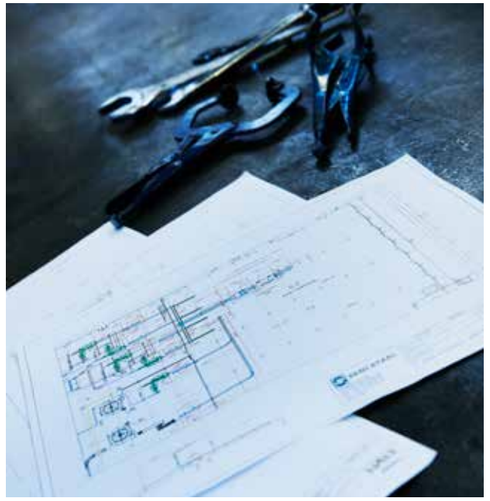
CLEANING AND AUTOMATION SOLUTIONS FOR:

BEDS AND MATTRESSES
CRATES AND RACKS
TROLLEYS AND CONTAINERS

Innovation runs in the family

The 3rd generation of Meyendorff's has taken over from the 2nd generation.



SEMI-STAAL introduction

SEMI-STAAL is an innovative family-owned company with 40 years of experience in the development, manufacture and service of washing, disinfecting and logistic solutions for the hospital and food industry.

SEMI-STAAL began in the food industry in the early 1970's developing cleaning systems for returnable packing such as crates, pallets, bins, tubs, racks etc. Since then, in partnership with some of the leading global food companies, SEMI-STAAL has developed and advanced its cleaning and conveyor solutions and now provides these services to hospitals as well.

Challenges in the hospital industry

In Denmark alone, 8-10% of all hospitalizations are subject to hospital infections. This equals approx. 400.000 extra bed days which is a considerable health and cost factor for the health sector*. SEMI-STAAL's ambition is to create innovative environmentally friendly solutions for hospitals, with the objective to help reducing re-hospitalization days by improving hygiene solutions for hospital beds, mattresses and internal transport systems.

**Source: States Serums Institute.*

40 YEARS OF EXPERIENCE

- In washing, storage and conveyor systems
- Innovative environmentally friendly washing and disinfecting systems for hospital beds and mattresses
- Partnerships with the largest Danish hospitals
- In house design, manufacturing and after sales service

The SonoSteam® decontamination technology

Force and technology
FORCE and SEMI-STAAL have entered into a collaboration whereby FORCE's SonoSteam® decontamination technology is integrated into SEMI-STAAL's disinfection solutions for hospital mattresses and beds.

The SonoSteam® division is a part of FORCE Technology. FORCE Technology targets its efforts at transforming highly specialized technological knowledge into practical and cost-effective solutions for a broad number of industries worldwide.

What is SonoSteam®?
SonoSteam® is a chemical free decontamination process designed for food and non-food surfaces. The technology applies the combination of steam and ultrasound to achieve rapid and enhanced treatment within seconds. The short and enhanced treatment is ideal for the decontamination of temperature and water delicate surfaces such as hospital mattresses and beds. Decontamination of contact surfaces such as transport boxes, conveyor belts, knives, hospital devices, and hospital mattresses, have all shown impressive results. In all cases, a total bacterial reduction can be achieved within seconds. SonoSteam treatment has been tested on different types of pathogenic bacteria including those that are relevant for the food industry (i.e. Campylobacter and Salmonella) and those that cause hospital acquired infections (i.e. pathogenic members of Enterobacteriaceae family such as E. coli).

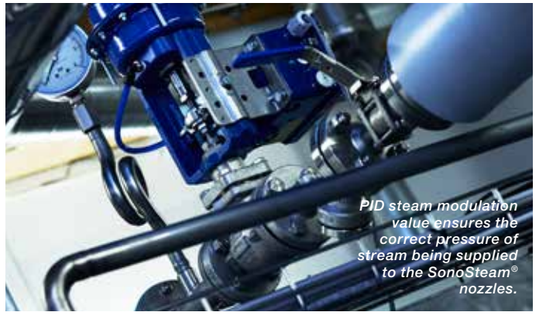
The SonoSteam® technology features only ultrasound and steam made from potable water. SonoSteam® is not controversial in any way and does not use any chemicals (e.g. disinfectants, antibiotics, additives or processing acids) that otherwise may leave residues

Basic principles behind the technology
The zone of air closest to the surface serves as a protective mantel restricting vapor and heat exchange across the surface. This layer is often referred to as the laminar sub-layer.

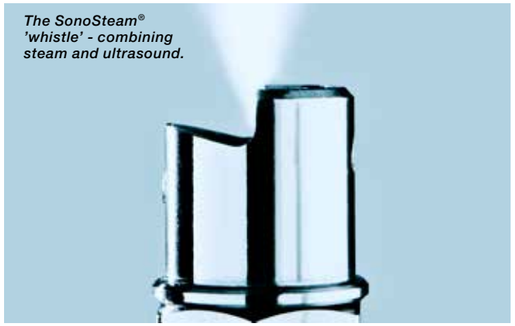
The ultrasound sets the air of the laminar zone in a state with intensified molecular oscillations, causing the steam to be continuously pumped and forced towards the very surface of the target material. This results in the destruction of the protective characteristics of the laminar sub-layer and hot steam can now enter microstructures and pits in the surface and secure fast heat transfer. The continuous pumping of new steam creates a fast substantial flux of heat to the surface structure.

Due to the small size of microorganisms, they are heated and killed so quickly that the depth of heat penetration into the surface of the product is kept at a minimum. Therefore, the treatment can be stopped before the surface is sensory affected. That is why the effective processing time in a SonoSteam® treatment is very short and for some applications even less than one second. This results in the protective decontamination of heat and water sensitive products.

The SonoSteam® nozzles are positioned close to the surface of mattress for the disinfection. Only steam and ultrasound are used in the disinfection process.



PID steam modulation value ensures the correct pressure of stream being supplied to the SonoSteam® nozzles.



The SonoSteam® 'whistle' - combining steam and ultrasound.

1. SIGNIFICANT REDUCTION OF MICROORGANISMS
Effective reduction of pathogens and multiresistent bacteria i.e. Klebsiella pneumonia, Escherichia coli, Clostridium difficile, Staphylococcous aureus and Enterococcus faecium which are common causes of hospital acquired infections. In addition, SonoSteam® is effective against yeast and fungi.

2. ONLY A FEW SECONDS OF TREATMENT
The combination of ultrasound and steam results in a heat transfer so fast that microorganisms are reduced within seconds.

3. NO USE OF CHEMICALS
SonoSteam® only features steam and ultrasound. The process does not use any chemicals or other agents that might otherwise leave residues. Therefore the technology can be applied to organic surfaces.

5. REACHES THE MICROSTRUCTURE OF THE SURFACE
Microorganisms placed in the microstructure and pits of the product surface are reached and reduced by the steam. The ultrasound causes the steam to be continuously forced into pits and pores on the surface.

A mattress going through the SonoSteam® disinfection treatment.

After the disinfection process the mattress is being dried with clean hot air.

DECONTAMINATION OF HOSPITAL MATTRESS IN SECONDS

- No chemicals: Only steam and ultrasound
- Process protects the mattress cover
- Fully automatic solution
- Up to 100 mattresses per hour
- Utility cost of approx 7¢ per mattress (1 ½ kg steam/ mattress)*
- Environmentally friendly system

**Based on utility prices in Denmark with gas heating*

The disinfection is done in an in line process where the dirty and clean sides are separated.

Mattress disinfection – Advancing hospital hygiene

Hvidovre Hospital is the second largest hospital in Denmark with 3500 employees. It has an increasing focus on reducing additional hospitalization days that arise from hospital infections and has installed an automatic cleaning and disinfection system for mattresses and beds from SEMI-STAAL.

A unique system for mattress disinfection

SEMI-STAAL has integrated the SonoSteam® treatment into its disinfection system for mattresses, which uses the combination of steam and ultrasound to achieve rapid and efficient disinfection of the surface of the mattress without causing thermal changes. PU coated fabric mattresses or similar are suitable for the SonoSteam® treatment. Mattresses are disinfected with the PU coated cover on and due to the short contact time no moisture is detected on the inside of the PU cover.

The SEMI-STAAL SonoSteam® mattress disinfection system achieves full Aerobic Count and Enterobacteriaceae reductions (below detection limit) on hospital mattresses within 25 seconds of treatment. The disinfection unit can handle up to 100 mattresses per hour. During the 'chemical free' process only steam and ultra sound are used as a disinfection agent.

The process

- Mattress is placed horizontally on the tilting station which raises the mattress to a vertical position
- Coarse particles are brushed off before the mattress enters the SonoSteam disinfection chamber
- The entire mattress is disinfected in only 25 sec.
- Drying of the mattress
- Tilting the mattress from a vertical to a horizontal position for manual removal

Some hospitals outsource the disinfection process of the mattress, which is a very costly process. Mattresses need to be sent to an outside decontamination center which not only requires transport, logistics and manual handling resources but also requires a 20-40% higher volume of mattresses as buffer volume to service the beds when mattresses leave the hospital.

Visit our home page on www.semistaal.com for a video illustration of our process.

A 'view' through the mattress disinfection system.

Fully automated cleaning, decontamination and drying of hospital beds

The fastest full automatic bed washing system on the market

SEMI-STAAL's bed washer consists of a fully automated system for washing, disinfecting and drying hospital beds. The tunnel system separates 'clean' and 'dirty' zones thereby avoiding any possibility of cross-contamination. SEMI-STAAL's bed washing systems are designed to be reliable, flexible and efficient with low operating costs and reduced environmental impact in terms of water and energy consumption.

The process

Automatic infeed system: The hospital beds are rolled onto the infeed conveyor/lifting table from where the process is automatic. From the infeed conveyor the bed is fed into the washing cabinet.

Washing: The beds are thermo/chemical treated in a closed chamber at a temperature which does not damage actuators and the electrical components. The washing is the basic phase for any washer/disinfector to remove gross contamination, saliva, tissues, adhering blood. During the washing cycles the beds are exposed to a mechanical treatment from nozzles which are tailored around the bed to ensure that all areas of the bed are treated.

Disinfection: SEMI-STAAL uses a cold disinfection technology to protect thermo sensitive components. In 2014/2015 it's provisioned to test the applicability of the SonoSteam® technology to hospital beds as well.

Final rinse: The final rinse is an important phase post disinfection and uses demineralized water or reverse osmosis water.

Drying: Following the final rise the beds are dried by using a powerful compressor system which feeds self-heated and filtered air to a set of air knives that dry the bed in a separate chamber. As the bed moves through the drying chamber the air knives follow the bed outline which ensures a perfect drying result.

Outfeed: After the drying process the bed is transported onto the discharge conveyor which dispatches the bed onto the floor level.

For additional flexibility, the SEMI-STAAL design is modularized and can be customer tailored.

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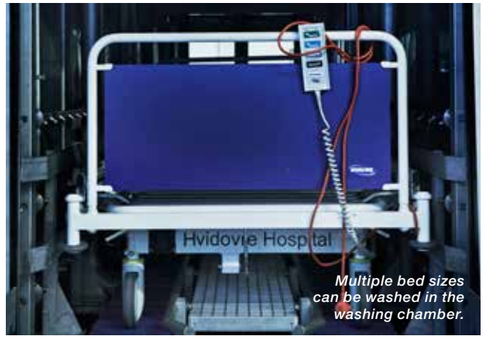
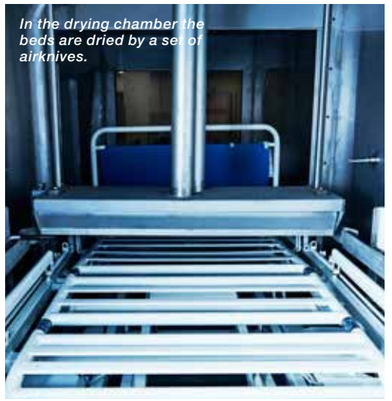


Multiple bed sizes can be washed in the washing chamber.


High capacity "run through" washing and drying system for hospital beds.


In the drying chamber the beds are dried by a set of airknives.


After the disinfection process the mattress and the bed are 'merged' again and are ready for reuse.


All access points to the machine are easily accessible for service purposes.

FULLY AUTOMATED WASHING AND DRYING SYSTEM FOR HOSPITAL BEDS

- Total utility of €0,75 - 1,00 per bed
- Capacity of up to 25 beds/ hour
- Innovative disinfection module for thermo sensitive components
- Environmentally friendly system - only 20 ltr of water is used per bed
- No operator intervention
- Separation of clean and dirty side
- Modularized system

Daily supplies and sterile products are distributed to hospitals in crates/ racks.

SEMI-STAAL's crate/ lid washer seen from the inside.

A rack in a washing machine with a rotating nozzle system.

WASHING AND DISINFECTION SYSTEM FOR CRATES AND RACKS

- Fully automated system for cleaning, disinfecting, drying, sorting and stacking crates/lids
- Fully automated washing and drying system for racks
- As the washing sections are closed recirculating systems the water and energy consumption is kept to a minimum

Sustaining hygiene in the hospital supply chain – crate and rack washing systems

Hospitals' daily and sterile consumables are often supplied in crates, which for ease of handling are transported in racks. As the transport system recirculates between external storage facilities and different departments in the hospital, it is critical that these are decontaminated for each cycle to prevent cross contamination.

SEMI-STAAL has installed a washing system which cleans and decontaminates the returnable carrier system that services all the hospitals in the Copenhagen area. 250.000 racks and 2.5 million crates are cleaned and decontaminated annually. The entire system is designed in line with the HACCP principles and consists of two separate lines: one for the racks and one for the crates/ lids.

Rack washer / The process

The rack washer is a fully automated tunnel system that cleans, disinfects and dries the objects. The racks are placed on a conveyor belt which feeds the racks into the washing chamber. The racks are washed at 60°C with an alkaline detergent in a recirculating system.

In the second zone the racks are rinsed at 76°C in a recirculating system. After the rinsing the racks are exposed to a final rinse of 85°C water to remove remaining chemicals.

The capacity of the system is 35 racks/ hour but can be increased to 100 racks/ hour by adding additional modules.

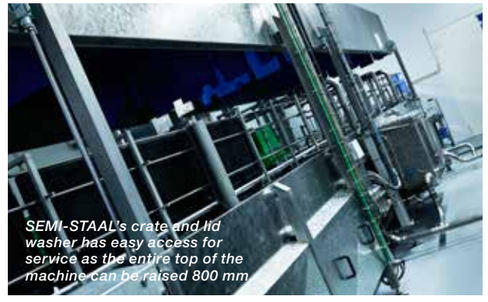
Crate washer / The process

The crate/ lid washer is a automatic tunnel system that cleans, disinfects and dries the crates. The crates and lids are placed on two infeed conveyors to the washing system. In the first zone the crates/ lids are washed at 60°C.

In the second zone the crates/lids are disinfected in a cold process where pear acetic is used in a recirculating system. After the disinfection process, the crates and lids are exposed to a final rinse of 85°C water to remove remaining chemicals before the drying process.

After the drying process the crates are sorted based by color code. One color code is for sterile goods and another is for non-sterile goods. After this process the crates and lids are ready for another distribution cycle to the hospitals.

Visit our home page on www.semistaal.com for a video illustration of our process



SEMI-STAAL's crate and lid washer has easy access for service as the entire top of the machine can be raised 800 mm

Waste handling systems for hospitals – focus on hygiene and efficiency

SEMI-STAAL has developed a complete system for the collection and handling of waste in hospitals and large institutions. The system consists of tailor-made waste disposal carts to collect and transport waste and a fully automatic emptying and washing system for the carts. The system can be laid out to handle up to 100 carts per hour.

SEMI-STAAL's washing systems and carts are designed and developed with the primary objective of meeting the hygienic demands of hospitals with environmental care.

The process

Collection: Waste is collected in local places, kitchens, canteens and packed primarily in plastic bags. These are laced up before being dumped in waste disposal carts.

Transport to the waste terminal: Full carts are hooked onto each other (up to 6 carts), which are then returned to the waste terminal through subterranean hall ways. At the terminal the carts are led onto the infeed conveyor of the washing system.

Infeed system: The length of the infeed system is adapted to the space and buffer capacity.

Emptying station: When the cart arrives to the automatic emptying station, it is fixed to the conveyor segment. The segment is lifted vertically and turned 125° whereby the waste is dumped into the waste container.

Check point: The cart is checked for any remaining waste. If none is detected it is led to a subsequent transport segment for manual inspection.

Turning: The carts are turned 180°

Pre-rinse: The cart is rinsed with hold water in a recirculating system with no running water consumption. The water is automatically filtered.

Wash: The cart is washed intensively with 60° water and detergent at 5-6 bar pressure. The nozzle system is designed according to the outline of the cart.

After rinse: The cart is rinsed with 85° water to remove all detergent.

Turning: The cart is turned 180° degrees. The cart dries itself through the accumulated steel in the cart. After turning, the cart is discharged on the floor and is ready for reuse.

After the washing process the carts are then rinsed and turned 180°

Full automatic washing system for waste containers with emptying and bail system for the waste content.

The waste containers are a hygienic and efficient way of handling the waste transport in hospitals.

After the waste content is emptied into a bailer, the containers are automatically checked if they are empty before they are forwarded to the washing system.

BWK SERIES

- Complete cleaning system for 2 and 4 wheeled bins from 60 to 1.100 ltr. capacity.
- Internal and external cleaning of contaniers with three-dimensional cleaning heads
- When wash cycle (variable) finishes the automatic rapid action door opens and the clean containers are moved out
- Fully automatic program run in a closed sealed cabin
- Low water and energy consumption due to recycling system
- Freely selectable washing programs
- Optional high pressure pump with 120 bar operating pressure
- Container rotation during cleaning process

BWA COMPACT

- Simple internal cleaning system for 2 and 4 wheeled bins from 60 to 1.100 ltr. capacity.
- The inside of the container is cleaned automatically – the outside can be cleaned with a high pressure handheld gun
- High hourly capacity with constant cleaning quality
- High pressure pump with 120 bar operating pressure
- Considerable time saving compared to manual cleaning
- Consistent cleaning quality by means of innovative technology
- Environmentally friendly through low water consumption (recirculating system)

Flexible and economic container cleaning systems

Containers are commonly used in hospitals as a waste carrier system and SEMI-STAAL has a range of cleaning solutions for these containers.

Flexible container cleaning system – BWK 1300
For cleaning of containers from 60 to 1.100 ltr. Either 2 x 60 to 360 ltr. containers or 1 x 660 to 1.100 ltr. containers per cycle. Simultaneous internal and external cleaning with three-dimensional cleaning heads and blow-off after the rinse cycle. The container rotates during cleaning process, which ensures no residue water on lid, bottom and rim areas and best cleaning result also in hard to reach areas

Economic container cleaning system – BWA COMPACT
Internal cleaning of two containers up to 360 ltr. or one container with 660 to 1.100 ltr. The container can be conveyed into the washing position with the aid of a pneumatic tilt system. Pressing the start button starts the automatic and time-controlled cleaning process.

During the automatic internal cleaning process the outside of the container can be cleaned with a high pressure handheld gun. Cleaning and disinfecting agents can be added as required.

When the wash program is complete, the containers are tilted back to floor level and the clean container can be removed.

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