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## MEAT PROCESSING: CENTRAL HOT WATER

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## ABOUT THE COMPANY

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### **About the Company**

Creekstone Farms processes premium Black Angus Beef products for supermarkets and food service industries throughout the United States and abroad. They have very high standards with an emphasis on product quality as their products are featured in the finest supermarkets and four-star restaurants around the world.

### **Corporate Goals at Creekstone**

Creekstone Farm programs include USDA Certification, Verifiable Black Angus genetics, USA raised cattle, Humane Animal Treatment, high quality feed, and state of the art processing, which now includes Hydroheaters to assure energy savings and water temperature.

### **Need Arises for Central Hot Water System to Supply the Entire Plant**

Creekstone Farms used a Direct Fire System to heat central hot water for their plant. This system was failing and had become a maintenance nightmare as it needed to be constantly fixed. The man-hours needed for maintenance, alone were a cash drain to the plant. Also, there were energy efficiency goals that the plant wished to address.

## Deciding on DSI

Creekstone Farms Engineers and Maintenance Supervisors were familiar with Direct Steam Injection (DSI) because a water heating unit, the EZ Heater®, was a standard part of their carcass wash system manufactured by Chad, 'The Industry Leader in Automated Washing and Pasteurizing Systems.' They liked the way the water heater controlled temperature instantly and they trusted the water to always be at the needed temperature. In fact, they'd never had maintenance issues with the EZ Heater, it simply worked as designed.

The smart engineers at Creekstone decided to look into an EZ Heater Skid for their central hot water needs. They researched their options for direct steam injection and settled on a Hydro-Thermal® skid for several reasons.

1. Hydro-Thermal had skid systems with controls and header options for peak usage periods (See figure 1). The Redundancy of the system provided peace of mind that enough hot water would always be available, even at peak usage times.
2. The patented internal parts of the Hydroheater® were unlike any other direct steam injection 3-way valve:
  - a. There are no internal springs, like some other DSI heaters, to scale up. Therefore, the Hydro-Thermal units never need to be taken offline and placed in an acid bath. Only a once-a-year maintenance schedule is recommended.
  - b. Hydro-Thermal units more precisely meter steam and therefore, are the best at providing water at the set-point temperature. That precise temperature is of great concern for meat processors because sanitation and food safety are their main goal.

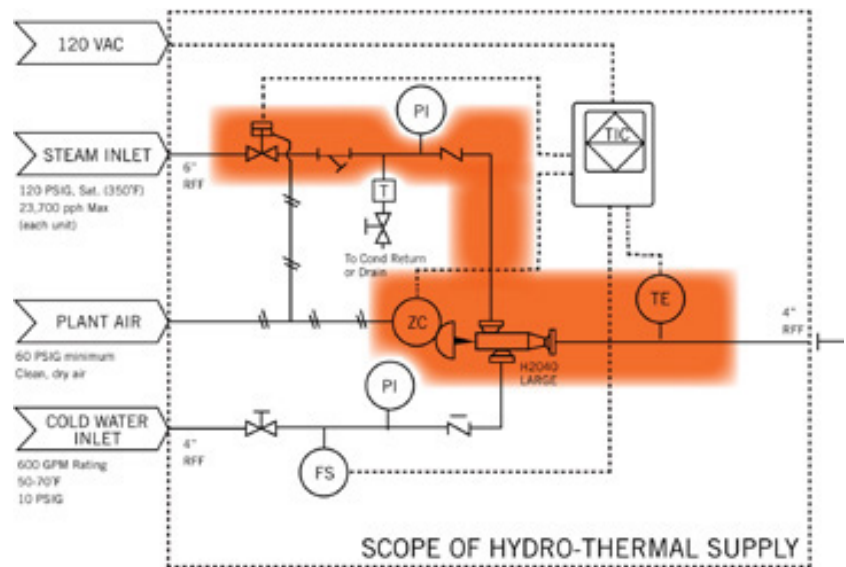


Figure 1: Scope of Hydro-Thermal Supply

- c. The Hydro-Thermal skid came with all the controls and headers needed to plug and plumb it in and begin producing hot water.
  - d. Hydro-Thermal offered complete engineering services pre- and post-delivery. They helped Creekstone choose the best unit, conducted a pre-site visit to be sure the piping was set up as recommended, and they sent a field technician to properly start-up the system. There was no guess work as to how the unit should be properly installed.
3. While proper process, HAACP procedures and food safety is the biggest concern, the low energy consumption of DSI was a great bonus to Creekstone Farms. Because this was a different technology than the current direct fire unit currently used or typical heat exchangers that are often used for this type of water heating application, the specifying engineer was practically making a career decision by specifying Direct Steam Injection. It needed to work as designed and promised.

# THE PROJECT

Most U.S. meat processing plants need central hot water at a constant 140°F [60°C] to comply with USDA requirements. There are additional point-of-use requirements for temperature, depending on process. These are usually called critical control points (CCP's) and are outlined in a processors HACCP plan. Water temperature is needed at 180°F [82°C], or above. If the water does not reach 180°F at a critical point, the processes can be shut down until the correct temperature can be reached or there is enough hot water to continue.

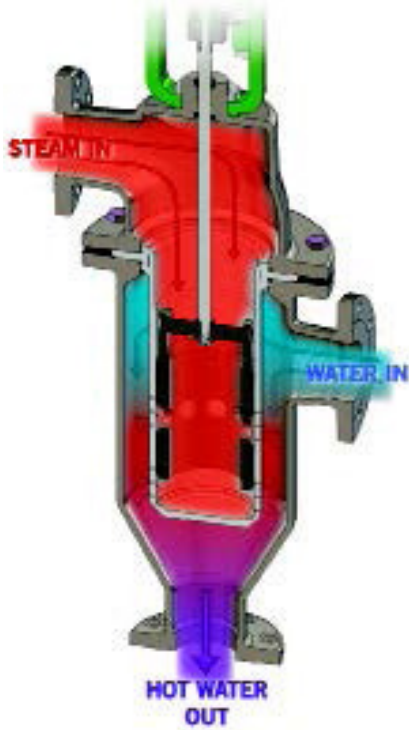


Figure 3:  
Fluid flow through a EZ Heater

## Custom Designed Water Heating System

Creekstone Farms required a central hot water system to provide the entire plant with water at a set-point of 165°F [72°C] at varying demand rates. Sometimes the need could be as much as 600 GPM [2.27 m<sup>3</sup>/hour].

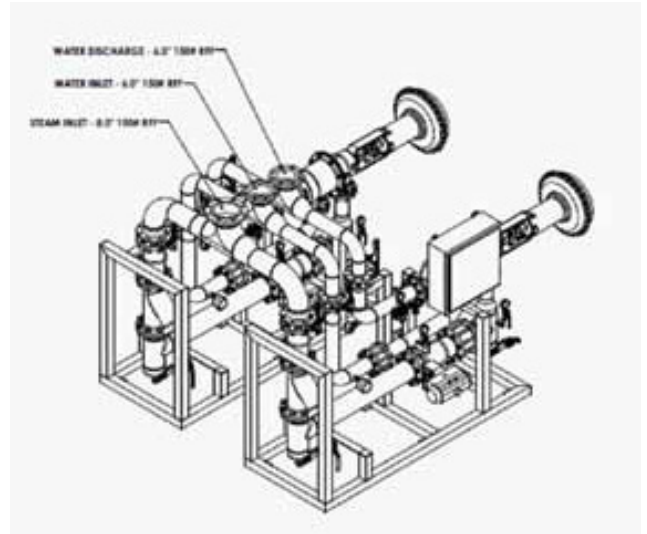


Figure 2:  
View of Redundant Hot Water Skid

PROCESS CONDITIONS	
Flow Rate	100-600 US GPM $\pm$ 5%
Input Temp	50-70°F $\pm$ 5%
Outlet Temp	165°F $\pm$ 5%
Steam Pressure	120 PSIG $\pm$ 5% at heater

A system was custom designed for Creekstone Farms using 316 Stainless Steel and sized to their exact process conditions which are shown above. Since central hot water is a mission critical process, Hydro-Thermal offered Creekstone Farms, Engineering design services, pre-startup site inspection, startup assistance, training for their staff and maintenance agreements to keep the system running at peak performance.

## How DSI Worked in This Application

In response to Creekstone Farms stated need to improve process efficiency, Hydro-Thermal recommended a system precisely engineered to heat 100-600 US gallons of water per minute from 50°F-70°F to 165°F using 120 psig steam. (See figure 2) Hydro-Thermal's patented fluid heating technology has a proven

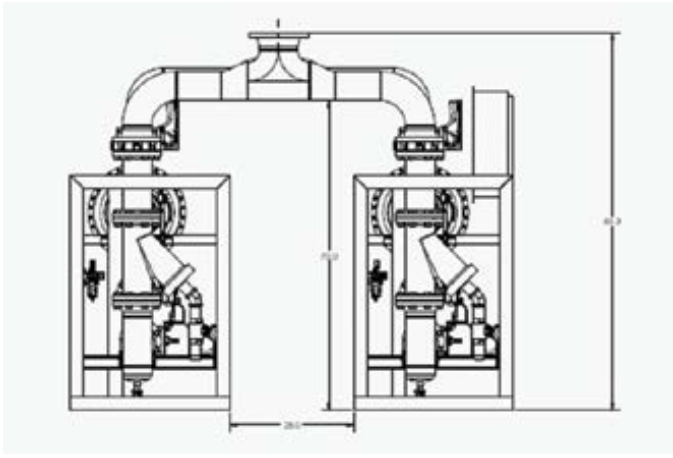


Figure 4:  
Back View of an EZ Skid

history of lowering costs due to reduced energy consumption and an uncomplicated maintenance schedule.

Hydro-Thermal heaters are sophisticated direct steam injection (DSI) devices. DSI devices heat water or slurries by mixing steam directly with the process fluid. This provides for instantaneous, 100% heat transfer efficiency and very precise temperature control. This rapid heat transfer also causes the steam to condense and be dispersed into the fluid very quickly; eliminating the hammer and vibration associated with less sophisticated DSI heaters. Unlike indirect methods of heating, Hydro-Thermal solutions do not have a heat transfer barrier (see figure 3) such as the wall separating the steam and the fluid in a heat exchanger. Heat transfer barriers have a specific rate of heat conduction which can reduce the response time of the device to process changes. Since Hydro-Thermal's DSI technology has no such barrier, it responds near-instantaneously to signals from the temperature controller. In effect, there is very little lag time with Hydro-Thermal heating systems. The fluid temperature will change immediately with changes in steam position. As a result, the system can be regulated as fast and precisely as the control loop is capable of measuring and responding to changes in temperature. When incorporating Hydro-Thermal heaters into a control loop, care should be taken to measure temperature quickly and accurately, eliminating as much "deadband" as possible.

## The Results

The Skid was ordered, designed and delivered in less than 6 weeks to Creekstone Farms (see figure 4). The specifying engineer had ordered a preinstall visit from Hydro-Thermal to be sure piping and other configuration was correct. On the day of start-up a Hydro-Thermal technician guided the process and in less than a ½ day, the skid was plumbed in and started up. Instantly, hot water flowed at the setpoint temperature.

The new EZ Heater® recorded immediate energy efficiencies and maintenance savings for the company. The direct steam system now measured a whopping 700mBTU savings per day!

In addition, the new EZ Heater skid requires less maintenance and the company is saving \$12,000 per year in parts. Electrical savings are also expected as the new system eliminated seven (7) electrical motors required by the old direct fire system.



Figure 5:  
Complete, un-installed EZ Skid



## The Conclusion

High standards often result in high costs, but not with a Hydro-Thermal direct steam injection system. The Hydroheater® skid delivered hot water at exactly the needed temperature with energy efficiency and very low maintenance. The affordable skid will produce hot water at the needed

temperature avoiding USDA noncompliance shut downs. It will operate continuously with little or no maintenance. The energy efficiency of direct steam injection will help the company meet cost reduction and sustainability goals.



Figure 6: Installed at Creekstone Farms

## About Hydro-Thermal Corporation

Hydro-Thermal Corporation manufactures a range of Direct Steam Injection heaters for a variety of heating applications. Over the years, Hydro-Thermal Corporation has adapted its technology and expertise to serve customers in the meat and poultry, primary metals, pulp and paper, chemical, textile, pharmaceutical, food and beverage, biotech, grain milling, Biofuels, petrochemical and water treatment industries. Hydro-Thermal offers engineered solution for every liquid heating application. The company holds patents on several internal modulation DSI heaters including the self-cleaning and straight through design heaters used for thick slurries.