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MODULAR WATER TREATMENT FOR CARBON FOOTPRINT REDUCTION

A White Paper

Introduction

Recently, the management of a new hotel chain requested a modular water package to provide maximal health, environmental and comfort benefits.

The reduction of carbon footprint became a major sustainability topic.

In this white paper, we quantify the carbon footprint benefits from adopting a modular system that treats the incoming water and reuses its consumed water multiple times, while at the same time reducing capacity demands on the local water district.

On-Site Treatment to Reduce Carbon Footprint

By choosing to treat its own water, a business can eliminate toxins on the incoming flow, while enabling secondary reuse for cooling tower water, landscape water feature replenishment, and where applicable, site irrigation.

Implementation of packaged, decentralized systems can not only permit the reuse of on-site water, thereby reducing overall water demand, but can also provide a level of treatment that will significantly reduce the overall carbon footprint a hotel facility will have on the local and global environment.

The proposed hotel facility was expected to consume on average 30,000 gallons per day (GPD) of potable water. This reflects normal domestic demands such as drinking, bathing, cooking, laundry, spa, and pools. Practical experience indicates that a 90% conversion of potable water to wastewater will occur in a facility such as this one.

With that value in mind, we estimated the carbon and nutrient loads generated at the proposed hotel facility and calculated the overall waste load discharged to the local public sewer or environment.

To better convey this thought process in easily understood terminology, we need to first understand what a hotel wastewater stream might produce for carbon and nutrients.

Modeling A Typical Hotel

A typical hotel domestic wastewater will have an approximate Biological Oxygen Demand (BOD) of 425 mg/L (milligrams per liter); that translates to an approximate biodegradable carbon load concentration of 425 mg/l. Nutrient loads for nitrogen and phosphorous will have concentrations of 50 mg/l and 10 mg/l respectively.

If a 30,000 GPD domestic potable water consumption has a 90% conversion rate to wastewater, the resulting wastewater demand will be 27,000 GPD and when we conduct simple mathematical calculations to convert metric concentrations to mass loading, we understand that a 27,000 GPD hotel wastewater rate will discharge 106.4 pounds (lbs.) of carbon, 12.5 lbs. of nitrogen, and 2.5 lbs. of phosphorous to the public sewer on a daily basis.

This same mass loading will equate to 38,836 lbs. (19.4 tons) of carbon, 4,562 lbs. (2.3 tons) of nitrogen, and 912 lbs. (0.5 tons) of phosphorous imposed upon the local public utility or to the local environment on an annual basis.

Achievable Gains in Carbon Removal

If a modular wastewater treatment process were implemented to reduce the carbon and nutrient load on the local water resource systems, it is entirely possible to sustainably achieve a 99% removal rate for carbon from this same waste stream and depending upon the type of process implemented, it is possible to achieve a nutrient removal rate of between 70% to 99% for nitrogen and phosphorous respectively.

These reduction rates would equate to the removal of 19.2 tons of carbon, 2.28 tons of nitrogen, and 0.49 tons of phosphorous annually. These values are truly significant in their total mass loading and reflect a substantial reduction in potential harm to the environment.

Dramatic Improvement in Water Quality

Beyond the carbon and nutrient footprint reduction, this same treatment capability will provide the opportunity to recover water that exceeds the most stringent of permit requirements so that the water can be reused for secondary purposes such as cooling towers, landscape water features, and site irrigation.

In warm and arid environments, the majority of the recovered wastewater can be used for site irrigation and cooling water.

In more temperate climates with typical annual rainfalls, it is still possible to discharge these same highly treated waters without any fear of impact to the local soil and water resources.

In short, modular water treatment systems can significantly reduce environmental impact, creating opportunities to reduce operating expenses through Insurance Programs (risk mitigation), reduction in water consumption costs, and possible tax incentives for enterprises that desire to implement footprint reduction programs related to water conservation and carbon emissions. The public's perception of good stewardship is an intangible, but valuable asset as well.

Why is this process special?

The question arises: how is this different from ordinary, centralized water treatment systems?

With a decentralized or modular solution, we can reduce both the water and nutrient footprints (carbon, nitrogen, and phosphorous) in a single package. By doing this, we have effectively reduced the impact on both the local water district and the local environment.

Our proprietary hybrid treatment method, featuring advanced blackwater treatment followed by advanced clean water processing, we can convert the nutrients to less harmful compounds, or even capture them for a beneficial purpose.

A long-term trend

An underlying market driver for this sophisticated solution offering is the simple fact that public utilities are experiencing rapid declines in available treatment capacity. They can't easily provide increased customer capacity without major investment in infrastructure upgrades at existing massive regionalized facilities.

These central upgrades take major funding: the EPA estimates that U.S. water infrastructure now requires a quarter-trillion dollars, which is unlikely to be funded.

Even assuming billions in funding and long-term obligations for the community, big central upgrades will take years of planning and engineering, and years of disruptive construction, assuming no community challenges, leading to further cost overruns and delays.

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Meanwhile, aging water distribution and wastewater collection systems are leaking precious clean water and harmful untreated wastewater into the local environment, all at cost to the individual utility customer who ultimately bears the cost and the impact.

Scalable from the small to the very large

This sustainable solution can be integrated from the small commercial level to very large institutional facilities. We expect that in the very near future, every new multi-story building erected on urban skylines will be equipped for potable water treatment, gray water treatment, and blackwater treatment systems, routinely delivered like an elevator or HVAC system, and intelligently controlled, so the facility can reuse its consumed water multiple times, while at the same time reducing the water and wastewater treatment capacity demands on the local utility. This type of decentralized service in a massive existing centralized infrastructure environment could not have been envisioned by water planners even ten years ago.

The key is to leverage rapidly evolving manufacturing and technology capabilities in new configurations that solve real world problems at the point of use.

Ultimately, we believe this will drive better health outcomes, economic growth and reduced environmental impacts.

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