Poster Presentation: TECcare® CONTROL Laundry System

...reducing avoidable harms

WOUNDS UK ANNUAL CONFERENCE, HARROGATE 2017

Adopting a new laundry process to improve mattress cleaning and disinfection

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Introduction

The high-performance, multi-stretch, moisture vapour permeable covers on most alternating pressure air mattresses typically require frequent cleaning or laundering to remove any soiling from the material and also to remove microbes that may be present on the fabric. Clinical literature reports that even after terminal cleaning and manual wipe downs, mattresses frequently remain contaminated with microbes. [1, 2] One way to eliminate the human error and variation in terminal cleaning of mattress covers is to put them through an appropriate laundry process.

Eliminating microbes from fabric requires either heat or chemicals. Therefore laundry is typically performed at temperatures of 75°C or over, and / or it involves exposure to chlorine releasing agents at concentrations of 1000ppm or greater. Whilst these processes help safeguard patients by ensuring any potential risk of infection / cross-contamination from these mattresses is reduced to its lowest possible level, they can result in some physical damage to the mattress covers over prolonged periods of time. Over time, the combination of frequent exposure to elevated temperatures and / or aggressive disinfectants often results in delamination of these relatively delicate, high performance fabrics. Cover delamination allows liquids and body fluids into the mattress interior which poses a significant and unacceptable risk of cross-infection to patients and staff and therefore delaminated covers typically require scrapping and replacing. Replacing damaged mattress covers is essential to safeguard patients from an infection prevention perspective, however it represents a significant, and often overlooked, cost for any mattress provider, Trust, loan store etc. which manages a fleet of dynamic, pressure area care mattresses.

Aim

This work aimed to identify an alternative method of mattress cleaning and decontamination which did not require elevated temperatures or corrosive chemicals but which could still deliver equivalent or improved mattress cover cleanliness. From a risk-management perspective a CLEAN mattress is a SAFE mattress.

Methods

A commercial laundry dealing with large quantities of high performance, multi-stretch, moisture vapour permeable mattress covers was chosen for the formal 4-week evaluation. The evaluation compared the standard laundry process (75°C) with the new TECcare® CONTROL Laundry System (see Figure 1) which runs at 35°C and combines a specialist detergent with a non-corrosive, high-level disinfectant rinse. The primary outcome for this evaluation was mattress cover cleanliness and textile disinfection. This was determined using a combination of controlled 90mm biomarker tests and pre-laundry vs. post-laundry mattress swab testing;

FIGURE 1.
TECcare CONTROL Laundry System

(i) **Microbiological swab testing** (full identification and total viable count) to quantify pre- and post-laundry bioburden on 20 mattress systems undergoing each laundry process. See Methodology 1.

(i) **Controlled 90mm biomarker testing** to determine the ability of each laundry process to eliminate a known number of *Escherichia coli; Staphylococcus aureus; Pseudomonas aeruginosa* from fabric samples. See Methodology 2.

Secondary outcomes focussed on laundry process efficiency, (i.e. wash cycle duration, water usage, energy expenditure) and cost.

Results

Compared with the standard (75°C) laundry process, the new (35°C) process using the TECcare CONTROL Laundry System offered the following benefits;

- 90% improvement in mattress cleanliness (both TVC and biomarker testing)
- 34% reduction in wash cycle duration (from 64 minutes down to 42 minutes)
- 40% reduction in water use (from 276 litres/wash down to 165 litres/wash)
- 30% reduction in product cost per wash cycle (from £1.96 down to £1.38)
- an overall process cost saving of 43% (equivalent to saving £8.40 per wash)

The new laundry system operates at a temperature 40°C lower, creates cleaner mattress covers whilst simultaneously saving 22 minutes and 111 litres of water per wash (see Table 1). Furthermore, the new process is simple to use, requires no specialist equipment or washing machine modifications and saves 30% in direct (product) costs.

As a result of these improvements the commercial laundry has adopted the new laundry system where it is now in daily use.

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Methodology 1: Mattress swab test Quantifying the microbial bioburden [total viable count (TVC)] on forty mattresses pre- and post-laundry was performed as follows;

1. Two swabs were taken from each dirty mattress using standard cotton tip swabs moistened with sterile water. These were serially diluted in 9ml Oxoid Ringers solution, plated onto Oxoid nutrient agar, incubated at 30°C for 24-48 hours and enumerated.
2. Twenty mattresses were then washed according to the standard laundry process, and twenty washed using the TECcare CONTROL Laundry System. Post-wash swabs were taken and processed as before.

Wash cycle duration, water usage and energy expenditure were measured and reported for each wash cycle (see Table 1 for results).

Methodology 2: 90mm biomarker test This test method is adapted from two American Society for Testing and Materials (ASTM) standards; ASTM E2274-09 (evaluation of laundry sanitisers and disinfectants) and ASTM E2406-09 (evaluation of laundry sanitisers and disinfectants for use in high efficiency washing operations). The test method is given below;

1. $1m^2$ pieces of 300 thread count, 100% bleached cotton fabric was used. One piece per inoculant organism, testing took place in triplicate.
2. Two 90mm inoculation areas (circles A and B) were drawn per fabric sample using a laundry marker.
3. A bacterial bioburden of log 10^6 cfu was used to inoculate each fabric sample with one of the following microbes: *Escherichia coli* (ATCC 11229); *Staphylococcus aureus* (ATCC 6538); *Pseudomonas aeruginosa* (ATCC 15442).
4. Inoculated fabric was incubated at 37°C (*E.coli and S.aureus*) or 30°C (*P.aeruginosa*) for 24 hours.
5. Nutrient agar dip slides were pressed flat over area A per fabric sample and incubated for 18-48 hours at 30°C.
6. Fabric samples were washed using either the standard or TECcare CONTROL process.
7. Area B of each post wash fabric sample was then tested using nutrient agar dip slides pressed flat over the area and incubated for 18-48 hours at 30°C.
8. All post incubation dip slides were enumerated and results summarised in Table 1.

Outcomes		Standard Laundry Process (75°C)	TECcare® CONTROL Laundry System (35°C)	% Improvement with TECcare®
90mm Biomarker testing (mean TVCs)	Pre-Laundry	Log 10^6	Log 10^6	-
	Post-Laundry	Log 10^2	<10	90%
Mattress swab testing (mean TVCs)	Pre-Laundry	10^5	10^5	-
	Post-Laundry	10^2	<10	90%
Wash cycle duration (minutes)		64	42	34%
Total water usage per wash (litres)		276	165	40%
Cost of water per wash (based on £0.05 / litre)		£13.80	£8.25	40%
Energy (electricity) expenditure per wash (£)		£3.74	£1.47	61%
Product cost per wash (£)		£1.96	£1.38	30%
TOTAL PROCESS COST (£) (Water + Electricity + Product)		**£19.50**	**£11.10**	**43%**

TABLE 1.
Comparison of the standard laundry process vs. the TECcare CONTROL Laundry System

Discussion

The laundry where this evaluation took place primarily processes specialist dynamic air mattress systems that have been used for pressure ulcer prevention / treatment. Mattresses are often returned with soiling from faeces, urine and in some cases wound-exudate and blood. To reduce the risk of infection / cross-contamination all mattresses must be thoroughly cleaned and disinfected prior to re-use.

The new laundry process proved very effective for mattress decontamination and therefore reduces the risk of infection / cross-infection posed by these medical devices. Since adoption into routine use the laundry has increased mattress throughput by approximately six loads (= sixty mattresses) per 12-hour shift whilst simultaneously reducing its carbon footprint as a direct result of employing the new, energy efficient TECcare CONTROL Laundry System.

It has been previously noted that most healthcare laundries use thermal laundering processes with high energy and water consumption for the disinfection of hospital textiles. [3] Whilst many advanced textiles can be damaged by frequent exposure to excessive heat the risk of decreasing the laundry temperature (to protect the textiles) is the increased likelihood of pathogenic microbes surviving the laundry process. [3]

The test methods and results set out in this poster clearly demonstrate that when compared with the standard laundry process, the new laundry system delivers cleaner textiles, while simultaneously reducing the wash temperature and saving time, water and energy.

Conclusion

The current economic climate forces healthcare providers to examine all aspects of service provision. Quality, productivity, outcomes, energy consumption and costs are all areas where improvements are welcome. The new laundry system meets each of these requirements and is of potential benefit to any healthcare laundry service provider.

References

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