

Energy Conservation and Systems for Manufacturing Production Increase

The Project.

The facility in question is a manufacturing plant that produces yeast, alcohol, and carbon dioxide from molasses. Conversion Technology, Inc. (CTI) conducted an energy conservation audit at the facility, in preparation for the facility's upcoming 75% increase in production. Through an examination of the plant, CTI was able to recommend and implement a number of changes to improve energy production at the facility and guide the facility's preparations for the production increase to ensure that the amplified energy needs of the plant would be adequately met. The end result for the facility was an upgraded energy generation system which significantly reduced energy costs at the plant.

The Analysis.

CTI performed a detailed analysis of the energy requirements of the plant, including projected energy demands after the production increase took place. CTI's analysis found:

- The energy demands of the facility at then-present levels of production required the annual use of 1,800 metric tons of No. 6 oil in order to produce 21,400 metric tons of steam per year.
- After the 75% increase in production, the energy demands of the plant were projected to increase to 42,000 metric tons of steam per year.
- The facility was generating bio-gas as a waste product of the manufacturing process, which contains energy-production potential.

The Solution.

Once the overall energy analysis of the facility was complete, CTI developed a plan of action to improve energy use at the facility to meet the expanded production needs. CTI's engineers explored the potential of using the bio-gas waste for energy generation, determining it to be a feasible source of producing power for the facility. CTI's design solution included:

- Modifying the facility boiler in order to improve thermal efficiency.
- Retrofitting the boiler burner to enable the combustion of both No. 6 fuel and the bio-gas waste produced in the manufacturing process.
- Employing a heat exchanger (with a thermal efficiency of 90%) to develop a continuous system, recuperating heat from the sterilized molasses and using it to preheat the raw, cool molasses entering the system (see Figure 1 below).
- Adding an economizer to recover heat from the boiler blowdown, allowing the preheating of boiler feedwater.
- Selecting a steam turbine and generator that utilizes high pressure steam to generate power, and still allows the low pressure steam from the turbine to be fully utilized by the facility (see Figure 2 below).

The Results.

CTI's design solution for the manufacturing plant led to noteworthy improvements in power generation and in energy savings at the facility:

- The addition of the steam turbine to the system created an additional 1.8 million kWh/year for the facility to use in its industrial processes.
- The addition of the heat exchanger to the molasses sterilization process saved the facility 12 tons of conventional No. 6 fuel oil each year.

CASE STUDY

- The recovery and use of bio-gas waste led to a reduced need for No. 6 fuel oil and lowered energy expenditures for the facility.
- The investment cost of the heat recovery system for the boiler blowdown was \$1.8 million. Through energy savings, this system paid for itself in 3 years.

The Final Word.

Facing the dilemma of meeting the energy needs of increased production at this manufacturing plant, CTI successfully implemented a system that both improved energy efficiency at the facility and identified additional energy sources in the form of waste streams from existing processes. The facility was able to adequately satisfy its increased energy demands at minimal additional cost. CTI specializes in identifying the potential for such improvements at industrial facilities – thoroughly evaluating the energy efficiency of processes and investigating methods of conserving energy in order to reduce costs and preserve scarce resources.

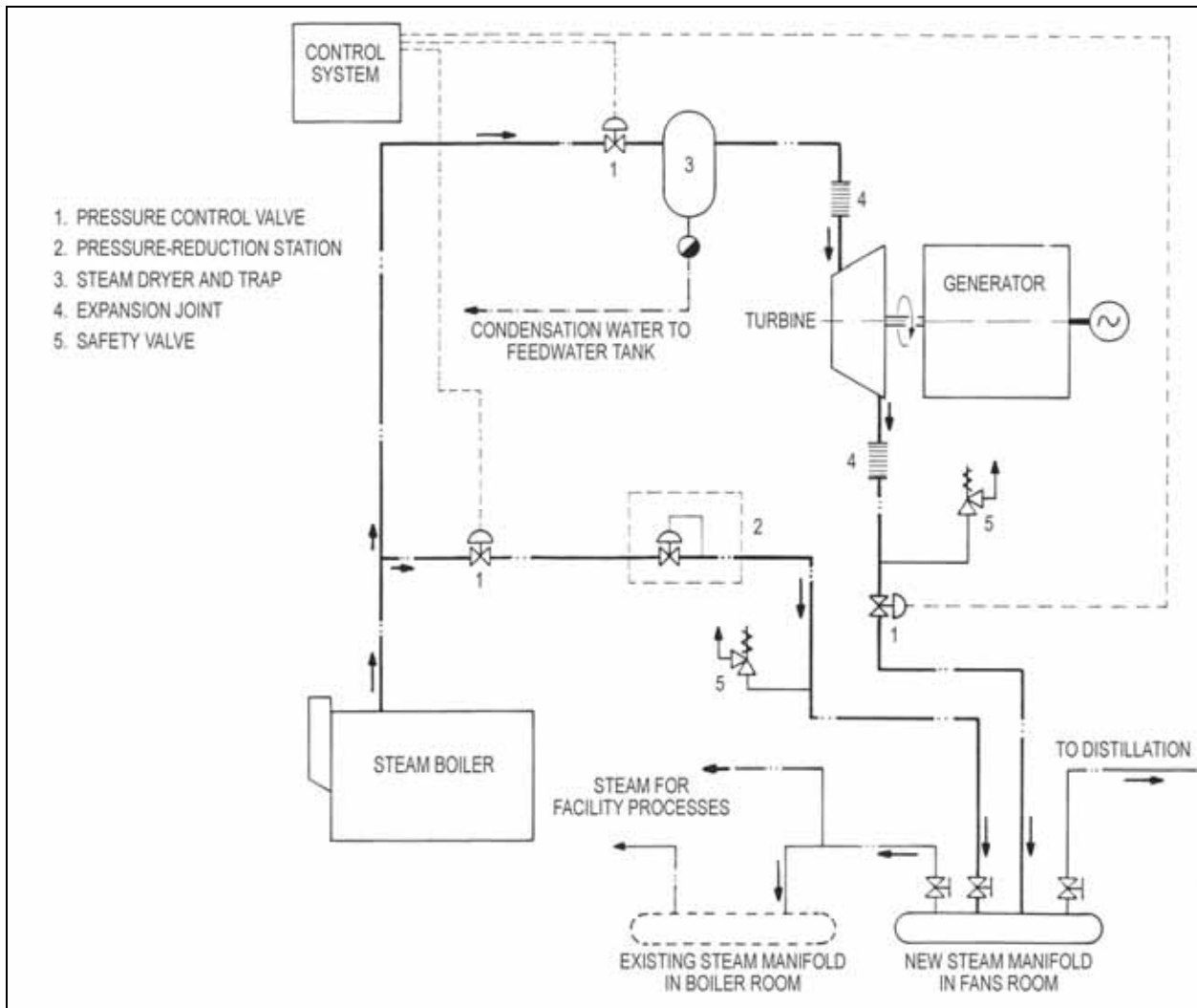


Figure 1: The addition of a turbine to the facility steam system generates power from the high-pressure steam produced in the boiler.

CASE STUDY

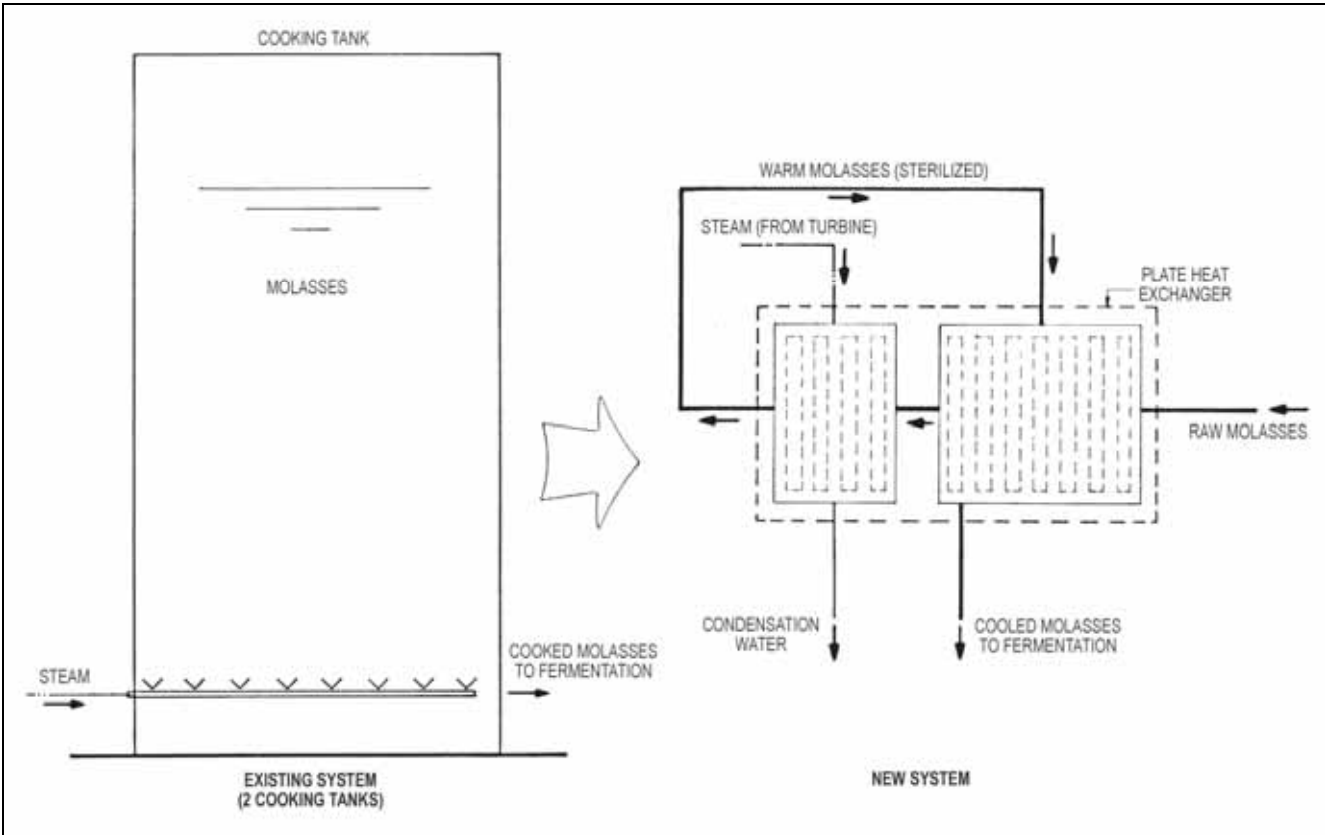


Figure 2: The redesigned molasses sterilization process at the facility creates a continuous system in which the sterilized molasses preheat the raw molasses entering the system.