High-Pressure Polymeric Membrane for Sea Water Desalination

***Prelims**: Current events of national and international importance| General science*

Why in news?

Recently Defence Research & Development Organisation (DRDO) has successfully developed an indigenous nano porous multi-layered polymeric membrane for high-pressure seawater desalination.

- **Desalination** - It is the process of removing dissolved salts and other impurities from saline water to produce fresh, drinkable water suitable for human consumption, agriculture, or industrial use.
- **Types**
  - **Reverse Osmosis (RO)** – Membrane-based filtration.
  - **Thermal Desalination** – Heating saline water to produce water vapor, which is then condensed to obtain fresh water.

Reverse Osmosis (RO) is a membrane-based water purification process in which saline water is forced through semi-permeable membranes under high pressure, allowing only water molecules to pass through while blocking dissolved salts, minerals, and impurities.

- **High-Pressure Polymeric Membrane -** This membrane is designed for use in high-pressure seawater desalination, aimed particularly at meeting the needs of the Indian Coast Guard (ICG).
- **Features** – The Nanoporous architecture increases surface area and selectivity.
- Multi-layered design offers improved mechanical strength, salt rejection, and chemical resistance.
- **Improved stability** – The membrane addresses a key operational challenge that is the ***instability of conventional membranes*** when exposed to chloride ions in saline water.
- The polymeric membrane is engineered to withstand high pressure and chloride-rich conditions, making it suitable for deep sea desalination systems.
- **Developed by** – Defence Materials Stores and Research & Development Establishment (DMSRDE), a Kanpur-based DRDO laboratory.
- It is currently under testing and trials in the existing desalination plant.
- **Strategic Utility** – it enhances self-reliance (Aatmanirbhar Bharat) in maritime technologies, reducing dependence on imported desalination systems.
- **Defense Capability** – It strengthens the operational sustainability of Indian Coast

Guard ships during long missions.
- It can support coastal desalination needs, helping address water scarcity.
- **Technological Milestone** – It demonstrates India's growing expertise in advanced polymer and membrane technology within a short R&D cycle.

Reference

PIB| High-Pressure Polymeric Membrane