Hoonah Heat Recovery Project

Hoonah, Alaska

Heat recovery system provides heat to six priority community facilities

Project Overview

In partnership with the Alaska Energy Authority (AEA), the Inside Passage Electric Cooperative (IPEC) completed a heat recovery project in Hoonah, Alaska. The project uses waste heat from the IPEC Hoonah diesel plant to heat six community buildings. Heat from the jacket water and exhaust manifold is recovered rather than emitted to the atmosphere by radiators. The six buildings include the elder housing, fire hall, police hall, school, swimming pool, and old powerhouse.

Quick Facts

- **Total Project Costs:** $1.3 million
- **Funding:**
  - Renewable Energy Fund: $472,937
  - Rural Power Systems Upgrade: $432,300
  - Denali Commission: $394,763
- **Equipment**
  - Gen. Make/Model: (2) Caterpillar 3456 (Marine)
    - Output: 455 kW each
  - Gen. Make/Model: (2) Caterpillar 3512
    - Output: 855 & 1,000 kW, respectively
- **Diesel Fuel Offset**
  - Estimated Annual: 55,000 gallons
  - Actual Annual: 47,000 gallons
  - Aug. 2012-Dec. 2014: 103,000 gallons
- **Fuel Savings**
  - Estimated Annual: $225,000
  - Actual Annual: $210,000
- **Benefit/Cost Ratio:** 3.55
- **Simple Payback:** 6.2 years

Objectives

The main objectives of this project were to use a heat recovery system to heat six priority buildings in Hoonah and to reduce the reliance on expensive diesel fuel. Doing so has reduced Hoonah’s energy costs and allowed for more money to stay in the local economy. This promotes jobs, education, and encourages residents to remain in Hoonah.

Heat Recovery—How it Works

As a rule of thumb, engines are 30 percent efficient. That is, of the fuel energy input, 30 percent each goes to horsepower, jacket water heat, and exhaust heat. 10 percent goes to radiation and other losses. Jacket water cools the engine by dissipating almost 28 percent of the heat it generates. This heat is low grade and is sent to the atmosphere using radiators or cooling towers. Heat recovery is a unique system that takes heat captured in the jacket water and harnesses it for space heating. The CAT 3456 was chosen specifically because it offered 38% operating efficiency, an 8% increase from the standard generator. The jacket water loop is isolated from the building heating loop by a heat exchanger so that the heat recovery system does not impact engine performance.

CAT 3456 w/ marine manifold, photo courtesy of AEA.
Economic Feasibility

The system became operational in August 2012. Between August 2012 and December 2014, it provided the community with 10,706 MM Btu of thermal energy and has displaced 103,000 gallons of diesel fuel. This displacement has saved Hoonah $440,000 in energy costs in two years of operation. Over its projected lifespan of 20 years, the project has a calculated benefit/cost ratio of 3.55.

Heat Sales Agreement

Hoonah purchases their diesel fuel from Hoonah Trading Company for $5 per gallon. When the heat recovery system is used, however, IPEC is able to sell their formerly wasted heat to the six facilities through a heat sales agreement. In accordance with the agreement, the buildings purchase heat from IPEC at 50 percent of IPEC’s fuel cost.

Learning Experiences/Challenges

One challenge that engineers overcame was figuring out proper site drainage for the new IPEC plant. The new plant was built adjacent to the old plant, which was set in a rock quarry with poor drainage. When it rained, there would be standing water in the old plant. Engineers made a better drainage system for the new plant facility so water would no longer be an issue.

The second challenge workers faced was when they had to lay the underground piping that transfers heat to the six community buildings. Construction workers had to make sure there was enough dirt fill on the side of the road to bury the existing pipe. They were able to identify a local area with proper fill material and transfer it to the construction site.

Community Benefits

A very special benefit heat recovery gives to the community is that fuel cost savings allow Hoonah to keep their heated swimming pool open. Being able to swim is essential, especially in a coastal community like Hoonah where fishing on open water is extremely commonplace. Residents young and old can learn to swim and be prepared in water emergencies.

The new power plant was designed to integrate with the Gartina Creek hydroelectric project that is currently under construction. When the hydroelectric facility comes online it will be able to merge with the heat recovery system in order to provide maximum efficiency and renewable resources.

Project Contact information

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Published August, 2015