Integrated Resource Recovery Case Study:

Okanagan College Wastewater Heat Recovery

Okanagan College Campus – Kelowna B.C.

Project: Heat recovery from sewage & district heating system

Location: Kelowna, British Columbia

Status: Operational since 2004

Environmental Benefits: Offsets over 800 tonnes of GHG emissions per year

Business Model: Owned by Okanagan College; project cost $1.5 million; estimated payback period of 15 years

Introduction

In Kelowna, British Columbia, Okanagan College uses waste heat from a nearby sewage treatment plant to heat its campus. Infrastructure for heat recovery and distribution was installed at the College along with several other energy efficiency retrofits. These upgrades offset more than 800 tonnes of greenhouse gases annually, equivalent to taking 166 cars off the road.

Waste Heat Recovery

Decomposition is a common component of sewage treatment. During the decomposition process, bacteria break down organic matter and produce heat. As a result, the temperature of treated water, also called effluent, ranges between 12° and 22°. Heat pumps, much like those used with geo-exchange systems, are then able to concentrate the heat to a higher temperature for use in district heating applications. At Okanagan College, treated water is pumped from the sewage treatment plant to the campus, where the heat is concentrated and distributed to surrounding buildings.[1]

[1] Kelowna's Wastewater Treatment Plant also recovers nutrients (for use as compost) from the treatment process, recovering another valuable resource.

For most of the year, the outside temperature is above 5° and the sewage heat recovery system meets the heating needs of all connected buildings. When the temperature drops below 5°, natural gas boilers provide additional heat. Overall 60% of the heating requirements are met by the wastewater heat recovery system, offsetting emissions which would otherwise be associated with natural gas.

Financing and Management

Estimates show that the $1.5 million sewage heat recovery infrastructure saves the College approximately $100,000 per year in heating costs. It is expected that the capital costs will be recovered within 15 years.

Okanagan College Heat Pumps

The sewage heat recovery system was not a standalone project. It was part of a larger energy efficiency upgrade program. The overall project costs including the other energy upgrades totalled more than $2.4 million. This total expenditure is expected to save the College $300,000 per year, potentially paying back the investment in 8 years.

Natural Resources Canada supported the project through a $24,000 feasibility study incentive, which allowed the College to explore a broad range of energy retrofit options. The remainder of the funds were provided by the College.

Planning Process

Several aspects of the decision-making and planning process at Okanagan College were important in the design of this resource recovery project. Firstly, unique local opportunities were identified by decision-makers. A study of the energy retrofit options identified the need for boiler upgrades and replacement, and the proximity of the campus to a source of free heat. This connection between the need for infrastructure replacement and local waste-resources is important, as every community or neighbourhood may have different opportunities for resource recovery.

Secondly, the project's costs and benefits were assessed based on the expected life-cycle of the infrastructure. Many economic models commonly used for decision-making limit acceptable payback periods to less than 15 years, and would have immediately discounted this project despite a positive rate of return.

The single most expensive aspect of the project was the construction and installation of the piping which sends treated wastewater 500 meters to the College boiler plant and returns cooled water back to the effluent outfall. Even a small increase in that distance could have jeopardized the business case of the sewage heat recovery project. Proximity between the source of waste heat and the end user is critical for the economic feasibility of waste-heat recovery projects.

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