

Micro-Combined Heat and Power

Efficient, economical primary power generation for commercial and residential applications

More than 800,000 small generators (less than 15 kW capacity) are sold in the United States each year. This number is expected to continue to grow given recent electricity blackout events, higher energy costs, and increasing concern over the environment. While industry has already benefited from generating their own electricity, advances in small micro-cogeneration technology are creating a new option for home and small business owners looking to ensure electric reliability, reduce energy costs, and protect the environment.

Small engine generators or “prime movers” utilize propane to simultaneously produce power and heat for commercial facilities and residences. These small cogeneration units, also known as micro-combined heat and power systems (micro-CHP), mainly consist of a propane-fueled engine, generator, and inverter. The units can generate electricity either as a prime power source or be connected in parallel to the grid.

Currently used in thousands of small commercial applications in Japan, micro-CHP systems have been very well received. These innovative systems offer high efficiency, long maintenance intervals, low noise levels, and the ability to operate multiple systems in parallel. Micro-CHP is poised to significantly boost year-round propane sales while bringing consumers clean, reliable off-grid energy that significantly reduces electrical and heating expenses.

Project Description

To accelerate the commercialization of micro-CHP systems in the United States, the Propane Education & Research Council (PERC) initiated the *Yanmar CHP Performance Testing and Evaluation (Docket 11866)* project. Led by the Gas Technology Institute (GTI), the project seeks to accomplish the following objectives:

- Characterize and validate performance of a propane-fueled Yanmar CP-Series cogeneration system for the U.S. market
- Identify and characterize a field evaluation/demonstration site
- Define data points, data acquisition requirements, and establish baseline monitoring protocols
- Install the propane-fueled Yanmar CHP unit and data acquisition equipment at the field evaluation site
- Collect and report performance information on a monthly basis and provide a final report

Global Applicability

Consumers in Japan and Europe have relied on micro-CHP systems to provide cost-effective, reliable energy and efficient operation with reduced emissions in commercial and residential applications.

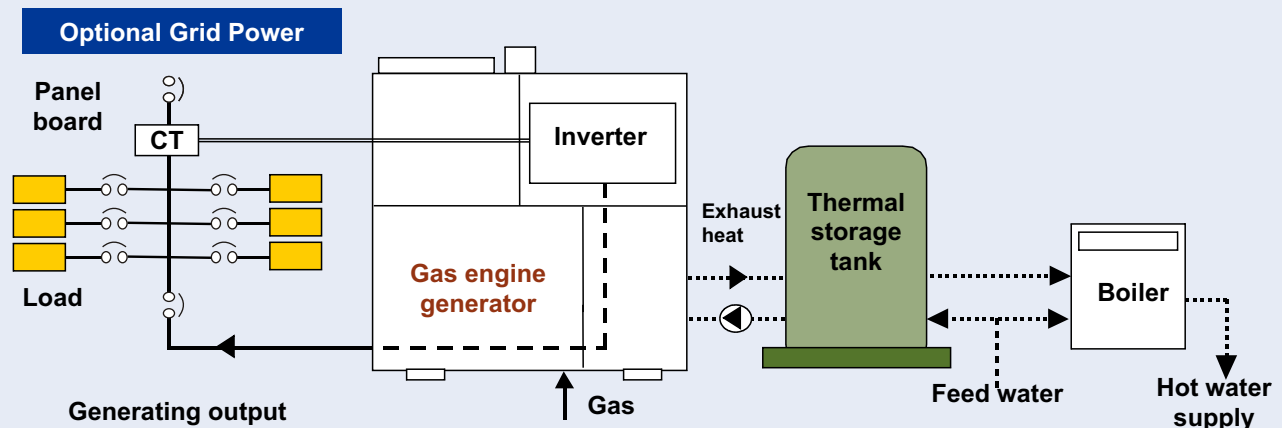
The Yanmar 9.9 kW micro-CHP system pictured below offers 85 percent overall efficiency and 10,000-hour maintenance intervals. In addition, operating noise is only 54 decibels, making this unit ideally suited to domestic and other applications where noise is to be kept at a minimum.



A micro-CHP Restaurant Installation in Japan



Configuration of a Typical Yanmar Micro-Combined Heat and Power System



About the Micro-CHP System

Reciprocating engines, also known as internal combustion engines, have been successfully commercialized for micro-CHP systems in Japan and Europe. As shown in the diagram above, a Yanmar four-cycle gas engine drives an electric generator, and the heat released through its exhaust and jacket water is captured as steam or hot water for space heating and cooling, water heating, and/or other thermally activated technologies.

Project Status: Testing to be Completed in 2007

The test plan is developed and the site selection process has begun. The unit is expected to arrive at the GTI test facility in late October.

Commercial Prospects for Micro-CHP

Micro-CHP offers fantastic opportunities for grid independence and ensuring power supplies to critical facilities. The successful completion of this project will provide valuable testing and in-service performance information on commercial propane-

fueled micro-CHP technology. This data is expected to lead toward propane micro-CHP applications in small rural facilities where power line extension and electric reliability come at a premium, such as residences, restaurants, health clubs, eldercare facilities, and truck stops.

The Yanmar 5kW micro-CHP System

The 5kW system is 20 percent more compact than a comparable conventional generator, allowing for application where space is at a premium and power demands are modest. This system offers 85 percent overall efficiency, low operating noise (51dB), and long maintenance intervals (10,000 hours) and is considered the optimal size for residential small commercial applications.



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