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OFFICE OF INDUSTRIAL TECHNOLOGIES
ENERGY EFFICIENCY AND RENEWABLE ENERGY, U.S. DEPARTMENT OF ENERGY

Additional Steam Traps Increase Production of a Drum Oven at a Petroleum Jelly Plant

Benefits

- Increased revenue by $52,500 per year
- Doubled plant throughput

Applications

Improving steam trap maintenance practices can increase the performance of almost any steam system. Steam systems are found throughout industry and consume a significant portion of the energy used at manufacturing plants.

Summary

In 1998, additional steam traps were installed on the drum oven at a petroleum jelly production facility at an ExxonMobil plant in Apapa, Nigeria. The steam traps improved heat transfer and reduced the amount of time required to adequately heat the drum oven. As a result, the plant was able to double production of petroleum jelly, which led to a $52,500 increase in annual revenue. Total project costs were $6,000.

Plant Overview

The ExxonMobil complex in Apapa, Nigeria, is composed of three production facilities: a lube oil blending plant, a petroleum jelly plant, and an insecticide plant. Each production facility is equipped with its own basic utility equipment, as well as backup power devices.

A fire tube boiler that supplies 100 pounds per square inch gauged steam for process heating purposes is employed for the drum oven in the petroleum jelly plant. The drum oven is a concrete vault with six large doors through which the drums are loaded. The oven is heated by steam from the boiler through a network of heat exchange pipes that pass through the oven and interconnect in several locations. Condensate leaves the heat exchange coils through a single float and thermostatic steam trap.

Project Overview

A survey of the oven's operation, which was conducted on a systems level, determined that the drum oven was not functioning properly. Production was restricted due to the amount of time required to adequately heat the drum oven and maintain temperature. The amount of time required to heat the oven after it had not been in use was approximately 72 hours.

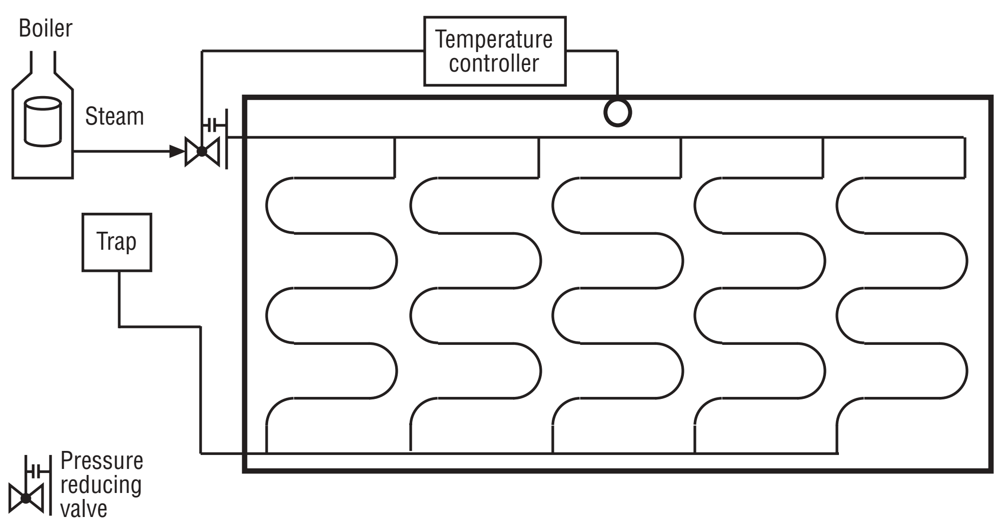
Because steam traps were not properly located in the system, condensate was forced to go from the bottom of the oven, up about 15 feet, and then down to the trap. This resulted in condensate remaining in the oven and backing up into the heat exchange area, causing poor heat transfer. For some sections of the oven, there was virtually no heat transfer. As a result, only half of the available area within the oven was adequately heated, and some sections of the oven never reached the proper temperature.

After careful analysis, it was determined that the best solution was to install additional steam traps on each of the oven sections and rearrange the heat exchange pipe network. This would allow all of the condensate to flow properly and enable the oven to function more effectively.

Project Implementation

The additional steam traps were installed within a few weeks with a separate trap on each section of the oven. The heat exchange piping was enlarged to improve condensate flow. Some of the condensate piping was also enlarged to allow the condensate to flow better.

Original Steam System Diagram



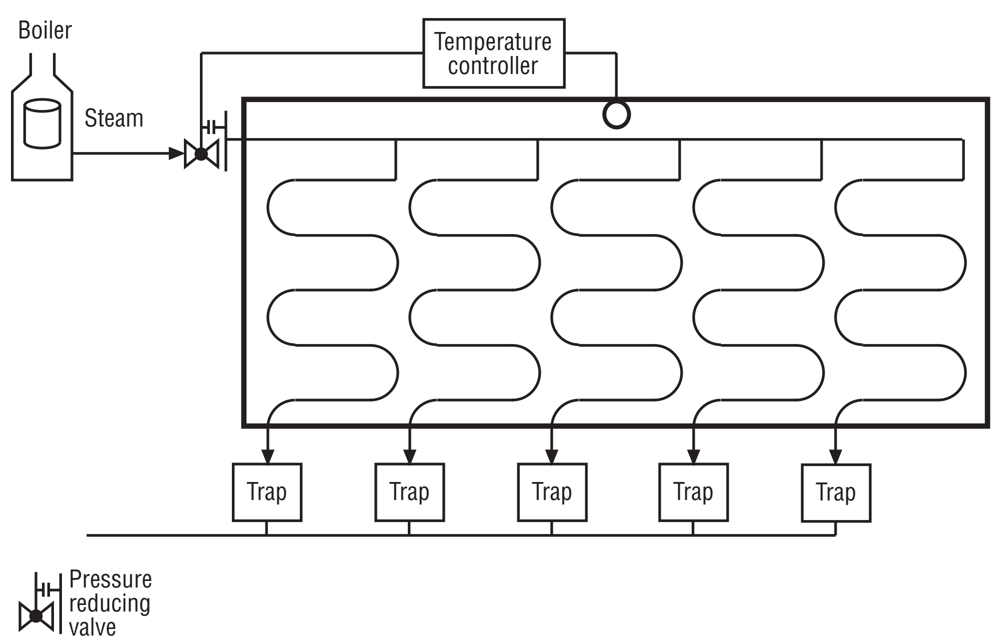
Results

The installation of additional float and thermostatic steam traps greatly benefited the petroleum jelly plant. The additional steam traps and the new configuration of the heat exchanger pipes were able to remove condensate and not waste steam. This led to quicker heating of the oven and more effective provision of heat to all parts of the oven. The production process was able to proceed more effectively and with fewer bottlenecks. The system performance was so greatly improved that production was able to double, leading to additional revenues of $52,500 from the previous year.

Lessons Learned

The performance survey, which was performed by independent auditors, allowed the personnel at the petroleum jelly plant to receive meaningful observations and recommendations about the plant's operation and the ways in which it could be improved. The recommendations were implemented and resulted in substantially better plant operation, as well as increased production and revenue.

Revised Steam System Diagram



Sometimes an apparently minor piece of equipment in the overall system can actually be quite important. In this case, a poorly designed steam trap system led to a number of problems, resulting in inefficient operation of the entire process.

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Project Partners

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