

STEAM
GENERATORS

Clayton steam generators help a college campus provide on-demand, fuel-efficient heating.

Colorado School of Mines utilizes Clayton 200 BHP low NO_x generators to help with load fluctuations and to cut energy costs.



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Advanced
Steam
Technology
that Is Safe,
Efficient
and Reliable

The Colorado School of Mines, a public research university focused on environmental science and engineering in Golden, Colorado, had been utilizing steam to heat their campus for a majority of the time, since their conception in 1874.

Yet in recent years, the school had not been using steam from their own boiler room. Instead, they were purchasing steam from the Coors Brewing Company facility down the road. The equation was simple: the Colorado School needed steam, and the Coors facility was creating excess steam. By building a series of vaults with pipe conduits connecting the Coors' plant to the campus buildings, they could divert their surplus steam to the school – allowing

the campus to relinquish their boiler room duties, and Coors to get some extra cash.

It was a symbiotic relationship, while it lasted.

Unfortunately, over the years, the pipe conduits within the vaults began to show their age, becoming worn. By April 2015, the wear was sufficient that Colorado School was faced with a decision: put in the money to repair the vault infrastructure or invest in a new boiler room.

The new boiler room was going to cost double the money it would take to renovate the vaults. But they knew that reinstating their own plant would be more economical over time. They had



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been paying Coors approximately \$13/1000 lbs for their steam, whereas the school could produce steam for \$7/1000 lbs. The return on investment would be seen in no time -- if they obtained the right boilers.

The limits of conventional boilers, and the need for supplemental support.

With Colorado's notoriously cold winters and the school's sizeable student body, it was clear that Colorado School was going to need conventional boilers to handle the 70,000 pounds per hour (pph) peak loads during the winter months. This is why Legacy Mechanical, the mechanical contractor overseeing the job, obtained two 50k pph conventional steam boilers. Together, these two water tube boilers could easily produce the constant steam load needed for the cold season.

Yet, the school's steam requirements are not always constant – they can be small or huge, depending on the day. And these conventional boilers are not able to quickly adjust to fluxes in

load demands. Even generating more heat for a single shower is difficult.

The problem is that these boilers comprise large tanks of water, all of which needs to be heated to make any amount of steam. They're similar to tea kettles, but only if the kettle

was always full. No matter the amount of tea you need, you have to heat the entire pot. This means the energy used to bring the boiler up to operating temperature will often be disproportionate to the amount of steam used – and it will take a long time.

Thankfully, Legacy Mechanical found a simple solution to help deal with the drawbacks of these conventional boilers: Clayton steam generators.

Fluctuating loads and energy savings, how Clayton Industries got involved

RMH group, the design engineering company working on the project, knew of Clayton's generators and were confident that the Clayton equipment would be able to pick up the slack from the conventional boilers. RMH, Legacy Mechanical and Clayton, led by Mark Begert, Clayton's regional manager, developed a plan.

Legacy Mechanical purchased two SEOG204-1-FGR steam generators



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Two Clayton steam generators and horizontal condensate receiver skid (in background)

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and condensate receiver (CR) feed-water skid package. The plan was to integrate a master lead lag system for the Clayton 200 BHP low NO_x steam generators into the boiler plant control master. They'd use the two water tube boilers for the base winter loads, and the Clayton generators to handle fluctuations on-demand, as well as the summer loads.

Clayton generators are not like conventional boilers, in that they are not like tea kettles. You don't have to heat the entire kettle. Instead of heating tanks full of water, these generators create steam by pumping a small amount of water through a coil tube. By using such a low quantity of water, the generators require less energy to operate, and are better able to modulate their steam output to match changing load profiles. One result? Instantaneous, energy-efficient hot showers for all.



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Additional perks: from superior safety features to environmental and user friendliness

The benefits of the SEOG204-1-FGR & CR skid steam generators don't stop at their on-demand responsiveness and energy savings. These generators are also coveted for their additional advantages, such as their:

Ensured Safety: With the use of such a small quantity of water, the once through design eliminates the possibility of a steam or water side explosion, making these boilers some of the safest on the market.

Reduced Emissions: Equipped with a Flue Gas Recirculation (FGR) system, the Clayton generators effectively reduce the NO_x levels in flue gas emissions by recycling some of the exhaust to the burner – enabling the school to meet Denver's 30 ppm requirement.

Less Water Waste: Clayton's design significantly reduces TDS blowdown, which in turn helps to reduce wasted fuel and water, cutting chemical costs.

Compact Size: The vertical design of Clayton's generators makes them about 1/3 of the size of conventional boilers, saving dollars associated with square footage.

Automatic features: The generators are easily operated with the flip of the switch or automatic start options, with minimal oversight and maintenance required.

Together, these features make for a generator with distinctive ease – from its small footprint, to its need for minimal supervision, and assured employee safety.

Beyond the mechanics: Clayton's quality customer support.

Installation went smooth, thanks in part to Clayton's service representative, who was conveniently located next door to campus. Even after Legacy Mechanical sold the equipment to Colorado School and the school's service group took over, the Clayton representative was always available to provide assistance or help troubleshoot. Yet, only minimal help was ever required, owing to an

often-overlooked detail of Clayton's services: their comprehensive instruction manuals.

As Utility Plant Chief Engineer Andrew Mudd attests, "It was a pleasure working with Clayton. One of the things that impressed me the most were Clayton's manuals, which were extremely user-friendly and allowed us to easily understand how to work the machine. Many manufacturers do not have such thorough and accessible instructions. A real perk."

The perks of Clayton's generators are numerous, as evidenced by this project. Clayton is a trusted name in the industry, known for providing the simple-to-use, safe, and energy-efficient steam generators. This is why Colorado School of Mines is already in talks about a third generator—so they can continue to deliver that reliable, on-demand heat to their faculty and student body as they expand their campus. 🏡



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