HYGIENIC ASSESSMENT OF DOLAV FOLDING LARGE CONTAINER

Background
Dolav Plastics Products Cooperative Limited has been producing one-piece pallet boxes for more than 40 years. These boxes are manufactured from high-density polyethylene (HDPE) and Polypropylene (PP) using structural foam injection moulding. This process is slower than high-pressure injection moulding, which is used for the majority of pallet boxes from other sources, but it yields products with superior strength and impact resistance, which means that the Dolav boxes have longer useful working lives.

Dolav one-piece pallet boxes have been developed and designed specifically for hygienic applications. Many ostensibly similar boxes have, for example, separate runners that are plugged into the underside of the container. While it cuts manufacturing costs, this arrangement potentially leaves concealed pockets that are hard to clean and can harbour contaminants that may leach out onto work surfaces. The Dolav boxes have integral runners that completely eliminate this problem.

The hygienic performance of Dolav Ace rigid one-piece boxes has been well proven in practice, and hundreds of thousands of them are in regular use in the meat industry across Northern Europe. In fact, many companies operating in this sector will no longer accept pallet boxes with separate runners.

Despite their popularity and success, Dolav Ace boxes have one significant shortcoming, which they share with all notionally competitive products. Because they are rigid, the boxes take up as much space when they are empty as they do when they are full. This is a particular problem when transporting empty boxes back to the supplier for reuse, as the vehicles used are essentially transporting mostly air. Another issue is that the empty boxes take up a lot of space when being stored prior to use.
In the automotive industry and many other sectors, this problem is eliminated by using boxes that can be folded flat when empty. Until now, this option has not been available for food manufacturers because it has been impossible to develop a hygienic design – the hinges used in folding boxes trap contaminants and are hard to clean reliably.

After almost five years’ work, however, Dolav has developed the DFLC - a large container that can be folded when empty but can also be cleaned easily and efficiently to ensure it reaches the very high standards of hygiene that are essential in the food sector. The key to this groundbreaking design is that the new Dolav DFLC can be disassembled into five components – the four sides and the base – and each component can be washed separately, which means there is no risk of trapping contaminants. Disassembly of the boxes prior to washing and reassembly after washing is straightforward and takes only seconds.
As they fold when empty to just half of their normal size, these boxes have the potential to save a substantial amount of storage space, and to dramatically reduce the number of vehicles needed to transport empty boxes. This not only cuts transport costs, but also helps to safeguard the environment by reducing the carbon footprint of the transport operations.

**Proof of Performance – Preliminary Evaluation**

While its innovative folding boxes have been designed to support the highest levels of hygiene, Dolav understands that if they are to achieve acceptance in the food sector, it is necessary to verify their hygienic performance. To do this the company is collaborating with Industrial Washing Machines Limited (IWM), a specialist developer and manufacturer of washing equipment with extensive experience in the food sector, and Holchem, a leading supplier of chemical cleaning solutions. The companies have agreed to carry out joint trials with sample containers supplied by Dolav and washing equipment provided by IWM, using detergents formulated and supplied by Holchem.

For the initial trials, the DFLC boxes were coated with a proprietary gel that fluoresces under UV light. The gel was liberally applied to all surfaces of the boxes to simulate as accurately as possible the worst cases of soiling they could receive in use. The boxes were then disassembled, and the components washed in an IWM P100 pallet washing machine, specially adapted to accommodate the new Dolav DFLC design.

The washing trial was programmed to provide a 55°C hot water recirculated detergent wash, with 0.5% of Holchem’s TWS traywash detergent, specially formulated for industrial washing equipment. The detergent wash was followed by a fresh water rinse to remove chemical residues and finally, a single stage blower to remove surplus water. The P100 machine used for the test is a conveyorised tunnel design, which provides efficient and effective cleaning on all surfaces on a continuous basis. The conveyor speed, for the purposes of this trial, was set up at 100 pieces per hour.

IWM has evaluated the Dolav DFLC and can offer a full range of washing machine options to suit this container, including multiple air knife sections for a complete drying facility.
After the box components had been washed, they were carefully checked for traces of gel using a UV light source in a darkened room. No fluorescence was observed indicating that the wash process had successfully removed the gel and had left no detectable residue. Within its limitations, therefore, this test confirms that the new Dolav foldable pallet boxes are suitable for use in hygienic applications.

Before:

After:
Proof of Performance – Definitive Testing

While the results of the UV gel test were encouraging, Dolav recognised that UV gel does not always respond to washing in exactly the same way as real-world contaminants, particularly those encountered in the meat sector, which have a tendency to adhere strongly to surfaces. To provide definitive evidence of the hygienic performance of its new foldable pallet boxes, Dolav arranged to repeat the washing trials under similar conditions, but with containers that were heavily soiled with sausage, minced meat and mayonnaise mixes. For comparison purposes, Dolav Ace non-folding containers and two folding containers from other suppliers were tested alongside the new Dolav DFLC.

Container A

Container B
A comprehensive report on the results of these tests, produced by the Holchem Technical Centre, is included as Appendix A, but the main details of the tests and the principal results are summarised below.

In practice, it did not prove possible to use the IWM P100 washing machine, which has been specifically developed for use with Dolav DFLC folding containers, for all of the trials. This was because the machine could not physically accommodate the Dolav Ace containers, or either of the containers from other suppliers. To overcome this problem, all items except for the Dolav DFLC side walls were washed in a standard IWM cabinet washer.
After the items had been washed, the standard of cleaning was first assessed visually, and then ATP (adenosine triphosphate) readings were recorded using a Hygiena SystemSure Plus luminometer and Ultrasnap swabs. An area 10 x 10 cm was swabbed on all container bases. Where applicable, swabs were also taken of the space between the sidewall and the hinges, after the sidewalls had been folded down. For the Dolav DLFC containers, swabs were taken on both sides of the side panels.
Definitive Testing – Results

Of the items washed in the cabinet washer, the Dolav Ace appeared visually clean, as did the Dolav DLFC base. Soiling could be seen, however, between the sidewalls of both of the folding containers from other suppliers. The ATP reading for the Dolav Ace was 16RLU (this container has no hinges or sidewalls). For the Dolav DLFC the readings were 24RLU for the base and 37RLU for the base edge. For the containers from other suppliers, all readings were in excess of 500RLU, and one exceeded 2,000 RLU.

The Dolav DLFC side panels were washed in the specially developed IWM P100 washing machine and, after washing, the panels gave ATP test readings between 3RLU and 50RLU.
Hygiena, the manufacturer of the ATP testing system, states that results below 10RLU indicate a clean surface, results between 10 and 50RLU a cautionary clean surface, and results about 50RLU a surface that is not clean. These figures are offered as a guide, with many food processors setting their own limits.

**Conclusions and Comments**

All of the results achieved for the new Dolav DLFC folding containers were in the clean or cautionary clean range, and were orders of magnitude better than the results achieved for the folding containers from other suppliers. This indicates that the Dolav DLFC containers, with the cleaning protocol used in the tests, would be suitable for use in low-care environments such as red meat abattoirs.

The tests carried out were completed on standard stock washing machines that accept these types of containers. IWM recommends that washing equipment, systems and chemicals should be designed to suit individual soiling levels, applications and specific site requirements. This would make it possible for the DLFC containers to be suitable for use in more demanding environments. IWM have recently designed a specialised system to accommodate all sections of the DLFC container through the same tunnel washer.