Indo-German Greentech Environment Excellence Award for 2000-2001.

This article outlines MGCC's journey towards full implementation of ISO 14001, now a central element of its environmental policy which was developed in response to the principles of sustainable development established at the Earth Summit in Rio de Janeiro in 1992.

IPCL focuses on environmental management at all stages of its activities

IPCL's approach to environmental protection

IPCL focuses on environmental management at all stages of its activities, from selecting technology to operating and monitoring process plants. Environmentally friendly, low waste technologies were selected during the project stage at MGCC, followed by environmental impact assessment studies to determine air emissions, water effluents, etc.. These studies, carried out by the Council of Scientific and Industrial Research (CSIR), an independent research organization funded by the Government of India, led to the preparation of a comprehensive environmental management plan.

The next step was to implement and monitor the plan, and upgrade the environmental management system (EMS) in line with technological developments worldwide.

IPCL commissioned a state-of-art effluent treatment system designed to release treated wastewater into the estuary of the Amba river, 26 km downstream from the plant site at Nagothane. The disposal site was identified by the government-funded National Institute of Oceanography (NIO) after 15 months of detailed studies. A 40 km stretch of the river is regularly monitored by NIO scientists to confirm that the water, sediment quality and biological characteristics today are benign and comparable with baseline water quality.

In order to upgrade the eco-system of the region, IPCL initiated arboriculture (greenbelt) development activities in 1986, consisting of planting some 1,8 million saplings on 400 hectares of land.

Route map to ISO 14001

ISO 14001 provides a framework to institutionalize environmental protection and integrate environ-

The ISO 14001-certified Maharashtra Gas Cracker Complex at Nagothane is surrounded by a 400 hectares green-belt area planted since 1986 by IPCL as a demonstration of its commitment to ecological conservation.

A bio-medical waste incinerator was installed in December 2001 to ensure environmentally safe disposal of infectious and contaminated hospital waste in compliance with Bio-Medical Waste Rules 2000 legislated by the Indian Government.

mental management practices with day-to-day activities. Implementation of the international EMS standard at IPCL's Nagothane complex began during 1st quarter 1999. The task covered 19 units, including process plants, utilities, service groups, medical units and township services, and culminated in ISO 14001 certification some 15 months later.

Today, environmental management at IPCL focuses on five core elements – **1)** *commitment to environmental policy*, **2)** *planning*, **3)** *implementation*, **4)** *measurement and evaluation*, and **5)** *review and improvement.*

1) *Commitment to environmental policy*

To fulfil the requirements of ISO 14001, IPCL environmental policy focuses on "4C's":

– *Compliance* with legislation

– *Conservation* of resources by minimizing waste and maximizing recycling

– *Continual improvement* to enhance environmental performance and reduce impact by prevention

– *Communication* to raise awareness among employees so they work in an environmentally friendly manner.

2) *Planning*

This is the key element of the EMS undertaken by a multi-disciplinary core team of 35-40 members in collaboration with an environment management group. During this demanding phase, approximately 350 "environmental aspects" were identified by the environmental audit, and mass flow diagrams indicating resources, waste emissions, etc., were prepared.

Construction of an underground water tank at IPCL's gas cracker plant will save an estimated 210 000 litres of cooling water per day by recycling instead of draining it to the waste water treatment plant.

The team also identified "significant environmental aspects" based on ISO 14001 guidelines, classified as:

- regulations and laws
- impacts
- wastage of resources
- interested parties
- frequency, control, preventive mechanisms, etc.

The core team set a number of environmental objectives in line with the environmental policy. These included technically and commercially viable targets based on signifi-

IPCL's ISO 14001 EMS requires the segregation of workplace waste at its scrapyard area prior to recycling or environmentally friendly disposal.

cant environmental aspects and on compliance with legislative requirements, focused on improving environmental performance, conserving resources, recycling, reduction of waste etc. Resource allocation for legislative compliance was given highest priority.

Forty-nine long- and short-term specific, challenging, achievable and time-bound targets with clearly defined responsibility were established. The team also framed ten objectives in line with environmental policy, highlighting compliance with rules and regulations for hazardous waste and bio-medical waste, calling for the phasing out of ozone depleting substances, reuse of resources and minimizing waste, improving housekeeping and the work environment, conserving water, optimizing energy consumption, reducing volatile organic ompounds and creation of a green belt. These will be achieved via targets set by each plant/department for continual improvement in environmental performance. Waste minimization/resource reuse and conservation of water are priorities.

ISO 14001 provides a framework to institutionalize environmental protection and integrate environmental management practices in day-to-day activities

3) *Implementation*

This was the resource allocation phase, involving money and manpower. Here, the core team established procedures for communications, document control, preparedness for emergency response etc., by preparing environmental system and procedure manuals and an environmental legislative compliance register.

In addition, the team prepared operation control procedure manuals for each plant/department to eliminate, minimize and monitor the significant environmental aspects of critical operations.

Training programmes played a key role in developing competency and an environmentally friendly approach among employees. All were made aware of the EMS and its requirements. The core team has also estab-

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lished a procedure to identify training needs and feedback results.

4) *Measurement and evaluation*

Internal audits are the principal means of measuring, monitoring and evaluating environmental performance at IPCL. These are conducted every six months by trained internal EMS auditors in order to identify procedural or system nonconformities, if any. In addition, Det Norske Veritas[2] our certification body, carries out surveillance audits in the intervening periods.

Also, environmental records associated with critical operations and ISO 14001 audit requirements i.e. nonconformities, corrective and preventive action, are properly maintained and audited. Collectively, these measurement and evaluation tools ensure EMS implementation in totality with minimal scope for complacency.

5) *Review and improvement*

Top IPCL management continuously reviews the EMS to ensure its suitability, adequacy and effectiveness. It focuses particularly on the extent to which objectives and targets have been met, on policy formulation, and on addressing chronic or long pending environmental issues. Other key elements of such reviews include investigations of any concerns among interested parties, and resource requirements including funding.

Benefits of ISO 14001 implementation

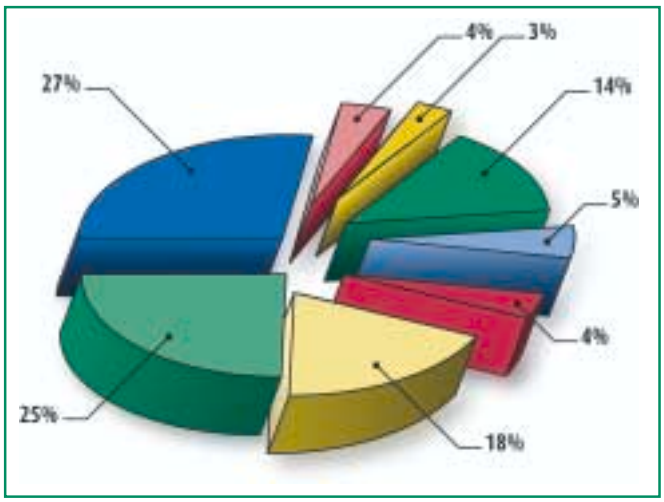
There is no doubt that implementation of the ISO 14001-based EMS at IPCL-MGCC's manufacturing operations at Nagothane has enhanced employee commitment towards resource conservation and prevention of pollution across the organization. Previously, the environment was considered the responsibility of a small group only, but now all personnel are involved and contribute increasingly to the betterment of the environment.

ISO 14001 certification has helped us gain in competitiveness

On the recent World Environment Day, employees were asked to respond to the question, "Why are we going for ISO 14001?" (see survey results, **Figure 1**). More than 50% believed that environmental protection and resource conservation was a must, and nearly 20 % thought that the present generation had a moral obligation to ensure sustainable development for future generations, and for society as a whole. While 14 % saw business, marketing and competitive enhancements as reasons for implementation, only 3 % thought that IPCL was doing it to enhance image or set an example.

The comprehensive audit undertaken during the initial environment review phase of ISO 14001 implementation has helped us estimate resource losses. This led to a change in mindset, and the acceptance that "waste is a misplaced resource". As a consequence, each plant and department has identified significant aspects and has set techno-commercially viable targets of waste reduction, recycling, re-use, elimination, or conservation of the resource. Savings resulting from such schemes are estimated at INR 20-25 million per annum. Furthermore, water recycling and reduction projects are expected to save INR 1,7-1,8 million per annum.

Figure 1 – Why are we going for ISO 14001? – survey results



ISO 14001 implementation leaves no scope for non-compliance with legislative requirements, and calls for compliance within a specific time frame for all new legislation. Accordingly, Bio-Medical Waste (BMW) Rules were implemented and the IPCL Medical Unit was among the first to register with the statutory authority, the Maharashtra Pollution Control Board (MPCB), in Raigad Zone. In addition, IPCL management has planned the installation of an incinerator well before the deadline specified.

One of IPCL's environmental objectives is the planting of 20 000-40 000 tree saplings per year to sustain its green-belt area. To date, the company has planted some 1,8 million saplings, of which approximately one million have survived.

India is signatory to the Montreal Protocol on the phase out of ozone depleting substances. As a responsible company, IPCL has already met intermediate phase-out targets for ozone depleting refrigerants, and is in dialogue with refrigeration agencies to identifying environmentally acceptable alternatives.

The EMS has had a major impact, since all plant/department personnel are now well informed of the latest environmental developments and their contributions to environment protection are monitored by top management. Scheduled internal and external audits do not allow any relaxation, and failure to comply with EMS requirements is easily noticed. Corrective and preventive actions are taken in management review meetings. As a result, the system is proving to be dynamic and a guarantee of continuous improvement.

Our well documented and communicated operation control procedures have drastically reduced "adhocism" – the element of inconsistency and complacency in old procedures. Also, ISO 14001 implementation has improved the housekeeping and work environment at IPCL. In this context, the company has developed and implemented objective evaluation mechanisms based on the Japanese 5S Principles (*Seri, Seiton, Seiso, Seiketsu and Shitsuke*).

Furthermore, ISO 14001 certification has helped us gain in competitiveness versus other organizations in the sector as it reflects IPCL's proactive approach to protecting the environment through preventive rather than corrective mechanisms.

The EMS has had a major impact since all personnel contributions to environment protection are monitored by top management

In conclusion

An ISO 14001-based EMS can help improve market share because certified organizations are perceived as believing in "Responsible Care". EMS implementation also helps build confidence among interested parties in the industry, and satisfy the aspirations of stakeholders such as employees, regulatory authorities, public customers, financing bodies, insurance organization and shareholders.