



# Commissioning A Biomass Heating System in a Remote Alaska Community

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Course Description

The use of biomass energy for heating commercial and institutional facilities is viable in areas with sufficient resources. This case study of **Southeast Island School District's** biomass program examines how lessons learned improved the program and helped SISD achieve their program requirements.

SISD's biomass boilers not only provide heat for the schools and greenhouses in six Prince of Wales Island, Alaska, communities, but also enhance the educational program and provide community and economic development opportunities. SISD learned valuable lessons that led to improved Owner's Project Requirements, revised design criteria, and important startup and operational goals.





### Learning Objectives

At the end of the this course, participants will be able to:

- 1. Understand how biomass boilers are used in a school and integrated to the community
- 2. See how "lessons learned" can be used to update and improve the next Owner's Project Requirements
- **3.** Learn how the Owner's Project Requirements can be used to improve project planning.
- 4. Learn how the Owner's Project Requirements can impact functional test procedures





Today's Presentation:

#### • Who we are

- Owner and consultant
- School District, Prince of Wales Island, AK

### • Biomass?

Home-grown fuel

### Community Involvement

- Economic Opportunities
- Student Fuel Management
- Cafeteria





Today's Presentation

### • Growth Through Experience

- Similar Projects
- Project Growth Curriculum Enhancement
- Lessons Learned

### • OPR for the Next Project

- Sizing for Growth
- System Effects
- Testing Plan
  - Getting What Was Wanted





Who We Are

- Jonathon Fitzpatrick SISD Maintenance Manager.
  - Managed contract scope and budget
  - Participated in OPR development
  - Participated in construction and startup
  - Boiler system operator





Commissioning a Community Biomass Boiler System Who We Are

• Walter Heins, PE, CxA, CCP

**Commissioning Consultant** 

- Facilitated OPR
- Supported Design
- Developed Cx Plan
- Participated in commissioning





Project Location: Prince of Wales Island, Alaska





Learning Objective 1

- Understand how biomass boilers are used in a school and integrated to the community
  - What are biomass boilers
  - Project example
  - Community integration
    - School curriculum
    - Economic engine
    - Community pride





#### What is Biomass?

- Cord wood
- Wood Chips
- Wood pellets
- Pressed bricks
- Processed sludge





- Automated or manual fuel loading
- Conventional hydronic heating
- Usually coupled with storage buffers











#### **The Wood Boiler System**





# Biomass: Technology Update

Thorne Bay, Kasaan, Coffman Cove, Whale Pass, Naukati, Hollis and Hydaburg Schools

### Wood Boiler Systems

Jonathan Fitzpatrick Southeast Island School District















### Community Involvement





Community Involvement

- Community Members can sell fuel to SISD by the cord
- Cash stays in the local economy









Community Involvement

- Student and adult fuel handlers
- Teams earn sports
  travel credits







Community Involvement

- Students run the boilers
- Adult and student fuel stokers earn wages
- Students learn scheduling and responsibility







Community Involvement

- Greenhouse
  - Educational opportunities
  - Horticulture
  - Aquaponics





Community Involvement

- Greenhouse
- Aquaponics











Community Involvement

 Student products are sold at local markets, restaurants and lodges







Community Involvement

- Business opportunities
  - Café
  - School Lunch





### **Student involvement**

- Operate boilers
- Logo design
- Manage accounting software
- Communicate with customers
- Balance pH/nutrients
- Fill in purchase orders
- Construction
- Wait tables/cook/wash dishes
- Select seed/fish/chickens
- Sow seeds/harvest
- Package and deliver
- Interviews
- Permit applications
- Sales
- Plumbing





Learning Objective 2

- See how "lessons learned" can be used to update and improve the next Owner's Project Requirements
  - Thermal Storage (Mass)
  - Realities of operations
    - Long night
    - Greenhouse can use lower quality heat







#### Lesson Learned

 Thermal Storage needs to last all night





- Lesson Learned
  - Have enough thermal storage





Lesson Learned

acy

- Have enough thermal storage





- Lesson Learned
  - Fuel Handling
    Manual
    Mechanized

Stacked cordwood for manual handling Palletized cordwood for mechanized handling







- Lesson Learned •

  - Fuel Handling
    Manual
    Mechanized

Forklift must maneuver in storage building and boiler building







- Lesson Learned
  - Adequate Ventilation
    - Powered fans
    - Free air movement

POW rainforest receives up to 100" rain per year











- Lesson Learned
  - Anti-Back-feed Control







- Lesson Learned
  - Anti-Back-feed Control





Learning Objective 3

- Learn how the Owner's Project Requirements can be used to improve project planning.
  - Site Selection
  - System Growth
  - Anti-Back-feed controls



- Owner's Project Requirements
  - Site Selection







- Owner's Project Requirements
  - Site Selection









- Owner's Project Requirements
  - System Growth











- Owner's Project Requirement
  - Anti-Back-feed Control





Learning Objective 4

- Learn how the Owner's Project Requirements can impact functional test procedures.
  - Site Access
  - Anti-Back feed
  - System Growth





**Presentation Summary** 

- Design-phase commissioning helps owners get what they really wanted.
  - Consider broad aspects and impacts of a new facility
  - Communicate OPR to the designers
  - Learn from experience and update the OPR
  - Develop success criteria
    - Improve it as new lessons are learned





This Concludes The American Institute of Architects Continuing Education Systems Course

## Commissioning a Community Biomass Boiler System

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