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Why Some Wood Pellet Projects Fail to Perform as Expected

How to not lose money making pellets

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This white paper could be called "wood pellet making 101". It highlights several critical areas in the process of converting wood to wood pellets.

Making wood pellets appears to be a simple and straight forward process: Take wood chips or sawdust and dry the material to a specified moisture content, mill to a very small particle size, press into a pellet, and load into bags or into bulk carriers. The reality of making wood pellets is far more complex.

The apparent simplicity of the process has caused many project developers to fail to incorporate the knowledge, skills, and, most importantly, the wisdom gained from experience into the plant designs and operations protocols. To this day, we see projects designed, built, and operated that seemed to have missed the wood pellet making 101 class. It is much more cost effective to get it right the first time rather than to retrofit, or worse, to fail. Errors in feedstock procurement strategies, plant design, equipment choices, process flow, operations methods, and transportation strategies lead to outcomes that fail to meet the benchmarks set in the spreadsheets that justified the project's development.

Every step of a wood pellet manufacturing project, from feasibility analysis, to the fiber procurement plan, to design and engineering, to commissioning, to full operations, to mill-to-user logistics, should benefit from all of the lessons learned by many years of seeing all the wrong ways of trying to make and market wood pellets. Wood pellet projects, whether for the heating markets or for producing industrial pellets, are far more complex that the process schematics and rosy spreadsheets would suggest.

The rest of this white paper offers some checklists with some of the more common areas that turn into project show stoppers and/or margin minimizers. Some of the bullet points may seem

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obvious; but FutureMetrics continues to see shortcomings of various degrees of severity in all of the bullet points below.

The importance of a well-crafted fiber strategy and fiber preparation

If the procurement strategy is poorly crafted, the average delivered wood costs may exceed expectations and fiber quality may not equal expectations. The following bullet points highlight a few of the fiber related issues that we have seen causing problems with production volumes and project cash flows.

- The plant must have a consistent volume for 24/7 operation regardless of supplier interruptions, seasonal harvesting interruption, and weather or road conditions.
- The plant location should be within a 50 mile radius of the majority of the fiber supply.
- Sustainability requirements and compliance costs have to be known and the wood basket has to be able to supply certified fiber at volumes and pricing as expected.
- Avoid fiber baskets which have competing pulpmills, board plants or other wood pellet plants that may demand the same wood.
- Have a strategy that provides as consistent a species mix and quality as possible. The feedstock should be clean and free of dirt, stones or foreign debris (garbage in is garbage out). Bad quality feedstock deteriorates pellet quality and durability. Lower quality feedstock and variable species mix also stresses the equipment and increases operating costs. Often, to cut costs, lower cost lower quality feedstock is used. In almost all cases, the cheap becomes the expensive.

Maximizing operational uptime and minimizing production interruptions begins with understanding the significant importance of fiber preparation and homogenization as the fiber is presented before each process center.

Fiber preparation:

- Blend species at consistent ratios.
- Protect chips and sawdust residues from extreme weather conditions if possible. Heavy rain and/or snow will cause production slowdowns or interruptions and dryer throughput constraints.
- Presenting completely homogenized feedstock of consistent species, particle size, and moisture level, will insure the efficient production of consistent quality pellets.

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The importance of the process flow and technical design

We often say that the manufacturing process of wood pellets is “70% technical and 30% art”.

Engineers may get the 70% right (or may not!), but if the 30% art (experience, knowledge and skill, wisdom) is not acknowledged, the project could spend many years in it’s commissioning phase or scuttled due to impatience on realizing the expected rate of return on the investment.

A flawed process flow design and improperly specified and/or poorly engineered material handling systems can become a big and enduring headache for project operators, owners, developers and investors.

We know from experience that in most cases having the project design and process equipment selection reviewed by an expert in pellet plant operations will result in a project that transitions from construction to full operation faster and a project that is much more likely to meet or exceed industry benchmarks. Relying on an EPC claiming to have the knowledge and experience to deliver an operating plant on time and on budget is a gamble. They may have several projects under their belt, and that is a positive, but they typically do not have the benefit of operations experience. Project developers that tap into the wisdom of those that have seen it all and already know all the wrong ways to do things and advise the engineering firm on design and equipment specifications are more likely to have far fewer headaches.

Final informed decisions on selecting process equipment for the correct size and capacity for the desired performance should be the responsibility of the project developer under the guidance of a seasoned pellet making expert. The perceived de-risking the project by relying on an equipment supplier to provide performance guarantees may lead to an under performing process center and possible litigation. Meanwhile diminished or zero production means diminished or zero cash flow.

We’re not suggesting that not all engineering firms and equipment suppliers serving the wood pellet industry aren’t qualified or lack knowledge and experience; many are highly qualified. But they are typically missing the “30% art” part. Without a holistic understanding of the entire process flow and the complexity of the interactions between fiber characteristics and conversation to pellets, even the best operating staff will be challenged if the flow of material and the quality of the material are erratic.

Decisions on the correct design and placement of woodyard equipment, dryer island, hammermills, pelletmills, coolers, material handling (conveyance systems), and product storage require wood pellet manufacturing knowledge and operations experience.

A few examples of critical decisions:

- The front end of the operation should always deliver correct sized chips from chip suppliers or from the plant's own woodyard to the dryer.
- How large should the storage yard and chipped inventory be? Should the chips and/or sawmill residues be weather protected?
- Dryer issues:
    - What type of dryer – drum or belt.
    - The dryer should be designed to the worst case moisture content scenarios.
    - What is the optimum drying temperature? We often see "case hardening" from too high a dryer temperature which results in chips that are not optimal for milling and pressing. This is often the result of wrong sized dryer being pushed too hard to move product.
    - The engineering should determine the best flue gas particulate separation and emissions controls for the worst case species mix and worst case variations in moisture content.
- What to look for when selecting the correct pelletmills.
- Where to place the cooler(s) and have the correct negative air flow.
- What type of conveyance systems work best at each stage of the process?
- How to design optimal surge bins or silos between process centers to eliminate just-in-time operations.
- How to design an optimal surge silo prior to the pelleting island. After the dryer and dry hammermilling before the pelletmill island, there is an optimal holding time for the hot feedstock that allows moisture content homogenization and some fiber conditioning prior to the pelletmill. This promotes steady state and more efficient pellet press operation and therefore more consistent pellet quality and reduced press maintenance.
- How to insure personnel safety, safe plant operation, and fire and explosion protection including how to manage a controlled emergency shut down.
- Process control equipment and automation to make the plant as operator friendly and robust as possible.

All of the above decisions (and some others not listed) are critical to maintain efficient plant performance levels, uninterrupted uptime, and consistent wood pellet production at or above quality specifications.

All project developers have learned or will learn that building the wood pellet plant is the easy part. Commissioning a wood pellet plant and bringing it to it's expected capacity and to its expected pellet quality is like the "valley of death" that may startups experience. Cash flows the wrong way while in the valley of death. Some never emerge while others see the IRR degrade as the investments needed to get it right that are made after the fact mount.

Getting it right early in the development cycle can shorten the commissioning phase and get the cash flowing in the right direction faster.

The importance of operations management and a properly trained operations team

A "state of the art" plant built correctly, only operates and performs as well as the people that operate it. A well trained and disciplined operations team is essential. An operations oriented company that recognizes how important the "30% art" part is and maintains a focus on their people-first culture to support a high level of motivation and professionalism is more likely to succeed and provide the project with the IRR that is expected.

Training prior to startup and during commissioning by seasoned operations experts is critical. Even if all of the criteria for fiber supply and plant design are on the mark, the operation is much more likely to emerge from the valley of death sooner if the operators are not learning from their own mistakes but are benefiting from the wisdom of those that have already seen all of the wrong ways to make wood pellets efficiently.

The importance of logistics.

We mention logistics because we have seen several projects fail to properly estimate the costs of moving the wood pellets from the mill to the market. Understanding the variables that impact logistics costs are critical to properly assessing the potential degradation in project IRR from some the following:

- Unexpected costs from demurrage (truck, rail, or ships/barges).
- Unexpected costs from dead freight or non-performance penalties.
- Currency risks.
- Payment terms and timing and the impact on working capital needs.
- Unexpected costs from sampling and record keeping while loading cargo.

- There are many other potential logistics pitfalls that a trucking, rail, barging, and/or shipping, company with experience in wood pellet bulk cargo should advise on early in the project cycle.

Summary

Bad surprises are never good in any business.

In the wood pellet business, it is too easy to think that a conceptually simple process of taking low cost fiber and drying, milling and pressing wood into pellets should be a money machine. Putting aside wood pellet market dynamics, the global supply and demand for pellets, and the impact of these factors on the demand for new production capacity, at the project level, assuming there is a market for the pellets at prices that support a project, making wood pellets can produce decent margins.

But just one large or a few small bad surprises can erase those margins.

In any manufacturing business, knowing how to vet the critical components of the process, from front to back, can expose shortcomings before they get baked into the hardware or into the "software" of operating logic and operator protocols.

The best way to avoid bad surprises and losing money making pellets is to have seasoned expert advice as early in the project cycle as possible and to ask challenging questions that are informed by operational experience.