Specifications for
RFID based Sample Bottle Tag Identification System

1 Introduction

The Radio Frequency Identification (RFID) based Sample Bottle Identification System (SBIS) shall be provided for identification of sample bottles of sampling system test setup. The test setup comprises of equipment and mechanism devised for obtaining liquid sample from process vessels remotely. The translucent polypropylene bottle is used to collect sample at test setup. The test setup comprises of sampling mechanism called as "Blister". The sample bottles are transferred to delivery location using pneumatic bottle transfer system for analysis of the samples.

The SBIS shall be deployed to tag, identify, monitor and locate the sample bottles along the complete sampling cycle.

2 Scope of Work

The scope of work includes design & engineering, supply, integrated inspection, development of software, testing, safe delivery to site, integration of SBIS into the control system, installation, testing & commissioning at CTF, BARCF Tarapur, preparation of final as-built documents, acceptance and warranty of the entire SBIS as per the requirements & specifications as per tender.

3 Description of System

3.1 Sampling System Test Setup

The sampling test setup consists of 2 blisters employed for sample collection. The two blisters are connected to a common loading station. Fresh sample bottles are loaded one at a time into the input stack of each blister (a maximum of 10 bottles per blister at a time) before sample collection. Each blister consists of a mechanism to ensure that only one bottle from the stack of 10 bottles is dropped in the blister at a time. Furthermore, the blisters consists of 10 sample collection points each connected to a unique process vessel. The sampling point is decided based on the sample request from the control system for sampling test setup. The sample request provides the Sample Request Number (SRN) and the vessel (corresponding to the particular sampling point) from which the sample is required to be collected. The sample bottle after sample collection are transferred to the dedicated delivery location of each blister using a pneumatic bottle transfer line.

3.2 Sample Bottle Identification System (SBIS)

The SBIS shall consist of hardware and software used to tag, identify, monitor and locate the sample bottles at different location along the complete sample collection and sample bottle transfer cycle. The SBIS shall include the RFID tags, RFID readers, RFID writer, RFID/ communication controllers / components (if required), cables, wires, SQL based database and software required for sample bottle identification.

The SBIS shall be integrated with the automation and control system pre-existing at site for operation and control of sampling test setup. Each sample bottle shall be tagged with an RFID tag. The design/engineering/selection of the RFID tag and its technology shall be in the scope of the bidder.

SQL based sampling database shall be maintained by the system to store real-time information about sample bottle location based on RFID reader/writer activity and input, sequential loading of the bottles in the blister input stack and also the information of the sample within the bottle based on SRN and process vessel data.

The bottle identification system shall also communicate with the PLC/SCADA system over standard industrial communication protocol (such as Modbus/TCP, etc.) for providing real-time information about sample bottles to the control system for sampling test setup.

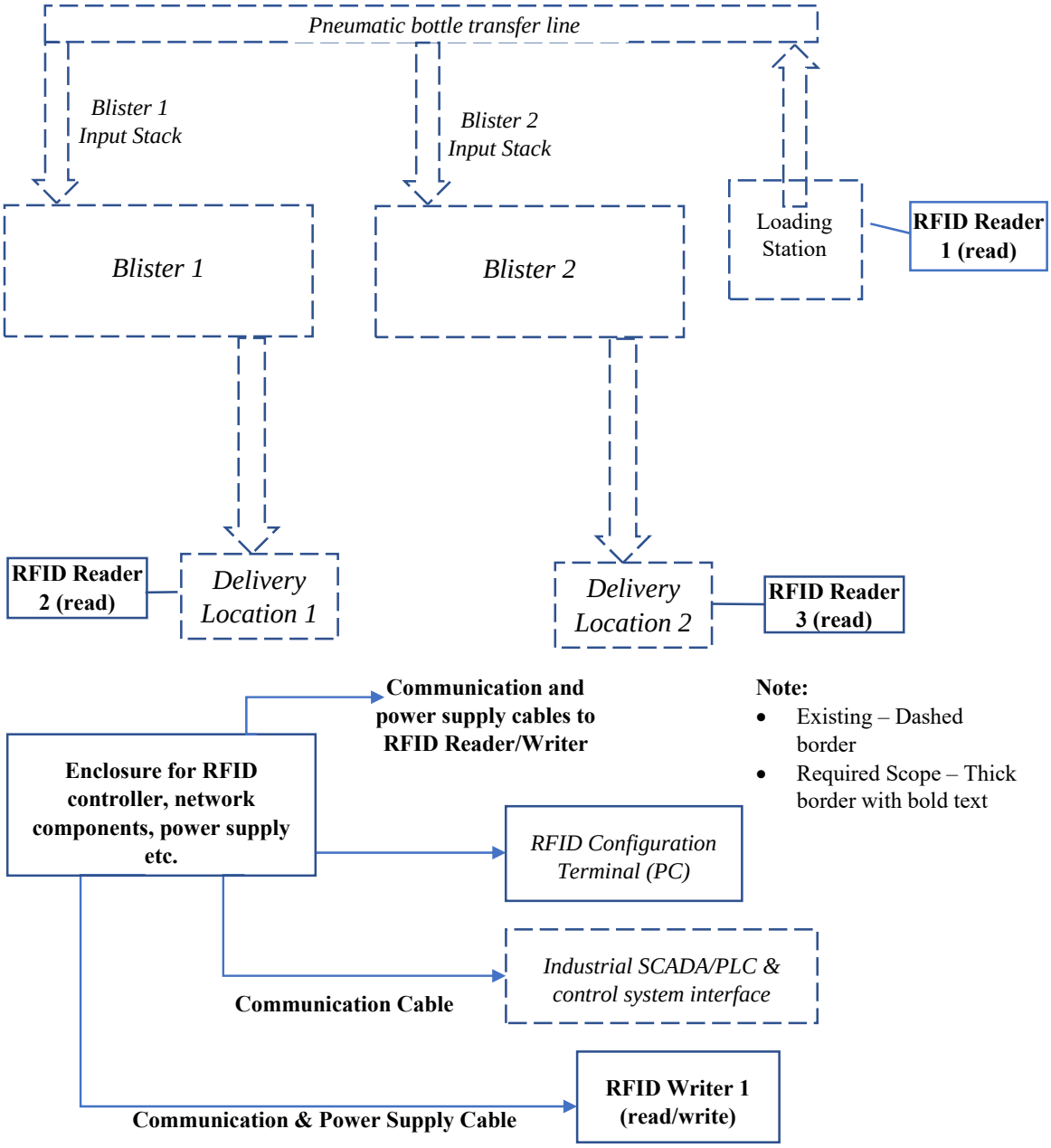
3.3 Functional Requirements

The RFID tag pasted on the sample bottle is coded using the RFID writer before introducing the sample bottle in the sampling cycle of sampling test setup. The pre-coded sample bottles are read by the RFID reader located at the loading station. The SBIS after successfully reading the RFID code pasted on bottle shall communicate to the control system of sampling test setup. After receipt of this signal, the bottle loading cycle is initiated from sampling test setup control system based on blister selection. The SBIS database shall record the blister number into whose input stack the sample bottle is loaded. The sample bottles in the input chute of the blister can be stacked up to a maximum of 10 sample bottles per blister. The SBIS along with the control system for sampling test setup shall identify and record the sequence of loading of the of the sample bottles in each blister. Now a sample request is generated from the control system for sampling test setup to collect the sample from the respective blister. Based on the SRN, the control system selects the sampling point within the blister. The control system for sampling test setup is used to load one sample bottle at a time from the stack of 10 bottles in to the blister and collect the sample. The SBIS system from its database shall identify the bottle code and mark the same with a unique sample request number (SRN) allotted to each sample collection request along with the process vessel details associated with the sampling point.

After sample collection the sample bottle is transferred to the dedicated delivery location. An RFID reader shall be deployed at each delivery location to read the sample bottle code, identify the sample bottle and mark the completion of the sampling request associated with the bottle code.

3.4 SBIS System Architecture requirements

The setup for process liquid sampling system is indicated in ***Figure 1: Test setup of proposed system.*** The setup shall include an enclosure housing the RFID controller/controllers, its power supply and network components. The RFID readers shall be mounted at the loading station and at the dedicated delivery locations. The RFID writer shall be used to pre-code the bottle code into the RFID tag pasted on the bottle.



Note: The proposed system layout shown is only for indicative purpose, successful bidder shall prepare architecture as per detailed engineering for the project.

Figure 1: Test setup of proposed system

The dimensions and shape of typical sample bottle and the pneumatic transfer pipe is shown in ***Figure 2: Sketch of sample bottle travelling through pneumatic transfer pipe.*** The material for bottle is polypropylene (or equivalent).

The purpose of RFID reader/writer as shown in ***Figure 1*** shall be as follows:

RFID Writer 1 : For pre-coding the bottle from a computer terminal

RFID Reader 1 : For identifying bottle at the common bottle loading station

RFID Reader 2&3 : For identifying bottle at the dedicated bottle delivery location

The sample bottle shall be affixed with suitable RFID tag on the outer surface curve of the sample bottle as indicated in the ***Figure 2.***

RFID writer 1 shall be used for tag writing desired (alpha-numeric) with unique code for bottle identification by entering tag data via RFID writer (read & write type) at a computer terminal. The database (SQL based) for all the tags shall be prepared for identification of the bottle status. The supply of computer with standard configuration required to meet the functional and operational requirements of SBIS shall be in the vendor's scope. Development and installation of software/database for SBIS system and its integration with the control system for sampling test setup shall be in the vendor's scope.

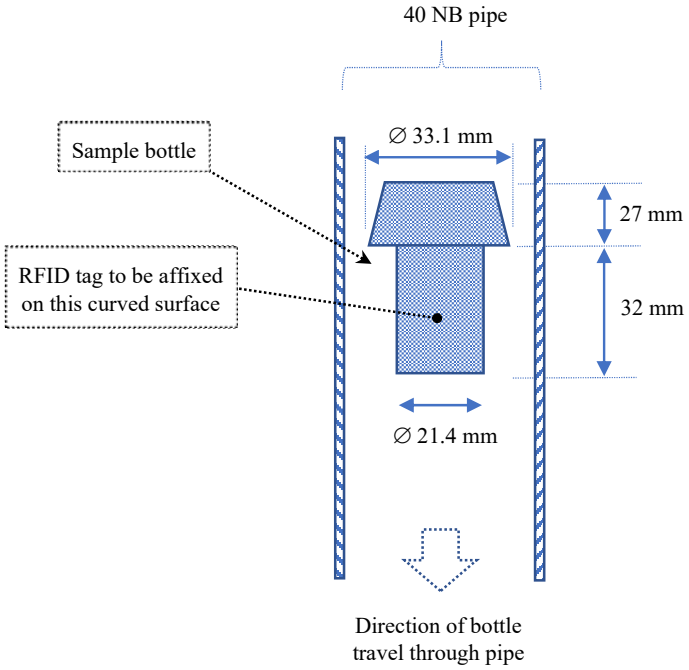


Figure 2: Sketch of sample bottle travelling through pneumatic transfer pipe

The RFID reader 1 shall be mounted at bottle loading station. The RFID reader may be mounted at close proximity to the loading.

The RFID Reader 2 and 3 shall be mounted at the bottle delivery location as indicated in ***Figure 1.*** These reader shall be mounted at approximately 5 meters from the bottle delivery point. It shall be ensured during the design that the selected RFID reader is capable to read the RFID tag pasted on the bottle from a distance of 5 meters from the sample bottle and with a glass window of approximate thickness 380 mm placed between the reader and tag.

It is to be noted that the orientation of tag on the bottle (bottle rotation along vertical axis) may be in any position during travel through the pipe. The head shall be capable of identifying the bottle irrespective of its orientation, through the 380 mm thick glass at the delivery location.

Mock setup required for testing of tag reading through the 380 mm thick glass will be provided by the purchaser at site.

RFID controllers shall be used to communicate in real time with the SBIS software and control system of sampling test setup (SCADA / PLC). Standard Ethernet based industrial communication protocol such as Modbus over TCP/IP shall be used for this communication. The RFID controller shall be equipped with Ethernet port. Serial communication for connection with SBIS software and control system of sampling test setup shall not be used. The RFID controllers may be an independent unit connecting multiple readers/writer or may also be integrated with the individual reader/writer. System components and communication devices for achieving functional and system architecture requirements shall be in the scope of the vendor.

All the connecting cables, power cables, communication cables and mounting accessories for RFID reader, writer, controller, network switch or any other device used in the SBIS shall be included in the scope of supply. The successful bidder shall submit the detailed bill of material and scheme based on the selection of the system and components.

The supply of SCADA/PLC is not in the scope of supply. However, the installation and configuration of software/drivers (MODBUS/TCP etc.) for communication with existing SCADA/PLC and updating the application program of SCADA/PLC to integrate SBIS with the control system for sampling test setup at site shall be in the vendor's scope.

4 Delivery Schedule

The complete system as described in this tender document shall be designed, developed, tested and delivered, installed, site tested and commissioned within 08 calendar months from the date of award of the Purchase Order.

5 Payment Terms

- No advance payment shall be made to the vendor.
- 80% payment of supply cost of purchase order together with statutory levies as admitted in the order will be made after delivery of all material and submission of the documents as per purchase order.
- Balance payment of 20% for supply cost of purchase order and cost for Installation & Commissioning will be made after successful completion of commissioning of the system at site and submission of the documents as per purchase order.

6 General Instructions

6.1 Delivery place:

The material shall be delivered to:

Assistant Stores Officer,
INRP Stores, BARC, Tarapur,
PO-Ghivali, Boisar, Dist-Palghar,
Maharahstra, India, Pin-401502.

6.2 Packaging and Shipment:

- Packing and shipment of the items to site shall be the responsibility of the Vendor. The items shall be packed and protected so as not to affect, damage or breakage during shipment and storage in a tropical climate.

6.3 Warranty/Guarantee

Supplier shall provide the warranty that the goods are free from defects in design, materials or workmanship.

The warranty shall cover for a period of 12 months from date of satisfactory installation & commissioning and final acceptance of the system.

If, within the expiry of the above stipulated warranty/ guarantee period, the subject items / component or any part thereof are found defective and did not deliver indented function, vendor shall at his own expense, repair / rectify / replace the parts.

6.4 General & Safety

- Vendor is responsible for the safety of his personnel working during manufacture, supply, installation, testing & commissioning of the entire system at its office/premises and installation areas at site at all times.
- Vendor shall provide all the equipment necessary for ensuring the safety and follow Industrial and Health safety regulations meticulously at manufactures', vendor's and purchaser's premises. Purchaser/Department will not be liable for any claims on this part.
- All tool tackles, manpower, machinery, equipment, temporary structures, instruments, cables, etc. required for testing and commissioning of the systems of system shall be in the scope of bidder. The tools, tackles machinery required for erection, installation of the system shall be taken back by the vendor.
- Police Verification Certificate (PVC) and government issued ID (AADHAAR card, PAN Card etc.) will be required for arranging entry pass for the personnel deployed for I&C activities.

7 Tender Bid Evaluation

The bidders shall submit the proposed scheme for RFID tag identification system along with the bid. The purchaser, during bid evaluation may further ask for any technical clarification on the scheme/system offered by bidder.

The purchaser may further ask for demonstration of the offered / equivalent system for technical clarifications, if any, during bid technical evaluation. The bidder shall in such case make arrangement for the system demonstration.

8 Detailed Technical Specifications

The components for the RFID system shall be suitable for industrial grade, 24 X 7, 365 days operations. The specifications provided in this section are typical. Bidder shall consider any component or assembly etc. for fulfillment of the application.

8.1 RFID Reader/Writer

Sr. No.	Specification	Requirement
	Common Specifications	
•	Operating voltage	24 VDC (preferably)
•	Operating frequency	Shall read/write from RFID Tags mentioned in section 8.2 below, operating at frequency suitable for the application
•	Compatibility with controller	The RFID readers and writer shall be compatible with the RFID Controller mentioned in section 8.3 below.
•	Status indication	Status LED for power, communication, read/write operation etc.
•	Degree of protection	IP65 or better
•	Accessories	Suitable mounting accessories shall be provided.
•	Cables and connectors	Suitable cables with industrial connectors shall be provided for RFID readers and writer to RFID Controller connections or to network switch as per design. Cable lengths shall be minimum 80 meters / as per system design
•	Discrete I/O	At least 2 DI and 2 DO shall be available per reader for status interfacing with PLC system. The DI/DO can be provided via the controller unit
	RFID Writer Head: Additional Specifications	
•	Mounting	To be located at RFID Configuration Terminal for pre-coding RFID tags
•	Operation	Read & Write Operation for pre-coding tags pasted on sample bottle shall be possible
•	Sensing range	0 to 130 mm typical
	RFID Reader (loading station): Additional Specifications	
•	Type	Compact design of the reader at loading station is desirable as the area available at loading station is limited.
•	Mounting	To be mounted at bottle loading station
•	Sensing range	0 to 130 mm typical
	RFID Reader (Delivery location): Additional Specifications	
•	Type and mounting	To be mounted near bottle delivery location and shall be designed as per detection requirements.
•	Detection requirement	Shall be able to detect bottle with a glass window of approximate 380 mm thickness
•	Sensing range	0 to 5 m typical

8.2 RFID Tags

Sr. No.	Specification	Requirement
•	Tag Type	RFID tag suitable for fixing on polypropylene bottle with curved surface. Bottle diameter – Approx. 21.4 mm
•	Dimensions	Suitable for available surface area of bottle as indicated in figure 2
•	Operating frequency	Suitable for the application
•	Memory	Capability to read / write. Desired String length is up to 16 characters.
•	Degree of protection	IP67
•	Quantity	500

8.3 RFID Controller

Sr. No.	Specification	Requirement
•	Number of reader/ writer support	Multiple preferred (number of controllers may be provided catering to reader/writer) Controller functionality may also be integrated with reader/writers.
•	Operating voltage	24 V DC (preferably)
•	Operating frequency	Supporting reader/writer & tags operating at frequency suitable for the application
•	Required as per design and engineering of proposed system by bidder for tendered application.	
•	Communication Port	Ethernet, Min. 100 Mbit/s speed
•	Protocol	Communication support for Modbus/TCP or other industrial protocols for communication with SCADA shall be available.
•	Configuration Software	The software utility to configure various controller parameters from computer via Ethernet connectivity shall be provided
•	SCADA connectivity	The controller shall be able to share the real time data obtained from RFID reader/writer with industrial SCADA/PLC. The MODBUS TCP protocol or other standard industrial protocols for communication with SCADA/PLC shall be supported.
•	Accessories	All applicable mounting accessories shall be provided.
•	Cables and connectors	Suitable cables with industrial connectors for power supply and communication shall be provided. The cable length for communication between RFID Controller and Industrial SCADA and RFID

Sr. No.	Specification	Requirement
		Configuration Terminal shall be minimum 80 meters/ as per system design

8.4 Power Supply

Sr. No.	Specification	Requirement
•	Output voltage	24 VDC
•	Ripple	Max. 150mVp-p
•	Rated current	10A / as per load calculations after detailed engineering)
•	Input voltage	230V , 50Hz
•	Line regulation	Max. ± 0.5%
•	Load regulation	Max. ± 0.5%
•	Inbuilt protection	Against overload, over voltage, over temperature and short-circuit

8.5 Enclosure

Sr. No.	Specification	Requirement
•	Size	As per detailed engineering
•	Sheet thickness	as per industrial standard
•	MoC	CRCA sheet, Epoxy painted.
•	Terminal size	Suitable up to 1.5 sq. mm. conductors.
•	Mounting hardware	Shall be provided
•	Terminal Make	Standard industrial
•	Protection	IP54
•	Components	Cable & terminals for 230V input, Fuse, MCB, RFID Controller and Power Supply.

Accepted and complied on behalf of Neemus Software Solutions Private Limited
Authorized Signatory