



Tesoro Petroleum

22-MW CHP System

Site Description

Constructed in 1908 and operated under the UTOCO and Amoco brand names, the Salt Lake City refinery was acquired by San Antonio based Tesoro Petroleum Corporation in September 2001. Tesoro Petroleum Corporation, a Fortune 500 Company, is an independent refiner and marketer of petroleum products and provider of marine logistics services.

The 55,000-barrel per day Salt Lake plant serves the growing hub of the Intermountain West. The refinery produces gasoline, diesel fuel, and propane that are sold into the high-growth markets of Utah and Idaho. The refinery also supplies jet fuel to Salt Lake City International Airport and the U.S. Air Force bases in Utah and Idaho. The Tesoro refinery is an active participant in the Salt Lake City Green Team, a community group that looks at long-term ways to protect the environment and make Salt Lake a more sustainable community.

Quick Facts

LOCATION: Salt Lake City, Utah
MARKET SECTOR: Refineries
TOTAL PROJECT COST: \$25,000,000
MONTHLY ENERGY BILL SAVINGS: \$200,000
EQUIPMENT: 2 Solar Titan Turbines and 2
 Rentech Heat Recovery Steam Generators
FUEL: Natural gas & refinery fuel gas
USE OF THERMAL ENERGY: Steam generation
FACILITY SIZE: 145 Acres, 200 employees
FACILITY PEAK LOAD: 15 MW
FACILITY AVERAGE LOAD: 14 MW
CHP IN OPERATION SINCE: May 2004
ENVIRONMENTAL BENEFITS: Greenhouse gas
 emissions reduced by more than 500 tons
 per year

Reasons for CHP

Reducing operating costs was one of the primary drivers for building the cogeneration facility. Tesoro's cost to generate electricity depends largely on the cost of natural gas. Currently they can produce energy for \$35 to \$40 per MW which has enabled Tesoro to save \$200,000 per month on its energy bill. Additionally, they sell \$300,000 of energy per month to Utah Power, making a monthly net improvement to its operations of \$500,000. Improving reliability of its power supply was another key driver. The refinery is located in Utah Power's rapidly expanding load center where investment in transmission infrastructure has not kept up with demand. This resulted in power outages that were disruptive to the refineries 24/7 operations. Other important drivers included the need to replace vintage 1940's boilers and a desire to be more efficient and environmentally conscious.



Tesoro petroleum refinery in Salt Lake City, Utah

CHP System Equipment & Configuration



The CHP system uses two SoLoNOx Titan T-130 gas turbine generator units and two heat recovery steam generators (HRSGs). The refinery is able to operate on the power and steam produced, and sell the excess of electricity to the utility grid. Power can also be imported from the grid if one of the turbines is down for maintenance. Power is generated at 11,000 volts and stepped up to 46 KV in a transformer at the CHP site. The 46 KV power is then distributed to the refinery, and sold to the grid.

The CHP system utilizes two sources of gas for fuel: high pressure natural gas and refinery fuel gas. The facility is connected to the existing boiler feedwater systems in addition to other plant utilities. The two

turbines each exhaust into their own heat recovery steam generator (HRSG) to produce the process steam required by the plant. The HRSGs use a supplemental burner system that is fired as needed to achieve plant steam demands. Each HRSG feeds a common steam header at the new CHP facility that is connected to the existing steam system. Steam production is limited to 350,000 pounds of steam per hour by permit. Each HRSG can individually produce 240,000 PPH of steam, which is enough to meet refinery steam demand.

The turbines and HRSGs operate 24 hours per day, seven days per week. Each cogeneration unit train is expected to shut down each year for three days for routine maintenance, and approximately once every five years for a turbine assembly replacement.

CHP Operation

- CAT Finance owns the facility. Tesoro leases from CAT Finance and manages the day-to-day operations.
- The cogen operates 24 hours per day, seven days a week, and covers 100 percent of the refinery's 15 MW total peak electric load and 14 MW average load. The cogen is configured to cover baseline demand.
- The equipment follows steam load at 240,000 pounds per hour.
- 7-10 MWs of excess power is exported to the grid.
- Reliability at startup was poor; experienced many trips in the first twelve months of operation. Completion of system FMEA to improve reliability has resulted in 99 percent uptime.
- Cogen is configured with remote monitoring to alert when there is a problem.
- Maintenance is performed by Tesoro and Solar.
- The net heat rate is 5,500 Btu/kWh.



This facility is unique in a couple of different ways. First, it is the only cogen facility in a Utah refinery. Second, it burns a mixture of refinery fuel gas and purchased natural gas. There are very few refinery cogen systems that are designed to burn refinery fuel gas because it is difficult to meet NOx emissions and also avoid fuel injector fouling.

For More Information

U.S. DOE INTERMOUNTAIN CLEAN ENERGY APPLICATION CENTER

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