

**HLL BIOTECH LIMITED****INTEGRATED VACCINES COMPLEX, CHENGALPATTU**

nne pharmaplan®

**Annexure – 1: User Requirement Specifications**

<b>Equipment/System</b>	Air Compressor System		
<b>Tender No</b>	HBL/IVC/TENDER/MECH/UTL-AIRCOMP/2014		
<b>Identification No</b>	NPI/120310/UTL(URS)/U1/D01		
<b>Effective Date</b>	2014.05.15	<b>Revision#</b>	02

**User Requirement Specifications****Air Compressor**

**Equipment ID:** UTY/AIRCOMP/VFD 01 & 02,  
UTY/AIRCOMP/01

**Tender No:** HBL/IVC/TENDER/MECH/UTL-AIRCOMP/2014

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### CONTENTS

<b>1. APPROVAL SIGNATURES.....</b>	<b>5</b>
<b>2. OVERVIEW.....</b>	<b>6</b>
<b>3. DESCRIPTION OF PACKAGE SYSTEM: .....</b>	<b>7</b>
3.1 PACKAGE .....	7
3.2 COMPRESSOR .....	8
3.3 MOTOR .....	8
3.4 DRYER:.....	8
3.5 RECEIVER: .....	8
3.6 FILTERS: .....	9
3.7 ACOUSTIC ENCLOSURE:.....	9
3.8 AIR COMPRESSOR CONTROL SYSTEM:.....	9
3.8.1 General:.....	9
3.9 ELECTRICAL: .....	10
3.10 SAFETY REQUIREMENTS: .....	10
3.11 WEIGHT & DIMENSIONS: .....	10
<b>4. GENERAL REQUIREMENTS.....</b>	<b>10</b>
4.1 SAFETY REQUIREMENTS: .....	10
4.2 NAME PLATES: .....	11
4.3 PAINTING: .....	11
<b>5. MATERIAL SPECIFICATIONS .....</b>	<b>11</b>
5.1 GENERAL .....	11
5.2 APPROPRIATE MATERIALS.....	11
5.3 PIPING .....	11
5.4 NON-METALLIC MATERIALS .....	11
5.5 INSULATION MATERIALS.....	12
<b>6. AVAILABLE UTILITIES.....</b>	<b>12</b>
<b>7. TESTING, COMMISSIONING &amp; INSPECTION: .....</b>	<b>12</b>
7.1 QAP .....	12
7.2 TESTING:.....	12
7.3 INSPECTION:.....	13
7.4 SITE ACCEPTANCE TEST (SAT):.....	13
7.5 INSTALLATION.....	13
7.6 COMMISSIONING.....	14

# HLL BIOTECH LIMITED

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nne pharmaplan®

### Annexure – 1: User Requirement Specifications

Equipment/System	Air Compressor System		
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Identification No	NPI/120310/UTL(URS)/U1/D01		
Effective Date	2014.05.15	Revision#	02



7.7	VALIDATION.....	14
7.8	TRAINING .....	14
8.	PRIORITY OF DOCUMENTS:.....	14
9.	DOCUMENTATION:.....	15
9.1	GENERAL .....	15
9.2	DOCUMENTATION .....	15
9.3	LIST OF DOCUMENTATION .....	16
10.	DELIVERY AND INSTALLATION:.....	17
10.1	INSTALLATION.....	18
10.2	SPARE PART .....	18
11.	GUARANTEE: .....	18
12.	QUALITY ASSURANCE: .....	18
13.	ATTACHMENT:.....	19
14.	ABBREVIATIONS .....	19
15.	REVISION INDEX .....	19

**HLL BIOTECH LIMITED****INTEGRATED VACCINES COMPLEX, CHENGALPATTU**

nne pharmaplan®

**Annexure – 1: User Requirement Specifications**

<b>Equipment/System</b>	Air Compressor System		
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**Annexure List**

<b>Annex No.</b>	<b>Drawing / Document No.</b>	<b>Detail</b>
1	NPI/120310/UTL(URS)/U1/D01.01	Data Sheet for Air Compressor – 400 CFM

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<b>Effective Date</b>	2014.05.15	<b>Revision#</b>	02

**1. APPROVAL SIGNATURES**

This document is prepared by project team of NNE Pharmaplan for the “Integrated Vaccines Complex (IVC)” (NPI project number: 120310) of HLL Biotech limited under the authority of their Project Manager. Hence, this document before being effective shall be approved by the QA team/Engineering team of HLL Lifecare limited, and authorized by the appropriate Project Authority.

<b>NNE Pharmaplan India Ltd.</b>	<b>Name and Designation</b>	<b>Signature</b>	<b>Date</b>
<b>Prepared By</b>	Vishal Shinde <b>Sr. Project Engineer</b>		
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<b>Approved By</b>	Deepak A V <b>Sr. Manager - Projects</b>		

<b>HLL Biotech Limited</b>	<b>Name and Designation</b>	<b>Signature</b>	<b>Date</b>
<b>Reviewed By</b>	Arjun Arackal <b>Assistant Manager</b>		
	Natarajan K. <b>Deputy Manager</b>		
<b>Approved By</b>	<b>Department Head</b>		
	<b>Head - QA</b>		
<b>Authorized By</b>	<b>Chief Operating Officer</b>		

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nne pharmaplan®

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## 2. OVERVIEW

### 2.1 Project introduction

HLL Biotech Limited (HBL), a subsidiary of HLL Lifecare Limited, (a CPSU under Ministry of Health & Family Welfare, Government of India, is implementing "an Integrated Vaccines Complex (IVC) - a project of national importance' at Chengalpattu, near Chennai. The proposed complex is a state of the art facility with cGMP compliance for manufacturing vaccines required for the immunization programme of Government of India.

For this purpose, NNE Pharmaplan has been appointed as consultant for setting up this facility, incorporating the latest standards of GMP and best practices.

### 2.2 Objective

This document is mainly prepared to define the requirements for the Air compressor system. The system is a package unit assembled and tested in the vendor's place.

It is the responsibility of the VENDOR to get familiar with the local situation prior to the start of the design work either by studying building and layout drawings or by an inspection on site.

### 2.3 Scope of Work

The scope of work / service shall include but not limited to design, supply, installation, testing, commissioning & Validation of Water cooled, Rotary screw type air compressor, desiccant type air dryer, air receiver and air filters. Scope also includes transportation, loading, unloading, erection, and training for the said package unit.

The vendor should accordingly consider all necessary items required for effective installation and performance of the system, whether mentioned or not in the specifications.

The vendor shall come back with any suggestions if, found to be more effective and efficient / better than that specified in this specification which may be considered by Client/ consultant

Client shall be entitled to inspect and audit the supplier's Quality Management System (QMS) and the facilities, if desired, prior to any business agreement.

The vendor should take full responsibility for the function of the Air compressor Package unit.

Note: Air compressor, Air Receiver and Air dryer shall be of same manufacturer.

### 2.4 Design Basis

New air compressor systems shall be set up for the above said project. These compressors shall be of rotary screw type, non-lubricated, 100% oil-free, water cooled air compressor package unit (two with VFD and One with Constant speed). Rated capacity is 400 CFM X 3 no's (F.A.D), 10.0 Bar (G) & desiccant dryer -: {PDP ≤ - 40°C}.

The compressor package unit must attain the air quality standard as per **ISO 8573.1: 2010 Class "O"**

The vendor should accordingly consider all necessary items required for effective installation and performance of the system, whether mentioned or not in the specifications.

The Scope of supply shall include but not limited to the following details.

# HLL BIOTECH LIMITED

## INTEGRATED VACCINES COMPLEX, CHENGALPATTU

nne pharmaplan®

### Annexure – 1: User Requirement Specifications

Equipment/System	Air Compressor System		
Tender No	HBL/IVC/TENDER/MECH/UTL-AIRCOMP/2014		
Identification No	NPI/120310/UTL(URS)/U1/D01		
Effective Date	2014.05.15	Revision#	02



- Item Name: Rotary screw type, non-lubricated, 100% Oil free, Water cooled Air compressor with (two with VFD and one with constant speed), Control panel, desiccant dryer (PDP  $\leq$  -40° C), Air receiver & filters.
- Capacity: 400 CFM (F.A.D)
- Quantity: 3 Nos. (two with VFD and One with constant speed)
- Generation pressure: 8 to 10.0 Bar (G)

The vendor shall clearly indicate the battery limits, the termination points, utilities required, etc., in the detailed offer.

### 2.5 Local weather conditions:

Outdoor Air Conditions Design Parameter	Temperature °C	Relative Humidity %
Max.	39.4	88
Min.	18.3	41

### 3. DESCRIPTION OF PACKAGE SYSTEM:

This requirement and respective document attached shall define the minimum requirement to be met by the vendor.

#### 3.1 Package

The Vendor shall supply air compressor package that is necessary to meet process requirement. The package shall have a common steel base structure with all system components, related valves and manifolds, including the following parts, but not limited to:

- Rotary Screw type non-lubricated, water cooled, Oil-Free air compressor.
- Motor with VFD and Control panel
- PLC control system.
- Inter & After coolers
- Noise hood (Acoustic enclosure)
- Filter with differential pressure indicators and drainage valves
- Desiccant type Air dryer with pressure gauge
- All piping, fitting, valve & Instrumentation within air compressor package and auxiliaries.
- Mild/Carbon Steel base structure
- Counter Flanges with Bolts, Nuts and Gaskets for air inlet & outlet as per standards
- Pressure gauge (Dial size – minimum 6”) and transmitter installed on top of the (air) receiver tank with auto drain valve
- Control cables between compressor power & control panel and local control cabinet.
- Power cables between compressor power & control panel and local control cabinet.
- Online Sensors for dew point measurement and indication (Inbuilt within control panel)

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nne pharma plan®

### Annexure – 1: User Requirement Specifications

Equipment/System	Air Compressor System		
Tender No	HBL/IVC/TENDER/MECH/UTL-AIRCOMP/2014		
Identification No	NPI/120310/UTL(URS)/U1/D01		
Effective Date	2014.05.15	Revision#	02



- Arrange to repair and/ or re-order all damaged & short supply items at free of Cost till handover of system
- Check valves & Safety valves
- Moisture separators
- Isolators for Electrical Panel

Vendor should consider and mention any other item if not mentioned above, which is necessary to make it a complete packaged unit.

### 3.2 Compressor

- Type: Rotary screw type, Water cooled, Oil-Free air compressor
- Stage: Multi stage (vendor to confirm the number of stages required based on capacity).
- Capacity: 400 CFM (F.A.D)
- Discharge pressure: 10 Bar (g)
- Casing material: Vendor to specify
- LP and HP Stage pressure: Vendor to specify.
- Pressure Gauge (dial size minimum 4") and Temperature Gauge (dial size minimum 4") at Discharge of Each Stage

The compressor shall be variable volume ratio control that enables it to perform at all operating conditions and loads. The capacity control system shall automatically modulate the unit from maximum to minimum value of the rated capacity.

### 3.3 Motor

- Type: 3-Phase motor, 415 ± 10% V, 50 ± 3% Hz
- Starting: Star delta Starter on bypass mode/Normally by VFD
- Motor Protection: Minimum IP 55
- Insulation: F class
- Earthing terminal shall be equipped in terminal block
- Minimum EEF – 1 efficiency
- Motor to suit the need constant speed and VFD operation of compressors

### 3.4 Dryer:

- Air Dryer: Desiccant type Air dryer with online dew point meter, Pressure Gauge (4")
- Air Dryer Quantity: 3 Nos. (One for each Air compressor)
- Capacity: 400 CFM
- Operation Pressure: 10 Bar (G)
- PDP: ≤ - 40°C
- Quantity: 3 Nos.
- Pressure Gauge at Discharge of each dryer and Transmitter for Pressure Monitoring.
- Flow Transmitter at the outlet of each dryer.
- Sampling Valve at outlet of each dryer.

Vendor to specify and demonstrate the guaranteed dryness (maximum & minimum) and the dew point attained.

### 3.5 Receiver:

- Tank: 4 KL
- MOC: Mild Steel sandblasted, internally Epoxy coated.



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<b>Tender No</b>	HBL/IVC/TENDER/MECH/UTL-AIRCOMP/2014		
<b>Identification No</b>	NPI/120310/UTL(URS)/U1/D01		
<b>Effective Date</b>	2014.05.15	<b>Revision#</b>	02



- Dish ends: Spherical
- Operating Pressure: 10 Bar (G) with Auto drain valve, Pressure safety relief valves, Pressure gauge (minimum 6"), Inlet & Outlet nozzles, **Pressure Transmitter for HMI.**
- Design pressure: 15 kg/cm2 (g)
- Mounting: self-standing
- Quantity : 1 No
- Sampling Valve
- Two layer Painting by approved colour to prevent from corrosion.
- Painting Colour: Sky Blue

### 3.6 Filters:

- Suction filter: 3 microns (Part of compressor unit)
- Pre Filters: 1.2 micron with bypass filter assembly with valves before air receiver.
- 2 set with bypass arrangement of Final Filters after Air Receiver: 0.45 micron and 0.2 micron with bypass arrangement with valves (SS 304 housing with provision of filter integrity testing arrangement).
- Capacity: 800 cfm
- Operation Pressure: 10 kg/cm2 (g)

**Note:** Pre filters and final filters shall be provided with pressure indicators at their inlet and outlet & drain valve to remove the moisture. Vendor should consider all necessary filters within the scope required to meet the air quality.

### 3.7 Acoustic Enclosure:

- Sound attenuated steel cabinet with full access doors
- Base frame with forklift slots
- The sound level shall not exceed 70 decibel at a distance of 1 metre from equipment

### 3.8 Air compressor control system:

#### 3.8.1 General:

Compressor shall be operated and controlled by vendor's supplied control system. The exchange of signals with HMI system has to be considered.

All vendor instrumentation and control systems, supplied with these package units shall be installed in non-hazardous area.

The compressor unit shall be automatic and controlled by controller, including safety control, standard functions control and automatic start-up / shutdown sequences and according to required operational duty at full / partial load.

Safety control: Compressor controller should monitor compressor inside parameters such as flow, pressure, signals and if the parameters exceed limitation Compressor controller can display alarm message and send an alarm signal to HMI.

This local control system will be located inside the compressor skid. It should meet the requirement of non-duty operation. Compressor supplier is responsible for the hardware choice, system design, integration and programming.

The local control panel will be designed and manufactured according to Vendor's standard practice. Controller shall offer these features as follows at least:

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Effective Date	2014.05.15	Revision#	02



- Online dew point monitoring for dryer.
- Set pressure point: receiver pressure
- Pre-alarm annunciator: warn potential shutdown conditions and display potential problems.
- Trouble annunciator: All operating conditions at trouble are store for display to assist in troubleshooting.
- Display: display complete operating and monitoring information
- Volume ratio control: provide the most efficient volume ratio during full or part load operation.
- Storage memory:
  1. Shall store all set-point and operation timing in case of power shut-off.
  2. Shall store all details including error logs, operating parameters for control and monitoring for a minimum period of 30days.
  3. USB port should be available to copy the above parameters in PDF format.
- Sensors for dew point measurement.
- Hour meter
- Emergency Push Buttons

Client will provide one point 415V, 50Hz electrical supply as per rated requirement from vendor to Electrical Power and control Panel of Compressor. Interconnection wiring/cablings between Electrical power and control panel to instrument/Power equipment such as Motor etc. in scope of vendor.

Vendor should provide the complete Functional specification for the above package unit.

**\*\*The control philosophy for Air compressor has to be submitted by the vendor and same shall be approved by the Client/Consultant.**

### 3.9 Electrical:

Compressor shall be designed and supplied with all necessary earthing and protection apparatus according to Indian Standard, connected to earthing lugs welded on the package skid frame.

### 3.10 Safety Requirements:

Vendor shall consider all safety requirements in accordance with good engineering practices and local regulation.

### 3.11 Weight & Dimensions:

Vendor shall provide with his quotation an outline arrangement drawing of the equipment giving major dimensions, operation / maintenance allowances, estimated weights of equipment and advice extent of site assembly and method of unloading / loading.

Vibration isolation mounts shall be provided with the package, if required.

## 4. GENERAL REQUIREMENTS

### 4.1 Safety Requirements:

Vendor shall consider all safety requirements in accordance with good engineering practices and local regulation.

# HLL BIOTECH LIMITED

## INTEGRATED VACCINES COMPLEX, CHENGALPATTU

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Equipment/System	Air Compressor System		
Tender No	HBL/IVC/TENDER/MECH/UTL-AIRCOMP/2014		
Identification No	NPI/120310/UTL(URS)/U1/D01		
Effective Date	2014.05.15	Revision#	02



All technical equipment/components shall have a CE sign confirming that the product meets the demands of all relevant guidelines and regulations of the European Union (EU). The VENDOR is fully responsible for the accordance with all appropriate regulations.

A CE certificate referring to the relevant CE directives shall be supplied.

The noise level of the system shall be as low as possible, and must not exceed 70 dB (A) measured at operator working place.

In the event of equipment malfunction or loss of utilities, the unit must contain all necessary protection devices to ensure that the equipment and the article remain in a safe condition.

#### 4.2 Name Plates:

Each item shall carry a nameplate in accordance with client's standard which shall be fitted in a conspicuous position on brackets projecting 25 mm from the vessel or insulation as applicable. Equipment tag number shall also be included.

#### 4.3 Painting:

Outside carbon steel surfaces (other than machined) shall be thoroughly cleaned, scale free and shall be painted according to vendor's specification duly approved by client. Outside stainless steel surfaces shall not be painted.

### 5. MATERIAL SPECIFICATIONS

#### 5.1 General

All valves and filters arranged for easy operation, service and handling. Utilities are provided according to installation drawing.

#### 5.2 Appropriate Materials

Appropriate materials of manufacture must be selected and specified on the specific application and process requirements and certificates must be supplied as requested by the customer/purchaser or as usually necessary.

Material of labelling on equipment and instruments shall be of durable type. They shall be resistant against cleaning detergents (e.g. 70% ethanol). Installation of tags has to withstand temperature influence and mechanical demands typical for normal transport, installation and operation, so that they are captive to the equipment.

#### 5.3 Piping

All interconnecting piping, valves, fittings, etc. from Air compressor to Air receiver and filters after receiver shall be included in vendor scope. All interconnecting piping, valves, fittings shall be of SS 304 for the skid mounted system.

Piping for all Moisture drain up to nearest drain point shall be under Contractor's scope.

#### 5.4 Non-metallic materials

Cables shall be resistant against heat, pressure and steam.

# HLL BIOTECH LIMITED

## INTEGRATED VACCINES COMPLEX, CHENGALPATTU

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Equipment/System	Air Compressor System		
Tender No	HBL/IVC/TENDER/MECH/UTL-AIRCOMP/2014		
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Effective Date	2014.05.15	Revision#	02



### 5.5 Insulation materials

Any material used for insulation must be free of asbestos. Insulation material shall be of low chloride content and shall comply with current standards for thermal insulation in contact with Austenitic Stainless Steel. Thickness & Type of insulation is to be specified by the vendor.

## 6. AVAILABLE UTILITIES

The following media interfaces are provided:

- Electrical power -415V/ 3 Phase/4 Wire/ 50 Hz
- Cooling water

Connecting points of all utilities, consumption and capacities of the required utilities shall be advised with the quotation.

All drain waters from the system shall be led to the waste water system. There shall be prevention for Re-Contamination from the waste water system.

## 7. TESTING, COMMISSIONING & INSPECTION:

Inspection and tests shall be made by vendor in accordance with requirement requisition document and/or any correlative standards and codes.

Testing and commissioning will be carried out by the VENDOR. The Client's representatives have the right to participate in testing and commissioning.

During testing and commissioning future operators/technicians shall be trained in all equipment / system functions (e.g. preparation, start-up, operation, shut down, maintenance, etc. - as far as applicable).

All testing and commissioning documents including design, Installation & operations document recordings and reports shall be in English language.

The VENDOR shall notify the customer/purchaser one month in advance of the start of Installation and commissioning.

### 7.1 QAP

Vendor to submit a detailed quality assurance policy along with offer for hold, review, witness points at factory and at site.

### 7.2 Testing:

If in case vendor proposes a testing procedure the same shall be approved by Client/Consultant.

Also testing requirements shall be listed on individual equipment engineering drawings, when provided. When the size or nature of the equipment makes hydrostatic testing impracticable then one or more of the following methods of testing shall be employed:

- Air test with external application of a soap solution
- Vacuum drop test
- Dye penetration test

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<b>Identification No</b>	NPI/120310/UTL(URS)/U1/D01		
<b>Effective Date</b>	2014.05.15	<b>Revision#</b>	02



The finished item shall be tested in the presence of client or their representative. The vendor shall supply without extra charge the labour appliances to carry out all tests. On completion of any test, the item shall be thoroughly dried and the interior cleaned.

### 7.3 Inspection:

Client reserves the right to carry out inspection & further performance at any time during fabrication/assembly before shipment. Inspection shall be done by the Client or their representative and / or their nominated inspection authority.

### 7.4 Site Acceptance Test (SAT):

The final acceptance tests at site will be carried out after compressor delivery on site and mechanical completion of the system and after successful completion of installation and commissioning. The purpose of the SAT is to verify that the system is supplied, installed and that it operates according to the relevant specifications. The SAT testing includes:

- Check of completion of open items supplied on site
- Check of transport damages
- Check scope of supply
- Proper operation of the systems
- Site performance test (Shall include verification of dew point, pressure at the outlet of air compressor and air dryer as minimum requirement)
- Verification of final documentation.

As far as site performance test is concerned, the supply includes: detailed test procedure, check lists and vendor's specialist assistance during the test according to a schedule to be agreed upon.

Vendor has to depute a person for site supervision and assistance during commissioning and start-up of the package unit. The procedure and schedule of the performance test and relevant acceptance criteria shall be defined / agreed upon between vendor and the client.

Vendor shall record all the results of the tests carried out and submit the report to the client for approval.

### 7.5 Installation

The Manufacturer shall be responsible for unloading & installation of water cooled Air compressor, dryer, receiver and other accessories.

The Manufacturer shall also be responsible for the re-assembly of sections or components of the packaged equipment, if any, including piping, wiring, instrumentation and any other equipment and components shipped separately or in sections.

Client shall provide the following:

- Foundations if any required (Successful Bidder shall submit detailed fit for construction foundation drawings within two weeks from the date of placement of order by Client)
- Connecting utilities
- Electrical, utility services and drain hook-ups

The vendor shall also be responsible for the reassembly of sections or components of packaged equipment if any including piping, wiring, instrumentation, other equipment's & components shipped separately or in section

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The system must be transported to the erection place and placed in position under the supervision of the vendor representative.

### 7.6 Commissioning

The commissioning plan shall be submitted to the Client 4 weeks prior to the commissioning dates and the approved document shall be used during the commissioning.

All the commissioning spares / consumables shall be supplied by the Manufacturer. Any component / instrument failure or damage noted during commissioning shall be replaced by the Manufacturer at no additional cost.

Commissioning may include, but is not limited to the following tests:

- Equipment, components and instruments installation check (with verifications of drawings, BOM etc.)
- Instrument calibration check
- Document check (especially components literature)

### 7.7 Validation

Vendor shall submit all necessary validation documents and test reports carried out at factory, which shall comply quality as per **ISO 8573.1: 2010 Class "O"**

Vendor Shall consider IQ, OQ and PQ in this scope

### 7.8 Training

The vendor shall provide operator training at site for not less than 5 working days at no extra cost. The training imparted shall include, but not be limited to, the following:

- Start-up and shut-down procedures
- Typical operations
- Emergency shutdown
- Safety training
- Troubleshooting procedures
- Control system & instrumentation operation and diagnostics
- Control system hardware maintenance
- Servicing and preventative maintenance schedules and procedures

The vendor shall ensure that the operation and maintenance manual is available at site for reference.

The vendor shall issue certificates to the persons trained by them after successful completion of training at no extra cost.

## 8. PRIORITY OF DOCUMENTS:

In case of conflicts between the engineering specification, data sheets and other reference code and standards, priority shall be given in the following order:

- Local authorities' codes
- Client's Tender, Data Sheets & URS
- Client's Purchase Contract
- Refer to codes and standards
- Vendor's Documents (agreed by Client).

# HLL BIOTECH LIMITED

## INTEGRATED VACCINES COMPLEX, CHENGALPATTU

nne pharmaplan®

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Equipment/System	Air Compressor System		
Tender No	HBL/IVC/TENDER/MECH/UTL-AIRCOMP/2014		
Identification No	NPI/120310/UTL(URS)/U1/D01		
Effective Date	2014.05.15	Revision#	02



## 9. DOCUMENTATION:

### 9.1 General

Compressor package is not a qualified package. However, vendor shall follow Good Engineering Practices. All documentation for the Compressed air generation shall be distinctly marked with Unique Name, Identity No. and Version No.

All documentation must be in English.

Specified list of all delivered documents, such as test protocols, drawings and specifications.

The documentation shall be delivered as four paper copies and one electronic version (CD-ROM). The documentation shall have final "as built" status.

The documentation provided by the vendor must allow

- Training of operators
- Operation, maintenance and calibration (Complete technical documentation)
- Testing or Qualification of equipment incl. generation of related documents (Design, installation and testing plan, commissioning & Validation documents)

### 9.2 Documentation

- Dimensions for space needed for installation.
- Unit size dimensions.
- Utility consumptions
- Weights

Vendor should provide a document list of his standard documentation together with examples for review and final approval by client. The review & approval of design documents will be as per good engineering practices. Client will check installation of compressor against design documents issued for construction according to good engineering practices.

Vendor shall submit before order placement the detailed supplier document index (to be approved by client), listing all drawings and documents that will be supplied and their delivery dates.

It is included in the vendor scope of work the preparation and supply of all documents (i.e. drawings, and documents etc.) and all obligations requested by local Authorities, in order to fulfil the applicable laws & regulations.

# HLL BIOTECH LIMITED

## INTEGRATED VACCINES COMPLEX, CHENGALPATTU

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### Annexure – 1: User Requirement Specifications

Equipment/System	Air Compressor System		
Tender No	HBL/IVC/TENDER/MECH/UTL-AIRCOMP/2014		
Identification No	NPI/120310/UTL(URS)/U1/D01		
Effective Date	2014.05.15	Revision#	02



### 9.3 List of Documentation

VENDOR shall provide the following documents for the complete package unit:

Document Name		Remark
<b>General</b>		
	Functional design specification	
	<b>List of the used material:</b> List of spares & consumables for trouble free operation for two years from the date of handover.	
	Process description, functional description	
	<b>Guarantee/ Warrantee:</b> 12 Months from the date of handover.	
<b>Schemes for approval</b>		
	Quality Assurance Policy along with applicable certificate.	
	ISO certification for quality of Air (Moisture and Oil content)	
	P&ID drawings	
	Layouts, overview plan	
	GA Drawings	
	Electrical & Control circuit diagram and panel layout with dimensions.	
<b>Instrumentation</b>		
	Input/output signal list	
	Parameter list of intelligent instruments, valves	
	Specification of hardware components	
	List of components	
	List of instruments	
<b>Operation / Service / Electronic Data Service</b>		
	Operation and maintenance manuals (including parts from sub- vendors)	
	Lists of spare parts with ordering information	
	Detailed manuals for single equipment	
	Technical datasheets for single equipment's (including capacities)	
	Documentation of first calibration (certificate)	
	Calibration procedure ( calibration plan)	



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Document Name	Remark
List of alarms including Trouble shooting	
Scheme of program work flow.	
Documentation of displays, tools for configuration	
Source Code on disk and Software Installation CD.	
Certificate of warranty	
Maintenance contact	
Plan of software structure (Overview of modular functions)	
Version of installed software user levels	
Certificate of data security	
<b>Safety</b>	
Safety Procedures	
<b>Training</b>	
Documented trainings for operators	

### 10. DELIVERY AND INSTALLATION:

Vendor shall be responsible for the delivery of the complete Package Unit to **HLL Biotech Limited, (IVC), Chengalpattu, near Chennai.**

Vendor shall be responsible for the positioning and installation of the complete Package Unit.

The vendor must consider the cost for packing, transport and insurance in their offer.

Before packing and dispatch, the system must be well cleaned inside as well as outside and dried. For the transport, the system shall be completely empty and dry. The packing shall be rigid to protect the PU against damage.

All nozzle flange faces should be protected from rust and shall be further protected with a wood or metal cover to prevent damage during shipment. Threaded connections are to be protected with thread protectors. Machined surfaces are to be covered with temporary metal protective. Both partly fabricated and completed items liable to suffer distortion during transit and erection shall be braced. Open ends shall be covered to keep out dirt and other foreign matter. Spare gaskets, bolts, nuts, etc., and any other loose items shall be boxed separately from the main equipment. Such boxes shall be suitable for site storage and clearly and permanently marked to show:

- Order number
- Item number (for which the parts are intended)

The item number shall be prominently painted on the side of the equipment.

All loose items have to be carefully fixed or packed in a separate box.

The Package Unit shall be equipped with appropriate lifting lugs and provisions for transport allowing easy loading, offloading and transportation inside the building.

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### 10.1 Installation

The erection and installation of the system is part of the scope of supply.

The manufacturer shall also be responsible for the reassembly of sections or components of packaged equipment if any including piping, wiring, instrumentation, other equipment & components shipped separately or in section.

The system must be transported to the erection place and placed in position under the supervision of the Vendor representative.

### 10.2 Spare part

The spare parts for commissioning and start-up are included in Vendor scope of supply. List of commissioning and start-up spare parts has to be included in the bid based on the selected Manufacturer's models.

Spare parts required for two years of guarantee of trouble free operation shall be listed and quoted separately item by item.

## 11. GUARANTEE:

### ➤ Mechanical Guarantees:

Vendor shall guarantee all equipment and components against defective materials; faulty design and poor workmanship and any failure resulting from normal usage for the guarantee period specified in the Purchase Order.

Vendor shall guarantee that units will operate in safe, efficient and reliable manner under the stipulated conditions of service and environment.

If any defects, failure or operational problems occur during the guarantee period, vendor shall make all necessary improvements, repairs and replacements at no cost to the Client, in accordance with the Purchase Order.

### ➤ Performance Guarantees:

All equipment shall be guaranteed for satisfactory performance at all operating condition specified at the pertinent paragraphs of this specification with no negative tolerance.

If any performance deficiency or defects occur during the guarantee and warranty period, vendor shall provide any modification / improvement, repair and replacements free of charge.

Vendor shall also guarantee the power and utilities consumptions.

## 12. QUALITY ASSURANCE:

The VENDOR must have a well-implemented QM-system, e.g. ISO 9000 certification. Auditing of QM-system with focus on software development methods / strategy has to be possible.

A quality assurance plan has to be delivered latest with placement of order.

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### 13. ATTACHMENT:

Also find enclosed the Data Sheet for Air Compressor unit – Document No.: NPI/120310/DS/U/ACR 01.

### 14. ABBREVIATIONS

QMS	Quality Management System
PU	Package Unit
EU	European Union
CE	the abbreviation of French phrase "Conformité Européene" which literally means "European Conformity"
GMP	Good Manufacturing Practice
ASTM	American Society of Testing Materials
ERW	Electric Resistance Welding
PFD	Process Flow Diagram
PID	Process and Instrumentation Diagram
HMI	Human and Machine Interface
SAT	Site Acceptance Test
DQ	Design Qualification
IQ	Inspection Qualification
OQ	Operation Qualification
PQ	Performance Qualification
F.A.D	Free air delivered

### 15. Revision index

Revision	Date	Reason for revision
00	2013.06.03	First Draft
01	2014.12.12	As per comment dated on 2014.01.29
02	2014.05.15	Comments updated as per mail dated