FINAL REPORT

The Effectiveness Of The Saturno Super Saturated Steam Appliance For Sanitization Of Common Food Processing Surfaces

Project # PPT 149

REA North America Saturated Steam Equipment
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Executive Summary

- The performance of the Saturno Super saturated steam appliance was assessed by measuring bacterial loads before and after cleaning, and after sanitizing contaminated work surfaces commonly used in food processing.

- A concrete floor, a stainless steel cart, a plastic pallet, and a Teflon conveyor belt were treated with ground beef inoculated with surrogate, non-pathogenic organisms representative of pathogenic strains/species of *E. coli*, *Listeria and Pseudomonas* at artificially high (10^5-10^6 CFU/100 cm^2), "worst-case" levels.

- For this study, only the steam, hot water and vacuum generated by the Saturno Super were used – i.e. no detergents or disinfectants were utilized.

- An intensive steam + water cleaning cycle followed by a saturated steam or steam + vacuum sanitizing treatment resulted in counts below the limits of detection (i.e. < 1 x 10^2 CFU/100 cm^2) or significantly reduced (3-4 log reduction) across all work surfaces.

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Objective

To evaluate the effectiveness of the Saturno Super saturated steam appliance in sanitizing common food processing surfaces.

Methods

The Guelph Food Technology Centre (GFTC) in collaboration with the Canadian Research Institute Of Food Safety (CRIFS) conducted evaluation of the Saturno Super. GFTC prepared, cleaned, and treated all work surfaces. CRIFS prepared all test materials, designed and carried out sampling protocols, enumerated results, and assisted in interpretation of findings.

Target Organisms

For this study, *Escherichia coli*, *Listeria innocua* and *Pseudomonas fluorescens* were selected as the target organisms. These non-pathogenic organisms are routinely used as surrogates to pathogenic strains/species most commonly implicated in food borne illnesses.

Inoculation of Test Material

Ground beef was inoculated to achieve a final concentration of each test organism of approximately 1.0×10^7 CFU/g.

Preparation Of Work Surfaces

Four work surfaces commonly found in food processing plants – a concrete floor, a stainless steel cart, a plastic pallet, and a Teflon conveyor belt – were used. Evaluations were completed one work surface at a time.

Each surface was marked off with twelve 10 cm x 10 cm square outlines using a cardboard template and permanent marker.

For each work surface, a single gauze pad swab in 50 mL of phosphate/saline buffer (pH 7.4) was taken immediately beside the marked test zone to establish pre-test bacteria levels.

One gram samples of inoculated ground beef were spread evenly within each of the marked outlines using a small wallpaper roller. All samples were left at room temperature for one hour prior to sampling.

Sampling Plan:

For each work surface:

- four of the twelve test areas were randomly chosen for initial sampling; i.e. prior to cleaning and steam treatment. Each of the selected areas was swabbed using a gauze pad. The four gauze pads were collected in 50 mL of phosphate/saline buffer (pH 7.4).

- all twelve test areas were cleaned using the prescribed procedure for each work surface (see below). Four of the eight test areas not yet sampled were selected at random and swabbed as previously described.

- all twelve test areas were treated with saturated steam according to the prescribed procedure for each work surface (see below). The four test areas not yet sampled were swabbed as previously described.

Cleaning and Steam Treatment Procedures

Each work surface was:

- scraped of excess ground beef using a rubber spatula
- washed with the Saturno Super using a combination of steam + hot water until visibly clean.
- treated with the Saturno Super using saturated steam or a combination of saturated steam + vacuum

Note: No detergents or disinfectants were used during cleaning and sanitizing. Steam lances were held within ¼" of the treated surface. Steam vacuum implements were pressed on to treated work surfaces with sufficient pressure to maintain a vacuum throughout the treatment. All implements were steam sanitized prior to use on each surface.

The implements and cleaning/treatment times employed are specified as follows:

	Cleaning			Steam Treatment		
Surface	Implement	Setting	Time	Implement	Setting	Time
Floor	small lance small brush	steam + water steam + water	15 sec. 75 sec.	floor cleaner	steam + vacuum	100 sec.
Stainless Steel Cart	small lance small brush	steam + water steam + water	20 sec. 37 sec.	small handheld vacuum	steam + vacuum	396 sec.
Plastic Pallet	small lance small brush	steam + water steam + water	20 sec. 37 sec.	small brush long lance	steam + water steam only	60 sec. 326 sec.
Teflon Conveyor Belt	small lance small brush	steam + water steam + water	86 sec. 45 sec.	small lance wide handheld vacuum	steam only steam + vacuum	45 sec. 49 sec.

Microbiological Testing

All samples were plated on to M^{ac}Conkey, Oxford and CPC agar to enumerate *E. coli*, *L. innocua and P. fluorescens* respectively. Plating was done using a spiral plater. Plates were incubated at 30°C for up to 48 hours. Presumptive colonies appearing on the plates were counted.

Results

	Prior to Cleaning (CFU/100 cm^2)			Steam + Water Clean (CFU/100 cm^2)			Final Steam Treatment (CFU/100 cm^2)		
	E. coli	*Listeria innocua*	*P. fluor-escens*	*E. coli*	*Listeria innocua*	*P. fluor-escens*	*E. coli*	*Listeria innocua*	*P. fluor-escens*
Floor	$5.0x10^5$	$3.6.x10^6$	$5.0x10^5$	$1.1x10^4$	$3.3x10^4$	$2.6x10^5$	$< 1x10^2$	$< 1x10^2$	$< 1x10^2$
Stainless Steel Cart	$2.3x10^6$	$3.5x10^6$	$9.5x10^6$	$3.00x10^3$	$1.3x10^3$	$2.1x10^4$	$< 1x10^2$	$< 1x10^2$	$< 1x10^2$
Plastic Pallet	$2.6x10^6$	$1.0x10^6$	$3.5x10^6$	$4.8x10^3$	$5.0x10^3$	$6.0x10^3$	$3.8x10^2$	$3.8x10^2$	$1.6x10^3$
Teflon Conveyor Belt	$4.5x10^6$	$1.6x10^6$	$3.0x10^6$	$3.0x10^3$	$3.0x10^3$	$3.5x10^3$	$1.3x10^2$	$< 1x10^2$	$< 1x10^2$