"Tiny Bubbles"

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Does your water appear like champagne straight from the tap? Is it cloudy from all the tiny bubbles coming out of solution? Are you hearing a not so sweet song of complaints from your customers? This nuisance at the water tap does little to make you feel happy or make you feel fine. Besides being unpleasant at the tap and the singing of unhappy customers, it can lead to other problems such as increased corrosion problems and/or cavitation in pumps so let us take a closer look at this nuisance.

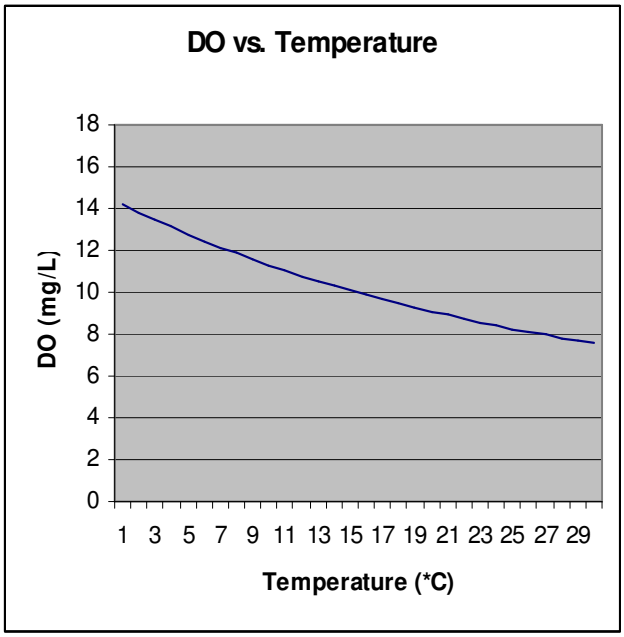
Tiny bubbles at the tap is usually caused by one of two items, trapped air in the distribution lines or water being supersaturated with gasses. Let us ask a few questions to focus in on the cause of this bubbly situation. Was recent construction done in your distribution system that may have introduced air? Does your system have high areas without the means of releasing air? What are the characteristics of your water entering the distribution system (Dissolved Oxygen and Temperature)? Is there a broad range of operating pressures in your distribution system? Being that oxygen is simple to test for, we will use Dissolved Oxygen (DO) as a reference.

Keeping it simple, try flushing your system. In most cases, this will remove large amounts of air from your system and may be all that is required to solve the problem. Hopefully, no further action is required. If the customer complaints begin again we must look deeper in order to find the root cause that is giving you grief.

Understanding Water and Oxygen:

All water can and will absorb oxygen. The amount of oxygen absorbed is determined by the following factors; temperature, pressure, purity of the water, source water characteristics, and treatment.

Temperature: Cold water will absorb and hold on to oxygen more readily than warm water. Here in the Northwest, with the colder temperatures and depending if your source is surface or ground water, it is not uncommon for DOs to exceed 10 mg/L. The relationship of the saturation point of oxygen



directly relates with temperature, the colder the water, the higher the saturation point.

For example: water in the distribution system is 12 degrees C and is saturated, if that water is allowed to remain in a household plumbing it may warm up to, let us say 23 degrees C. The water coming out of the tap is now super-saturated and oxygen will come out of solution.

Pressure: Also be aware that higher pressures have a higher saturation point. Taking for example a distribution system has a pressure of 40 psig; this water can have a higher saturation point than that of water coming out of the tap at zero psig.

Purity of the Water: Pure water more readily accepts oxygen thus making many of the new state of the art technologies more prone to having saturation levels in the distribution system.

Source Water Characteristics: Surface water sources contain more oxygen than ground water and during high algae periods, water may become supersaturated. Depending on your system, this usually reduces during treatment.

Treatment: Disinfection using ozone also increases oxygen in the water and often requires stripping of the oxygen prior to distribution.

Determining Cause:

After flushing your system and the tiny bubbles return, a distribution profile will help tell a story about what is happening in your system. Samples should be taken in affected and unaffected portions of the systems with two samples taken at each site and at the cold-water tap. One immediately after the tap is turned on; the second after the tap has ran a few minutes. This will assist in determining if the problem is local to the sample point or in your distribution lines. The profile should contain both temperature and DO.

The samples should be taken in such a way that minimal turbulence occurs and recorded immediately. Compare results with the following scale. If the DO is greater than or equal to the Saturation Concentration for the given temperature the water is supersaturated and gasses are being released.

Source: Adapted from Standard Methods for the Examination of Water and Wastewater. 15th ed. 1981.

Once the cause is determined appropriate action can be taken to resolve the problem. The solution may involve pressure reduction, air stripping, source water changes or other items that may be appropriate to the systems equipment and resources.

Temperature, *C	Saturation Concentration mg/L	Temperature, *C	Saturation Concentration mg/L
0	14.621	16	9.870
1	14.216	17	9.665
2	13.829	18	9.467
3	13.460	19	9.276
4	13.107	20	9.092
5	12.770	21	8.915
6	12.447	22	8.743
7	12.139	23	8.578
8	11.843	24	8.418
9	11.559	25	8.263
10	11.288	26	8.113
11	11.027	27	7.968
12	10.777	28	7.827
13	10.537	29	7.691
14	10.306	30	7.559
15	10.084		