Heating school buildings with wood chips
Motivators and Lessons Learned
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Quillayute Valley School District
Bio-Mass Boiler
Where is Forks?

- 140 miles, and a ferry ride, west of Seattle on the Olympic Peninsula;
- Known for its rain (124”+/yr), timber, and pop culture revision of “vampires and werewolves”
- Approximately 3,500 people in town and immediate environs; serve as a hub for very rural area of ~10,000.
- Four tribal nations in immediate area: Makah, Quileute, Hoh, Quinault.
- Natural Resources, government, and tourism are the economic engines

- Home of the Quillayute Valley School District – K-12 with 1100 local students and a virtual high school with 2500 students;
- Long history of utilizing technology to address issues
Motivators for Project

- Wood waste in the Timber (Cedar) Industry
- Diesel consumption for heating in the K-12
- Declining revenue vs. increase in cost
- Need for more stable means of heating portion of middle school and potential to heat new high school building of 50,000 square feet
- Interest of being a “pilot project” at a time when State was looking at various alternative energy initiatives
Cost for Bio-Mass Plant

- Original estimation - $1 million to $1.5 million
- The original bid came in around $2 million.
- The District value – engineered the specifications and the Bio-Mass plant went out to bid for a second time.
- Bid award for 1.7 million dollars to JH Kelly.
- Final cost of the plant – $2.3 million (due to change orders and unforeseen costs)

Funding ($1 million state grant, matched with local school funds and a construction bond for new high school)
Quillayute Valley School District  
Bio-Mass Boiler – The System

- Hurst boiler
- Messersmith Manufacturing, Inc. built the system
- Garage (Chip Bin) for storage of chips with an auger
- Conveyor belt – moves chips to metering machine
- 800 gallon domestic hot water tank heated by system
- Forced air heating units in classrooms
- Baghouse – 48 bags required to meet Olympic Region Clean Air Agency (ORCAA) standards
- 51 ½ foot stack – Separate from the diesel stack
- Ponyback boiler for warmer weather
Bio-Mass Boiler – Garage Entrance
Bio-Mass Boiler – Garage (Chips)

We use about 25 tons of green wood chips about every two to three weeks.
Bio-Mass Boiler – Conveyor Belt
Bio-Mass 3 Auger Chip Dryer
Bio-Mass Air Lock System
Bio-Mass Boiler (Steam)
Bio-Mass Boiler – Hurst Boiler
The System – Specific Information

Building Heat
- Floor Area 2,184 SF Hot water system heats fan coil air handling units:
- Building Height 26 Feet
- Forks Intermediate School, 15,000 SF, including 11 classrooms and Multi-purpose Room
- Top of Stack Structure is 51 Feet
- Forks High School Addition, 38,000 SF
- 800 Gallon domestic hot water tank

Furnace/Boiler including 15 classrooms, library, and administration
- Fire-Tube Boiler – Wood chip:
- Messersmith Combustion System

Woody Biomass Fuel
- Hurst Boiler, Model #FB-400
- 2,000,000 BTU per hour net output Wood waste processed chips:
- Size 2” x 2” x ¼”
The System – Specific Information

Water-Tube Backup Boiler – #2 Fuel Oil:
- Bryan Boiler, Model CLM-300-W
- 2,400,000 BTU per hour net output

Fuel Storage
- Chip Bin Capacity 28 tons
- Chip Bin Overhead Door 12’ x 16’
- Diesel Fuel Tank 2,000 gal

WA Emissions/ORCAA Requirements
- Funding
- Advanced Metals Cyclone
- Filter Technology Baghouse

Chips
- Moisture Content 15-45%
- Estimated Annual Use 300-600 green tons
Lessons Learned

- Air quality will over ride many factors
  - Engage local air quality board at outset
  - “fear of unknown” may be a driver in their response/reaction – be prepared to learn and educate
  - Aim to exceed the air quality regulations – they may change
- Spend a lot of time at the front understanding the type of systems that are available and engage public at local, regional, and state level
  - A lot of “ideas” – sift them collectively
  - Don’t instantly dismiss an idea – but “trust and verify”
- Possible partners in your effort may include local economic development council, land grant university extension agency, state energy office, etc.
Lessons Learned

- Create a plan for community awareness and communication to dispel myths about a Bio-Mass plant.
- Consider your local fuel sources before beginning the project and complete a sustainability study of fuel resources.
- Design a system around a sustainable fuel product that is accessible in your community.
- We aimed to exceed the air quality with the design of our plant – we have no trouble meeting the regulation. CO levels must be under 100 – our readings are at 8.
- Work with other “like” entities who have put in similar systems to gain as much knowledge as possible (our best resource for information was a K-12 school district in Darby, Montana).
Mechanical Upgrades

- 2 Additional chip dryers due to excessive moisture content of wood chips
- Adjustments and tuning of the Baghouse
- Addition of an airlock system to regulate firebox draft
- Motorized pump for back up ponyboiler diesel system
- Additional pump system for boiler room heaters
The Benefits

- Our Intermediate and high school classrooms are heated 24 hours a day when our boiler system is on.
- Our classroom environment has improved dramatically as a result.
- Cost benefit – savings fluctuate depending on fuel prices.
- Air quality with the bio-mass is cleaner than the old boiler system (which was grandfathered in to meet old standards).
- Students have an opportunity to see and study a working bio-mass system at school and understand renewable energy systems.
Thanks to the team . . . 

- We had a team of individuals who assisted us throughout this project:
  - Governor - Christine Gregoire
  - State Senator – Jim Hargrove
  - State Representatives – Lynn Kessler and Kevin Van de Wege
  - State Commerce – Peter Moulton
  - QVSD Board of Directors
  - City of Forks – Rod Fleck
  - Port of Port Angeles – John Calhoun
  - QVSD Employees – Bill Henderson & Sali Kilmer
  - Project Team – BLRB Architects, JH Kelly and Olympic Associates Company
A Great Big Thanks to . . .

Messersmith Manufacturing, Inc

Gailyn Messersmith, President

Without Gailyn’s expertise, solutions, and dedication to our project, we would not have been successful.