



AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

APPLICATION PROFILE

APPLICATION BIOMASS WASTEWATER TREATMENT

INDUSTRY FOOD & BEVERAGE

AQUA-AEROBIC SOLUTION AquaSBR® SEQUENCING BATCH REACTOR

VERSATILITY OF SEQUENCING BATCH REACTORS IN THE DAIRY INDUSTRY RESULT IN LOWERING COSTS AND INCREASING EFFICIENCY

The Challenge

Of the multiple sectors within the food and beverage industry, dairy consistently ranks as one of the top wastewater producers. Dairy processes begin with raw milk, before applying a range of downstream separation and conditioning steps to yield finished products, such as milk, cream, butter, condensed milk, powdered milk and whey, ice cream, yogurt, cheeses, lactose, etc.



Milk processing generates up to (3) times the effluent volume per gallon produced. The largest percentage of wastewater typically comes from the frequent rinsing and cleaning processes of tanks and transfer equipment. Dairy process wastewaters vary in flows, loadings and composition, depending upon production volumes and product diversity at a given plant. These facilities are challenged with discharge to public waterways, under NPDES permits or, after

pretreatment, to publically owned treatment works (POTW).

The liquid process effluent is made up of soluble organic compounds (such as casein and other proteins, lactose and carbohydrates) reflected in high biochemical and chemical oxygen demand (BOD_5 /COD). Suspended solids are often curd residuals from milk fats and cheeses. Typically, this wastewater also contains FOG (fats, oils & grease), dissolved solids, salts (mainly chlorides) and sulfates. The cleaning processes contain residual levels of sodium from caustic (sodium hydroxide), detergents and sanitizers. The pH of these streams can often be acidic, from the conversion of milk sugars to lactic acid.

Typical Dairy Production Wastewater Characteristics	
pH	6 – 9
COD	1000 – 10,000 g/L
BOD_5	300 – 6000 mg/L
TSS	500 – 5000 mg/L
TN	10 – 25 mg/L
TP	15 – 30 mg/L
TDS*	200 – 500 mg/L
Hardness	150 - 300 mg as CaCO ₃ /L

*Chlorides 25 -100 mg/L Dairy wastewater can be treated with a combination of physical, chemical and biological processes. The wastewater has a large biodegradeable component, lending itself to secondary treatment, biological activated sludge systems such as sequencing batch reactor technology.

The Solution

Dairy plants can take advantage of Aqua-Aerobic Systems' Sequencing Batch Reactor (SBR) process to optimize the treatment of their wastewater. The AquaSBR® is true batch technology, with all phases of treatment accomplished in a single reactor. This activated sludge process has standard controls strategies to manage varying flow rates based on known and changing production schedules, and corresponding effluent loadings. This system assures consistent compliance to effluent discharge permits. The featured Aqua MixAir® system minimizes the energy consumption and optimizes biological nutrient removal. Combined with advanced process control, such as the IntelliPro® Process Management System, operation of the system is enhanced with passive or active control, comprehensive trending and data analysis.

The Proven Result

Rutter's Dairy in Pennsylvania processes over 22,000 gallons of milk, producing 1300 gallons of ice cream, butter, yogurt, creamers, and cottage cheese, in addition to other non-dairy beverages. A single-basin, AquaSBR system installed in 1987, was designed for an average design daily flow of 50,000 GPD, with peaks up to double the average flow.



Rutter's Dairy -- York, Pennsylvania

The system features retrievable diffusers that can be serviced without taking the SBR tank offline. Historically, this system has consistently removed phosphorus and 96% of the BOD₅, with effluent BOD₅ and TSS levels below discharge permit. After 26 years of successful operation, the system was upgraded with the most current AquaSBR components.

In 2009, the City of Tulare in California, expanded their industrial wastewater treatment plant to almost double the flow up to 12 MGD, consisting primarily of effluent streams from six, local dairy processing facilities. The system was designed for influent BOD₅ up to 2000 mg/L (COD 2X), TSS 300 mg/L, and Total Nitrogen of 75 mg/L, This upgrade converted older, aerated lagoons into equalization capacity and partial biological treatment, before a new, six-basin, AquaSBR process. The sequencing batch reactors, each 140 ft square, were designed to treat up to 20%, additional peak flow, and perform nitrification. A unique feature of this facility is that the industrial WWTP and domestic WWTP effluents are combined prior to discharge, for local agricultural reuse.

The many industrial segments within the food and beverage processing category have adopted a range of wastewater treatment methodologies that manage FOG, Biochemical Oxygen Demand (BOD₅), remove nutrients and adjust pH to achieve required effluent quality. Whether a green field project, upgrade or expansion, Aqua-Aerobic Systems can recommend an optimized, compact and energy-efficient design for food and beverage applications.

AquaSBR® ADVANTAGES

- Low construction, installation, operation and maintenance costs
- Tolerates variable hydraulic and organic loads
- Limits filamentous growth
- Independent aeration and mixing provides lower energy consumption
- True-batch system allows React, Settle and Decant phases to occur within the same reactor
- Time-managed operation offers process flexibility with greater handling of hydraulic fluctuations
- Durable, floating decanter provides subsurface withdrawal of decant volume
- No secondary clarifiers or return activated sludge (RAS) lines
- Small footprint
- Simple to expand or upgrade
- Produces low effluent BOD₅, COD, TSS, TN & TP from industrial and municipal wastewater treatment processes