

EBOOK

India Vaccine Manufacturing: The Top Challenges, Technology Gaps & Solutions for 2027

An industry outlook on the technologies shaping vaccine R&D, manufacturing, quality, automation, facilities, supply chain and cold-chain operations in India.

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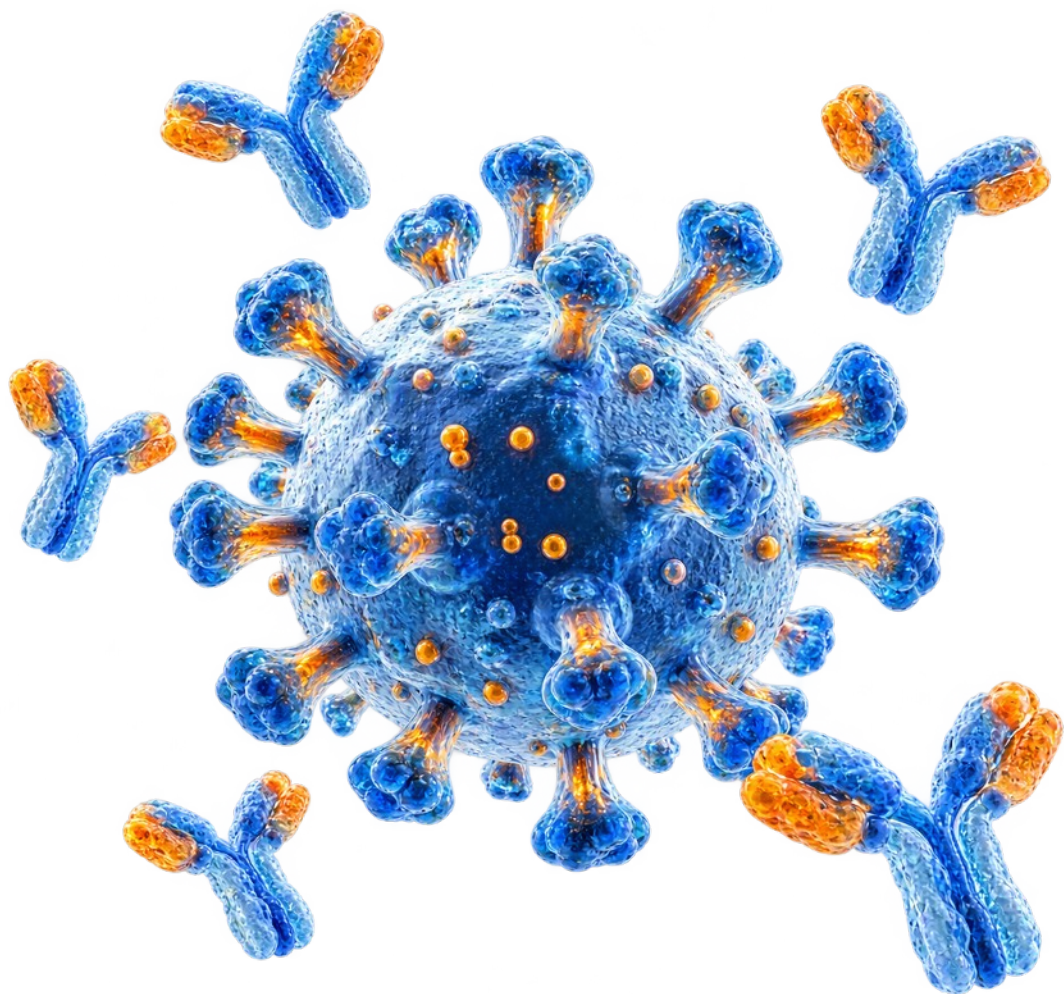
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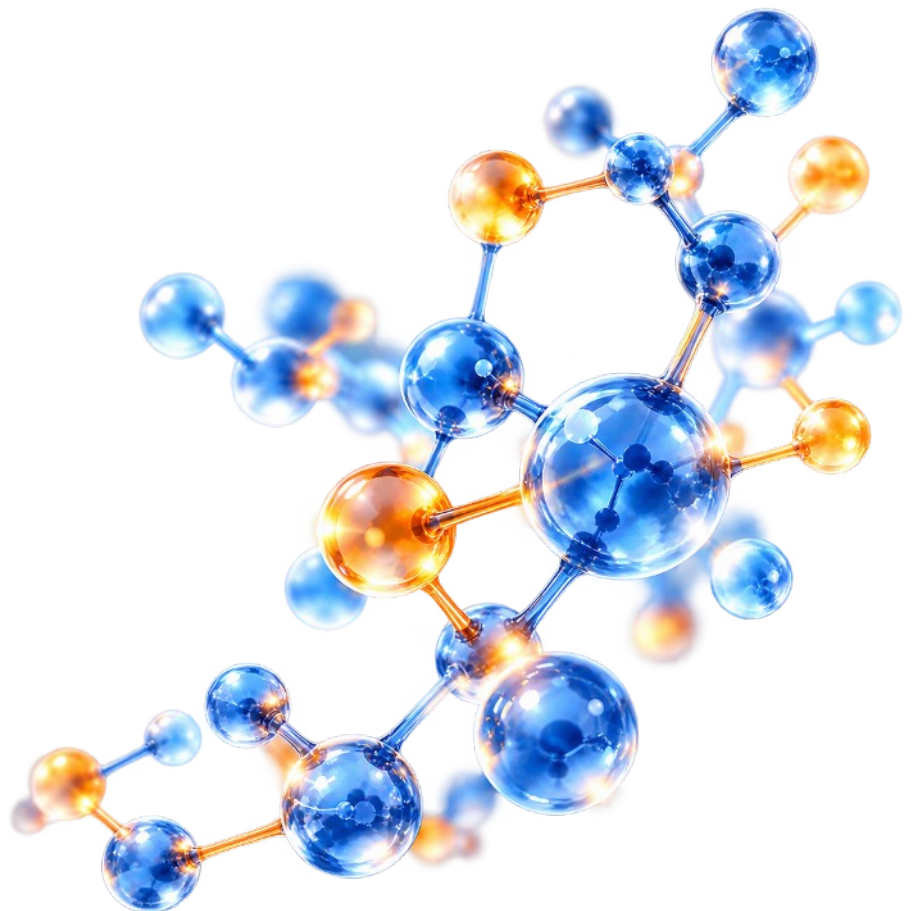


INTRODUCTION

India's vaccine manufacturing ecosystem is entering a new phase of growth. Increasing production capacity, adoption of next-generation vaccine platforms, evolving quality requirements and the need for greater manufacturing efficiency are creating new technology requirements across the value chain.

The opportunity is no longer limited to manufacturing capacity alone. Vaccine manufacturers are increasingly looking for technologies that can improve productivity, process control, automation, quality, facility performance, data visibility and supply-chain resilience.

This report maps the key technology challenges across vaccine manufacturing, the technology requirements emerging from those challenges, and the solution providers addressing them.



INDIA VACCINE MANUFACTURING: TECHNOLOGY CHALLENGES & SOLUTIONS

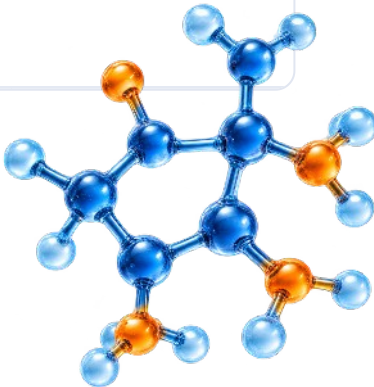
Area	Technology Challenge	Technology Requirement	Technology / Solution	Example Providers
Bioreactors & Upstream	Scale-up, productivity and process variability	Scalable, controlled production	Advanced bioreactors, fermentation systems, process control	Sartorius, Cytiva, Thermo Fisher, BIOZEEN, Riviera, Scigenics
Single-Use Technology	Contamination risk, cleaning requirements and limited flexibility	Flexible, closed processing	Single-use bags, assemblies, tubing and connectors	Sartorius, Cytiva, Pall, Merck, V&W Biotech, Shah Brothers, Ami Polymer
Process Development	Slow development-to-scale transition	Faster process optimisation and scale-up	Development bioreactors, scale-down models, process-development platforms	Sartorius, Eppendorf, BIOZEEN, Bioline Technologies
PAT & Process Monitoring	Limited real-time process visibility	Continuous monitoring and control	PAT, sensors, real-time analytics	Mettler Toledo, Endress+Hauser, Yokogawa, Sartorius
Downstream Processing	Purification bottlenecks and product loss	Higher recovery and throughput	Chromatography, TFF, filtration and process skids	Cytiva, Sartorius, Merck, Pall, Repligen, Aaruni Lifesciences
Filtration	Limited filtration capacity and process efficiency	High-performance separation	Depth, membrane and viral filtration	Pall, 3M, Sartorius, Cytiva, V&W Biotech

INDIA VACCINE MANUFACTURING: TECHNOLOGY CHALLENGES & SOLUTIONS · cont.

Area	Technology Challenge	Technology Requirement	Technology / Solution	Example Providers
Chromatography	Long purification cycles and capacity constraints	Faster, scalable purification	Chromatography systems and resins	Cytiva, Sartorius, Merck, Tosoh Bioscience, ChromaTan
Formulation	Product stability and formulation complexity	Controlled mixing and formulation	Mixing, formulation and buffer-preparation systems	Sartorius, Cytiva, Thermo Fisher
Aseptic Processing	Contamination risk and manual intervention	Closed, controlled sterile processing	Isolators, RABS and aseptic processing systems	Getinge, SKAN, Syntegon, OPTIMA
Fill-Finish	Aseptic capacity and filling consistency	Automated sterile filling	Filling machines, isolators and RABS	OPTIMA, Syntegon, IMA, Bausch+Ströbel, Capfill Technologies, GMP MachPro
Container Closure	Seal integrity and leakage risk	Reliable container closure	Stoppering, capping and container-closure integrity testing	Stevanato Group, West Pharmaceutical Services, Datwyler, Gerresheimer
Inspection	Manual inspection and defect detection	Automated quality inspection	Vision inspection and automated defect detection	Antares Vision, Syntegon, Stevanato Group, Wipotec, Novus Nextech

INDIA VACCINE MANUFACTURING: TECHNOLOGY CHALLENGES & SOLUTIONS · cont.

Area	Technology Challenge	Technology Requirement	Technology / Solution	Example Providers
Packaging	Manual processes and limited line flexibility	Higher throughput and automation	Cartoning, labelling, serialization and packaging lines	IMA, Syntegon, Marchesini, Körber, Harikrushna Machines, Cadmach
Cleanroom	Contamination control and controlled environments	Higher environmental control	Cleanrooms, HEPA filtration and contamination-control systems	Camfil, Klenzaims, Exyte
HVAC	Temperature, humidity and air-pressure control	Precise environmental control	HVAC, air handling and pressure-control systems	HTL Aircon, Syntec Airflow Systems, Camfil, Systemair
Water & WFI	High-purity water requirements and utility efficiency	Reliable purified water and WFI	Water purification and treatment systems	Veolia, BWT, Ion Exchange, Indu Ionpure
Sterilisation	Sterility assurance and equipment turnaround	Reliable sterilisation	Autoclaves, depyrogenation and sterilisation systems	STERIS, Getinge, Fedegari, Tuttnauer
Quality Control	Testing complexity and long turnaround times	Faster, reliable analysis	Analytical instruments and laboratory automation	Thermo Fisher, Agilent, Waters, Shimadzu, Bio-Rad
Microbiology	Manual testing and contamination monitoring	Faster microbial testing	Rapid microbiology, environmental monitoring and testing systems	bioMérieux, Merck, HiMedia, Thermo Fisher



INDIA VACCINE MANUFACTURING: TECHNOLOGY CHALLENGES & SOLUTIONS · cont.

Area	Technology Challenge	Technology Requirement	Technology / Solution	Example Providers
Data Integrity	Fragmented quality and production data	Centralised, traceable data	Digital QC, electronic records and data-management systems	Körber, ValGenesis, AVEVA
Automation	Manual intervention and process inconsistency	Automated production control	PLC, SCADA, DCS and industrial automation	Siemens, Emerson, Rockwell Automation, Schneider Electric, ABB
MES / Digital Manufacturing	Disconnected manufacturing systems	End-to-end production visibility	MES, electronic batch records and digital workflows	Körber, Siemens, AVEVA, Dassault Systèmes
Industrial IoT	Limited equipment and process visibility	Connected equipment and real-time data	IoT sensors, dashboards and remote monitoring	Siemens, Schneider Electric, Emerson
Predictive Maintenance	Equipment downtime and reactive maintenance	Early fault detection	Condition monitoring and predictive analytics	Siemens, Emerson, ABB, Honeywell
Robotics	Manual handling and repetitive operations	Reduced human intervention	Robotic handling and automated material movement	ABB, FANUC, KUKA
Facility Engineering	Complex facility expansion and integration	Faster, compliant facility development	Facility design, engineering and EPC solutions	Exyte, Jacobs and specialist pharma engineering companies
Energy & Sustainability	High utility consumption and operational costs	Efficient, optimised facilities	Energy monitoring, utility optimisation and efficient systems	Siemens, Schneider Electric, ABB and specialist providers

INDIA VACCINE MANUFACTURING: TECHNOLOGY CHALLENGES & SOLUTIONS · cont.

Area	Technology Challenge	Technology Requirement	Technology / Solution	Example Providers
Cold Rooms	Temperature stability and storage capacity	Reliable controlled-temperature storage	Cold rooms and refrigeration systems	Carrier, BITZER, Frascold, Elanpro, Bluecold
Temperature Monitoring	Temperature excursions and limited visibility	Real-time monitoring	IoT sensors, data loggers and alert systems	Sensitech, Controlant, ELPRO, Tive, Berlinger
Thermal Packaging	Temperature exposure during transport	Passive / active temperature control	Thermal packaging and temperature-controlled containers	CSafe, Pelican BioThermal, SkyCell, Sonoco ThermoSafe
Cold-Chain Logistics	Distribution complexity and shipment visibility	Controlled and trackable transport	Refrigerated logistics and connected shipment monitoring	Envirotainer, Kool-ex, Snowman, Celcius
Refrigerated Transport	Maintaining temperature during long-distance transport	Reliable temperature-controlled vehicles	Reefer systems and pharmaceutical transportation	Thermo King, Carrier, Kool-ex, Snowman
Supply-Chain Digitalisation	Limited end-to-end visibility	Connected supply-chain data	Track-and-trace, IoT and logistics platforms	Tive, Controlant and specialist logistics technology providers
Technology Localisation	Need for regional technology capability	Local equipment, components and support	Indian equipment, components and system integration	BIOZEEN, Scigenics, Riviera, Aaruni Lifesciences, V&W Biotech

THE TECHNOLOGY OPPORTUNITY ACROSS THE VALUE CHAIN

Manufacturing Priority	Technology Opportunity
Increase production capacity	Bioreactors, process equipment and automation
Improve productivity	PAT, sensors and process optimisation
Reduce contamination risk	Single-use, closed systems and cleanrooms
Improve purification	Chromatography, filtration and TFF
Expand aseptic capacity	Fill-finish, isolators and RABS
Improve product quality	Inspection, analytics and QC
Reduce manual operations	Automation and robotics
Improve data visibility	MES, SCADA and Industrial IoT
Strengthen facilities	HVAC, cleanrooms, water and sterilisation
Improve cold-chain performance	Monitoring, refrigeration and thermal packaging
Improve distribution visibility	Connected logistics and track-and-trace
Strengthen technology ecosystem	Local suppliers, system integrators and specialist providers



WHO IS ADDRESSING THESE TECHNOLOGY GAPS?

India's vaccine technology ecosystem extends beyond the largest multinational suppliers. It includes established global technology companies, Indian manufacturers, specialist solution providers, engineering companies, automation integrators and emerging technology businesses.

Provider Segment	Role in Vaccine Manufacturing
Global Technology Leaders	Advanced equipment, platforms and integrated manufacturing solutions
Indian Established Suppliers	Local equipment, manufacturing and technical support
Specialist Technology Providers	Niche technologies addressing specific manufacturing requirements
Engineering & System Integrators	Facility, process and automation integration
Emerging Technology Companies	New technologies, localisation and specialised applications

The opportunity spans the full manufacturing ecosystem:



CONNECTING TECHNOLOGY WITH INDIA'S VACCINE ECOSYSTEM

The evolving requirements of India's vaccine industry are creating opportunities for technology providers across bioprocessing, single-use systems, purification, fill-finish, packaging, quality, automation, digitalisation, facility infrastructure and cold-chain operations.

Vaccine World Summit India 2027 brings together vaccine manufacturers, biotech companies, technology providers, regulators, researchers and industry stakeholders to discuss the technologies and solutions shaping India's next phase of vaccine manufacturing.



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Learn more

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CONFIRMED 2027 SPEAKERS

**Dr. Tathagata Dutta**

President, JODA S EXPOIM PVT LTD., India

**Dr. Rajni Kant**

Sr Adviser, VHAI, Visiting Professor, SEARCH, Former Director, ICMR-RMRC, Gorakhpur, Chair-Disease Elimination & Scientist G & Head, Policy & Communications, ICMR Hqrs., New Delhi, India

**Dr. Santosh Taur**

Director Medical Affairs, Vaccines & Digital, Pfizer Ltd., India

**Dr. Vikram K**

Deputy Site Lead – Patient Safety, Bristol Myers Squibb, India

**Dr. Rajendar Burki**

Vice President, Research & Development, Biological E., India

**Dr. Ankur Mutreja**

Director – External Affairs & Global Health Security, PATH, India

**Dr. Vaibhav Salvi**

Director and Head – Clinical Study Unit, India and South East Asia, Sanofi, India

**Dr. Prem Singh**

Director & Senior Technical Advisor, Immunization, Jhpiego, India

**Dr. Mandeep Singh Dhingra**

Director and Head, R&D Programs, CEPI, USA

**Dr. Kapil Maithal**

President – Vaccines & Diagnostics, Zydus Lifesciences Limited, India

**Dr. Chakshusmathi Ghadiyaram**

Head – Pre-Clinical R&D, Mynvax, India

**Dr. Abhishek Agarwal**

Deputy Director (Research), The INCLEN Trust International, New Delhi, India

**Dr. Kar Muthumani**

President – R&D, Bharat Biotech International Limited, India.

**Dr. Petro Terblanche**

Chief Executive Officer, Afrigen Biologics (Pty) Ltd, South Africa

THE CONNECTION



Where India's vaccine manufacturing challenges meet the technologies and solution providers addressing them.

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