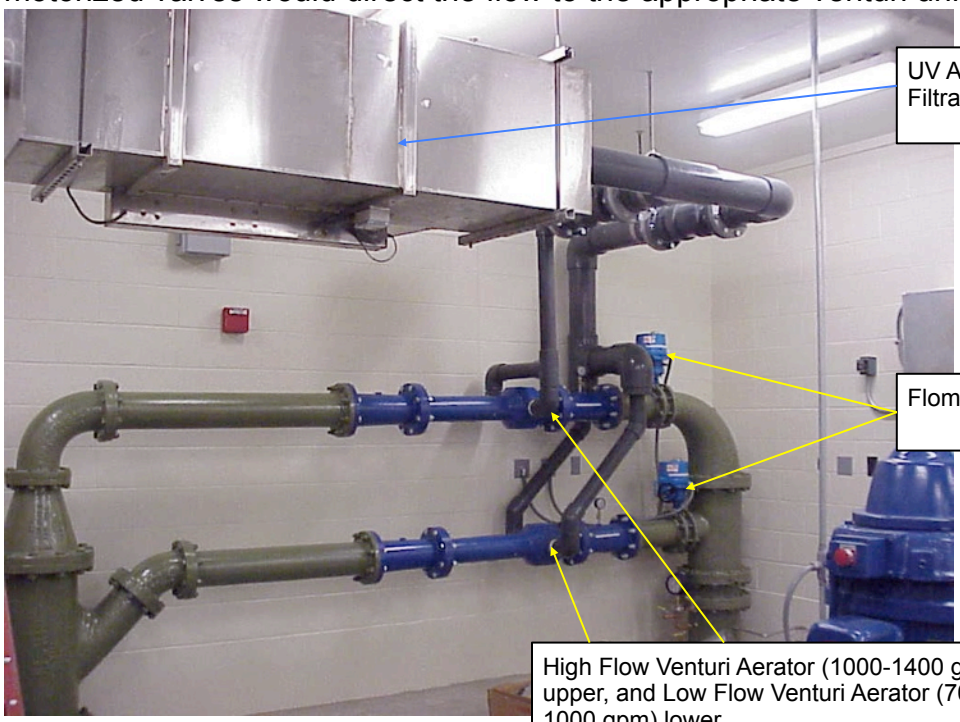
Corrosion Control
Radon Stripping
Non-Chemical pH Adjustment
UV Air Disinfection

VENTURI AERATORS STRIP SOLUBLE RADON AND CARBON DIOXIDE

A new pump station was brought on line to handle the increase in consumer demand for a medium sized water utility in northern Maine. The system's raw water was relatively neutral in pH but it contained soluble Radon at >450 pCi/L. The water utility was desirous of addressing both Radon and adding non-chemical pH adjustment to meet the anticipated changes in US EPA Radon Regulations now at the time of the new construction rather than face the issue of retrofitting the system at some point in the future. Plus non-chemical pH adjustment would help reduce chemical costs.

To accomplish both Radon reduction and non-chemical pH control the engineer [Wright-Pierce, Topsham, ME] selected the venturi aerator technology since it is capable of addressing both issues with a very simple design. There was one design factor, which was new on this installation for the venturi aerator technology that was handling varying flow rates based on the number of wells online. This flow would vary from 700 gpm up to 1400 gpm. To accommodate this two venturi aerator units were selected with different internal nozzles. One six-inch venturi aerator would handle low flows from 700 gpm up to 1000 gpm. The second six-inch venturi aerator would handle higher flows between 1000 gpm up to 1400 gpm. Two Flomatic™ motorized valves would direct the flow to the appropriate venturi unit.



The system is designed to be a “one pass” through the venturi aerator unit configuration. All the wells have good alkalinity (~120) and raw water pH’s on the various wells range from 7.6 to 7.8. The venturi aerators due to the high internal Reynolds turbulence and the pressure drop across the internal nozzle strip both carbon dioxide and soluble Radon simultaneously. Therefore, pH is increased from 7.6 to 8.0 on the low flow venturi aerator unit and from 7.6 to 8.32 on the high flow venturi aerator. Soluble Radon is lowered from 446 to 119 pCi/L on the low flow venturi aerator and to <95 pCi/L on the high flow venturi aerator. Treated water is released into a tank with an exhaust fan to create a negative pressure to prevent reabsorption of the released gases.

The air that is aspirated by the venturi aerators is disinfected in a UV Germicidal Air Filtration and Disinfection Unit designed to handle the maximum air flow of the high flow venturi aerator, i.e. ~400 scfm. Air is aspirated due to natural vacuum [28.0 to 29.5 inches] created by the venturi aerator. UV disinfection of the air ensures that any airborne bacteria will be “killed” by the UV Germicidal wavelength bulbs. Further this unit also has a pleated fabric filter and electrostatic filter to remove dust, pollen and other airborne particles.

Additionally, the UV Air Disinfection and Filtration unit is also equipped with a unique Sentinel™ bulb sensor system, which is a bulb “on-off” indicator. Should one of the UV bulbs fail the sensor would alert the operator that a bulb is not functioning and requires replacement. This Sentinel™ unit is on the bottom of the UV unit so that the operator could walk under it and look up. It is recommended that operator inspect the system monthly and that a “maintenance and inspection log” be kept for audit and review by the local Board of Health. The PM-40 Pleated Fabric Filter should be changed quarterly at a minimum and the electrostatic precipitator cleaned at the time of inspection. The UV Germicidal bulbs should be changed at a minimum of annually as UV wavelength degrades over time. Monthly they should be wiped clean at the time of inspection.