



Energy Solutions

Chevron Energy Solutions Cogeneration and Grease Receiving Station Projects



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Chevron

- Largest Renewable Energy Producer among global oil and gas companies
 - Wind Farms
 - Solar Installations
 - Largest Geo Thermal Producer
- Chevron invested over \$1.5B in clean energy technologies including hydrogen, solar PV, fuel cells and advanced batteries. Over \$2.5B more slated.
- Chevron Energy Solutions



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City of Millbrae, CA Cogeneration and Grease Receiving Project Background



City of Millbrae owns and operates a Water Pollution Control Plant to serve 21,000 residents.

- 50 years old – Design capacity of 3 MGD
- Small 75-kw internal combustion electrical generator fueled by biogas from the plant's anaerobic digesters
- Generator required frequent maintenance
- Replacement parts difficult to find
- City faced significant costs to modernize and update various plant processes (\$30M)

City of Millbrae, CA Cogeneration and Grease Receiving Background



- City was already successfully operating cogenerator so couldn't take credit for electricity generated by existing IC engine
- Looked for ways to increase methane production to make larger generation capacity a possibility
- City had some confidence level that addition of grease would increase methane production based on previous historical data
- Once we settled on grease receiving station, city opted to maximize amount of work which could be done on a self funding basis

City of Millbrae, CA Cogeneration and Grease Receiving Project



- \$5.5 Million worth of improvements at no additional cost to city's ratepayers
- Project produced savings and additional revenue from grease disposal fees of \$366,000
- Provided increase WWTP utility savings from additional digester produced methane fuel for microturbine

City of Millbrae, CA Cogeneration and Grease Receiving Project Solution



A solution that featured engineering design, procurement, and turnkey construction of a cogeneration system and grease receiving facility.

- Project Value: \$5.5M
- 250 kilowatt dual-fuel microturbine cogeneration system
- Thermal recovery heat exchanger
- 12,000 gallon grease storage tank and receiving station
- Compressed natural gas storage
- Fuel treatment and blending facility
- Electrical Switchgear
- New Digester Mixing System

New Grease Receiving Facility



- More than 3,000 gallons of restaurant grease is delivered each day
- Grease disposal haulers empty into the grease receiving station
- Increase in methane production, originally modeled at 30% is actually a 100% increase from pre-project quantities



New Grease Receiving Facility

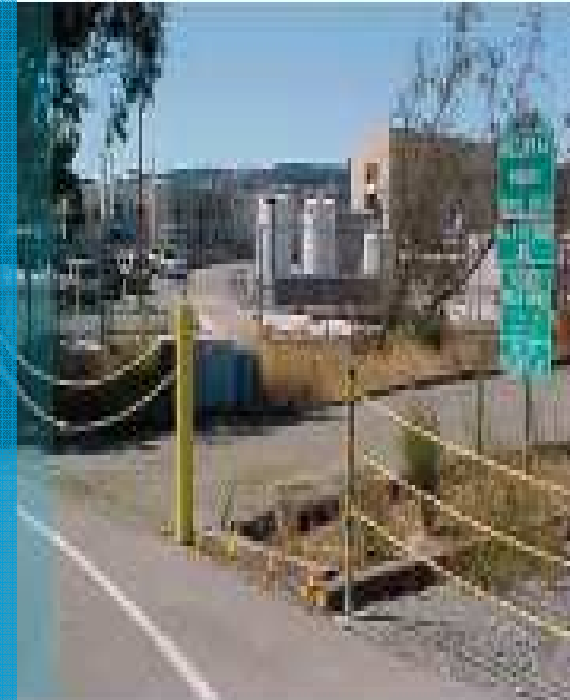


- Gas is used to fuel the new 250KW microturbine cogenerator to produce electricity and plant boiler for heat
- Meanwhile excess heat produced by microturbine warms digester tanks for optimum methane production



Scope also included:

- A card reading system allows for off-shift unattended operation by grease hauling truckers
- Automatic grease sampling system for tracking purposes
- Tank odor control system
- Truck Washing station



Putting Waste to Energy = Green Power



CES President Jim Davis, City Mayor Robert Gottschalk and Alexis Strauss, Director U.S. EPA

- Upgraded system increases production of green power to 80% - still increasing
- Provides City with a source of electrical power that is independent of the utility grid
- Disposal of sludge has fallen more the 25% since addition of grease to digesters
- Saves over 1.2 Million pounds of greenhouse gas emissions
- Equivalent of planting 150 acres of new trees

City of Rialto, CA Cogeneration and Grease Receiving Project (in design)



A solution that features engineering design, procurement, and turnkey construction of an entire wastewater treatment plant at no new costs to existing ratepayers

- Project Value: \$50M
- Replace existing 8 MGD plant with new 12 MGD plant (completed in stages)
- Grease receiving station
- 3 250 kW Fuel Cells fueled by methane from the digesters
- New gravity flow design for plant



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Questions



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