

Energy Conservation Audit & Implementation of Heat-Recovery System for a Cotton Gin

The Project.

The facility in question is an international cotton gin. Commencing with the raw material of cotton picked in fields, the cotton is ginned through various processes, including being dried, separated, cleaned, and baled into cotton lint. Conversion Technology, Inc. (CTI) was commissioned jointly by the facility and governmental agencies to investigate energy conservation methods at the facility which could serve as a model for similar cotton-producing gins.

CTI's goal was to thoroughly audit all facility processes to propose improvements that would enable the gin to conserve energy through economically-feasible methods. CTI performed all of the engineering, supervised the construction of recommended improvements, and ensured the proper start-up of the system.

The Analysis.

CTI performed a comprehensive analysis of all energy consumption at the gin. This examination determined where energy inefficiencies were occurring, costing the facility unnecessary money and wasting valuable resources. The analysis found:

- The main energy consumer in the facility was the process of drying the cotton. A heat-recovering gin-waste incinerator had recently been installed in the plant, allowing the facility to produce its own energy using its own cotton wastes as fuels for the drying process. However, the incinerator system that had been put into place was prone to technical failures and inefficiencies.
- Extremely large amounts of energy were being lost through the non-insulated drying towers and pipes.
- The layout of the centrifugal fans in use in the dryer was found to be inefficient in electricity use.

The Solution.

Once the energy analysis was complete, CTI developed a plan of action that would increase the energy generated on-site and reduce the energy lost through inefficiencies. CTI designed the systems and upgrades required, and managed the project through installation and start-up. The improvements designed and implemented by CTI were:

- CTI recommended and implemented an overhaul of the incinerator to allow for the efficient conversion of facility waste into energy. These improvements included an ash removal system, additional combustion air fan, temperature feedback control system, excess waste feeding system, and augmentation of the height of the heat exchanger/stack (see Figure 1 below).
- CTI determined the exact dollar cost of the energy being lost through the non-insulated drying towers and pipes, and then determined the proper insulation needed to maximize energy efficiency.
- CTI redesigned the arrangement of the centrifugal fans in the dryer to optimize equipment layout and minimize energy loss.

CASE STUDY

The Results.

CTI's engineers dramatically improved the overall energy picture at the facility through significant changes in process efficiency at the plant.

- The thermal efficiency of the incinerator increased by 13%, leading to a significant increase in the amount of energy produced. In the end, the incinerator was able to provide 86.7% of the energy requirements of the cotton gins, all from the facility's own waste products – clearly the most available and cost-effective fuel accessible. Only a small percentage of the facility's energy continued to be supplied by conventional fuels.
- The costs of modifications to the incinerator paid for themselves in one year due to the energy savings incurred.
- All told, the facility:
 - Conserved 3,745 million Kcal/year (14.9 billion Btu/yr or 149,000 Therms/yr)
 - Saved ~\$500,000/year
 - Decreased product cost by 10.59%
 - Increased profits by 5-7%

The Final Word.

The dramatic financial and energy savings achieved at this plant demonstrate the enormous promise that energy conservation holds for all types of industries. The analysis of this project displays how process wastes contain great potential for energy recovery – and increased profits. Through this endeavor and numerous others, CTI has developed a technical methodology for performing detailed energy conservation audits for varied plants – all with the purpose of maintaining production while lowering costs and reducing environmental impacts.

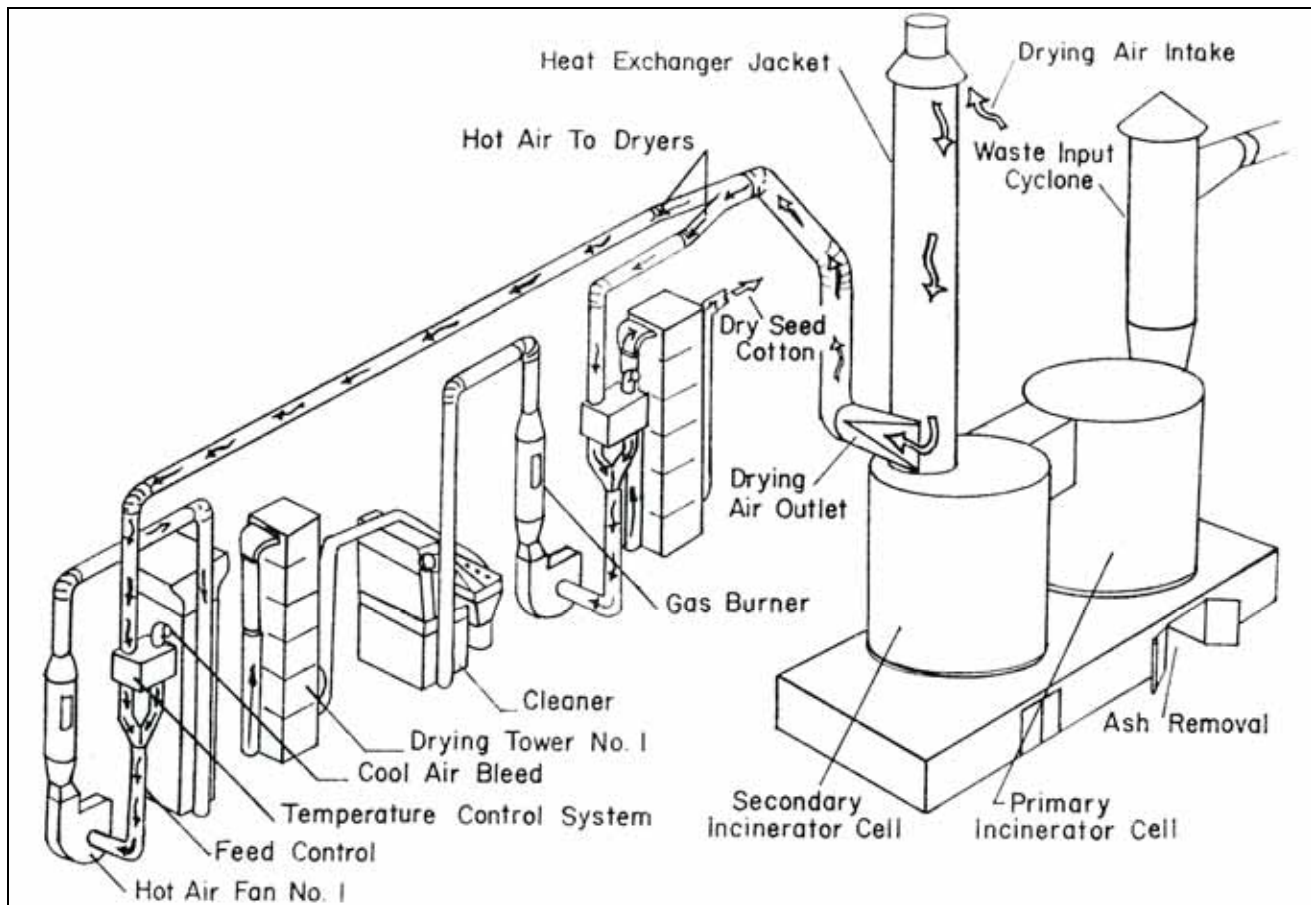


Figure 1: Heat-recovering gin-waste incinerator, allowing the facility to generate energy from its process waste.