

Maceration for the modern sluice room

An effective and well-planned modern sluice or dirty utility room which enables clean and effective human waste disposal and disinfection is absolutely key to ensuring excellent hygiene and infection control standards in hospitals and other healthcare facilities. Adam Roach, Engineering director at DDC Dolphin, discusses the company's approach to minimising infection risk from human waste in clinical and patient settings via the ongoing development of a range of advanced, easy-to-use, and highly effective single-use pulp macerators.

The careful and safe disposal of human waste and associated decontamination of reusable items such as bedpans and urine bottles – to minimise the risk of cross-infection from body fluids – is one of the most important operations for maintenance of both patient and healthcare worker wellbeing. By disposing of all human waste in a single area, infection can easily be contained and isolated before it can spread.

Minimising the risk of HCAs such as Methicillin-resistant *Staphylococcus aureus* (MRSA), *Clostridium difficile*, norovirus, Extended-spectrum beta-lactamase (ESBL), and *Legionella*, will directly reduce costs, due to significant decreases in nursing time and the use of antibiotics, as well as through the avoidance of a total ward shutdown when an infection cycle needs to be broken. Within a sluice/dirty utility room, effective decontamination is key to delivering good hygiene, and thus sound infection control.

What is decontamination?

Decontamination involves the removal of hazardous substances (bacteria, chemicals, radioactive material) from individuals' bodies, clothing, equipment, tools, and working environments – to the extent necessary to prevent the occurrence of adverse health and/or environmental effects.

It should also be noted, however, that the decontamination of reusable medical equipment is all about acceptable risk, and falls into different bands. For example, it would be lethal to merely wash surgical instruments in hot water and detergent, whereas sterilising a bedpan for an hour in an autoclave would be highly impractical and costly. Therefore there are various regulations which relate to decontamination through disinfection and sterilisation. The choice of equipment is down to many considerations – including

regulations, size of room, equipment to be decontaminated, and budgets, but it is an important consideration for all healthcare environments.

Available disinfection options for bedpans and utensils

Washer-disinfectors

Thermal or heat disinfection – using low temperature steam – has become a key methodology for decontaminating reusable items within sluice/dirty utility rooms. Washer-disinfectors that use thermal disinfection are now an essential

element for emptying, washing, and disinfecting, human waste containers, such as bedpans, commode pots, and urine bottles. Following the flushing of waste from the container, which is placed in a racking system within the washer-disinfecter to remove visible contents, a steam generator heats to a minimum of 80°C for at least one minute to ensure that all proteins are denatured. The heat acts to completely disinfect the container, as well as the machine chamber; it should be noted, however, that such steam disinfection is not sufficient to destroy *C. difficile* spores, and therefore alternative methods are sought.

Pulp macerators

There has been growing popularity of pulp macerators and 'single use' pulp items, which has been driven by the need for higher standards in infection control in all healthcare facilities.

Due to the increasing number of outbreaks of infection caused by high-risk microorganisms, such as *C. difficile*, and the inability of washer-disinfectors to completely eliminate the risk of cross-infection, many UK healthcare establishments are now moving away from the use of reusable human waste containers, and switching instead to single-use 'pulp' containers, with subsequent pulp maceration and disposal as an alternative, and extremely reliable, means of total infection control.

Such pulp macerators will completely destroy disposable pulp bedpan/urine bottle containers and contents, including 'macerator-friendly' wipes and bags, by pulverising items into small particles using carefully designed blade technology. Furthermore, as well as totally eliminating the contamination risk arising from reusable products, pulp macerators enable much faster cycle times, thereby enhancing work efficiencies, and reducing valuable staff time spent in the sluice/dirty utility room.



Wall-recessed pulp macerators are specifically designed to be incorporated into architects' plans during the build and design stage of a project.

How pulp macerators work

There are two common methods of maceration – one saturates the pulp in the chamber by initially filling the chamber with water before the cycle commences, while the other method sprays water into the chamber continuously throughout the cycle while the cutting blades spin at high speed, smashing into the pulp products, and breaking down the ever-decreasing pieces. This precise use of water provides the optimum maceration and flushing of the pulp through the machine into the sewer.

Modern blade technology

As mentioned previously, macerators will completely destroy both the pulp bedpan/urine bottle container and its contents, by pulverising items into small particles using carefully designed blade technology. A round disc in the base of the chamber is fitted with a carefully engineered blade, and as the disc spins at high speed, the blades smash into the pulp products and waste, breaking them down into tiny particles as each broken piece is saturated with water. This process is repeated throughout the cycle while the smaller particles are released into the drainage system.

There is a narrow gap around the disc and the wall of the upper chamber, which will only allow items to pass through to the lower chamber when they have been broken down into very tiny particles, which are easily flushed through an existing sewer system. Large particles cannot physically pass through the gap between the blade and chamber, and will not enter the drainage system. This helps to prevent blockages within the unit, or the main drainage system operating like a sieve. At the end of the cycle the machine automatically injects a disinfecting and deodorising fluid into the machine (see Fig. 1). This measured dose cleans the internal surfaces of the machine and leaves a fresh odour when the lid next opens.

So, why have pulp macerators become so popular, and what other benefits are there to investing in this form of human waste management?

The benefits of maceration
Infection control

One of the key advantages of using single-use pulp items and pulp macerators is that all the human waste, including the receptacle, are disposed of directly into the machine, and there is no further interaction with the bedpan, urinal, or other pulp receptacles. The entire waste and bedpan is macerated and flushed into the sewer system in one simple procedure. This function alone removes the risk of utensils not being

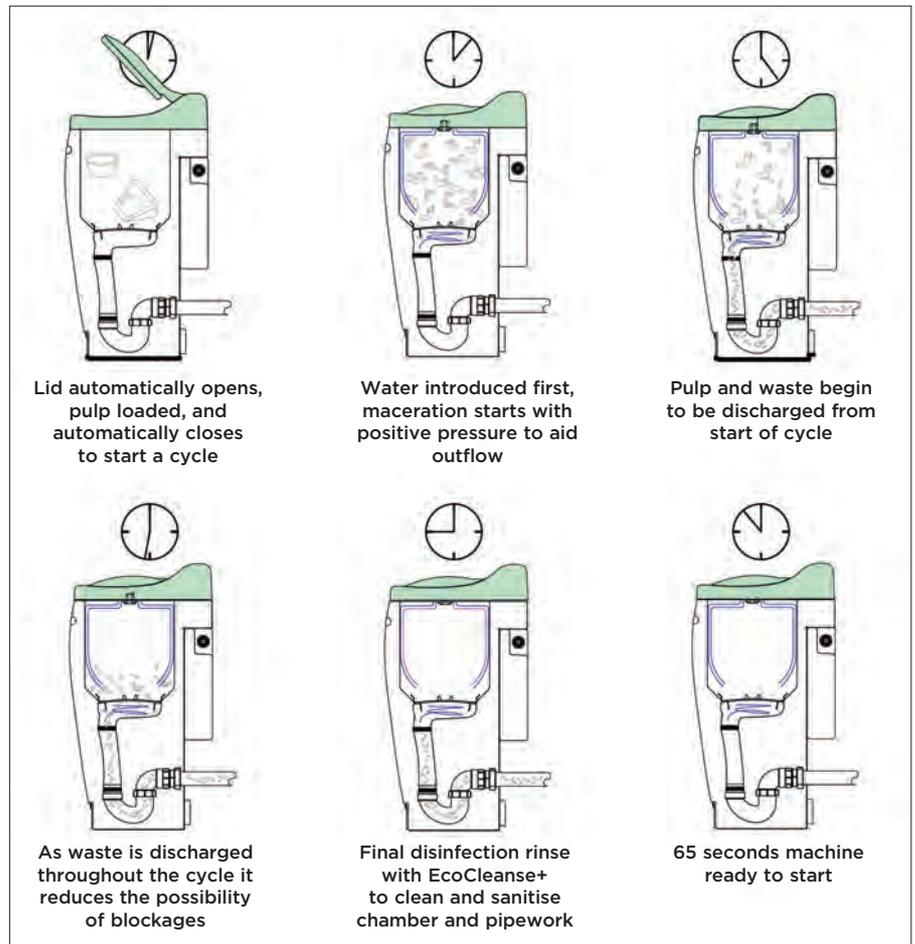


Figure 1: Stages of maceration using a DDC Dolphin Pulpmatic Uno. Other higher capacity machines may have longer cycle times.

One of the key advantages of using single-use pulp items and pulp macerators is that all the human waste, including the receptacle, are disposed of directly into the machine

correctly sanitised and returned to the ward, thereby eliminating the danger of re-infection in wards. Some macerators also have the benefits of hands-free operation. This eliminates the risk of contact, and therefore cross-contamination, while antimicrobial surfaces and post-use disinfection chemicals reinforce the machines' infection control credentials.

Economic considerations

The efficient operation of pulp macerators translates into significant cost savings in terms of staff time, water, and electrical consumption. Macerators are not complicated machines, and do not require as much maintenance and performance monitoring as the traditional method using washer-disinfectors. Water usage is low and economical, and is calculated depending on the capacity of the machine. Cold water only is used in macerators, so they are less prone to problems associated with limescale build-up. Without the need to apply heat

for sterilisation, as with reusable items, macerators' electrical consumption is low and economical.

Cost and time savings

As it is not necessary to empty the machine before or after use, staff do not need to waste valuable nursing time in the sluice/dirty utility room. Minimising and eliminating cross-infection ensures a decreased workload, and staff themselves are healthier and require fewer days off sick. Reducing the risk of healthcare-acquired infections directly reduces a healthcare provider's costs due to reductions in nursing time and use of antibiotics, as well as the avoidance of ward shutdowns when an infection cycle needs to be broken.

What is medical pulp?

Traditionally medical products have been made of stainless steel or plastic materials. In the modern environment – with an increased focus on reducing hospital-

Table 1: Macerator versus bedpan washer considerations.

Macerator considerations	Bedpan washer considerations
Pulp macerators have fast cycle times, allowing them to cope easily with workload peaks	Bedpan washer-disinfectors use thermal disinfection, which can cause heavy scale deposits
Pulp macerators use less electricity	Testing and validation procedures must be carried out to ensure correct temperatures are reached
Destroy all HCAIs, including <i>C. difficile</i>	Bedpan washers have longer cycle times and use more electricity and water = higher running costs
Pulp macerators have a low water consumption	Thermal disinfection does not destroy <i>C. difficile</i> spores, but does destroy all other major HCAIs
Pulp products are single-use, reducing the risk of cross-infection	Plastic and stainless steel items are reusable – recommended replacement time is 18 months
Environmentally friendly – reduces landfill	Regular service and maintenance recommended to maintain optimum performance
Lower service and maintenance requirements	

acquired infections and the seemingly endless demands on healthcare budgets – recycled paper pulp is considered to be a clean and cost-effective alternative. Moulded pulp products are considered a sustainable product, as they are produced from recycled materials such as old phone books, newspapers, magazines, cardboard – in fact any product made of paper fibres. In some instances, the pulp products can be recycled again after their useful lifecycle to fuel power plants. The recycled paper is mixed in large vats with hot water at between 43°C and 65°C. The hot water swells the fibres, causing them to break apart, and after 20 minutes they become pulp. This is then filtered to screen out plastic and other contaminants, and is then moulded into shape using a fully automated process. Moulded pulp products can also be made waterproof with a spray or dip coating of wax after.



Pulp macerators will completely destroy disposable pulp bedpan/urine bottle containers and contents, by pulverising items into small particles using carefully designed blade technology.

Reducing costs

Pulp products for use in hospitals are purpose-built for managing a wide number of different, but entirely typical nursing situations that occur on an everyday basis, such as holding/collecting vomit, urine, or faeces. Once the product has been used it can be safely destroyed, together with the human waste material, in a pulp macerator. By switching to pulp utensils instead of stainless steel or plastic, nursing staff and healthcare providers can reduce costs by avoiding costly purchases of reusable utensils, and the task of washing and storage of such utensils. Staff can also avoid the unpopular task of handling used or dirty bedpans.

Further benefits include:

- Immediate savings, with lower water and electricity use, and reduced nursing time.
- Simplicity of use, meaning comfort and independence for the patient, and easy handling for nursing staff.
- Guaranteed hygiene control – no washing or rinsing after use, and total destruction of waste and utensil in the macerator.
- Strength – ‘Highly reliable’ waterproof products.
- Environmentally-friendly design – with biodegradable products.

Macerator design advances

The growing use of maceration as a method of human waste disposal has heralded huge advancements in both the technology itself, and manufacturers’ understanding of the importance of ever-changing healthcare sector requirements. Macerators are designed with the focus on the continuing need to reduce the risk of infection in healthcare facilities by using the latest technology, in turn helping to redefine infection control.

Recent designs incorporate features

that are considered to be highly desirable for increased contamination control and ease of use. For example, hands-free operation, and the incorporation of antibacterial materials in contact areas to create a ‘microbe-safe’ surface, are all highly recommended to help reduce cross-contamination. There is an increasing number of machines available to fit all requirements – large capacity machines able to cope with 4-6 pulp items, and suitable for busy sluice/utility rooms, and smaller, compact machines, designed for low-demand areas or single-bed wards and *en-suite* facilities.

Fulfilling design advancements

In recent years the introduction of BIM (Building Information Modelling) has allowed professionals involved in new-build projects visibility of a virtual information model which can be handed over from the design team to the main contractor and sub-contractors, and then finally onto the owner-operator. This reduces information losses that traditionally occurred when a new team took ‘ownership’ of the project, and provides more extensive information to owners of complex structures. With the build being fully fitted out at the design stage, architects are searching for products to fit their vision for healthcare facilities for the future, and have been asking for unobtrusive, quiet, human waste disposal machines suitable to build directly into patients’ rooms.

Designing healthcare build projects for the 21st century requires an innovative, informed, and cost-effective approach. With the introduction of BIM, all materials and fittings need to be accounted for during the initial planning stages. The architectural design of a large-scale refurbishment or new-build project needs consideration of all factors relating to infection control, room access, flow of work, and layout, while taking into



A selection of single-use pulp containers.

account the needs of the hospital or care home and the associated regulations.

Wall-recessed machines

Wall-recessed pulp macerators are specifically designed to be incorporated into architects’ plans during the build and design stage of a project. They are built into the walls, thereby fully concealing the mechanics and plumbing of the machines, improving the look of the room, and allowing them to be used in sluice/dirty utility rooms, isolation rooms, and *en-suite* facilities in individual patients’ rooms.

This new generation of built-in macerator has the increased benefits of reduced noise levels, making it suitable for isolation and individual patient rooms, with antimicrobial nanotechnology and wipe-clean, crevice-free surfaces for easy cleaning. Operation is totally hands-free, with an audio prompt system which can be programmed into any language.

Conclusion

Inadequate decontamination and disposal of human waste can result in the transfer of infections to patients and health workers; every location in which decontamination procedures are undertaken should be properly designed, maintained, and controlled. A healthcare establishment must be able to guarantee that it can effectively deliver the clean and efficient disposal/disinfection of human waste containers to maintain a safe and hygienic environment for patients, residents, and staff alike.

More and more healthcare facilities are moving over to single-use pulp products and maceration. Whether this is planned in at the build stage, or when replacing existing systems, choosing the most effective method of sluice/dirty utility room management for the establishment is of paramount importance.

Using maceration and single-use pulp products to dispose of human waste certainly reduces the risk of cross-contamination and re-contamination from products moved from ward to ward, and although the cost of repeat pulp product orders can be higher than other methods, to outweigh this there are significant long-term savings which need to be considered.

Whether you chose a macerator or washer-disinfector (see Table 1), there are certain key features considered desirable for increased contamination control and

ease of use. For example, hands-free operation, and the incorporation of antibacterial materials in contact areas to create a ‘microbe-safe’ surface, are highly recommended to help reduce cross-contamination. Reduced water consumption is also advantageous for conservation of water, particularly in areas where water is a valuable commodity, and of course reduced power use both helps the environment and keeps costs to a minimum.

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Adam Roach, Engineering director for DDC Dolphin, has been with the DDC Dolphin team for over a year, and has over 20 years’ experience in mechanical engineering, designing mechanisms, rotating machinery, and products for Man Machine Interface in many industry sectors, including automotive, aerospace, and medical.



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