

## **Specifications:**

Multi-Port, Water (or any drinking liquid) Vending Machine (WVM) by **Vinay Sharma**

### **Background and Purpose**

Vinay Sharma in India has developed Multi-Port, Water (or any drinking liquid) Vending Machine (WVM). These WVMs have the capability by which it sends all the parameters regarding system and sales to server on regular interval. These parameters can be remotely monitored and modifications can be done based on our requirement. The purpose of this Document to create a workflow, so that the process can be explained regarding working of Water Vending Machine, its design, look and feel and data for monitoring of system, sales details and generated alarms can be directed to respective stakeholders for quick action.

### **Machine Description**

WVM consists of a water purification system, purified water storage, water chilling system, water dispensing system and a controller with display.

Process flow for the water purification system is shown in Figure 1. It consists of a:

- Raw Water Pump,
- Multi Grade Sand Filter,
- Activated Carbon Filter,
- Anti-Scaling Cartridge filter if source water is of less than 600TDS or,
- If more than 600 TDS then Anti-Scaling liquid Dosing Pump,
- 5 Micron Filtration Cartridges,
- High Pressure Pump,
- Reverse Osmosis Membrane Filtration,
- 0.5 Micron 99.9% Ultra-filtration (UF) Cartridge to,
- Finally store treated water in SS304 Food Grade Chiller Tank.
- The water storage tank has a submerged ultra-violet disinfection device and an inline UV System before dispensing to keep the water disinfected.
- Membrane discharge and spilled during dispensing will be collected in a storage tank for general use, before discharging the overflow.

Water chilling system consists of gravity-filled chilled water storage tank, refrigeration system and heat exchanging coils wrapped around the chilled water tank.

Dispensing is done by gravity from chiller tank to taps via  $\frac{3}{4}$ " water lines, each dispensing line has a flow meter to measure volume of water dispensed and a solenoid valve to start/stop the flow of water.

Two of the dispensing consoles are coin operated where the dispensation is linked to a coin acceptor. Third console is RF enabled, and operator-assisted. We are working toward making the 3<sup>rd</sup> console to accept valet payments in near future. Hence, it can have complete cashless option too for clients.

Controller is used to monitor and control the water purification process as well as control the dispensation while keeping track of sales. Controller function and its requirement are described in more detailed below.

### **Water Purification:**

Water purification process is automated where pumps are switched on or off depending on the level of the water in the tanks. There needs to be adequate water available for the system to start. This is governed by the pressure switch on the feed water supply line. As long as feed water is available, start/stop of the feed pump and the high pressure pump is governed by the level of water in product water tank, with the system shutting off when the tank is full and starting when the level drops below a prescribed level.

Submerged UV is to be on all the time when power is available and, the UV in line will turn ON as soon as water starts flowing through solenoid valve. Chiller operation is controlled by a temperature sensor that controls the water temperature close to the set point.

Coin-assisted water dispenser sells only one SKU, which is 1 L. When the right amount of coin is deposited in the coin acceptor, one liter of water is dispensed in the customer brought container. This is to avoid long queues during high traffic and customer taking long to decide and if anyone decided to take more water, others may get delayed to catch the train.

Operator-assisted is available on all 3 dispensers and, it can provide additional options to the customer. These dispensing consoles have flexibility in dispensing five SKUs: 300 ml, 500 ml, 1 L, 2L and 5L. Customer further has the option of dispensing these volumes in Vinay Sharma provided containers or in customer-brought containers. Customer pays cash for this transaction and operator selects appropriate options on a dispensing console, including the tap the customer has to use. Customer goes to the assigned tap and presses an acknowledgement button to start the dispensing.

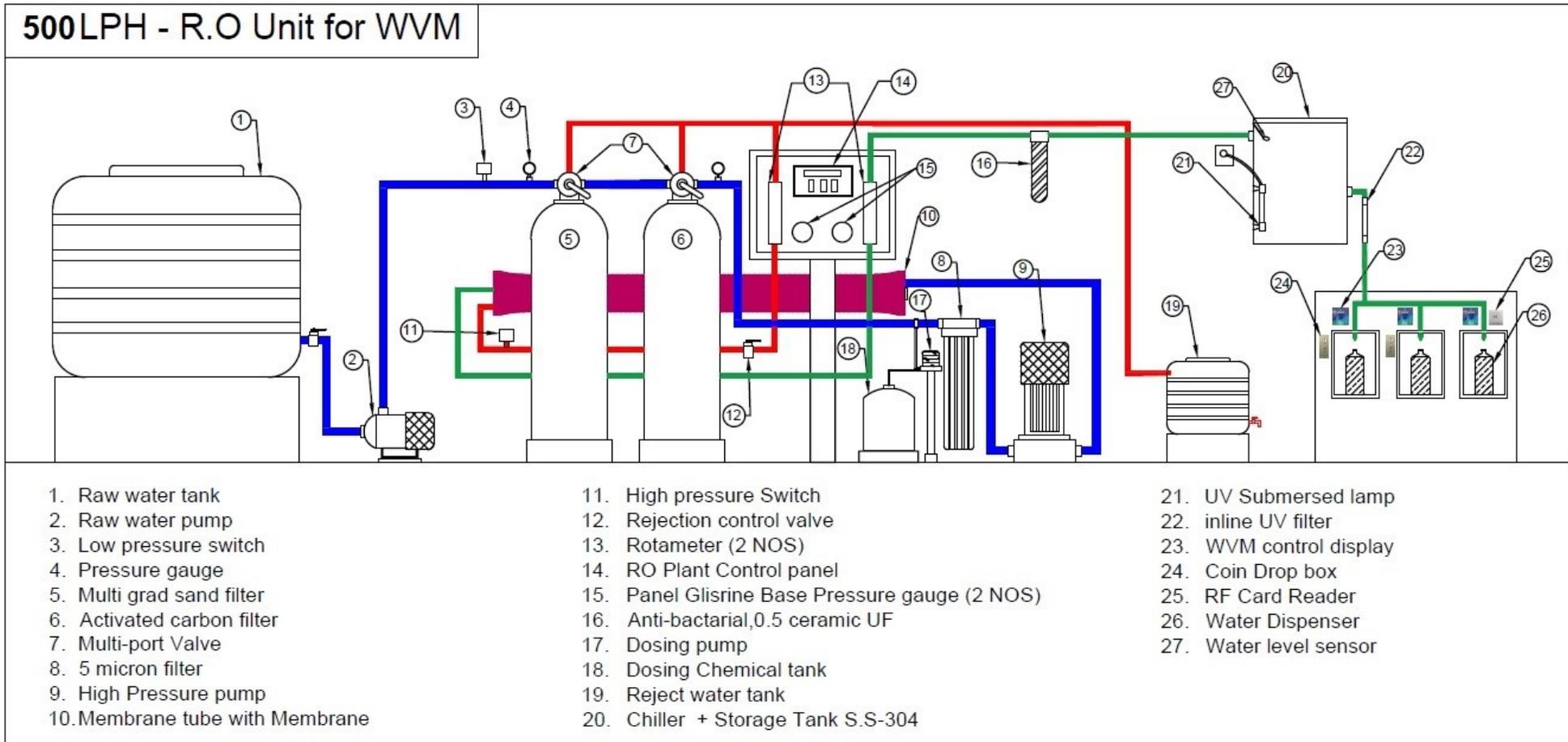
In both cases, dispensing stops automatically once the request amount of water has been dispensed; Water purification process and the coin-operated dispensing are independent of the operator login and are functional by default when the machine is on. Operator-assisted dispensing requires an operator to be signed in as the sales are tracked by the operator who is signed in.

### **Working Principle:**

- Machine configurations are stored locally as well as archived on Vinay Sharma Cloud server;
- Configuration files consist of acceptable operator login method/code and calibration constants for each tap for different SKUs along with other parameters such as price for each SKU, communication settings and encryption/decryption algorithms;
- When the machine is switched on for the first time, configuration file with authorized personnel list is downloaded and stored in the machine;
- Operator signs in using his/her assigned code or ID card;
- After Operator completed his login, system is ready for dispensation using the operator assisted consoles;
- The dispensation console will get activated once the operator login and, log out the operator, if s/he leaves for more over 60 minutes;
- Each operator-assisted console has capability to dispense 5 types of SKU's 300ml, 500ml, 1Ltr, 2Ltrs and 5Ltrs with and without container. These SKU's can be dispensed through all the taps;

- System also contains coin dispensation which works with 3 different types of 5 Rupee coins. It has only one SKU I.e. 1Ltr
- For each dispensation the GPRS system in PCB will send comment to the server through API;
- After every transaction, transaction details are pushed from WVM to server through API;
- If an intermediate server is used, then this server pushes the transaction details to Vinay Sharma Cloud server.

Figure-1



## Functional Requirements:

Information data related to volume and revenue transactions will be sent from the WVM to the central server at a periodic interval irrespective of whether any transaction has taken place or not. Apart from the above, regular information will be sent to the central server for the events described below. Controller needs to have a local storage space. The data will be sent using GPRS and unless the handshake of WVM controller and the server happens, the data will continue to be stored in the WVM controller.

Each dispensing lines are equipped with a flow meter. After the customer presses the acknowledgement button to start to dispense water and the flow does start (as indicated by onset of flow pulses), the dispensation is stopped and event recorded as an alarm.

Sr. #	Description	Details
1	Dispensation System	<ul style="list-style-type: none"><li>▪ 2 taps with coin acceptor and all taps with operator assistance, coin acceptor will accept only 5 Rupee coin and dispenses 1000 ml of water.</li><li>▪ Operator assisted taps will dispense 5 SKUs (300 mL, 500 mL, 1 L, 2L and 5 L) Controller has built-in GPRS communication module, with data transfer directly to Vinay Sharma server in excel compatible format.</li><li>▪ It should provide remote startup and shut down options and allow both push and pull of data to/from the machine.</li></ul>
2	Controller	<ul style="list-style-type: none"><li>▪ Each WVM will be assigned unique ID (based on GPRS SIM) that will be used to geographically locate the machine in the server. Each time data is transferred, the machine ID needs to be communicated.</li></ul>
3	Process Data Logging and communication	<ul style="list-style-type: none"><li>▪ Process data to be logged at a specified interval:<ol style="list-style-type: none"><li>1. Date/time</li><li>2. Plant status (ON/OFF)</li><li>3. Feed water pressure switch status</li></ol></li></ul>

		<ul style="list-style-type: none"> <li>4. Product water tank, level switch status</li> <li>5. Water TDS</li> <li>6. Water pH</li> <li>7. Status of high pressure switch</li> </ul>
4	Controller Interface	<ul style="list-style-type: none"> <li>▪ Main: <ul style="list-style-type: none"> <li>➤ Main system ON/OFF button;</li> <li>➤ RFID card reader or another means for operators and other support personnel sign in and out.</li> </ul> </li> <li>▪ Coin-based dispenser: <ul style="list-style-type: none"> <li>➤ 5-rupees coin slot;</li> <li>➤ Start button</li> </ul> </li> <li>▪ Console for operator-assisted dispensing: <ul style="list-style-type: none"> <li>➤ 5 different SKUs (0.3L, 0.5L, 1L, 2L and 5L);</li> <li>➤ 2 bottle option (customer brought or seller-provided) touch buttons;</li> <li>➤ All tap option;</li> <li>➤ OK or Start button</li> </ul> </li> <li>▪ Acknowledge button next to each tap for customer to press and start the dispensing process.</li> </ul>
5	Data Communication – Event Based (Alerts and Alarms)	<ul style="list-style-type: none"> <li>▪ Data to be pushed by controller to server on the occurrence of the event;</li> <li>▪ Device ID and date/time stamp to be included;</li> <li>▪ Exceptional events when data needs to be sent: <ul style="list-style-type: none"> <li>➤ Abnormal stop with reason (low pressure, high pressure, high TDS, pH out of range);</li> <li>➤ High ON TIME alert: Event alarm to be generated if the machine is producing water continuously in excess of the tank capacity at designed flow rate;</li> <li>➤ High OFF TIME alert: If the plant is not producing water for a very long time;</li> <li>➤ High usage alert: Water is getting dispensed continuously (indicator of problem with solenoid valves);</li> <li>➤ Unsuccessful dispense because of flow</li> </ul> </li> </ul>

		meter issues.
6	Data Communication – Periodic – Sales Tracking	<ul style="list-style-type: none"> <li>▪ Data set to be sent at a prescribed frequency;</li> <li>▪ Frequency of data transfer needs to be field settable;</li> <li>▪ Data package to include; <ul style="list-style-type: none"> <li>➤ Device ID;</li> <li>➤ Operator ID;</li> <li>➤ Time/Date stamp;</li> <li>➤ For the time period, number of SKU sold by SKU for each of the two operator assisted taps separately;</li> <li>➤ For the time period, number of 1 L SKU sold in coin-based dispenser;</li> <li>➤ For the time period, volume flow through coin-based dispenser;</li> <li>➤ For the time period, volume flow through operator-assisted dispenser (by individual tap);</li> <li>➤ For the time period, number of dispenses with seller provided 1 L bottles by tap number;</li> <li>➤ Whether the dispensation timed out.</li> </ul> </li> </ul>
7	Data Logging and Communication – Sales Event	<ul style="list-style-type: none"> <li>▪ Authorized cash collection personnel will visit each machine and collect cash from the operator present;</li> <li>▪ Each operator assigned to a machine has his/her cash box and is responsible for the cash inside;</li> <li>▪ Collection personnel logs in to inquire cash available with each operator;</li> <li>▪ After cash collection from operator is reconciled and collected, the collection personnel rests the cash count with operator signifying zero cash in the cash box;</li> <li>▪ Above event of cash collected and reset from respective operator is logged and information</li> </ul>

		<p>with date/time stamp, amount of cash reconciled, collection personnel ID and operator ID is transferred to server;</p> <ul style="list-style-type: none"> <li>▪ At any time, operator can independently inquire total cash collected since last reset to reconcile with total cash in the cash box.</li> </ul>
8	Data Communication – from Server	<ul style="list-style-type: none"> <li>▪ Commands to be sent from server <ul style="list-style-type: none"> <li>➤ System START;</li> <li>➤ System STOP;</li> <li>➤ System RESET;</li> <li>➤ System REBOOT;</li> <li>➤ Activation/deactivation of an operator or collection personnel;</li> <li>➤ Price change for each SKU in operator-assisted taps.</li> </ul> </li> </ul>



Vinay Sharma - WVM Image - 1



Vinay Sharma – WVM-Image - 2