WATER QUALITY AND ENERGY INTENSITY

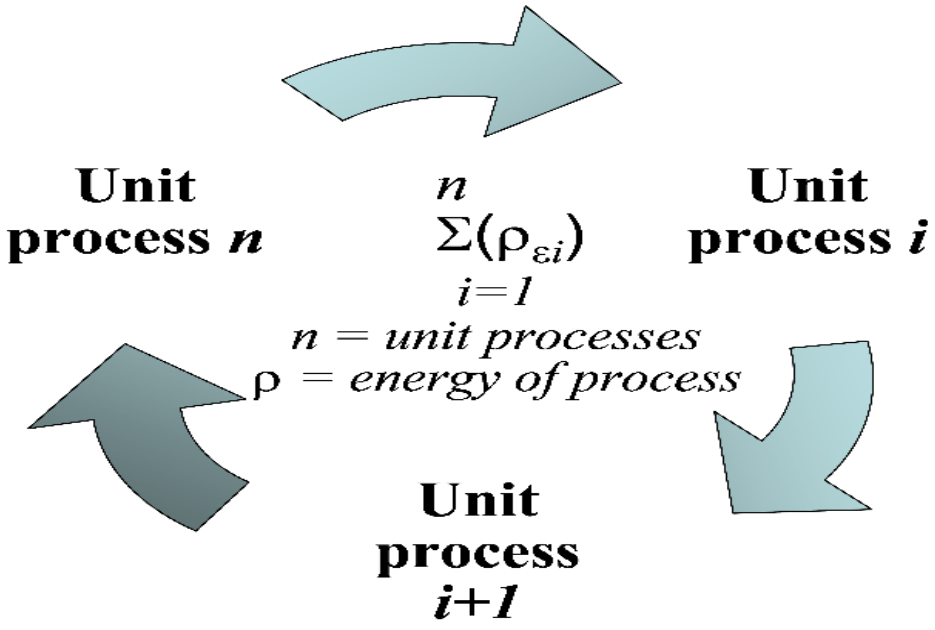
Water quality is a function of increasing energy input. An increase in water quality is observed for each unit of energy, although the relationship is often non-linear or proportional. Increasing levels of water quality can be characterized by lower levels of turbidity, suspended solids, biochemical oxygen demand, bacterial count, colour, total dissolved solids and taste. Water products that have higher purity are either naturally pristine due to environment or have been transformed from lower quality to higher quality from a man-made treatment system or series of unit processes.

Energy intensity is an energy-time based relationship and can occur in both natural treatment systems and physical-chemical (man-made) treatment systems. The main difference being the energy intensity in a natural treatment system is typically much lower than a physical-chemical system. Therefore, the cycle time needed to obtain a specific water quality is longer in the natural system.

Figure 2 depicts a typical unit process energy and water quality cycle. Water quality varies depending on the location within the cycle.

The figure shows that each unit process is additive in that as you progress around the cycle, energy consumed is cumulative. For example, if surface a water treatment plant (Unit process i) was pumped from sea level through a distributed conveyance system (Unit process i+1) to a reclamation plant (Unit process n) at elevation 152 m (500 feet), the pumping energy would be added at the beginning the subsequent unit process for a cumulative unit process energy consumption. The water quality of the surface water would likely degrade within the distributed conveyance and pumping system and following reclamation, the water quality would increase. The energy consumed is location specific and includes many factors such as the quality of the source water, types of unit processes used to obtain the desired water quality, topography and size of the service area.

Figure 2. Unit process energy and water quality cycle



For example, the treatment of groundwater requires less energy to achieve a specific water quality since groundwater normally has fewer contaminants than surface water. Capture and treatment of stormwater and rainwater harvesting also have the benefit of reducing the energy intensity to achieve a specific water quality without the added energy intensity of distributed conveyance and pumping systems. Optimizing water quality is an increasingly important sustainability issue for overstressed watersheds. One method to reduce embodied energy is to substitute a lower quality source with a pristine source, however, pristine sources are often located near environmentally sensitive areas. Therefore, decision makers need to balance energy and water quality.

Source: http://www.iwawaterwiki.org/xwiki/bin/view/Articles/EmbodiedEnergyintheWaterCycle