Best practice for cleaning poultry transport crates- Draft

Design and operation of crate washing systems for live poultry transport crates

The best practice information below is intended to enable poultry processors to achieve a defined standard of crate cleanliness following the washing process that normally takes place in the lairage area or vicinity. The proposed defined acceptable standard is yet to be set out in precise terms and so far only includes the broad requirement that the crates are visually clean following the washing process. However as the aim is to achieve a reduction in Campylobacter as well as other microbiological pathogens the information below is aimed to cover this as well. As an indication of adequate improvement in microbiological terms, a reduction in aerobic plate count of at least 4 log10 units has been suggested. This may be too difficult to achieve consistently but a minimum of 2 log10 units is quite realistic. Following the guidelines set out below should reliably achieve this.

Notes

Visually clean is defined as a crate with no readily removable debris on the surface

*Microbiologically clean can be defined as a crate with a level of floor surface contamination that does not exceed a specific limit, as determined by a set swabbing and plate count procedure. Alternatively, a reduction by **X** log10 units relative to the unwashed crate may be required. This best practice information is based on a Research project that undertook aerobic plate count, enterobacteriacea and Campylobacter counts.*

Code A: applies to all crate washing systems- a minimum requirement based on equipment in use in 2004/5
Code B: applies to existing crate washing systems where appropriate modifications can be made- limitations can be due to space/location /finance
Code C: applies to newly installed systems only
Code D: applies to future designs of crate washers.
Code O: optional - suggested alternatives can be used

No.	***Opera-tion***	**Requirement**	**Explanation**	**Code**
0	General layout	Crate washing systems essentially need four main components that will achieve a crate that is both visually and microbiologically clean: (a) initial removal of large amounts of solid debris, (b) an effective soaking stage to loosen dirt, (c) a washing stage to actually remove the dirt and (d) a disinfection stage.	General design criteria for good washing	A

0a	General layout	Layout is important: screen off the crate washing operation and especially the clean crates from the hanging area and crates with live birds	The unwashed crates and the birds both represent potential sources of recontamination of the cleaned crates; good separation is desirable.	B
0b	General layout	Access to all parts of plant needing regular maintenance must be both easy and safe for operators	Regular servicing is more likely if the equipment is easily accessible.	A
1	Crate inversion	All debris removed by flipping action must be collected in an adequate way; accumuated floor spillage is unacceptable.	Accumulated debris represent a potential source of re-contamination for cleaned crates	A
2	Pre-washing	This is an optional step necessary only for heavily soiled crates. Its omission is justified if additional cleaning time is given to the subsequent soaking and main wash stages.	The main advantage of pre-wash is to reduce the amount of suspended matter entering the water loop in the soak and main wash cycles; therefore, the pre-wash water loop must be kept separate.	O
3	Pre-washing	Avoidance of spillage of wash water onto the floor - either by leakage or by splashing/spraying. Use of guards, shields; overflow from separator screen directed to a drain.	The water in the pre-wash represents a major source of contamination of the rest of the area including that used to store cleaned crates. Aerosols, in particular, should be minimised. Air flow should be from clean to dirty	A
4	Pre-washing	Frequent cleaning of run down screen; set a definite check routine assigned to a specific operator - suggested frequency, once an hour	As well as ensuring efficient separation of debris (and thus reducing jet blockage), this also minimises the overflow of water to the drains/floor.	A
4a	Pre-washing	As an alternative to item 4, there is the option for the development of self-cleaning systems.		C
5	Pre-washing	Frequent changing of wash water - . Set a frequency around planed plant stoppages eg lunch and tea break	A great deal depends on the level of crate soiling more frequent water changes being needed for dirtier crates. Neglect of this matter will lead to poorer cleaning and the greater likelihood of jet blockage.	A
6	Pre-washing	Frequent inspection of water jet nozzles; set a definite check routine assigned to a definite operator - suggested frequency, once an hour	Blockage of nozzles is a common problem which often goes unnoticed for long periods of time. The loss of one or more nozzles greatly reduces the efficiency of cleaning.	A
6a	Pre-washing	As an alternative to item 6, there is the option of the development of better nozzle design and/or specification		C
7	Soaking stage	Minimum residence time of 30 seconds	Use of shorter periods of immersion can result in failure to achieve a visibly clean wash If hot soaking is used (see below) then there is increased benefit with longer periods than the 30 sec indicated.	B

8	Soaking stage	Minimum soak temperature of 50 deg.C Intermediate temperatures of 25-40 can improve the *cleaning* process but the effect may also be to enhance the growth of bacteria in the large volumes of retained water leading to microbiological problems	There is very strong evidence that soaking in water at 50 deg C both enhances the physical cleaning process and reduces microbial contamination of surfaces by 2 log10 units or more. Raising the temperature to 62 deg.C substantially increases this benefit but brings the need for operator protection.	B
9	Soaking stage	Use of a recommended detergent - ammonia or alkaline addition would have a detergent and antibacterial effect	Detergent usage is necessary to produce a visibly clean crate. To gain full benefit, additional quantities should be added throughout the shift reflecting the volumes of make up water added.	A
10	Soaking stage	Take make up water from the main washing stage.	The use of mains water for making up lost volumes is wasteful and serves no benefit. The clean water would be better used in a final rinse stage (see below).	B
11	Soaking stage	Recirculation of soak tank water at rates in excess of 10 tank volumes per hour in countercurrent route - ie: the water is removed from the point at which crates enter and upgraded water (see below) returned to the end where crates are lifted out.	Setting up a strong flow along the length of the soak tank will assist in conveying debris away from the crates as they move along. In addition, there will be some cleaning benefit from the physical effect of the water flow	C
12	Soaking stage	Clarification and recirculation of soak tank water - use of sedimentation or filtration methods to treat the water. Frequent removal of the sludges produced to separate closed vessels.	Any large build up of debris in the recirculated water is likely to reduce the cleaning efficiency of the water. The associated organic content will have a further detrimental effect in nullifying the effect of the detergent added.	C
13	Main wash	Avoidance of spillage of wash water onto the floor - either by leakage or by splashing/spraying. Use of guards, shields; overflow from separator screen directed to a drain.	The water in the main wash still represents a potential source of contamination for the rest of the area, including the cleaned crates (often stored nearby). Aerosols are of particular concern and should be minimised. Airflow should be from clean to dirty.	A
14	Main wash	Frequent cleaning of run down screen; set a definite check routine assigned to a specific operator - suggested frequency, once an hour	As well as ensuring an efficient debris separation (and thus reducing jet blockage), this also minimises the overflow of water to the drains/floor.	A
15	Main wash	Frequent inspection of water jet nozzles; set a definite check routine assigned to a specific operator - suggested frequency, once an hour	Blockage of nozzles is a common problem that often goes unnoticed for long periods of time. The loss of one or more nozzles greatly reduces the efficiency of cleaning.	A

16	Main wash	Removal of entrained water on crates emerging from the soak tank - eg: by use of air jets or vibration mechanism located on the lifting section of the track	Entrained water will lead to a faster build up of contamination in the water of the main wash loop. If a hot wash is used, the same entrained water will lead to faster cooling of the wash water and a higher energy cost.	B
17	Main wash	Use of hot-water sprays (30 to 60 deg.C): this is an option that can be omitted if adequate cleaning is achieved in the other stages of the process and if a hot rinse step follows.	Spraying crates with hot water has been shown to enhance both visual cleaning and the reduction in microbial contamiantion. Even water at 30 - 40 deg.C is likely to be better than cold water.	O
18	Main wash	Minimum residence time of 15 seconds - implying 5-10 crates held within the main wash cabinet.	There is a clear benefit in extending the wash time although this must have a practical limit owing to space limitations. Doubling the current residence time of 5 - 10 seconds to 15 - 20 seconds may be achieved by foregoing the pre-wash section.	C
19	Main wash	Use of detergent/disinfectant in the main wash - option that can be omitted if satisfactory cleaning is achieved using other methods	The effectiveness of cleaning chemicals has been well demonstrated with domestic dishwashers but they may represent an unnecessary step in the main crate wash. It is more important to ensure adequate volumes of chemicals for the soak stage and for subsequent disinfection.	O
20	Rinse stage	Removal of residual water on crates emerging from main wash section by use of air jets or a vibrating section of the track.	In order to gain the maximum benefit from the final rinse stage, as much residual water as possible should be removed from crates leaving the main wash.	C
21	Rinse stage	Provision of an adequate rinsing using clean (potable) water - minimum volume of 2 litres per crate	With several thousand crates passing through a typical cratewasher each day, this may seem a large usage of fresh water However this would represent the total feed of clean water to the whole crate washing plant. The overflow from this process would act as make up for all previous stages in a countercurrent route. The volume of 2 litres represents approximately twice that retained on a solid floor crate.	B/C

22	Rinse stage	Use of hot clean water (40-60 deg.C) for the purpose of final rinsing. This can be omitted if preceded by a hot main wash but the energy saving would be small. The benefits would be increased if hotter sprays (up to 80 deg.C) could be used.	The purpose of a rinse stage is to displace any residual water on the crate from the main wash; use of hot water would slightly improve this process as well as enabling better drainage ahead of disinfection. On the basis that all clean water enters the system via the final rinse, using cold water would not greatly reduce the energy bill if a hot main wash is to follow.	O
22a	Rinse stage	The hot water effluent would efficiently be used as a top up for the soak tank or recycled back to a heater/treatment unit	Any thermal process must include efficient energy management and control of evaporation (and fog production in winter)	C
23	Rinse stage	Use of plastic flaps to separate the main wash section from the rinse section	To gain full benefit from the rinse stage, some protection of crates from the sprays generated at the main wash section is appropriate. The alternative of using separate booths for each operation is likely to be an unnecessarily complication.	B
24	Disinfection stage	Removal of residual water on crates emerging from main wash section by use of air jets or a vibrating section of the track. This can be omitted but the penalty would be a larger volume of chemical disinfectant per crate.	Residual water will reduce the effectiveness of disinfectant by dilution. A solid floor crate can retain over a litre of water - applied volumes of disinfectant would normally be much less than this amount. If the residual water contains organic matter, the effectiveness of the disinfectant is further reduced.	O
25	Disinfection stage	Separation of disinfectant stage from the main wash and rinse stages - eg: use of plastic flaps if sharing the same booth.	Avoid unnecessary contamination of the cleaned and disinfected crates.	B
26	Disinfection stage	Disinfection to be carried out in its own booth with the collection and re-use of drained chemical	A high proportion of disinfectant will not land on the crate surface or will drain off rapidly. The use of a booth will allow collection and re-application of this material ensuring both a better coverage and less waste. A booth will have the additional and important advantage of protecting nearby staff.	C
27	Disinfection stage	Applied dose of disinfectant to reflect recommended amount eg: for Virkon S, 250 ml at 1% strength per crate. Other disinfectants may be considered including peroxygens such as "Sorgene 5" - some are less sensitive to organic debris.	There is good evidence that a reduction of 2 or more $\log_{10}$ units is achieved when the recommended dose of disinfectant is administered. Lower doses may be suitable if crates are sprayed in a booth.	A

28	Disinfection stage	Disinfectant jets located to spray all surfaces of the passing crate	Both the outside and inside of the crate need to be wetted by the spray although the inside is more important. It will be difficult to achieve an efficient application without using a booth.	B
28a	Disinfection stage	As an alternative to item 28, dip tanks may be considered although this may result in a higher consumption of disinfectant. Efficient removal of liquid would be a minimal requirement with this alternative. Additional application of disinfectant can also be made to the clean crates reloaded into a module.		
29	Disinfection stage	Frequent inspection of disinfectant jet nozzles; set a definite check routine assigned to a specific operator - suggested frequency, once an hour	Blockage of nozzles is a common problem even for disinfectant jets. Even a partially blocked nozzle will lead to a poor application.	A
30	Disinfection stage	A minimum of 3 seconds spray contact time. This is a guide the aim is to ensure adequate application and can be achieved in various ways	This is to ensure good wetting of all surfaces of the crate	O