Alaska SeaLife Center

windows to the sea

Alaska SeaLife Center Seawater Heat Pump Project
Denali Commission Emerging Energy Technology Grant
UAF 10-0069
Alaska Energy Authority Renewable Energy Grant
AEA Grant Agreement No. 7030017
Quarterly Report ending September 30, 2010

During the quarter ending September 30, 2010 the Alaska Energy Authority Renewable Energy Grant Agreement was executed by the City of Seward with a period of performance July 1, 2010 to December 31, 2011.

Key Activities Completed:

1. Design Narrative completed on August 5, 2010.
2. 35% Design Documents and Cost Estimate completed on September 30, 2010.
3. Demolition and removal of Culligan system water tanks and related piping to make space for the heat pumps; removal of retired salmon research PVC piping to make space for the condenser and evaporator loop piping; and removal of retired salmon project heat exchangers to make space for the second heat exchange between the condenser loop and 40% PG AHU loop.

Existing or Potential Problems Addressed:

1. During design development a decision was made to utilized existing cooling coils in AHU's 1, 2A/2B, 4, 5, and 6 as these same cooling coils can receive 120F glycol from the new heat pump condenser loop and function effectively as pre-heat coils. This concept makes use of the existing coils, 3-way valves, shut off valves and copper piping adjacent to the coils; however the Schedule 40 PVC piping that transports glycol from the basement level to roof level must be replaced with steel or Type L copper to accommodate 120F during the heating season. The design and budget has been developed to incorporate the installation of grooved steel piping for the condenser and heating loop to the air handlers.
2. The ASLC has prevented freezing of the AHU coils by keeping 40% propylene glycol (PG) in the AHU coil loops. The design narrative and 35%

design drawings suggested that a continuous circulation of 25% PG would appropriate in the AHU coil loops; however this circulation could be interrupted by pump failure, power failure, 3-way valve failure, heat pump shutdown, etc., - the worst case being system interruption/failures late at night on a holiday weekend for example when it below zero outside. Because of this risk the design has been modified to retain 40% PG in the in the AHU coil loops and add a second large heat exchanger between the condenser loop piping (treated water) and AHU piping (40% PG) that will exchange heat from the condenser loop of water with no PG to the 40% PG AHU coil loop. The second heat exchanger is added at a cost of $21,000 and will guarantee freeze protection of the coils no matter what happened with heat pumps, circulation pumps, controls, 3-way valves, thermostats, or air handling units.

3. The design has identified feasibility of heat recovery from existing building sources; however, this project is currently outside of the budget. We are currently evaluating how much of the piping installation work could be accomplished by ASLC personnel. During 35% design document review, the potential to save approximately $94,000 in outside contractor cost by ASLC staff installation of seawater supply loop, evaporator loop, condenser loop, and heat/cooling loop piping was identified. This could free up enough of the grant funds budget to pay for the heat recovery project which has a forecast return on investment payback of 2.2 years by boosting the available heat to the heat pump evaporator loop by 1.5 to 3 degrees F. We are currently determining feasibility of ASLC staff installation as a component of the 65% design documents and cost estimate.
4. The 35% design cost estimate includes the $23,000 purchase of a very robust control package with the heat pumps. During the 65% design phase, we will be evaluating if this control package is necessary given the built in controls on the heat pumps along with existing ASLC building automation controls.

Activities Targeted for Next Quarter

1. Completion of Final Design
2. Procure Major Equipment
3. Procure Outside Contractor Services
4. Begin installation of condenser loop, evaporator loop, heat loop, and seawater supply loop piping
5. Commence Exhibit Design

ASLC HEAT PUMP PROJECT TIMELINE

Revised October 1, 2010

June 6, 2010 – July 7, 2010: Procure and contract mechanical/electrical engineering services

July 8 – November 15, 2010: Complete design (Drawings, Specifications, Final Cost Estimate)

November 16 – December 15, 2010: Procure and contract mechanical/electrical contractor

November 16, 2010 – April 30, 2011: Equipment procurement (including instrumentation), installation and commissioning, and final reporting:

a. Shop drawing/manufacture submittals and review – 3 weeks
b. Manufacture and ship heat pumps, heat exchangers and instrumentation to Seattle – 10 weeks
c. Ship heat exchangers, heat pumps, instrumentation from Seattle to Anchorage to Seward – 2 weeks
d. Installation of all mechanical, electrical and instrumentation components – 6 weeks, including piping and seawater supply pump
e. Start-up and commissioning – 2 weeks

May 1, 2011 – June 30, 2012: Project monitoring and reporting to ACEP

EXHIBIT TIMELINE

November 1 – February 28, 2011: Exhibit design and procurement

March 1- April 15, 2011: Exhibit fabrication

April 15 - 30, 2011: Exhibit installation and evaluation

The following is the revised schedule for executing the design work. The ASLC anticipates commencing major equipment procurement upon the completion of 65% design and cost estimate. Completing the Final Design by early December, 2010 will allow the opportunity for ASLC to procure and install the equipment for the sea water heat pump demonstration project by end of March, 2011. Mid-March through mid-May is the time of year when sea water temperatures are the lowest and the system can be tested in the most challenging operating conditions when chiller efficiency is lowest.

Phase	**Description**	**YCE Presents to ASLC**	**ASLC Comments By**
Phase I	Project Scoping Meeting At ASLC	July 8, 2010	July 15, 2010
Phase I	Design Narrative & Cost Estimate	August 6, 2010	Aug 12, 2010

Phase II	35% Drawings, Specs & Cost Estimate	September 21, 2010	Sept 28, 2010
Phase II	65% Drawings, Specs, & Cost Estimate	October 28, 2010	Nov 5, 2010
Phase IV	Final Drawings, Specs, & Cost Estimate	November 30, 2010	Dec 6, 2010

Project personnel assigned to the design phase are as follows:

Steven Carrick, Director of Visitor Services & Facilities	Project Executive
Darryl Schaefermeyer, ASLC Operations Manager	Project Manager
John Underwood, ASLC Facilities and Life Support Supervisor	Project Engineer
Andy Baker, P.E., (www.yourcleanenergy.us)	Consulting Engineer
Lee Bolling, EIT, (www.yourcleanenergy.us)	Engineering Technician
John Faschan, P.E. (www.edc-alaska.com)	Electrical Engineer
Kevin Hansen, P.E. (www.edc-alaska.com)	Mechanical Engineer

The project is on schedule and budget to meet the Contract completion date of January 15, 2012.

Attachments:
(1) Agenda, July 8, 2010 Design Scoping Meeting
(2) Design Scoping Meeting Minutes
(3) Design Narrative
(4) 35% Design Documents
(5) Financial Reports
(6) Photos

Figure 1 Removing Culligan System Tanks

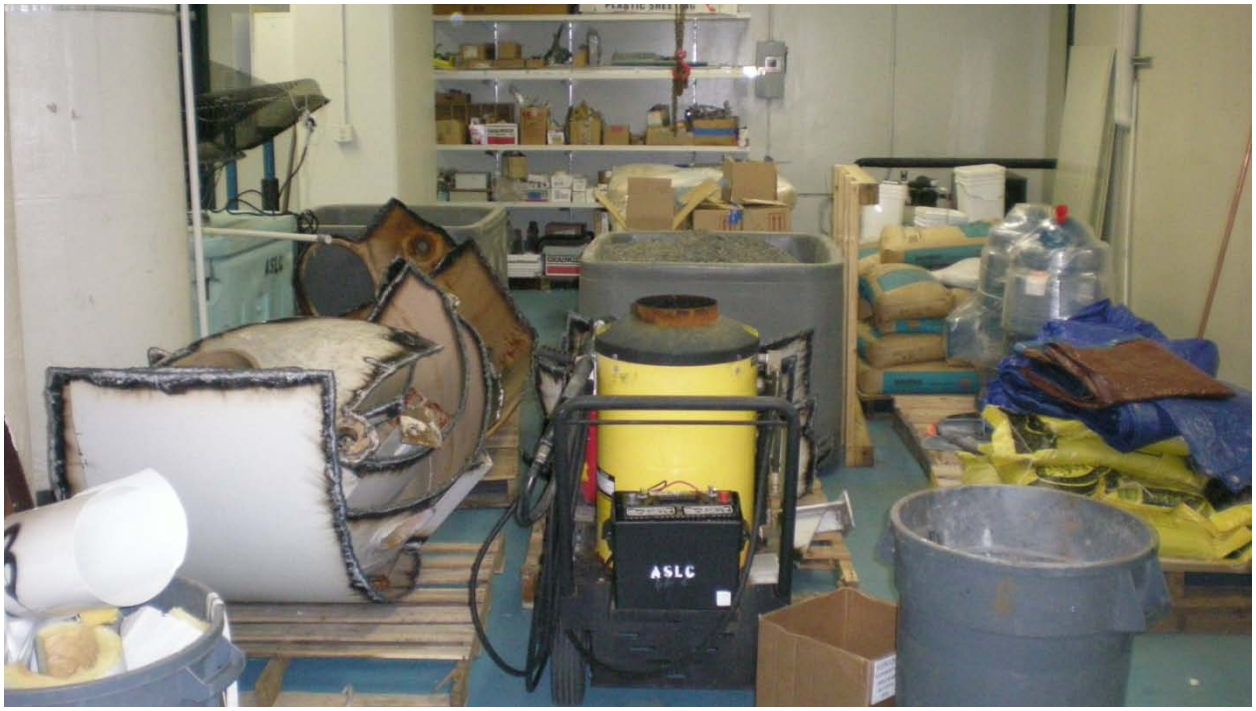

Figure 2 Heat Pump Location

Figure 3 Removal of Salmon Project HX - Location of Seawater HP HX 6

Figure 4 Pipe Corridor for Condenser and Evaporator Loop Piping

Figure 5 Corridor for Condenser and Evaporator Loop Piping

Figure 6 Corridor for Condenser and Evaporator Loop Piping

Figure 7 Location for Titanium Plate Heat Exchanger - HX 3

Figure 8 Location for Heat Pump Seawater Supply Pump

Figure 9 Domestic Hot Water Tank

Figure 10 Pavement Heating Heat Exchanger