Hydrogen-free desulphurization process by CSIR-IIP

October 14, 2022

In news– CSIR-Indian Institute of Petroleum(CSIR-IIP) announced its new atmospheric-pressure hydrogen-free low-carbon desulphurization process for crude oil and refinery streams.

Key updates-

- Crude oil and many **petroleum refining streams contain Sulphur-Containing Heterocyclic Aromatic Compounds (SCHAC)**, which are **responsible for the corrosion of assets, poor fuel quality, health issues**, and environmental problems.
- **Refinery streams like petrol, diesel, jet fuel, kerosene and fuel oil therefore need to be treated for sulphur reduction** before its final end-use.
- Conventionally, such treatment involves expensive, high-pressure hydrogen, high-temperature operations and significant capital investment, and also substantial associated net greenhouse emissions (carbon footprint) for effecting the necessary desulphurization.
- To address this, a novel single-step hydrogen-free desulphurization process has been developed by CSIR-IIP.
- Crude oil from various sources, and sulphur-containing streams from several refineries in India, have been tested; up to 90 percent of the sulphur content, depending on the specific nature of the stream being treated, can be removed by the process.
- **The transformed sulphur compounds produced from the SCHAC components by the CSIR-IIP process are easily**

separable from the de-sulfurized crudes or other refinery streams via simple filtration process, and offer promise in bulk applications like road construction and coatings.

- The facile, **inexpensive process offers a potentially transformative low-carbon desulfurization solution** for bulk processing of petroleum streams at ambient pressures and mild temperatures.
- **It has the potential to change the existing desulfurization configuration of crude oil** and refinery streams in a cost-effective manner without the use of expensive hydrogen, especially for marine and industrial heating applications.

What is Hydrodesulfurization?

- It is a **catalytic chemical process widely used to remove sulfur (S) from natural gas** and **from refined petroleum products,** such as gasoline or petrol, jet fuel, kerosene, diesel fuel, and fuel oils.
- The purpose of removing the sulfur, and creating products such as ultra-low-sulfur diesel**, is to reduce the sulfur dioxide (SO2) emissions** that result from using those fuels in automotive vehicles, aircraft, railroad locomotives, ships, gas or oil burning power plants, residential and industrial furnaces, and other forms of fuel combustion.
- Another important reason for removing sulfur from the naphtha streams within a petroleum refinery is that sulfur, even in extremely low concentrations, poisons the noble metal catalysts (platinum and rhenium) in the catalytic reforming units that are subsequently used to upgrade the octane rating of the naphtha streams.
- The industrial hydrodesulfurization processes include facilities for the capture and removal of the resulting hydrogen sulfide (H2S) gas.

Note-

- Established in 1960, CSIR-Indian Institute of Petroleum is one of the 37 constituent laboratories of the Council of Scientific and Industrial Research, an autonomous Society headed by the Honourable Prime Minister of India.
- CSIR-IIP develops and offers technologies, products and services aimed at reducing India’s dependence on fossil fuel imports, in mitigating the environmental impact of the global oil and gas sector, and in efficiency enhancement, capacity building and thought leadership for low-carbon energy transition across a wide range of energy producer and energy user industries.