


Going Green in the Water & Wastewater Industry

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The Greening of America

Green design and construction has become the fastest-growing initiative within the AE&C industry. Green is often defined as environmentally conscious attitudes, values, and principles combined with science, technology, and engineering practice, all directed toward improving local and global environmental quality. Green initiatives encompass all the key engineering and design disciplines, in conjunction with materials of construction, to minimize the overall environmental impact throughout the entire life cycle of a facility.

Every day we see increased emphasis on environmental stewardship by both public and private owners. As we crossed into the new millennium, the discussion of sustainable design and construction was just beginning. In 2000, only a handful of owners asked about green buildings. Today, only nine years later, almost every owner has a general awareness, and the majority are investigating green for their existing or new facilities.

The growth of green buildings has been unprecedented and correlates directly with the increasing awareness of the impact buildings have on our natural environment, economy, health, and productivity. In the United States alone, buildings account for:

- 72 percent of electricity consumption
- 39 percent of energy use
- 38 percent of all carbon dioxide (CO_2) emissions
- 40 percent of raw materials use
- 30 percent of waste output (136 million tons annually)
- 14 percent of potable water consumption[1]

With these figures in mind, industry experts predict that a slowdown in green construction is highly unlikely. McGraw Hill Construction predicts "that the overall green building market (both non-residential and residential) is likely to more than double from today's $36-$49 billion to $96-$140 billion by 2013 and that the value of green building construction is projected to increase to $60 billion by 2010."

Recognized as one of the driving forces associated with the growth of green construction is the United States Green Building Council (USGBC) founded in 1993. The USGBC is a Washington, D.C.-based nonprofit organization committed to cost-efficient and energy-saving initiatives for the next generation of green buildings. The USGBC includes more than 20,000 member companies and organizations and more than 100,000 LEED accredited professionals[1].

The USGBC is the developer and administrator of the Leadership in Energy and Environmental Design (LEED) Green Building Rating System. LEED is an internationally recognized green building certification system, providing third-party verification that a building was designed and built using sustainable design and construction strategies aimed at improving performance in the following areas:

- Energy savings
- Water efficiency
- CO_2 emissions reduction
- Improved indoor environmental quality
- Stewardship of resources and sensitivity to their impacts[1]

LEED provides building owners and operators a concise framework for identifying and implementing practical and measurable green building design, construction, operations, and maintenance options. LEED certification is achieved by satisfying certain required prerequisites and achieving points based upon the number of sustainable design and construction principles incorporated into a project. LEED certification is obtainable at the following levels:

- LEED® Certified
- LEED® Silver
- LEED® Gold
- LEED® Platinum

Currently 35,000 projects are participating in the LEED system, comprising over 4.5 billion square feet of construction space in all 50 states and 91 countries.

Challenges of LEED Certification in Water and Wastewater

As the LEED Green Building Rating System focuses on buildings, meeting the challenge of obtaining LEED certification for a water or wastewater treatment plant requires owner participation, advanced planning, permit agency cooperation, and on-site management of materials and resources during construction.

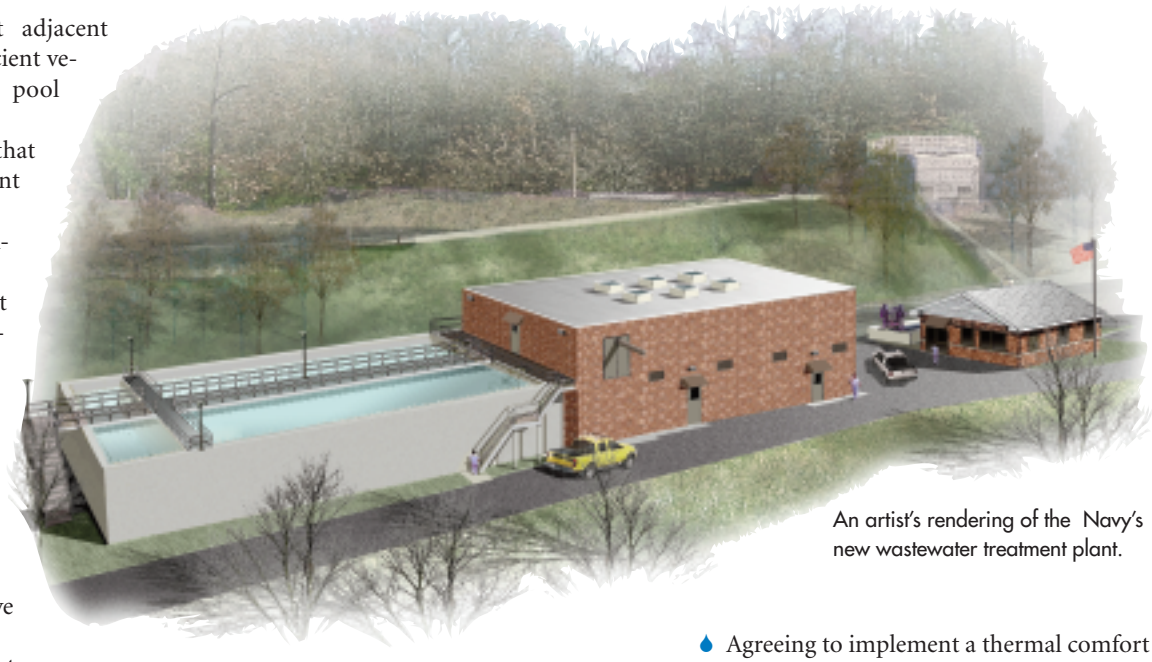
Recently the U.S. Navy selected Haskell to design and construct a LEED Silver wastewater treatment plant at one of their naval support facilities. The project converted an existing extended aeration waste activated sludge facility to a continuous-flow SBR system for nitrogen reduction, followed by de-nitrifying filters and chemical phosphorus removal. Other improvements included UV disinfection, post aeration, a reuse system, sludge dewatering facilities, and a new control building.

Since the site was existing and construction was limited to within the site area, Haskell worked with the Navy to conduct a site evaluation to determine if the requirements for a sustainable site could be met, while satisfying the objectives and goals of the end users. Because of mandatory prerequisites, the evaluation determined that the control building was the only building that could achieve a LEED certification because of limited space on the site and the building type.

Other challenges were specific to redevelopment of the site. As required by LEED, the site has to be defined and remain consistent throughout the project for all credits. With limited space available and an existing site with greater than 50 percent impervious paving, the project team had to find a balance among providing transportation facilities, stormwater measures, and site disturbance. The team achieved this by providing an implicitly defined boundary of the limits of disturbance, using pervious pavers in driveways and parking areas, taking measures to assure post-development runoff would be less than pre-development runoff, adopting construc-

tion measures to protect adjacent streams, and using fuel-efficient vehicles spaces and car/van pool spaces.

In an effort to ensure that the wastewater treatment plant control building achieves a LEED Silver certification, the Navy and Haskell plan to implement the following sustainable design and construction principles:



An artist's rendering of the Navy's new wastewater treatment plant.

Sustainable Site, credits for:

- Site selection by not developing farmland, undeveloped land whose elevation is lower than five feet above the 100-year flood plane, land that's not a habitat for threatened or endangered species, land not within 100 feet of a wetland, land not within 50 feet of a water body and land that was not previously designated as parkland.
- Alternative transportation by providing bicycle storage and changing rooms, fuel-efficient vehicle and car/van pool parking, and adequate occupant parking capacity.
- Stormwater design by rate and quantity reduction and treatment of runoff.
- Heat island effect by providing a light colored roofing shingle that reflects light.
- Light pollution reductions by using lighting that will automatically turn off during non-business hours, minimizing the amount of exterior lighting and designing the exterior lighting to produce minimal upward illumination and glare.

Water Efficiency, credits for:

- Water efficient landscaping by selecting drought-tolerant plant materials and not providing an irrigation system.
- Water-use reduction by using high-efficiency fixtures and occupant sensors.

Energy and Atmosphere, credits for:

- Optimizing energy performance and minimizing pollutant discharges to the atmosphere by completing a whole-building energy simulation, assuring a 30-percent reduction in energy usage has been achieved.
- Commissioning fundamental building systems.
- Enhanced refrigerant management through the use of alternatives to chlorofluorocarbon (CFC) and hydrochlorofluorocarbon (HCFC) refrigerants.
- Development of a measurement and verification plan to insure that ongoing accountability of building energy consumption is in accordance with the required specifications.

Materials & Resources, credits for:

- Construction waste management by diverting from landfills a minimum of 75 percent of the construction waste from disposal.
- Specifying materials with a minimum of 10-percent recycled content.
- Procuring materials and products that have been extracted, harvested, recovered, and manufactured within 500 miles of the project site.
- Using a minimum of 50 percent of wood-based materials and products certified by the Forest Stewardship Council Principles and Criteria.

Indoor Environmental Quality, credits for:

- Monitoring outdoor air delivery using devices that can measure within 15 percent +/- of the design minimum air flow.
- Increasing ventilation by increasing the air turnover rates by at least 30 percent.
- Developing an indoor air quality (IAQ) management before and after occupancy, including protection of ductwork and materials, filtration for HVAC units, and testing of indoor air quality prior to occupancy.
- Using low-emitting volatile organic carbon materials for adhesives, sealants, paints, coatings, composite wood, and agrifiber products.
- Providing individual lighting controls for 90 percent of the building occupants and individual comfort controls for 50 percent of the occupants.
- Agreeing to implement a thermal comfort survey of the building occupants after 10 months of occupancy.
- Insuring that at least 90 percent of the building occupants have a view to the outside.

Innovation & Design Process, credits for:

- Innovation in design by providing reduced mercury in light bulbs and permanent sustainable design and construction education in the building for its occupants.
- Having LEED® accredited professional involvement in the project.

Mandatory prerequisites may make LEED certification of many water and wastewater treatment projects unachievable, but all projects can incorporate the key sustainable principles to protect and conserve our natural resources.

The Cost of Going Green

Although environmental stewardship continues to grow in visibility and interest, the cost of going green remains a significant factor. In any green effort, typically the cost will correlate with the extent of the sustainable initiatives and/or level of LEED certification that a facility is pursuing, but these costs continue to go down as more suppliers of sustainable materials and energy-efficient equipment become available.

Another major factor that minimizes cost is practical experience—in other words, overcoming the learning curve. Achieving LEED certification is an integrated program that brings into play all the key engineering and construction disciplines in conjunction with major vendors, suppliers, and subcontractors. The more experienced the team, the more cost-effective the program.

Note 1 – Source: USGBC