

Biomass Supply Chain for District Heating: How to Avoid Supply Chain Failure

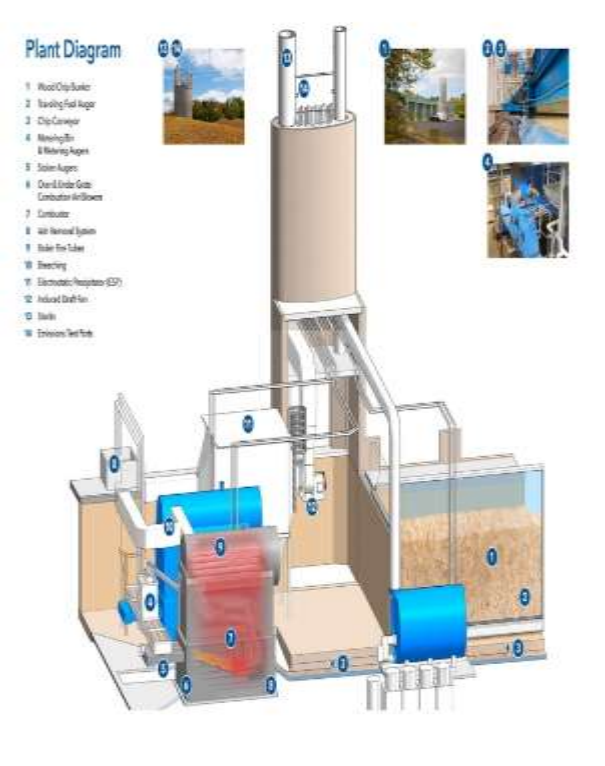
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Small/Medium Sized Facility



What Constitutes Small & Medium Size

- ▶ 10MW or less
- ▶ Annual intake of biomass less than 15,000 BDMT
- ▶ Projects that are typically adopted by campus, schools, hospitals, military base, prisons etc.

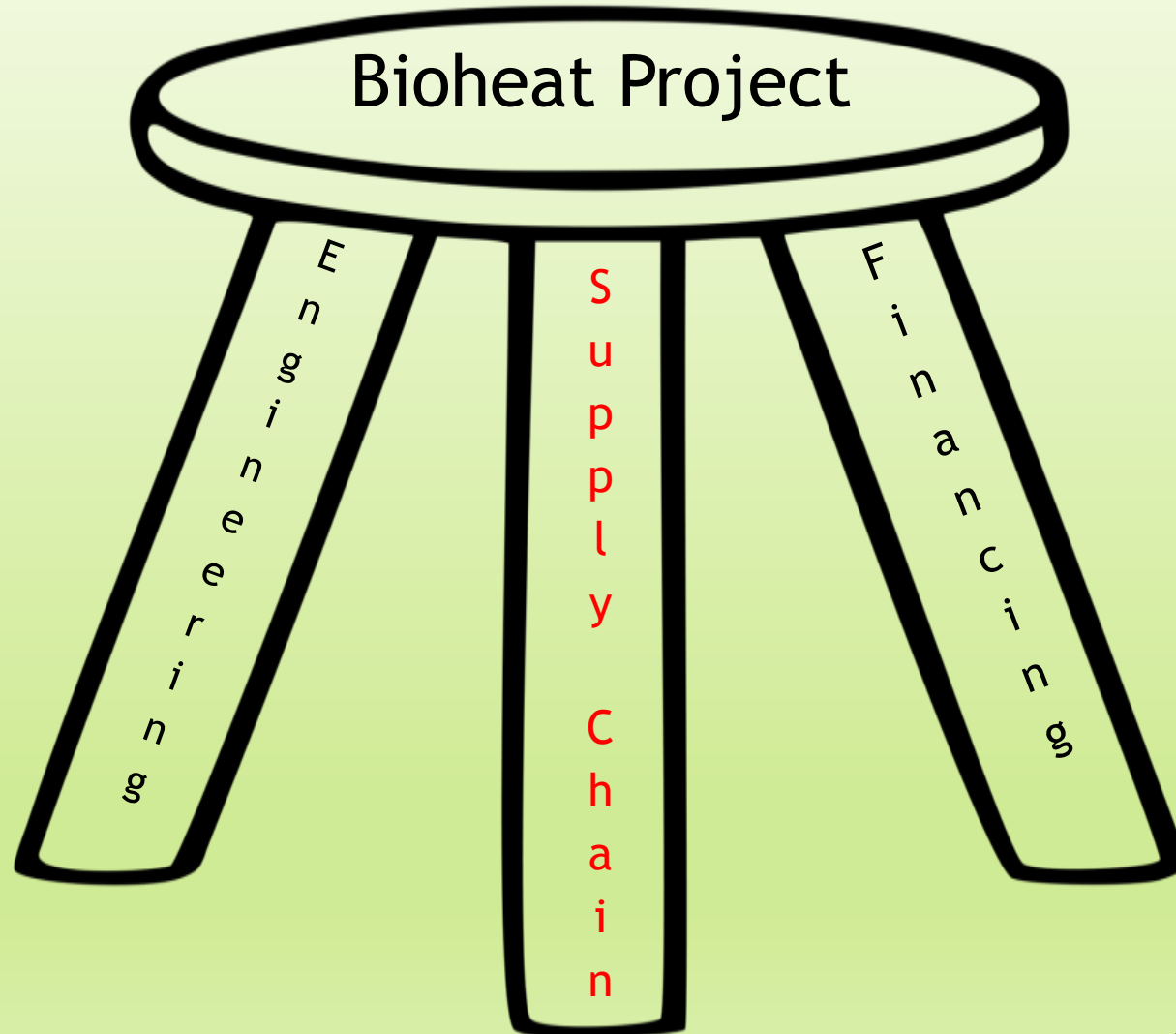
Typically projects bigger than the ones mentioned above has a very different supply chain. The supply chain of large scale facilities mirror those of pulpmills and biomass power plants.

Examples of District Heating Biomass Projects

- ▶ Colby College in Waterville, ME - 22,000 Tons Per Year
- ▶ Battle Creek VAMC, Battle Creek, MI - 20,000 Tons Per Year
- ▶ Red River Army Depot, Texarkana, TX - 20,000 Tons Per Year
- ▶ Beverly Greenhouses, Hamilton, ON - 10,000 Tons Per Year
- ▶ Chillicothe VAMC, Chillicothe, OH - 14,000 Tons Per Year

Biomass Supply Importance

Under the right regulatory conditions



Typical Supply Chain Mistakes

This can increase the price of wood chips a facility buys going forward.

- ▶ Cart Before the Horse (buying a biomass system prior to understanding wood basket)
- ▶ Pre-construction mistakes (Budget Vs Operations)
- ▶ Boiler manufacturer's fuel specifications do not match market availability or specifications that are unrealistic.
- ▶ Bad RFQ planning with unrealistic demands and no allowances for flexibility unnecessarily increase the price for fuel.
- ▶ Bad RFQ that makes it tough for small businesses to bid.
- ▶ Not flexible with suppliers and no supply disruption plans.

Mistake 1: Cart Before the Horse

- ▶ No due diligence is done on wood basket prior to purchasing biomass system
- ▶ Wood basket throughout North America varies in terms of prices, specifications, species, moisture content and terminology.
- ▶ Purchasing expensive biomass system and hope for the best with suppl.
- ▶ Biomass heating projects banks on the fact, if you build it, they will come.
- ▶ Take equipment supplier's advice for granted on supply chain without properly consulting local suppliers.

Mistake 2: Pre-Construction Mistake

Project Manager and Operations manager's interest are not aligned. Project manager is interested in construction budget, while operations manager wants the plant to run efficiently without disruption. This can cause the following issues:

- ▶ Not building a substantial enough storage for long weekends and weather disruption to be below budget
- ▶ Not planning for variances in moisture content of wood chips prior to choosing a wood boiler. A boiler with strict restrictions tends to be budget friendly.
- ▶ Not planning for sizing variances in wood chips. This can be solved with a small screener but it requires more money.

Mistake 3: Fuel Specifications.

- ▶ Requesting for specifications that currently do not exist in the market.
- ▶ Wood Biomass Terminology Confusion(i.e. sawmill chips, whole tree chip, etc.)
- ▶ Requesting for specifications that only 1 or 2 suppliers in the market can provide, this can cause a supply issues if one of those suppliers go out of business.
- ▶ Banking on the fact that if you build it, supplier will come and make it work to fit your needs.
- ▶ Government guidelines that does not reflect market conditions.

Mistake 4: Unnecessarily Requirements

► Examples of unnecessarily requirements:

- 1) Screened wood chips to removed all fines even with pulp quality chips.
- 2) No leeway for wood chips moisture (wood chip moisture can vary with season)
- 3) Unnecessary tight wood chip size spec(wood chip is delivered in bulk and hence requires some allowances)
- 4) Late wood chip orders and late wood chip cancellations.
- 5) Sizing of wood chips that is not realistic (i.e. chip thickness of no less than 0.25 inch)
- 6) Species specific (hardwood vs softwood)

Mistake 4: Bad Planning of RFQ or RFP

- 1) Bid bonds that are exceedingly high
- 2) Setup bid on website hoping for vendors would notice only to find out small vendor pool.
- 3) Not Reaching out to vendors in market and notifying them of potential bid.
- 4) Supply contract terms that are either too long or too short.
- 5) Penalties or rejection that are too steep.
- 6) Testing procedure for wood chip quality that is open for interpretation.
- 7) Supply quantity that is open ended. This makes it difficult to plan.
- 8) RFQ terms that do not reflect the realities of the market. (i.e. long unloading time, partial load delivery, not paying by weight, etc)

Mistake 5: Disruption Plans

Example of Supply Disruption

- 1) Equipment break down
- 2) Weather disruption
- 3) Insolvent supplier
- 4) Unreliable supplier (i.e. only 1 truck, bad employees, etc.)

Plans

- 1) Off-site inventory
- 2) Purchase from multiple suppliers
- 3) Ensure the supplier has back up truckers

Miscellaneous Oversight

- ▶ Trailer Size and setup
- ▶ Storage monitoring
- ▶ Long weekend inventory
- ▶ Government Regulations
- ▶ Frozen wood chips in trailers (Northern weather)
- ▶ Weighing of trucks.

Case Studies

Wood Chip Heating Facility North Carolina

- This facility made a mistake on the wood chip terminology on their RFQ to vendors in their area.
- This facility used the term Whole Tree Chips in their RFQ and did not specify percentage of oversize they can tolerate.
- Whole Tree chips in North Carolina means the chipping of trees together with the crown and the bark of the tree which would typically create oversize prices. This product is typically used by power plants in NC.
- Problem could have been solved with an initial investment and installing of a screen resizer.
- The outcome of this was the use of pulp mill grade wood chips which cost \$5 to \$8 per ton more than Whole Tree Chips. The facility did not budget for this price hike.

Case studies

Biomass heating facility in Ontario

- This facility in Ontario did not plan for a potential supply disruption in the event of a weather delay and long weekend.
- Current storage is only enough for 2 days.
- Initial idea was to use walking floor trailers as additional storage on site but they did not take into account wood chip freezing in trailers in the winter months when wood chip is required the most.
- Most or all vendors in the region would rather not supply a facility that requires just in time delivery (JIT) and supply the 3 pulp mills in the region that is flexible and have a good history with the local vendors.
- The facility can also only handle wood chips with a moisture content of less than 50% otherwise it would create issues with the boiler.
- Wood chip moisture in Ontario in the winter months can range between 45% to 55% depending on weather condition.
- This facility would need to manage carefully their inventory over long weekends and supply disruptions.

Case Study

Correctional Facility Indiana

- The correctional department in Indiana has two facilities' with new biomass boilers.
- The goal was to save heating cost compared to fossil fuel.
- The problem with the project stems from wood chip specification.
- First facility requires wood chips at maximum 25% moisture content and the second facility requires wood chips at 15% moisture content.
- The supply chain in the region does not have wood chip producer that can produce this type of material without drying wood chips with a belt or rotary dryer.
- The project team did not do their due diligence on market supply assessment.
- Wood chip is naturally 45+% moisture depending on species. By actively drying the material, major investment is required.
- Although this moisture is achievable, the state of Indian wood chip is tied to 1 supplier and that supplier can will have price leverage over the state.

Conclusion

- ▶ Due diligence on supply chain is very important (Supply Assessment/Supplier Vetting)
- ▶ Do your supply due diligence prior to construction.
- ▶ Working closely with suppliers rather than an ultimatum
- ▶ Know who the vendors are in the market and notify them of your project.
- ▶ Working closely with engineers/boiler manufacturers to ensure that specifications can actually be met in the market place.
- ▶ Ensure that there are many suppliers in the market to avoid being tied down to one supplier.
- ▶ Equipment, Equipment, Equipment (Do not cheap out on equipment)

Conclusion

- ▶ Your local wood basket determines if you should purchase a wood boiler.
- ▶ Don't blindly trust experts. (talk to non-stakeholders i.e. other users of biomass)
- ▶ Cheapest bidder doesn't mean the most reliable bidder. Heavily scrutinize your vendors.
- ▶ A successful project is crucial to promote the viability of biomass heating in Ontario and not to scare others away.

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