

# Increasing efficiency and sustainability with direct steam injection for meat slurry heating line

## BACKGROUND

Pet food processors are not strangers to the use of direct steam injection for water heating and sanitation, but it is a fairly new technology to be considered for meat slurry heating. Many know Hydro-Thermal's EZ Heater for its efficiency with instantaneous hot water, eliminating the risk of running out of hot water and reaching a precise and accurate temperature for sanitation purposes, but what about direct steam injection for slurry heating?

It is obvious that meat slurry heating is vastly different from water heating due to its viscous properties, and common equipment used, such as jacketed tanks, tend to unevenly heat the meat slurry and produce hot spots, or burn-on. To retain product quality, precise and uniform heating is essential to avoid clogging and burn-on, which makes the 3A-certified Sanitary Hydroheater the perfect heating solution.

Also introduced in 2012, Hydro-Thermal released a hygienically designed product line ideal for extra thick and chunky slurries (viscosities up to 20,000cps Newtonian and 200,000cps Non-Newtonian). The Sanitary Solaris provides the instantaneous, uniform and gentle heating needed for maintaining product integrity with its use of Mach trim steam injection technology and straight-through flow design.

By replacing the use of jacketed kettles and mixers, the Sanitary Hydroheater (also projected for the Sanitary Solaris) can save upward of US\$20,000/yr in energy and maintenance savings for meat slurry cooking. The following calculations were compiled from a proprietary end user in the pet food industry utilizing the Sanitary Hydroheater.

## KEY POINTS

### How does the Sanitary Hydroheater work?

- Meat slurry flows from the inlet to a precise gap determined by the specific properties
- Steam flows at sonic velocity to reduce the risk of plugging and increase ideal mixing
- Meat slurry and steam combine nearly instantaneously inside the specifically sized combining tube for uniform heating, maximum mixing and to eliminate hammer and vibration (Figure 1)

### Why is the Sanitary Hydroheater more efficient and sustainable?

- 100% heat transfer efficiency
- Patented self-cleaning technology
- Exact and precise temperature control to within  $\pm 1/2^\circ\text{F}$  ( $1/4^\circ\text{C}$ )
- Easy installation and less maintenance
- High solids capability with 3A certification
- Little to no footprint and replaces existing equipment

### Why use the Sanitary Solaris for thick, chunky meat slurry?

- Straight-through design (low shear)
- Maintains product integrity
- Very low pressure drop
- Up to 10:1 slurry turndown
- Superior CIP capability

## ENERGY SAVINGS STUDY

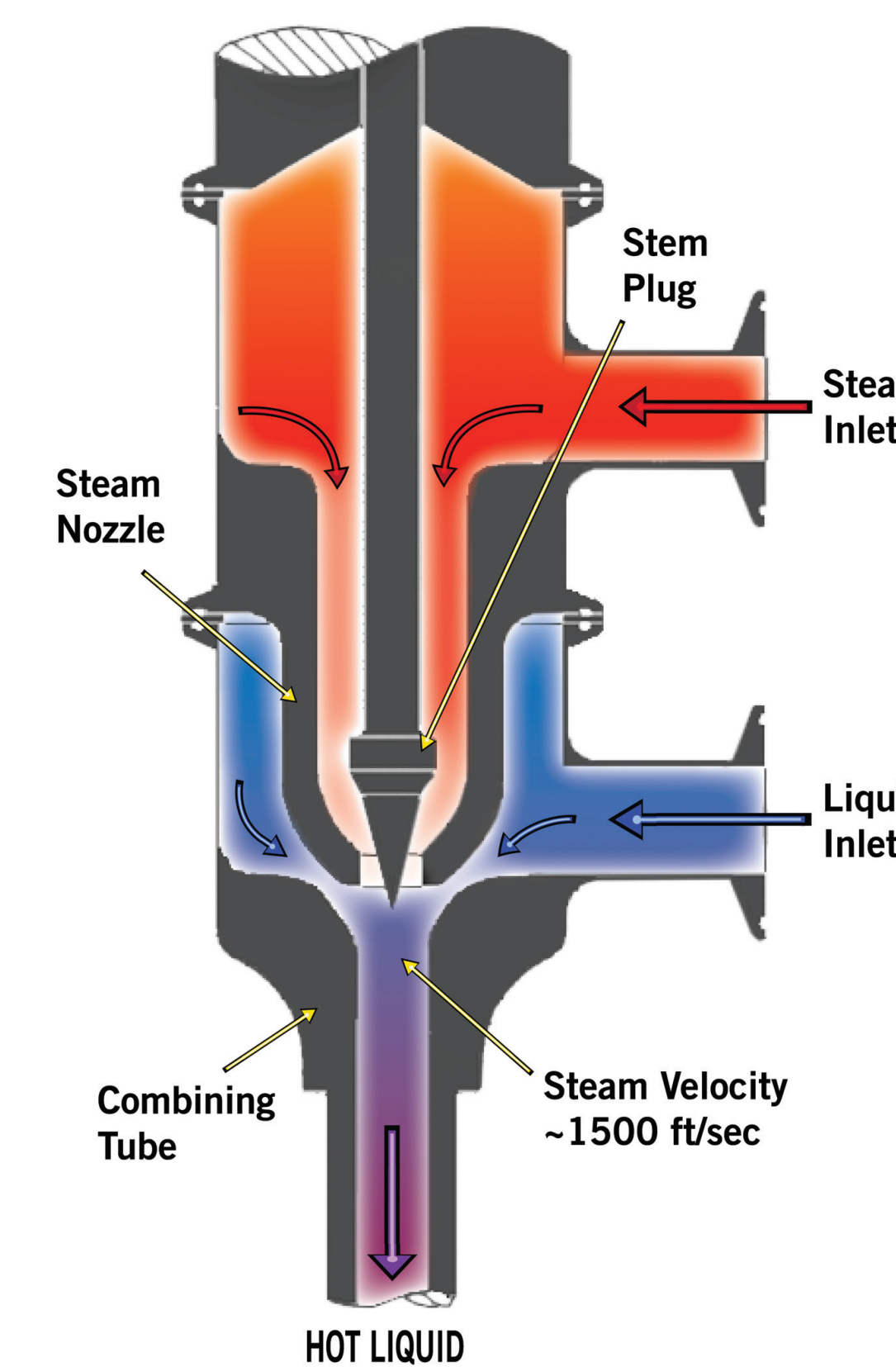
This end user wanted to replace a jacketed kettle and a live steam cooker with direct steam injection heaters to heat, mix and cook meat slurry for dog food. The design conditions consisted of:

- Slurry properties with 19% solids
- Flow rate of 109gpm (25 m<sup>3</sup>/hr)
- Inlet temperature of 95°F (35°C)

### Figure 1. How the Sanitary Hydroheater works

Meat slurry and steam combine nearly instantaneously inside the specifically sized combining tube of the Sanitary Hydroheater for uniform heating, maximum mixing and to eliminate hammer and vibration.

By replacing the use of jacketed kettles and mixers, the Sanitary Hydroheater (also projected for the Sanitary Solaris) can save upward of US\$20,000/yr in energy and maintenance savings for meat slurry cooking.



### Table 1. Results of energy savings study

An energy audit was conducted to estimate the annual savings this end user would reap by replacing its existing equipment.

#### Replacing jacketed kettles and live steam cooker with direct steam injection

Initial steam flow used with jacketed kettles and live steam	6,493 pph steam
Steam flow required with Hydro-Thermal direct steam injection	4,545 pph steam
Estimated annual savings (average 6.04 hrs/day @ US\$4.00/1,000#)	US\$17,177/year

#### Eliminating three 3-HP mixers

3 HP x 0.7456 kW/HP	2.23 kW
2.23 kWh x 6,000hrs/year	13,420 kWh/year
13,420 kWh/year x US\$0.08/kWh	US\$1,073/year
US\$1,073/year times three mixers	US\$3,221/year
Estimated annual savings	US\$3,221/year

#### Removing one 10-HP transfer pump

10 HP x 0.7456 kW/HP	7.456 kW
7.456 kW x 2,500hrs/year	18,640 kWh/year
18,640 kWh/year x US\$0.08/kWh	US\$1,490/year
Estimated annual savings	US\$1,490/year

- Outlet temperature of 195°F (90°C)
- Steam pressure of 100 psig (7 barg)

An energy audit was conducted to estimate the annual savings this end user would benefit from by replacing its existing equipment. Three 500-gallon jacketed kettles with steam spargers along with three 3-HP mixers and one 10-HP transfer pump were removed from the process and

replaced by one A210 Sanitary Hydroheater that heated the slurry while being pumped to the next step in production. In addition to removing unnecessary mixers and pumps that added electrical costs, the intense steam mixing of the Sanitary Hydroheater allowed for 100% energy transfer to the slurry without steam lost in a tank bubbling up to atmosphere.

## SUMMARY

- Savings of US\$17,177/year by replacing the jacketed kettles and live steam cooker with the Sanitary Hydroheater
- Savings of US\$3,221/year by eliminating three 3-HP mixers
- Savings of US\$1,490/year by removing 10-HP transfer pump

Additional "soft dollar" cost savings:

- Maintenance: little maintenance compared to heat exchangers/other steam injectors
- Tank cleaning: saving two man-hours/week
- Process cycle time improvement
- Plant floor space savings
- Possible energy credits for energy saving equipment

Total estimated savings (not including additional soft dollar cost savings): US\$21,888/year (Table 1)



### About Hydro-Thermal Corp.

The leader in direct steam injection for over 75 years, Hydro-Thermal has a strong legacy in the pet food industry derived from our focus in meat processing. The knowledge has been successfully leveraged into energy and sustainability. Let Hydro-Thermal apply our expertise to your processes.

