Process times and process yields improve for mills that have fully converted to Venturi Steam Traps. The main focus of this paper is to discuss a number of factors that can impact process time and process yield in saw mills that use steam in the production of wood products. Process time improvements can range from 1% to more than 25%. Typical improvements range between 5% and 15%.

How do Venturi Steam Traps improve Process Time and Process Yield in Wood Products manufacturing?

The orifices of the Venturi Steam Traps are optimally sized:

With Venturi Steam Traps, the orifice size of the trap is optimized for achieving maximum heat transfer to the product while handling the typical large condensate loads and providing a safety margin against condensate floods. This sizing is based on the parameters of the steam system and the process equipment as well as experience gained by the Blue Energy Technologies application engineers.

Continuous flow:

Rather than the open/close action performed by mechanical steam traps, Venturi Steam Traps operate in a continuous manner. During the process heating cycle, steam is being condensed the entire time. As the condensate forms in the coils, the Venturi Steam Traps are operating continually and providing a path to the condensate return system or to drain.

Better heat transfer:

Continuous operation optimizes the surface area of the coil available for heat transfer from the process steam. In the case of the mechanical open/close trap, flow is discontinuous and has a start-stop action. In these conventional traps, whenever the trap opens, flow has to be reaccelerated. When the trap is closed, and since the condensate is 10 to 15 F lower in temperature than the condensing temperature, the heat transfer surface area of the pipe is decreased due to condensate being held in the coils. More heat transfer is accomplished by using the Venturi Steam Trap due to higher temperatures at the back end of the coil.

To obtain fully optimized heat transfer, experienced Venturi trap distributors also suggest the use of Venturi Steam Traps in the distribution system for moving dry saturated steam to the coils in the processing equipment. Dry steam improves the heat transfer in the distribution system since there is less insulating action on walls of the coil. Moreover, the continuous flow of condensate with Venturi Steam Traps will stabilize the speed of steam and condensate flow in the system.

Eliminating Short-Circuiting

Many wood processing equipment manufacturers use gang trapping for the heating coils as a trade-off to reduce the cost of the equipment to the mill. Gang trapping assumes that the pressures and product in the equipment are essentially equal and that condensate production...
PROCESS TIME AND YIELD IMPROVEMENTS WITH VENTURI STEAM TRAPS IN DRY KILNS WITH STEAM

is equal in all platens. However, this trade-off can significantly impact the performance of the steam in the equipment if “short-circuiting” is occurring. Even small differences in loads and pressure at the outlet of individual coils can affect the process yield of the equipment; attempts to compensate for the yield variations will undoubtedly impact the process throughput. Even in the case of only small difference of loads on both sides of the coil, the difference in pressure can result in backflow towards the lowest pressure coil, which will degrade the heat transfer rate. Flooding of coils will seriously damage the equipment and shorten the useful lifetime of the machine.

The recommended method for condensate removal on a multi-platen press is to install one trap on each platen to avoid “short-circuiting.” Removing the condensate as fast as possible results in greater heat transfer, improved process yields and reduced process cycle times. With Venturi Steam Traps, you remove the failure rate problem associated with mechanical traps and take advantage of the improved heat transfer in your process.

**Faster Start-up times:**

Kilns can achieve faster start-up times by using Venturi Steam traps on each coil/platen. “Short-circuiting” will be avoided and the heat transfer rates in the individual platens and coils will be dramatically improved.

**More consistent drying:**

Once all of the coils in a kiln are converted to use Venturi Steam Traps, the kiln’s performance is more consistent throughout the machine. Process yield will be improved because there are fewer hot and cold spots, resulting in a tighter bell curve.

**Tighter process bell curve offers opportunities for faster cycle times:**

Since there is less variation in the process, the kiln manager will not be concerned with the issue of wet/uncured product. He will be able to reduce the overall process time and further tighten the overall process cycle times.

Contributing and constraining factors on whether or not a saw mill can achieve faster cycle times with Venturi Steam Traps and the resulting tighter bell curve.

**Some sawmills can take advantage of the improved drying bell curve more than others:**

In order to achieve improved process cycle times, certain conditions must to be met:

- The wood used in the process must be compatible with faster drying cycles
- The mill must be able to sort wood to take advantage of the faster drying times
- The mill must be able to measure and verify the improvements in the process output and be able to adjust the manufacturing process parameters accordingly
- The mill must have the financial backing to convert older kilns from ganged coils to individual Venturi Steam Traps to avoid “short-circuiting”

Even in mills that do not achieve substantial improvements in process cycle time, converting to Venturi Steam Traps will yield the benefits from better drying uniformity, improved steam system efficiency.
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Even in mills that do not achieve substantial improvements in process cycle time, converting to Venturi Steam Traps will yield the benefits from better drying uniformity, improved steam system efficiency throughout the plant, and the avoidance of downtime due to steam trap repairs and replacements.

**Wood processing plants that have the largest constraints to being able to improve process times often have the following conditions:**

- The wood species used in the plant must be dried very slowly to avoid damage
- Final Moisture Content has to be exceptionally low
- The mill is supply constrained and cannot sort product to be processed by species, similar process parameters, or other characteristics
- The mill may have other issues with the overall steam system that prevent plant management from taking advantage of better process cycle times at the individual pieces of drying equipment

   For instance, in hardwood mills, the product must be dried slowly; certain species will have cell damage if dried too quickly (i.e. Ponderosa Pine dried using 8% MC), blending air dried wood with green; or by mixing batches of wild wood together with miscellaneous wood.

**Case hardening** — If the wood is dried too quickly, the moisture in the outer areas is reduced and heat transfer to the inner areas of the piece is hindered. Especially in hardwood, moisture control is critical to the drying process, and must be carefully controlled throughout the curing process to allow the inner and outer areas of the piece to dry at approximately the same time.

**Summary**

Sawmills that undertake the commitment to fully convert to Venturi Steam traps will receive the benefits of improved process times and process yields. Venturi Steam Traps operate in a continuous manner which results in better heat transfer throughout the steam system and in the process equipment.

Converting equipment with ganged steam traps, by installing a Venturi Steam Trap on each coil, will prevent “short circuiting” and will improve heat transfer. The resulting optimal heat transfer produces more consistent drying which shows up as a much improved process yields and process cycle times.

Various process and product factors, such as wood species, the ability to sort the incoming product and the ability to change moisture content targets must be taken into account when making the decision to convert to Venturi Steam Traps.

Even those mills which are not able to improve process cycle times significantly can still yield substantial benefits such as improved drying consistency, better overall steam system efficiency, and the elimination of downtime due to steam trap failure and maintenance.

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Blue Energy Technologies designs and manufactures **SMART Venturi Steam Traps** in several different configurations for line sizes ranging from ½ “ up to 2”.

BET has experience with wood manufacturing plants and processes and can assist your facility with achieving improved cycle times and process yields by assessing your facility and helping you install the **SMART Venturi Steam Traps**.

Contact us at (562) 888-0178 for further information or visit the Blue Energy Technologies web site at: [http://www.blueenergytechnologies.com/products/venturi-steam-traps/](http://www.blueenergytechnologies.com/products/venturi-steam-traps/)
YOUR LOCAL DEALER

E-mail: info@blueenergytechnologies.com
www.blueenergytechnologies.com

BLUE ENERGY TECHNOLOGIES
USA Division: +1 562 888 0178
EU Division: +370 685 71393
info@blueenergytechnologies.com

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