

INDUSTRIAL CASE STUDY

Cleanroom Air Sterilization & Process Heating Solutions

Modular HEPA/UV-C Sterilization AHU with Integrated Process Air Heating — 20,000 CFM Pharmaceutical Cleanroom System

Designed, Engineered & Validated by KERONE Engineering Solutions Limited

20,000

CFM

SYSTEM AIRFLOW

Supply Air Handling

80

degC

PROCESS TEMP.

Drying / Process Air

6-Log

Reduction

BIOBURDEN CONTROL

UV-C Germicidal Dose

ISO 7

Class

PARTICLE COMPLIANCE

Grade C Achieved

32

%

ENERGY SAVINGS

Via Heat Recovery

<1

CFU/m3

VIALBE COUNT

At Diffuser Outlet

20

ACH

AIR CHANGE RATE

Grade C Cleanroom

~3.2

Yrs

PAYBACK PERIOD

Energy + Compliance Value

Field	Detail
Client Organisation	Vitalis Pharma Industries Ltd. — Sterile injectable & oral solid dosage manufacturer
KERONE Reference	KRDC/ICS/CleanAir/2025-02 Based on KRDC Lab Report 52/KRDC/LAB/22
Technology	Modular Cleanroom AHU with HEPA H14 Filtration, UV-C Germicidal Sterilization Module & Electric Process Air Heating Bank
Feedstock / Input Condition	Return + fresh makeup air — average airborne bioburden 450 CFU/m3 (as-received), non-compliant particle counts
Product Output	ISO Class 7 (Grade C) conditioned air — <1 CFU/m3 viable count, 6-log bioburden reduction, 80 degC +/-0.5 degC process air
Plant Location	Client facility — Injectable Manufacturing Block, Baddi, Himachal Pradesh, India
Document Date	June 2026 Validated on KRDC Lab Data — October 2025

Pharmaceutical Cleanrooms | GMP Compliance | Airborne Bioburden Control | Process Air Heating | HVAC Energy Recovery | Life Sciences

Executive Summary

Vitalis Pharma Industries Ltd., a growing Indian manufacturer of sterile injectables and oral solid dosage forms, faced a recurring compliance and productivity challenge at its Baddi manufacturing block: the existing HVAC system could not consistently hold airborne bioburden and particle counts within ISO Class 7 (Grade C) limits, and the process air heating system serving the granule-drying and lyophilization support areas ran on inefficient, poorly controlled electric duct heaters with no heat recovery.

KERONE Engineering Solutions Limited was engaged to design, validate, and specify a combined cleanroom air sterilization and process heating system capable of simultaneously meeting GMP-grade air quality requirements and reducing energy consumption, at a total conditioned airflow of 20,000 CFM serving the injectable filling and coating suites.

Following structured laboratory validation at KRDC (Kerone Research & Development Centre) using a scaled UV-C germicidal test rig across multiple dosage levels (10, 20, 35 and 50 mJ/cm2), the optimal industrial process parameters were established. The KERONE modular AHU — combining HEPA H14 filtration, a 35 mJ/cm2 UV-C sterilization bank, and an electric process heater bank with rotary heat-recovery wheel — delivers a 6-log (99.9999%) reduction in airborne bioburden and sustains ISO Class 7 particle compliance, while cutting heating energy consumption by 32% versus the baseline system.

CHALLENGE	KERONE SOLUTION	OUTCOME ACHIEVED
Airborne bioburden of 450 CFU/m3 and inconsistent particle counts — repeated Grade C non-conformance flags in internal audits, with high-energy, uncontrolled process air heating.	Modular 20,000 CFM AHU with HEPA H14 + 35 mJ/cm2 UV-C sterilization bank, electric process heater with heat-recovery wheel — validated from KRDC lab trials.	6-log bioburden reduction, <1 CFU/m3 viable count, sustained ISO Class 7 compliance, 32% heating energy reduction.

Key Performance Summary

KPI	Baseline (Existing System)	After KERONE System (20,000 CFM)	Improvement
Airborne Bioburden	450 CFU/m3	< 1 CFU/m3	6-log (99.9999%) reduction
Particle Count (0.5 micron)	Non-compliant (Grade D)	< 352,000 /m3 (ISO 7 / Grade C)	Grade compliance achieved
Process Air Temp. Stability	+/- 5 degC	+/- 0.5 degC	10x tighter control
Heating Energy Consumption	Baseline (no recovery)	32% lower	Heat-recovery wheel + zone control
Compliance Status	Non-compliant / audit flags	USFDA & WHO-GMP audit-ready	Grade uplift
Estimated Annual Value	INR 0 (cost centre only)	INR 2.1-2.6 Cr/yr (energy + batch-loss avoidance)	New value stream from compliance

Industry Context & The Business Challenge

India's pharmaceutical manufacturing sector operates under increasingly stringent air-quality mandates as export-oriented plants pursue USFDA, EU-GMP, and WHO-GMP certification. Sterile and semi-sterile manufacturing areas (Grade B/C/D per EU-GMP, broadly equivalent to ISO Class 5-8) must maintain both non-viable particle counts and viable (microbial) counts within defined limits — failures in either parameter are among the most common observations cited in regulatory audits of Indian formulation plants.

Conventional HVAC systems designed primarily for temperature and humidity control frequently fall short on microbial control, since standard filtration alone does not neutralize airborne bioburden — it only captures particulate matter down to a given efficiency. Facilities are increasingly required to add active sterilization (UV-C, or less commonly ionization/ozone) to achieve consistent log-reduction performance, while simultaneously managing the substantial energy cost of conditioning large volumes of pharmaceutical-grade air, particularly where process heating (for drying, granulation support, or lyophilization pre-chambers) adds further thermal load.

The Commercial Problem — Why Non-Compliant Air Quality Erodes Value

Quality Parameter	Baseline System (Vitalis Pharma)	GMP Requirement (Grade C / ISO 7)	Gap
Viable Count (Bioburden)	450 CFU/m3	< 100 CFU/m3 (typical Grade C limit)	FAIL — 4.5x over limit
Non-viable Particles (0.5 micron)	~610,000 /m3	< 352,000 /m3	FAIL — ~1.7x over limit
Process Air Temp. Control	+/- 5 degC swing	+/- 1 degC (typical process spec)	FAIL — inadequate for drying uniformity
Heating Energy Efficiency	No heat recovery	Industry benchmark: heat-recovery equipped	Gap — recurring energy overspend

Table 1: Baseline air quality parameters vs GMP requirement for Grade C / ISO Class 7 cleanrooms | Source: KRDC Analysis & ISO 14644-1 / EU-GMP Annex 1 Reference Limits

Revenue & Risk-Avoidance Opportunity

The Opportunity: Non-compliance in cleanroom air quality carries two direct cost streams for a facility of this scale — batch rejection/rework losses estimated at INR 1.2-1.6 Cr/year based on Vitalis Pharma's recent audit history, and avoidable HVAC energy overspend of an estimated INR 55-70 Lakhs/year due to the absence of heat recovery. Upgrading to a validated, GMP-compliant AHU with integrated sterilization and heat recovery converts both of these into recovered value: an estimated INR 2.1-2.6 Cr/year combined benefit, alongside the strategic value of audit-readiness for export markets.

About Vitalis Pharma Industries Ltd.

Vitalis Pharma Industries Ltd. is a privately held Indian pharmaceutical manufacturer with sterile injectable and oral solid dosage manufacturing capacity, supplying both domestic and export markets. Its operations span injectable filling, lyophilization support, tablet coating, and packaging — positioning the Baddi facility as a representative anchor site for KERONE's cleanroom sterilization and process-heating technology. The KRDC trial was conducted using return-air samples and duct-mounted UV-C test coupons from Vitalis Pharma's actual injectable filling suite (sampled over 6 days, 12-17 October 2025) to ensure industrial relevance of all process parameters.

Process Validation — From KRDC Lab to Industrial Scale

KERONE's engineering approach mandates laboratory-scale validation before any industrial system specification. The KRDC (Kerone Research & Development Centre) conducted a structured experimental programme on air samples and bioburden coupons drawn from Vitalis Pharma's actual filling suite over 6 days (12-17 October 2025), using a scaled duct-mounted UV-C germicidal test rig to establish the process envelope that informs the 20,000 CFM industrial AHU design.

KRDC Experimental Programme — Key Findings

Test Condition	UV-C Dose	Log Reduction	Viable Count Result	Assessment
Control (no UV)	0 mJ/cm2	0-log	450 CFU/m3	Baseline — untreated air
Low dose	10 mJ/cm2	~2-log	4.5 CFU/m3	Insufficient — rejects Grade C spec
Medium dose	20 mJ/cm2	~4-log	0.45 CFU/m3	Acceptable for Grade D areas
OPTIMAL	35 mJ/cm2	6-log	< 0.01 CFU/m3 (practical: <1 CFU/m3)	Optimal for Grade C compliance
High dose	50 mJ/cm2	~6.5-log	< 0.01 CFU/m3	Marginal gain — diminishing returns, higher lamp OPEX

Table 2: KRDC Laboratory Results — duct-mounted UV-C germicidal test rig on Vitalis Pharma return air | KRDC Test Report 52/KRDC/LAB/22 | Viable count per IP/USP settle-plate & active air sampling method

Scale-Up Methodology — Lab to 20,000 CFM

KERONE's scale-up process follows a structured engineering framework where laboratory germicidal parameters are translated to industrial AHU specifications using validated UV dosimetry and airflow residence-time models. The key translation factors for this project are:

Parameter	KRDC Lab (Test Rig)	Industrial Plant (20,000 CFM AHU)	Scale-Up Factor
UV-C Dose	35 mJ/cm2	35 mJ/cm2	1:1 (direct)
Airflow Residence Time in UV Bank	0.8 sec	0.8 sec (bank sized to match)	1:1 (direct)
Airflow Capacity	~120 CFM	20,000 CFM	~167:1
Filtration Stage	HEPA H13 (test-scale)	HEPA H14 (terminal, full bank)	Upgraded
Process Air Temp.	80 degC (bench heater)	80 degC +/- 0.5 degC (zone-controlled)	1:1 (direct)
Heating Mode	Electric coil (single stage)	Electric bank + rotary heat-recovery wheel	Configuration change

Industrial System Design — 20,000 CFM Continuous Cleanroom AHU

Process Flow — Fresh Air Intake -> Pre-Filter (G4) -> Heat Recovery Wheel -> Fine Filter (F8) -> Electric Process Heater Bank -> UV-C Sterilization Module -> HEPA H14 Terminal Filtration -> Supply Air Fan -> Cleanroom Diffusers -> Return Air -> BMS/SCADA Monitoring throughout.

System Architecture — Major Process Units

Unit / Section	Equipment	Design Parameters	Function
U-01: Fresh Air Intake	Louvered intake hood + G4 pre-filter	20% fresh air makeup 4,000 CFM rated	Remove coarse particulate; weather protection
U-02: Heat Recovery	Rotary thermal wheel (sensible)	70% recovery efficiency 20,000 CFM rated	Recover exhaust heat to pre-condition incoming air
U-03: Fine Filtration	Bag filter F8 stage	MERV 13-14 equivalent 20,000 CFM	Protect downstream UV lamps & HEPA bank from loading
U-04: Process Heater Bank (Primary)	KERONE Electric Duct Heater Bank	80 degC +/-0.5 degC 3-zone SCR control 20,000 CFM	Core process heating for drying/support areas
U-05: UV-C Sterilization Module	Duct-mounted UV-C lamp bank	35 mJ/cm2 dose 0.8 sec residence 20,000 CFM	Achieve 6-log airborne bioburden reduction
U-06: Terminal Filtration	HEPA H14 filter bank	99.995% efficiency @ 0.3 micron Diffuser-mounted	Final particulate control at point of delivery
U-07: Supply Air Fan	Plug fan, VFD-controlled	20,000 CFM @ 150mm WG 30 kW motor	Maintain design airflow & room pressurization
U-08: Ductwork & Diffusers	Galvanised steel ducting, laminar diffusers	20 ACH +ve pressure cascade (15/10/5 Pa)	Deliver conditioned air with correct pressure cascade
U-09: BMS/SCADA Control	PLC/SCADA control panel	Siemens S7 / Allen Bradley Remote monitoring	Automated temperature, UV-dose, pressure & filter-DP monitoring; data logging for GMP records

Core Equipment Specification — KERONE Cleanroom AHU

The KERONE Modular Cleanroom AHU is the heart of the air sterilization and process heating system. Designed and manufactured in-house at KERONE's Ambernath facility, it directly scales the validated laboratory UV-C dosimetry from KRDC trial 52/KRDC/LAB/22 to industrial airflow while maintaining the identical dose, residence time, and filtration staging that produced the 6-log reduction result.

Parameter	Specification
Design Airflow	20,000 CFM (34,000 m3/hr)
Operating Temperature (Process Bank)	80 degC (max design: 120 degC)
UV-C Residence Time	0.8 sec (adjustable via bank length / fan speed)
AHU Casing	Double-skin, 50mm PUF insulated, powder-coated GI
Filtration Stages	G4 pre-filter -> F8 fine filter -> HEPA H14 terminal
Heat Recovery	Rotary thermal wheel, 70% sensible efficiency
Heater Bank	Electric, SCR-controlled, 3 independent zones
Drive System	VFD-controlled 30 kW plug fan motor
Installed Power	~95 kW (total connected load)
Construction	GI casing with SS 304 contact surfaces (heater/UV zone)
Sealing	Gasketed panel joints, leak rate < 0.5% at test pressure

Utilities & Ancillary Requirements

Utility	Specification	Consumption (at 20,000 CFM)	Source
Electrical Power	415V, 3-phase, 50Hz	~95 kW connected ~72 kW avg demand	Site utility
Chilled Water (for cooling coil, if summer load)	7 degC supply / 12 degC return	45 m3/hr	Site chiller plant
Compressed Air	6 bar dry instrument grade	8 Nm3/hr	Air compressor (site)
Space Requirement	Plant room / covered area	L 14m x W 6m x H 4m	Existing utility floor or new plant room

GMP / ISO Compliance Validation

Validation Point	Parameter	Result Achieved	GMP / ISO Limit	Status
Diffuser outlet (Grade C room)	Viable Count	< 1 CFU/m3	< 100 CFU/m3	COMPLIANT
Diffuser outlet (Grade C room)	Non-viable Particles (0.5 micron)	< 300,000 /m3	< 352,000 /m3	COMPLIANT
Process air (drying support)	Temperature Stability	+/- 0.5 degC	+/- 1 degC (process spec)	COMPLIANT
Room pressure cascade	Differential Pressure	15/10/5 Pa (cascade)	> 10 Pa between grades	COMPLIANT

Air Balance & Energy Analysis — 20,000 CFM Operation

Detailed Air Balance — Per Hour at Full Load

Stream	Description	Flow Rate (CFM)	Notes
Fresh Air Intake (IN)	Outdoor makeup air	4,000	20% of total supply; pre-filtered at G4 stage
Return Air (IN)	Recirculated cleanroom air	16,000	80% of total supply; passes through heat-recovery wheel
Supply Air (OUT)	Conditioned air to cleanroom	20,000	80 degC process stream / 22 degC room stream as required, HEPA H14 filtered
Exhaust Air (OUT)	General exhaust after heat recovery	3,800	~95% of fresh-air-equivalent exhausted after heat recovery
Leakage / Room Relief	Envelope leakage & relief damper	~200	Maintains positive pressure cascade

Energy Consumption Estimates

Energy Category	Equipment / Unit	Power (kW)	Load Factor	Consumption (kWh/hr, avg)
Process Heater Bank	Electric SCR-controlled duct heater (3-zone)	60	70%	42
Supply Air Fan	VFD plug fan	30	85%	25.5
UV-C Lamp Bank	Duct-mounted UV-C lamps	3.5	100%	3.5
Controls & Auxiliaries	BMS/SCADA, dampers, sensors	1.5	90%	1.35
TOTAL (before heat recovery credit)		~95 kW		~72.4
Heat Recovery Credit	Rotary thermal wheel (70% sensible)	-	-	~23 (energy avoided)
NET CONSUMPTION				~49.4 kWh/hr (32% below baseline)

Cleanroom Performance Specification & Application Areas

Expected Performance Specification — KERONE Processed Cleanroom Air

Parameter	Test Method	Baseline (Input)	Processed (20 mJ/cm ²)	Processed (35 mJ/cm ² , Optimal)	Grade C / ISO 7 Requirement
Viable Count	IP/USP active air sampling	450 CFU/m ³	~0.45 CFU/m ³	< 1 CFU/m ³	< 100 CFU/m ³
Non-viable Particles (0.5 micron)	ISO 14644-1	~610,000 /m ³	~340,000 /m ³	< 300,000 /m ³	< 352,000 /m ³
Temperature Stability	BMS trend log	+/- 5 degC	+/- 1.5 degC	+/- 0.5 degC	+/- 1 degC (typical)
Relative Humidity	BMS trend log	45-65% RH	45-55% RH	45-50% RH	45-55% RH (typical)
Room Classification Achieved	Overall assessment	Grade D / non-compliant	Grade D+ (borderline)	Grade C (ISO 7)	Grade C (ISO 7) target

Table 6: Performance specification — baseline air vs KERONE-processed air at two UV dose levels vs Grade C / ISO 7 requirement | 35 mJ/cm² column = recommended operating point

Application Areas for KERONE Cleanroom Air Sterilization & Process Heating

- Sterile Injectable Filling Suites: Grade B/C background environments for aseptic filling lines require sustained viable-count control; the 35 mJ/cm² configuration meets Grade C background requirements feeding Grade A/B filling zones.
- Oral Solid Dosage (OSD) Manufacturing: Tablet coating, compression and granulation areas benefit from combined particulate and process-heat control for consistent drying and reduced cross-contamination risk.
- Lyophilization Support Areas: Pre-chamber and loading areas require tight temperature and humidity control; the process heater bank with +/-0.5 degC stability supports consistent lyophilization cycle starting conditions.
- Biologics & Fill-Finish Facilities: Higher sensitivity to bioburden makes the 6-log UV-C reduction pathway attractive as a supplementary control layer ahead of terminal HEPA filtration.
- Semiconductor & Electronics Cleanrooms: Non-pharma cleanroom applications requiring ISO Class 6-8 particle control can adopt the same AHU platform without the UV-C bank where microbial control is not a requirement.
- Hospital Operation Theatres & CSSD: Healthcare facility HVAC upgrades can use a scaled-down version of the same architecture for OT and sterile supply areas requiring GMP-equivalent air quality.

Financial Analysis & Return on Investment

CAPEX Estimate — 20,000 CFM System

Cost Head	Scope	Estimated Cost (INR Lakhs)	Notes
Cleanroom AHU (Primary Equipment)	KERONE supply, factory tested	38-45	FOT Ambernath; includes casing, fan, drive
UV-C Sterilization Module	Duct-mounted lamp bank, controller	8-10	35 mJ/cm ² rated, spare lamp set included
Electric Process Heater Bank	SCR-controlled, 3-zone	9-11	60 kW rated, SS contact elements
Heat Recovery Wheel	Rotary thermal wheel + drive	6-8	70% sensible efficiency rated
HEPA H14 Terminal Filtration	Diffuser-mounted terminal HEPA modules	6-7	99.995% @ 0.3 micron, DOP test ports
Ductwork & Diffusers	GI ducting, laminar diffusers, dampers	7-9	Includes balancing dampers, VAV as needed
BMS/SCADA & Instrumentation	PLC/SCADA panel, sensors, cabling	5-6	GMP-compliant data logging & alarms
Civil & Structural	Plant room, foundation, utilities connections	3-4	Client scope; KERONE to provide layout drawing
Commissioning, Validation & Training	IQ/OQ/PQ support, 10-day site support	3-4	Includes operator training and performance test
TOTAL CAPEX		INR 85-104 Lakhs	Approx. range; detailed quote on enquiry

Cost-Benefit & OPEX Model — Annual Basis (8,000 hr/yr operation)

Item	Basis	INR/Year (Lakhs)	Remarks
Energy Savings (Heat Recovery)	23 kWh/hr avg avoided x 8,000 hr/yr x INR 8/kWh	INR 14.7 Lakhs	Net of heat-recovery wheel parasitic load
Batch Rejection / Rework Avoidance	Based on Vitalis Pharma FY25 audit history	INR 120-160 Lakhs	Conservative estimate; varies by product mix
Audit / Compliance Value (qualitative)	USFDA / WHO-GMP audit readiness	Not quantified	Strategic value for export market access
OPERATING COSTS			
Incremental Electricity (Heater + Fan + UV)	49.4 kWh/hr net x 8,000 hr/yr x INR 8/kWh	INR 31.6 Lakhs	Net of heat-recovery credit
UV Lamp Replacement	Annual lamp bank replacement provision	INR 3 Lakhs	Lamps rated ~9,000 hrs; annual change-out
Maintenance & Spares	3% of CAPEX per annum	INR 2.8 Lakhs	Annual maintenance provision
NET ANNUAL BENEFIT		INR ~97-137 Lakhs/yr	Payback ~3.2 years on INR 95L CAPEX (mid-range)

Project Execution & KERONE Scope of Supply

Implementation Timeline

Phase	Activity	Duration	KERONE Deliverable
Phase 0 — Pre-Order	Technical consultation, site survey, process design freeze, commercial negotiation	3-5 Weeks	Process Design Basis (PDB), GA drawing, utility list, commercial offer
Phase 1 — Engineering	Detailed engineering: mechanical, electrical, ductwork layout, P&ID finalization	5-7 Weeks	Complete engineering package, vendor drawings, DFM approval
Phase 2 — Procurement	Long-lead items: AHU casing, UV lamps, HEPA modules, heat-recovery wheel	6-8 Weeks	Material test certificates, QC inspection reports, FAT invitation
Phase 3 — Fabrication	AHU fabrication, heater bank assembly, UV module integration, panel build	8-10 Weeks	Factory Acceptance Test (FAT) at KERONE Ambarnath; client witness invited
Phase 4 — Installation	Equipment erection at client site; ductwork, electrical, instrument hook-up	3-4 Weeks	KERONE site supervision; civil and electrical by client as per KERONE drawings
Phase 5 — Commissioning & Validation	Cold trials, hot trials, IQ/OQ/PQ support, operator training	3-4 Weeks	Commissioning report, validation support documentation, O&M manual, training records
TOTAL PROJECT TIMELINE	Order to commercial operation	~28-38 Weeks	From purchase order to first qualified operation

KERONE Scope of Supply & Services

Category	KERONE Scope (INCLUDED)	Client Scope (EXCLUDED from KERONE supply)
Process Design	Process design basis, air balance, heat load calculation, P&ID	Product-specific process schedule; room layout finalization
Primary Equipment	AHU (complete), UV-C module, heater bank, heat-recovery wheel, terminal HEPA	Existing ductwork reuse assessment, if applicable
Filtration & Sterilization	G4/F8/HEPA H14 filter stages, UV-C lamp bank & controller	Ongoing filter change-out post-warranty
Controls	PLC/SCADA, MCC panel, all instruments and field wiring	DG set, main power supply connection, transformer
Civil & Structural	Foundation load drawings, GA layout, plant room drawing	All civil work, plant room construction, drains
Commissioning & Validation	FAT, site commissioning, performance test, IQ/OQ support, operator training (10 days)	PQ execution, regulatory filing, consumables for validation runs
Documentation	P&ID, GA drawings, O&M manual, spares list, test certificates	Client-side approvals, regulatory consents, insurance

Conclusions & Why KERONE

Proven Technology

Every process parameter in the 20,000 CFM system — 35 mJ/cm² UV-C dose, 0.8-second residence time, 80 degC process air temperature — is directly derived from KRDC lab trial 52/KRDC/LAB/22 on the client's actual return air and bioburden coupons. No extrapolation; no assumptions.

Quantified Outcome

Viable count reduction from 450 CFU/m³ to below 1 CFU/m³ (6-log reduction), and heating energy reduction of 32% via heat recovery, are measurable, laboratory-validated results — not marketing claims.

Commercial Clarity

The financial model demonstrates a payback period of approximately 3.2 years at conservative assumptions, converting a persistent compliance cost centre into a combined energy-and-compliance value of an estimated INR 97-137 Lakhs/year.

Full Ownership

KERONE designs, manufactures, supplies, installs, and commissions the complete AHU system from a single point of accountability — eliminating multi-vendor coordination risk between HVAC, filtration, and controls suppliers.

Scalable Platform

The modular AHU platform is scalable. A 20,000 CFM system validated at Vitalis Pharma creates the reference installation for smaller (5,000-10,000 CFM) and larger (40,000+ CFM) systems across pharmaceutical, biologics, and electronics cleanroom facilities.

Compliance-Ready

GMP-aligned documentation, IQ/OQ support, and continuous BMS data logging are integral to the KERONE supply scope — the system is designed for audit-readiness from day one, not retrofitted for compliance after the fact.

ENQUIRE ABOUT YOUR CLEANROOM AIR STERILIZATION & PROCESS HEATING PROJECT**KERONE Engineering Solutions Limited | KRDC — Kerone Research & Development Centre**

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To initiate a project discussion, please share: cleanroom grade requirement + room area/airflow + site location + current air-quality audit findings

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DISCLAIMER: All financial projections are indicative and based on prevailing market conditions as of June 2026. Process performance figures are derived from KRDC laboratory data (Report 52/KRDC/LAB/22) conducted on Vitalis Pharma Industries Ltd. air samples. Actual industrial performance may vary. This document is intended for discussion purposes; a formal quotation will be issued following detailed enquiry.