

Matsya-6000: India's Fourth-Generation Deep-Ocean Submersible successfully Completes Wet Testing

500-Meter Depth Demonstration by end of 2025

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Under the Government of India's Deep Ocean Mission initiatives, the Ministry of Earth Sciences has entrusted the National Institute of Ocean Technology with the ambitious task of designing and developing the 4th Generation deep-ocean human scientific submersible named "Matsya-6000," as part of the Samudrayan Project. This cutting-edge submersible is engineered to accommodate three humans within its compact 2.1-meter diameter spherical hull, marking a significant milestone in India's ocean exploration capabilities.

Following the completion of the design phase, various subsystems vital to Matsya-6000's functionality were identified and developed. The submersible features a comprehensive array of components: a main ballast system for diving, thrusters for movement in all three directions, a battery bank for power supply, and syntactic foam for buoyancy. It also includes a sophisticated power distribution network, cutting edge control hardware and software, along with advanced underwater navigation devices. Communication systems include an acoustic modem, underwater telephone, and VHF for surface communication, supplemented by underwater acoustic positioning and GPS for precise surface location tracking.

Inside the spherical hull, careful attention has been given to the integration of human life-support systems, displays of various environmental/critical parameters, navigation joysticks for manoeuvrability, as well as various oceanographic sensors, underwater lighting and cameras outside the hull. All these subsystems have been indigenously designed and are currently undergoing thorough integration and qualification testing.

To ensure a seamless integration of all systems within its exo-structure, the Matsya underwent a comprehensive series of integrated dry tests over a 500-meter operational range. Following the successful completion of these tests, Matsya was transported to the L&T Shipbuilding facility located at Kattupalli Port, near Chennai during 27 Jan to 12 Feb, 2025 for conducting wet tests and demonstrating the submersible functionality.

The tests aimed to meticulously assess Matsya's performance across several critical parameters. Evaluations focused on the robustness of power and control networks, floatation and stability of the vehicle, human support and safety systems, and maneuverability within limited degrees of freedom, specifically forward and reverse motion. Additionally, navigation and communication capabilities were scrutinized. The scientific payloads, which included multiple sophisticated oceanographic sensors, were thoroughly tested and demonstrated to confirm their intended functionality. This demonstration phase featured eight dives in total, comprising five unmanned dives and five manned dives. Each manned dive was rigorously qualified, ensuring the reliability of the life support system.

Due to the restricted water depth in the harbour, underwater voice communication was less effective, highlighting the necessity for further testing at greater depths to enhance confidence in shallow-water operations. In certain areas, additional efforts are needed to achieve optimal performance and completeness. Nevertheless, the successful wet test of the Matsya6000 at the harbour bolstered confidence for conducting shallow-water demonstrations at depths reaching up to

500 meters by the end of 2025.

1. Unmanned, without buoyancy module
2. Unmanned, with buoyancy module
3. 3 human inside the submersible, Manned with buoyancy module
4. Matysa team





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