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National Technology Day

India's Technological Leap Toward Atmanirbharta

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While science serves as the foundation for the progress of any nation, technology provides the means to resolve the daily-life problems of the citizens. Science articulates principles, whereas technology represents the practical application of those scientific principles. India celebrates National Technology Day every year on May 11 to commemorate India's major technological achievements and to honour scientists, engineers, and innovators who contribute to national development. The day marks the anniversary of the Pokhran-II Nuclear Tests conducted in 1998, which demonstrated India's indigenous technological capabilities in nuclear science and defence. This particular day highlights the importance of Innovation and technology in economic growth, national security, and societal progress. It also encourages young researchers, startups, and industries to develop indigenous solutions supporting the vision of Atmanirbhar Bharat (Self-Reliant India), strengthening India's position as a global leader in science and technology.

Vision of Atmanirbhar Bharat focuses on strengthening domestic capabilities in science, technology, manufacturing, and innovation. The initiative aims to reduce dependence on imports, promote indigenous research, and build globally competitive technologies developed within the country. Scientific institutions, universities, startups, and government agencies have played a crucial role in developing home-grown technologies that support this vision.

Country's organisations such as the Department of Science and Technology (DST), Indian Space Research Organisation (ISRO), Defence Research and Development Organisation (DRDO), and Council of Scientific and Industrial Research (CSIR), Department of Biotechnology (DBT) and Department of Atomic Energy (DAE) have contributed significantly to the development of indigenous technologies across multiple sectors including space, defence, healthcare, energy, agriculture, and digital technologies. These innovations not only



enhance national capability but also strengthen economic growth and technological independence.

CSIR, one of the largest publicly funded research networks with 37 national laboratories across India. CSIR develops indigenous technologies and translates scientific research into practical industrial solutions. These innovations reduce import dependence, support domestic industries, and address national challenges in health, energy, agriculture, and environment.

Bio-Bitumen from Agricultural Waste

Two laboratories of CSIR have come up with a significant innovation called bio-bitumen which is used in road construction. These labs are the Central Road Research Institute (CRRI), New Delhi and the CSIR-Indian Institute of Petroleum (IIP), Dehradun. Bio-bitumen is produced from agricultural residue, especially rice straw. The technology converts crop residue into bio-oil through pyrolysis, which is then processed into a bio-binder suitable for road construction. This innovation can replace up to 30% of petroleum-based bitumen used in road building. The technology not only reduces dependence on imported petroleum products but also

addresses the environmental problem of stubble burning in northern India.

Indigenous Dialysis Technology

Scientists at the CSIR's Indian Institute of Chemical Technology (IICT) have developed an indigenous technology for manufacturing ultra-thin hollow fibre membranes used in dialysis machines. Previously, these membranes were mostly imported and were expensive. The indigenous version is cost-effective and more affordable for patients. It also maintains global quality standards. The technology also includes advanced reverse osmosis and Nanofiltration systems that produce high-purity water needed for dialysis procedures. This innovation demonstrates how indigenous medical technologies can improve healthcare accessibility while reducing reliance on imported medical devices.

CSIR has also developed several indigenous diagnostic tools and biomedical innovations such as micro-PCR diagnostic devices, DNA-based diagnostic chips for infectious diseases, and low-vision enhancement devices. These technologies enable rapid and affordable disease detection and treatment. Such innovations strengthen India's healthcare infrastructure and promote domestic manufacturing of medical technologies.

Food and Environmental Protection Technologies

Thiruvananthapuram based CSIR lab National Institute for Interdisciplinary Science and Technology (NIIST) has developed high-protein rice varieties with improved nutritional value. The rice contains nearly three times the protein of conventional varieties and has a low glycaemic index, making it beneficial for health-conscious consumers. Along with this, CSIR scientists have also developed technologies such as low-sodium salt formulations and advanced food

preservation methods to reduce post-harvest losses of fruits and vegetables.

CSIR laboratories have also developed innovative environmental technologies. The CSIR-National Environmental Engineering Research Institute (NEERI), Nagpur has created an indigenous Faecal Sludge and Septage Management (FSSM) system that converts waste into organic manure. The system uses a Mechanical Dewatering and Drying technology that safely processes sludge collected from septic tanks and sanitation systems. The resulting product can be used as fertilizer in agriculture. This technology promotes sanitation, environmental protection, and circular economy practices in urban areas.

Sodium-Ion Batteries and Green Hydrogen Technologies

CSIR laboratories are actively working on emerging energy technologies such as sodium-ion batteries, green hydrogen production, and advanced energy storage systems. These technologies aim to reduce dependence on imported lithium-based batteries and fossil fuels. Sodium-ion batteries use abundant and inexpensive raw materials, making them a promising solution for energy storage and electric



mobility. Similarly, CSIR's research in green hydrogen technology supports India's transition toward clean and sustainable energy systems.

The Department of Science and Technology (DST) of Indian government plays a critical role by funding research, encouraging industry-academia collaboration, and promoting the commercialisation of indigenous technologies. A number of DST-supported innovations in recent years address major national challenges such as clean water, healthcare, renewable energy, digital technologies, and rural development. These technologies reduce dependence on imported solutions while strengthening India's innovation ecosystem.

AMRIT Arsenic Removal Water Technology

This is one of the most impactful DST-supported innovations for water purification. It is developed by researchers at IIT Madras. The system uses nanotechnology-based filters to remove

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