

Providing Quality Recycled Water to the Tulare Community



## Industrial Wastewater Treatment Plant Expansion Project



**S**ITUATED IN THE HEART OF SAN JOAQUIN VALLEY AND SURROUNDED BY RICH FARMING COMMUNITIES, the City of Tulare owns and operates two wastewater treatment plants: the domestic wastewater treatment plant (DWWTP) and the industrial wastewater treatment plant (IWWTP). The IWWTP primarily treats industrial processing waste from six large milk processing facilities. The City sought to expand and upgrade the IWWTP to convert the treatment process from aerated lagoons to a more reliable process to consistently meet discharge requirements. The expansion project, completed in 2009 increased the IWWTP's capacity from 6.7 million gallons per day (mgd) to 12 mgd. The expansion added several units to the treatment process to improve its efficiency and process reliability and modified the existing aerated lagoons that are used in the process. The project included modifying the existing aerated lagoons to provide equalization and biological treatment, and adding a dissolved air flotation (DAF) unit to remove fats, oils, and grease (FOG); six sequencing batch reactors (SBRs) to remove organics, and denitrification filters to remove residual nitrate or nitrogen. This plant is one of the largest SBR operating wastewater treatment facilities in the nation and will continue to provide quality recycled water to the Tulare community.





**1 HEADWORKS.** The “headworks” of a wastewater treatment plant is the initial stage of a complex process. The collected wastewater from milk processing industries flows into the influent pump station and is then pumped over to headworks for preliminary treatment. The main purpose of the headworks is to remove large particles that could damage the downstream equipment/unit processes and to provide enough head for the wastewater to flow through downstream unit processes by gravity.



**2 BULK VOLUME FERMENTER (BVF).** After the influent passes through the headworks, it is split into two streams: up to 4 mgd is sent to the existing BVF, which anaerobically removes organics from the wastewater; the remainder (about 8 mgd) flows directly to the fats, oils, and grease (FOG) removal unit.

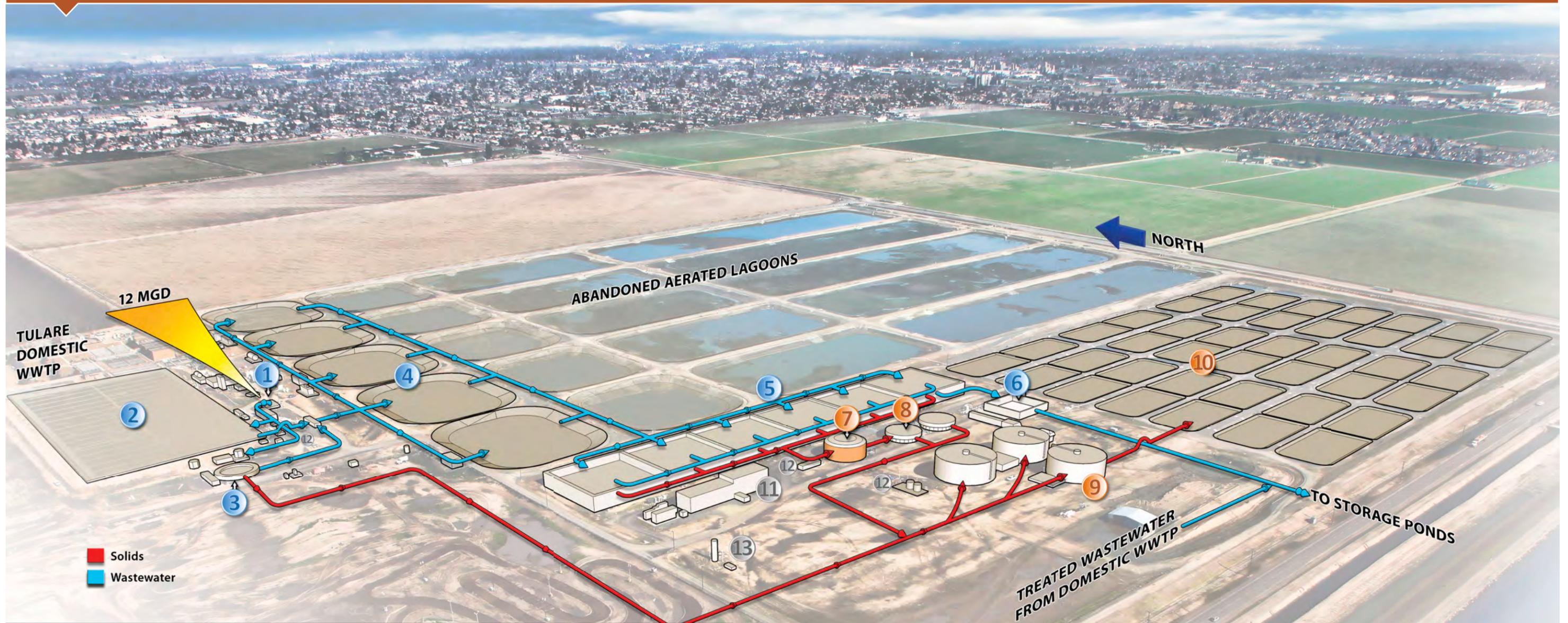


**3 FOG DAF.** The remainder of the flow (up to 8 mgd) is sent to the dissolved air flotation (DAF) unit to remove fats, oils, and grease (FOG). The flow passes through a mixing chamber where coagulant is added to help remove the FOG. This effluent is then mixed with the BVF effluent and sent to the aerated lagoons.



**4 AERATED LAGOONS.** The combined flow from the FOG DAF and BVF is conveyed to splitter boxes that distribute the flow among the five aerated lagoons, significantly modified to provide equalization and partial treatment. In these lagoons, the wastewater is aerated to help microorganisms break down the organic material. When the process is complete, the contents of the lagoons are pumped to the sequencing batch reactors (SBRs).

# Tulare Industrial Wastewater Treatment Plant



Each component in the industrial wastewater treatment process is identified in this schematic, and a more detailed description of each is provided throughout this brochure.

- |  |  |                           |
|--|--|---------------------------|
| ① Headworks  | ⑤ Sequencing Batch Reactors (SBRs)               | ⑨ Digesters               |
| ② Bulk Volume Fermenter (BVF)                                    | ⑥ Denitrification Filters with methanol addition | ⑩ Sludge Drying Beds      |
| ③ Fats, Oil, and Grease (FOG) Dissolved Air Flotation (DAF) unit | ⑦ Sludge Storage Tank                            | ⑪ Blower Building         |
| ④ Modified Aerated Lagoons                                       | ⑧ Sludge DAFs                                    | ⑫ Odor Control Facilities |
|  |  | ⑬ Gas Flare               |



**5 SEQUENCING BATCH REACTORS (SBRs).** The flow from the aerated lagoons is pumped into six SBRs that operate in timed sequence for further biological removal of organics and nitrogen.



**6 DENITRIFICATION FILTERS.** Following treatment in the SBRs, the wastewater is sent to methanol-fed denitrification filters to remove the remaining nitrate. Effluent from the denitrification filters is then mixed with treated domestic wastewater and sent to storage/percolation ponds for application on the nearby farmland.



**8 SLUDGE DAF.** DAF units thicken the sludge by removing moisture. The solids are separated from the liquid phase so that a smaller volume of sludge is pumped to and treated in the digesters, which creates a stable digestion process.



**7 SLUDGE STORAGE TANK.** The waste activated sludge generated from the SBRs is pumped intermittently to a 550,000-gallon sludge storage tank from where it is transferred, in a continuous flow, to two dissolved air flotation sludge thickeners (sludge DAFs).



**9 ANAEROBIC DIGESTERS.** Fats, oils, and grease from the FOG DAF and thickened waste sludge from the sludge DAFs are pumped to three anaerobic digesters. Volatile solids and pathogenic organisms in the sludge are digested producing methane gas, which is used to heat the digesters or can be potentially used in fuel cells to generate electricity.



**10 SLUDGE DRYING BEDS.** The digested waste sludge from the anaerobic digesters is applied to the 42 paved sludge drying beds, where it is sun-dried for about 4 to 5 weeks before it is hauled away for land application.



**11 BLOWER BUILDING.** The majority of treatment that occurs in the SBR units requires oxygen. The blower building houses four centrifugal blowers that deliver oxygen to the process.



**12 ODOR CONTROL FACILITIES.** The collection, treatment, and disposal of municipal and industrial wastewater often create odors. To eliminate these odors, the IWWTP plant odor control system is equipped with two odor control units to treat foul air before it is released to the atmosphere.

## Plant Characteristics

Item	Characteristics	Item	Characteristics
<b>Design Flows</b>		<b>Fat Oil and Grease (FOG) Removal System</b>	
Average Flow (mgd)	12	Number	1
Maximum Daily Flow (mgd)	18	Diameter (ft)	60
Hourly Peak Flow (mgd)	24	Side Water Depth (ft)	11
<b>Influent Wastewater Quality (Average)</b>		Design Influent Flow Rate (mgd)	8
BOD (mg/L)	2,000	<b>SBR Units</b>	
COD (mg/L)	4,000	Number	6
TSS (mg/L)	600	Dimensions, each L x W (ft x ft)	140 x 140
Total Nitrogen (mg/L)	75	Maximum Liquid Depth (ft)	21
Fats, Oil and Grease (FOG) (mg/L)	300	Maximum Liquid Volume, each (mgal)	3.08
Electrical Conductivity (EC) (μmos/cm)	1050	Theoretical Hydraulic Detention Time (hrs)	37
pH	Range of 5.8-7.0	Solids Retention Time (SRT) (days)	8.3
<b>Design Effluent Quality (Average)</b>		<b>Denitrification Filters</b>	
BOD (mg/L)	40	Number	6
COD (mg/L)	120	Dimensions, each L x W (ft x ft)	69.3 x 11.7
TSS (mg/L)	40	Media Depth (ft)	6
Total Nitrogen (mg/L)	10	<b>Waste Sludge Storage</b>	
Electrical Conductivity (EC) (umhos/cm)	<500 over source water	Number	1
pH	6.7	Volume (gal)	550,000
<b>Influent Pumps</b>		Dimensions, diam. x SWD (ft x ft)	67 x 21
Number	4	<b>Sludge DAF Thickeners</b>	
Capacity, each (mgd)	10	Number	2
Sump Dimension, L x W x D (ft x ft x ft)	25.3 x 19.3 x 6	Diameter (ft)	55
<b>Headworks No.1</b>		Side Water Depth (ft)	10.8
Overflow Weir Gate	1	Influent Sludge Flow Rate, each (gpm)	300
Capacity (mgd)	8.4	<b>Biofilter Odor Control System</b>	
<b>Headworks No.2</b>		Number	1
Parshall Flume Size (ft)	3	Foul Air Treatment Capacity (scfm)	2,500
Mechanical Bar Screens (mgd)		<b>Bio-Trickling Filter Odor Control System</b>	
Number	2	Number	1
Capacity, each (mgd)	15	Foul Air Treatment Capacity (scfm)	300
Manual Bar Screen		<b>Anaerobic Digesters</b>	
Number	1	Number	3
Channel Width (ft)	4	Diameter (ft)	90
Motorized Recycle Weir Gate		Side Water Depth (ft)	29.3
Number	1	Operating Volume (ft <sup>3</sup> ), each	186,000
Capacity (mgd)	4.4	<b>Digesters Gas Handling System</b>	
Grit Cyclone/Classifier		H2S Removal System	
Number	1	Number	2
Volume (gal)	550,000	Waste Gas Flare	
Dimensions, Diameter x Side Water Depth (ft x ft)	67 x 21	Number	2
<b>Bulk Volume Fermenter (BVF)</b>		Capacity (scfm)	350
Number	1	Heat Capacity (MMBTU/hr)	12.6
Capacity (mgd)	4.4	<b>Sludge Drying Beds</b>	
Depth (ft)	30	Number	42
Volume (MG)	30	Dimensions, each L x W (ft x ft)	200 x 100
<b>Aerated Lagoons</b>		<b>Storage/Percolation Ponds</b>	
Number	5	Number	8
Top Dimensions, each, L x W (ft x ft)	304 x 247	Volume Range, each (ac-ft)	254-470
Bottom Dimensions, each, L x W (ft x ft)	200 x 120	Total Volume (ac-ft)	2881
Side Water Depth (ft)	14	<b>Standby Generator</b>	
Volume, each (mg)	4.5	Number	4
		Size, kW	1000; 2 @ 1500; 2000



## City of Tulare

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