Potable Water Ozone Purification System

Treatment Technology: Ozonation

Ozonation is one of the most advanced but time tested technology and can be retrofitted with great advantage in treatment of existing water system.

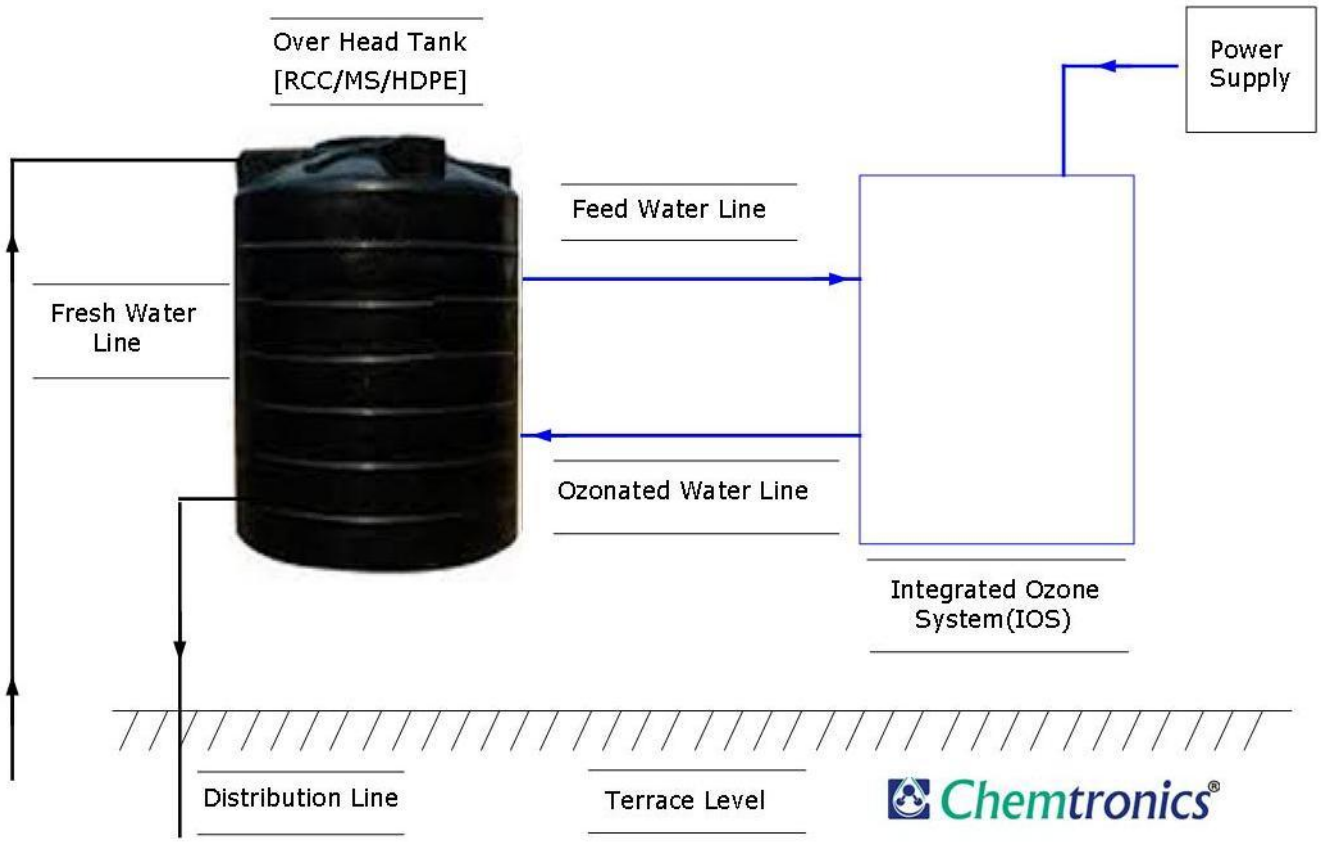
Chemtronics has successfully designed and installed solution to integrate and retrofit with the present and conventional system with proven, time tested ozone based technology. Its technology integration gives buy back of CapEx in reasonably short period depending upon the application and customised solution.

Drinking water Ozonation is a worldwide standard practice. Ozone in approved by USFDA and also accepted under GRAS guidelines.

Installation / Integration of Ozonation & Process Description

Integrated Ozone System [IOS] is plug and play technology, designed to quickly integrate in to an existing water system. It requires one inlet, one outlet & one power point.

IOS will be installed near over head tank/ on the terrace level. This can also be installed 10 – 30 mtrs away from storage tank. The existing water supply system can remain as it is & IOS is installed/ integrated as add on technology, where one feed water connection is taken from overhead tank. The ozone system works on continuous is circulation mode. The entire operation is automatic in operation. The residual ozone level is continuously monitored within the system & feedback is given to ozone generator. Once the ozone level reaches the required preset level the ozone generation goes into standby mode, preventing excess ozone (fig. 1)



Advantages of IOS Technology:

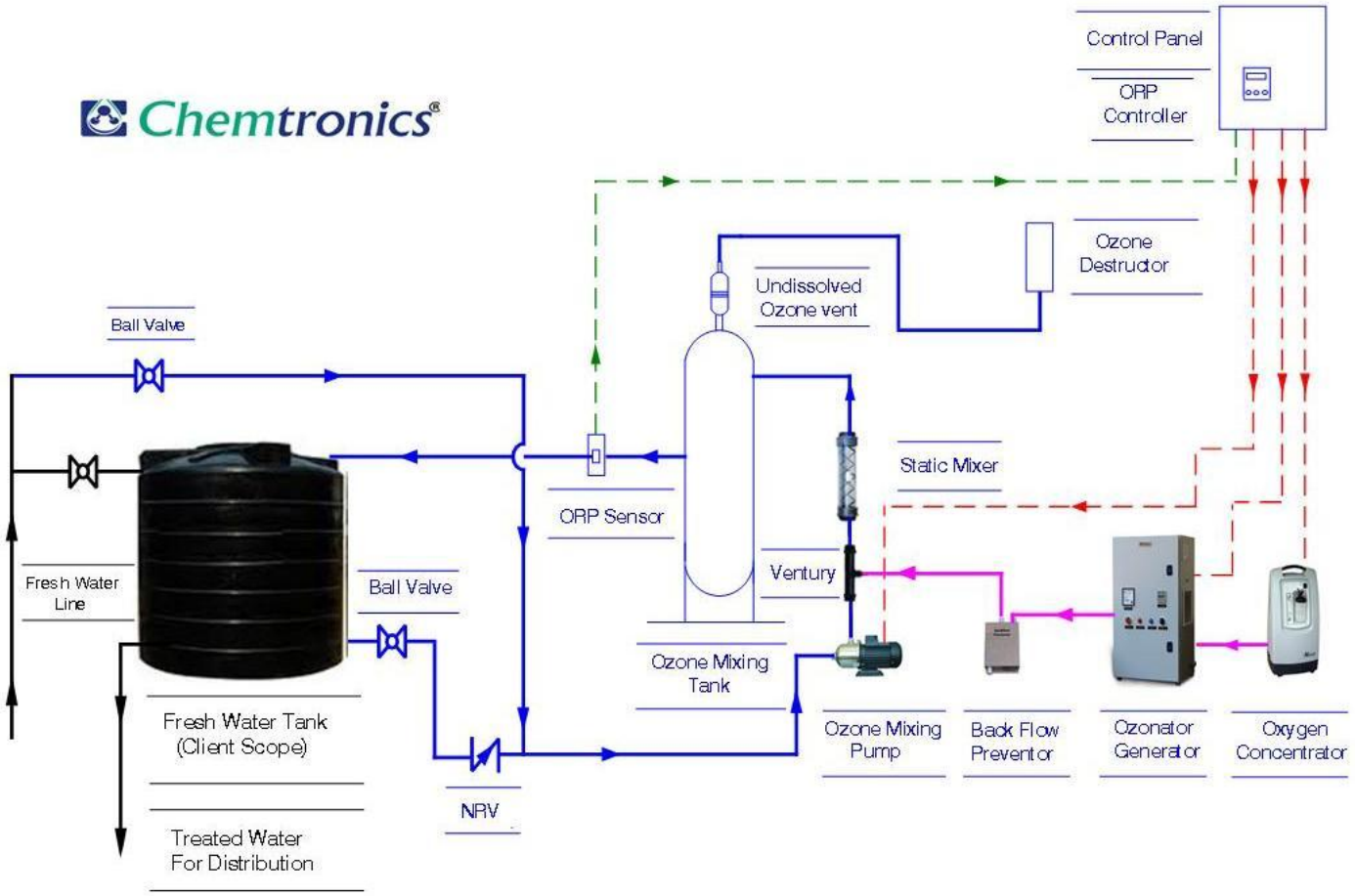
- It has continuous level of disinfection.
- Recognized by many municipalities & research agencies
- Ozonated water keeps distribution pipe line, storage tank, taps etc. disinfected.
- Ozonated water is safe for drinking in fact it has medicinal benefits.
- There are multiple applications of Ozonated water in domestic, office & commercial establishment.
- BARC does not use chlorine in their process but uses ozone.
- In USA & Europe municipalities use ozone for their drinking water, laundry, waste water, cooling tower, swimming pool, agriculture, aquaculture, dairy foods & beverages, pharmaceuticals & many more areas.

Effectiveness of Ozone over other treatment technologies

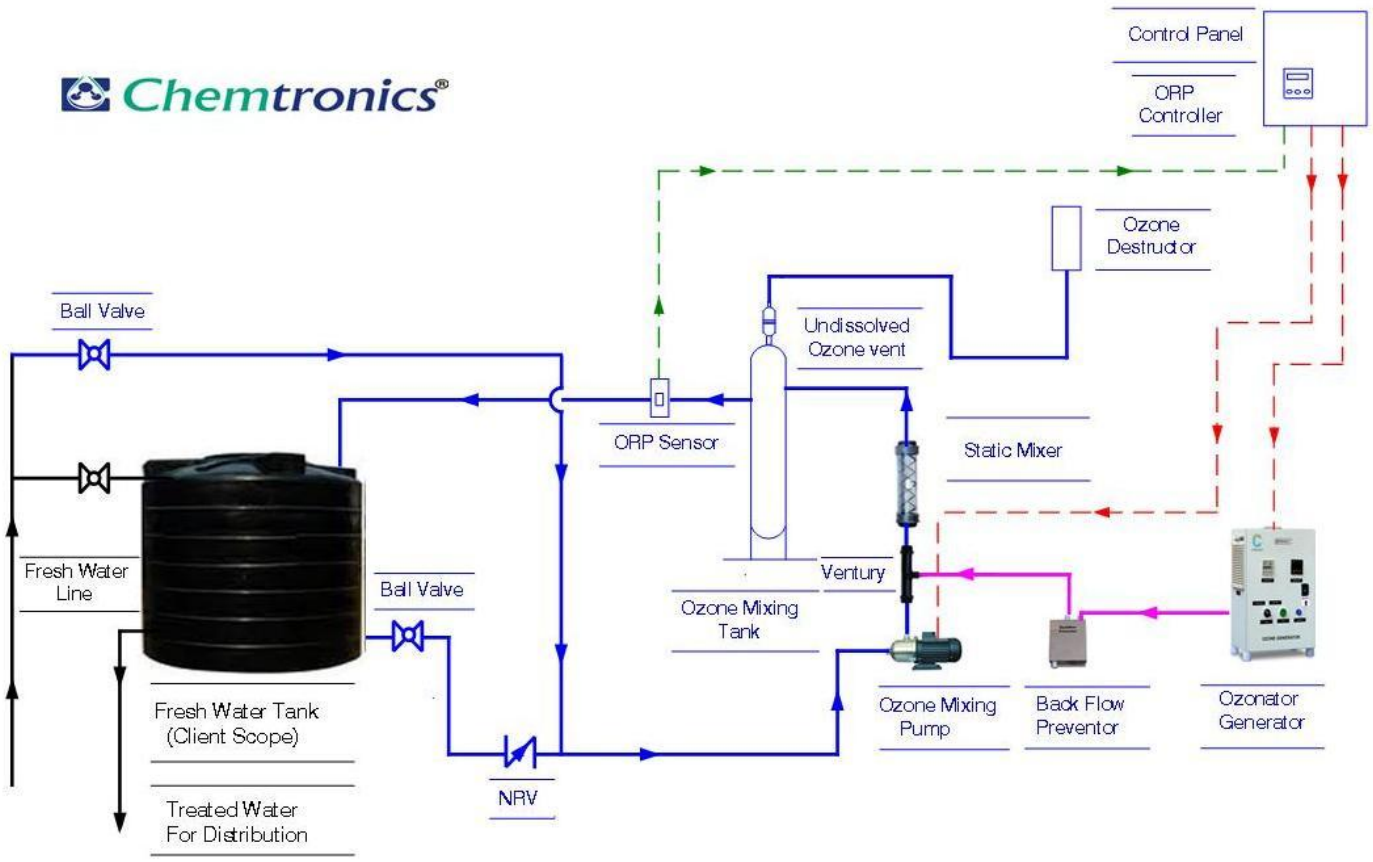
Sr. No.	Characteristic	Ozone	Chlorine/ chemical	Filtration	ACF	U V	U F
1	Sensitive to pH	Low	High	No	Low	Low	Low
2	Germicidal properties	High	Moderate	No	No	High	Low
3	Residual Property	Moderate	High Carcinogenic	No	No	No	No
4	Residual Benefit	Good	Harmful	No	No	No	No
5	Re contamination	No	No	Yes	Yes	Yes	Yes
6	Extra Chemicals	No	Yes	Yes	No	No	Yes
7	Micro flocculation	Yes	No	No	No	No	No
8	Formation of harmful byproduct	No	High	No	No	No	No

9	Operating cost/ Maintenance	Moderate	Low	Low	Low	High	High
10	Color / odor reduction	High	Moderate	No	Moderate	No	Low
11	Organic removal	High	Moderate	No	Low	No	No
12	Distribution Disinfectant	Yes	Yes	No	No	No	No
13	Process Application	Yes	No	No	No	No	No
14	Package Drinking	Yes	NO	Yes	Yes	Yes	Yes
15	RO Pre/Post Treatment	Yes	No	Yes	Yes	Yes	Yes
16	Pesticide Removal	Yes	No	No	No	No	No
17	Distribution Line Sanitation	Yes	Yes Carcinogenic	No	No	No	No
18	USEPA Compliance	Yes	No	NA	NA	Yes	NA
19	USFDA Compliance	Yes	No	NA	NA	Yes	NA
20	GRAS Compliance	Yes	No	NA	NA	Yes	NA
21	Pharmaceutical	Yes	No	Yes	Yes	Yes	Yes

Process flow Diagram



Integrated Ozonation System with Oxygen



Integrated Ozonation System without Oxygen

Methodology

Integrated Ozone System has five main stages:

1. Feed Gas preparation
2. Ozone generator
3. Mass Transfer
4. Cell Cooling
5. Safety, Sensor, Controls & Automation

Integrated Ozonation System [IOS]

1. Oxygen Concentrator: Oxygen is generated from Compressed air by a separation process which uses the principle of selective adsorption. The air is passed through a bed of Zeolite Molecular Sieves (ZMS) which has a property of very high degree of affinity to nitrogen. The ZMS contains an infinite number of micro-pores and it retains the adsorbed nitrogen molecules in these pores.

Before this process is affected, the compressed air has to be purified by removing all contaminants i.e. solids, condensed liquids and oil & water vapor's by passing it through Pre filter, Oil Removal Filter (not required if oil-free Compressor is used) and Air Dryer. The dry & oil-free air from Air Dryer is stored in a Dry Air Receiver before it enters the PSA System. In this System, there are two adsorbs filled with ZMS where nitrogen along with any traces of moisture are adsorbed and product gas (dry oxygen) comes out and passes to Oxygen Surge Vessel. In the PSA System, one adsorbs is in production cycle while the other is regenerated (desorbed) by depressurization. The two adsorbs keep switching from adsorption to desorption automatically, through a sequence timer. The pressure in the adsorbs swings from atmospheric pressure to line pressure, which is why this process is known as Pressure Swing Adsorption (PSA).

2. Ozone Generator: Ozone Generators are of high concentration, water cooled corona discharge type. Ozone generator has inbuilt oxygen concentrator in that it takes ambient air as a feed to oxygen concentrator, which generate 85 – 90% pure dry oxygen gas and feed to ozone cell to generate ozone gas. Ozone gas mix with water through Ventury injector & reaction carried in Chemone ozone contactor cum diffuser. In water there are many odorous gases are dissolved like H2S, NH3, NO2 etc. these gases get oxidized by ozone in Chemone ozone contactor cum diffuser.

3. Back Flow Preventer:

In addition to non return valves (NRV) we use special back flow preventer unit to prevent accidental reverse flow of water into Ozone Generator in case of any device failures reverse water will be drained.

4. Cooling Cell:

Forced air cooled internal and external radiation fins for Ozone cell cooling.

5. Ventury Injection:

Require high Ventury injection system for ozone & Water mixing.

6. Static Mixer:

Zeeta Potential Mixer. Microfine bubble generation.

7. Mass Transfer & Contact Chamber:

Require Ozone compatible Stainless steel / PVC tank for mass transfer & Ozone Water mixing chamber.

8. Ozone Vent:

To isolate un dissolved ozone vent.

9. Ozone Off Gas & Destruct System:

Destruct the same to oxygen with water trap.

10. Ambient Ozone Leakage Sensor:

To monitor & use as alarm system.

11. Centralized Control Panel:

To interconnect all ancillary equipments & operate the system.

- **Salient Features of IOS:**

1. Ozone compatible mixing pump
2. SS 304 Skid
3. Operation – Automatic
4. Oxidation online Sensor – ORP
5. Forced Air Cooled internal & external electrode

Technical Specification:

Sr. No.	Tank Capacity Liters	Ozonator Model No.	Ozone Dose PPM	Ozonator Capacity mg/hr	Feed Gas	Ventury inches
1	500	MCI/LC-250	0.2 – 0.3	200	Air	¾
2	1,000	MCI/LC-250	0.2 – 0.3	200	Air	¾
3	2,000	MCI/LC-500	0.2 – 0.3	400	Air	1
4	5,000	MCI/LC-1000	0.2 – 0.3	800	Air	1
5	10,000	MCI/LC-4000	0.8 – 0.9	4,000	Air	1
6	20,000	MCI/LC-4000	0.4 – 0.5	4,000	Oxygen	1
7	40,000	MCI/LC-8000	0.8 – 0.9	8,000	Oxygen	1
8	50,000	MCI/LC-10000	0.6 – 0.8	10,000	Oxygen	1

For more information please visit: http://www.chemtronicsindia.com/