

BIOSOLIDS MANAGEMENT AND BIOGAS UTILIZATION

WATER
OUR FOCUS
OUR BUSINESS
OUR PASSION

Modeling Biosolids and Biogas Using Blue Plan-it®

Integrated Approach to Biosolids and Biogas Management

Driven by stricter regulations, increasing energy costs, tighter budgets, and greater interest in resource recovery, biosolids and biogas management are becoming more important in wastewater treatment and facility master planning. Carollo Engineers has developed expertise to help utilities plan and improve their energy recovery and biosolids management strategies and practices. Our integrated approach combines wastewater treatment and digestion model, feedstock analysis, solids and food waste co-digestion model, biosolids management evaluation, and biogas utilization assessment in one powerful and friendly platform, the Blue Plan-it® (BPI) Decision Support System.

The Blue Plan-it® model utilizes a graphical interface, the intelligent process flow diagram (iPFD), to represent the process flow of the wastewater, biosolids and biogas systems. When clicking on these smart graphic icons, user can access detailed breakdowns and customized dashboards to enter or retrieve data, perform analysis, exporting reports, and more.

Biosolids Management Alternatives

The biosolids management tool evaluates alternatives such as aerobic digestion, anaerobic digestion

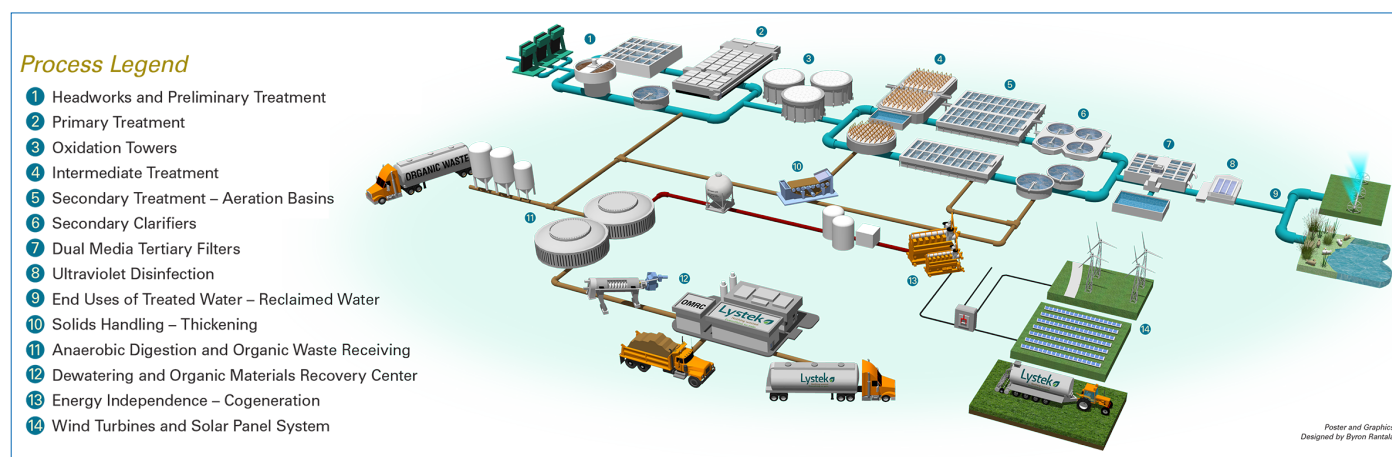
(thermophilic or multi-stage digestion to produce Class A biosolids, digestion to produce Class B biosolids), thermal hydrolysis paired with mesophilic digestion, and thermal processing options such as incineration, drying, gasification, pyrolysis, hydrothermal liquefaction, composting, solids stabilization, land fill and land application, etc. The evaluation can be expanded to assess the use of digested and undigested sludge in thermal processes to produce biochar, syngas, and/or bio-oil.

Biogas Utilization Alternatives

Many energy management alternatives can be evaluated using the biogas utilization tool, including the use of digester gas as boiler fuel for digester heating, fuel for cogeneration or fuel cell for onsite power generation, source for producing vehicle fuel or pipeline-quality renewable natural gas (RNG) for sale, or other energy recovery strategies.

Integrated Wastewater Biological Process Modeling

Our team has successfully integrated Blue Plan-it® with wastewater biological process model such as GPS-X™. This allows us to accurately assess the amount of biosolids produced from the wastewater treatment facility and in turn the biogas production. It also assesses the impacts of introducing feedstock to the anaerobic digester on solids dewatering and the impacts of the change in recycle stream quality on wastewater treatment plant nutrient removal as well as operational costs.



Biosolids and Biogas Management are critical to wastewater utilities.

Feedstock Impact Analysis

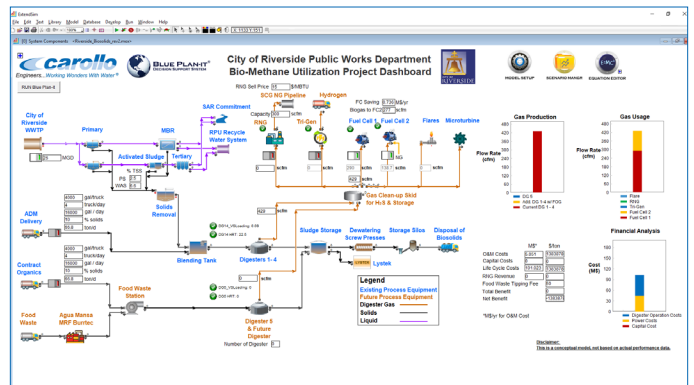
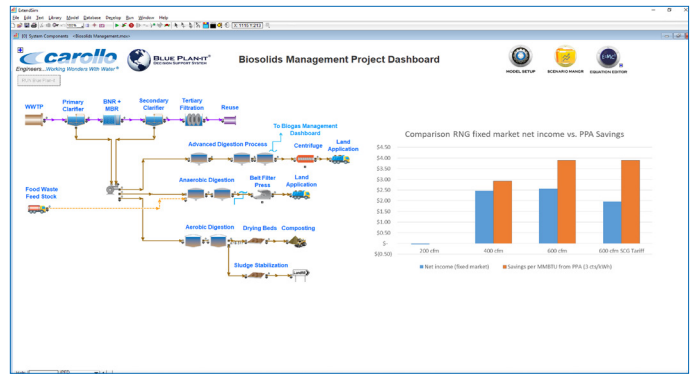
The Blue Plan-it® model predicts the impacts on key digester operational parameters, such as retention time, volatile solids loading, nutrients, digestate solids loading on dewatering, biogas production, digester heating requirements, etc. Using this dashboard, user can select applicable types of feedstocks (e.g., municipal wastewater, food waste mix, red meat/poultry, fats, oils, greases [FOG], fruit and vegetables, sugars, from different sources, i.e., household, supermarkets, food and beverage processing, restaurants, and other) and enter or adjust the quantity in flows, strength, or tons/day for each type of feedstocks. The model uses default feedstocks characteristics data (e.g., percent total suspended solids, volatile solids to total solids ratio, etc.) to calculate the total volatile solids available in the feedstocks. When actual lab data is available, user can choose to enter these parameters to override the default values.

Financial Analysis

The Blue Plan-it® model includes the capital costs associated with the proposed additional facilities as well as the O&M costs for all relevant facilities (including chemical usage, power consumption, natural gas usage, solids disposal, maintenance, labor, etc.). It will further assess the economic feasibility of the various biosolids management and biogas utilization alternatives based on a simple payback and/or return on investment (ROI).

Friendly and Diversified Dashboards

Blue Plan-it® presents modeling results graphically and illustrates process limitations (e.g., when digester loading is exceeded) using animated warning icons (e.g., red, yellow, green flags, or other customized warnings). This feature is instrumental for identifying system bottle necks and low hanging fruit improvement opportunities. It equips the user the cutting edge virtualization techniques and data analytics to best capture saving opportunities, prioritize investment, and optimize their biosolids and biogas management strategies.



Feedstock				Solids Handling				Biogas				Digesters				Financial Analysis			
Source	Flow	TS	VS	Capacity	Flow	TS	VS	Capacity	Flow	TS	VS	Units	DO 1-4	DO 5-14	Units	Value			
City of Riverside WWT/P	25	10000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000		
ADM	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000		
Food Waste	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000		

Blue Plan-it® Biosolids Management Dashboard (top) and Biogas Utilization Dashboard (middle and bottom) are informative, friendly, and dynamic, integrating wastewater process modeling, biosolids and biogas management in one platform.