

GOVERNMENT OF INDIA  
MINISTRY OF CHEMICALS AND FERTILIZERS  
DEPARTMENT OF CHEMICALS AND PETROCHEMICALS  
**RAJYA SABHA**  
UNSTARRED QUESTION No. 1627  
ANSWERED ON 10.12.2024

**CUTTING EDGE TECHNOLOGY IN CHEMICALS AND PETROCHEMICALS**

1627: SHRI AYODHYA RAMI REDDY ALLA:

Will the Minister of CHEMICALS AND FERTILIZERS be pleased to state:

- a. the manner in which India's chemical and petrochemical industry leverage cutting-edge technologies like artificial intelligence, blockchain, and IoT to enhance efficiency, sustainability and innovation;
- b. the strategies employed to ensure growth of the sector is environmentally sustainable and aligned with global climate change mitigation efforts;
- c. the manner in which chemical and petrochemical industry of the country will navigate the evolving global trade landscape, including emerging protectionism and shifting supply chains; and
- d. the role digitalization and Industry 4.0 technologies will play in transforming the manufacturing processes of the sector, quality control and customer engagement?

**ANSWER**

THE MINISTER OF STATE FOR CHEMICALS & FERTILIZERS

(SMT. ANUPRIYA PATEL)

(a): Emerging technologies such as artificial intelligence and machine learning have the potential to transform the landscape of the chemical and petrochemical industry, offering benefits for optimizing production and decision-making processes. The use of these technologies could assist in automated data analysis, scenario planning, risk mitigation as well as process optimization. Currently, the use of these technologies in the sector is limited.

(b): The Government of India has implemented various measures to ensure that chemical plants in India comply with environmental regulations and are equipped with effective pollution control technologies. The Ministry of Environment, Forest and Climate Change (MoEF&CC) has prescribed environmental standards for various pollutants under the Environment Protection Act, 1986. All industrial units, including chemical plants, are required to comply with these standards to control air, water, and soil pollution. Various regulations/standards with respect to environment regulations are as under:

- **The Environment Impact Assessment Notification 2006** by MoEF&CC, mandates any project or activity likely to cause significant environmental impacts, including chemical units, must undergo an Environment Impact Assessment (EIA) and prepare environment management plan before obtaining Environmental Clearance (EC).
- These industries are also required to obtain Consent to Operate (CTO) under the Air (Prevention and Control of Pollution) Act, 1981, and the Water (Prevention and Control of Pollution) Act, 1974, to ensure compliance with pollution control norms.
- The compliance of EC conditions is monitored by the Regional Office of MoEF&CC for Category 'A' projects and by the State Pollution Control Boards (SPCBs) or Pollution Control Committees (PCCs) for Category 'B' projects. Similarly, the compliance of CTO conditions is monitored by the respective SPCBs/PCCs. This multi-layered monitoring system ensures that industries operate in an environmentally responsible manner.
- **Hazardous Chemicals Safety Regulations:** The MoEF&CC administers the Manufacture, Storage and Import of Hazardous Chemicals (MSIHC) Rules, 1989 (as amended), and the Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996 (CAEPPR Rules, 1996) (as amended). These rules establish preventive mechanisms for chemical safety in industrial operations. The occupiers of Major Accident Hazard (MAH) units are required to conduct annual safety audits and update their Safety Audit Reports. They must also prepare and update the On-site Emergency Plan.
- **Off-site Emergency Plans:** The MSIHC Rules, 1989 assign responsibility for preparing the Off-site Emergency Plan to the District Collector or designated District Emergency Authority (DEA) in each district. The Chief Inspector of Factories (CIF), appointed under the Factories Act, 1948, assists the DEA in preparing these plans, ensuring coordinated action in case of chemical emergencies.
- It is mandatory for all the Chemical industries to have adequate Effluent Treatment System and adequate Air Pollution Control System and to comply with the prescribed effluent and emission discharge standards.
- Central Pollution Control Board (CPCB) has issued directions to all 17 categories of highly polluting industries including Certain Chemicals industries to install Online Continuous Effluent / Emission Monitoring System (OCEMS) with real time data connectivity with CPCB. CPCB conducts regular inspections of the industries based on exceedance alerts of OCEMS or if OCEMS becomes offline. Based on the observations of inspections, CPCB takes action on the defaulter industries as per extant rules.
- The Extended Producer Responsibility (EPR) Regulations mandate targets for minimum level of reuse, recycling/ refurbishment and use of recycled content.
- Industries are encouraged to adopt energy-efficient technologies under the Perform, Achieve, and Trade (PAT) Scheme of the Bureau of Energy Efficiency (BEE). The Carbon Capture, Utilization, and Storage (CCUS) programme aims to reduce carbon emissions through emphasis on research and development and capacity building.
- The Department of Chemicals and Petrochemicals implements the Scheme for setting up of Centres of Excellence (CoEs). The CoEs undertake research in development of biodegradable and bio-based chemicals and polymers for various applications.

(c): The Indian chemical and petrochemical industry has adopted a strategic approach to boost competitiveness, diversify markets, and align with global trends. The steps taken include capacity expansion in niche and emerging areas; investment in modern technology; offering cost-effective and scalable manufacturing capabilities; foreign collaborations for technology transfer and co-development of high-value products; exploring new export markets; ensuring compliance with international standards and regulations etc.

The Government provides due support to the industry by negotiating Free Trade Agreements (FTAs) as well as advocating for our industry's interests at multilateral forums such as the World Trade Organisation (WTO) so as to mitigate the impact of tariff and non-tariff barriers as well as secure preferential market access for Indian products; positioning India as an attractive investment destination by undertaking ease of doing business reforms; facilitating infrastructure development through the Petroleum, Chemicals, and Petrochemicals Investment Regions (PCPIRs) and Plastic Parks; supporting innovation to enhance competitiveness; and ensuring that Indian chemical products meet global quality and safety standards.

(d): Digitalization and Industry 4.0 technologies have the potential to transform the chemical and petrochemical sector, promoting efficiency, sustainability, and competitiveness across the value chain. The use of these technologies enhances operational efficiency, enables process optimization, ensures quality consistency and compliance with safety standards, ensures timely delivery along with real time tracking, helps to reduce waste generation and lower carbon emissions. It also allows for collection and analysis of customer behaviour and feedback, thereby facilitating development of customized solutions.

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