

Uponor



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Company Background

Uponor Corporation provides plumbing, radiant heating, and fire suppression solutions to both residential and commercial markets internationally through the use of extruded cross-linked polyethylene pipe (PEX). Wirsbo Company was founded in Sweden as a high-quality steel company in 1620. Uponor acquired Wirsbo in 1988. Uponor North America employs approximately 500 employees and is a major player in the PEX extrusion industry. Their products may be used commercially or residentially for plumbing, in-floor radiant heating, and fire suppression infrastructure, in NPS sizes from 1/2-in to 4-in. Uponor also offers pre-insulated piping solutions for long-distance and/or exterior-run pipe.



“Working with MnTAP was a fantastic way to gain engineering and project management experience. Learning about Lean manufacturing principles was also a huge benefit to me, since the ideas of continuous improvement and eliminating wasted time and work can be applied to any job.”

corresponding increases in energy use and operating cost resulted in no net gain of performance versus operating price. The incentive for Uponor to reduce energy, water, and other inputs is to lower the operating cost of the new process in order to widen the profit margin of their PEX pipe production.

Project Background

The overarching project goal was to optimize Uponor’s next generation cross-linked polyethylene (PEX) extrusion process in order to bring down operation costs while conserving energy and natural resources. Using lean and green tools to improve the new process that is still in test mode, I managed projects to improve the overall process. In particular, I focused on tracing out all air, nitrogen, water, and electrical inputs, quantifying the amounts needed per hour and per kg of material consumed. I also investigated energy efficiency opportunities not currently part of the line and presented options to the technology and process engineering groups for review. Since this new process is the future technology, the opportunity to provide viable system improvements to future lines is significant.

Incentives To Change

Uponor is finalizing development of a new extrusion process. The major selling point of this new system is greatly increased extrusion output. However,





from the extruder barrel to the production floor via natural convection. Safety will also be improved by protecting employees from the hot extruder barrel.

Remove Redundant Blower

Another improvement opportunity was to rearrange process steps to eliminate unneeded operations. As the extruded pipe passes through the cooling tanks, it is blown dry with an air wipe station twice in order to be measured at two separate locations. The first time is between the second and third cooling tanks, where cross-linking is measured. The second time is at the very end of the process, where the outer diameter of the pipe is measured just before coiling occurs. The recommended solution is to put both of the required-dry measurement machines at the very end of the process, removing the need for multiple air wipes and thus conserving electricity.

Solutions

Optimize Curing Process

One opportunity for optimization is to adjust the curing process to its lowest possible setting while maintaining product cross-linking specifications. The process was designed with all settings at 100% during extrusion operation. Optimization experiments revealed that all settings could be reduced to 70% while still meeting product specifications.

Switch From Nitrogen To Compressed Air

The extrusion system was designed to use nitrogen as the injected gas that prevents the hot extruded pipe from collapsing after leaving the die. Using Uponor's compressed air system, it is possible to replace nitrogen with compressed air. Compressed air generated in-house is much less expensive than purchasing 100% pure nitrogen.

Insulate Extruder Barrel

Insulating the extruder barrel is another possible improvement that would lower energy costs. An insulation blanket with an aerogel core, which possesses an extremely small conductive heat transfer coefficient, was recommended and will be custom-fitted to the extruder barrel. This will greatly reduce the costs associated with start-up and production, since much less heat will escape



| Recommendation | Reduction | Annual Savings | Status |
|--|---|----------------|-------------|
| Optimize curing process | 553,000 kWh | \$55,300 | In progress |
| Switch from nitrogen to compressed air | 86,400 ft ³ /hr N ₂ | \$1,300 | In progress |
| Insulate extruder barrel | 26,000 kWh | \$2,600 | In progress |
| Remove redundant blower | 6,500 kWh | \$600 | In progress |