

## **Catering for a Sustainable Future, Group**

### **Dishwasher ~ Energy Efficiency**

The commercial dishwasher is one of the most labour saving devices in the commercial kitchen and is probably one of the most expensive to run, so it makes sense when considering energy efficiency and sustainability to look at the wash-up. All dishwashers require four components to work successfully - water, energy, detergents and time, all of which are expensive so any savings which can be engineered will save money and increase the economic, environmental and social bottom line.

The first consideration is the quality of the wash as a customer's perception of the caterers hygiene standards can stand or fall by the cleanliness of the tableware placed in front of them. Secondly the new wash-up facility must provide best overall value when investigating not only the initial purchase price but also the ongoing running and disposal costs.

The calculation for heating a set amount of water over a given time cannot change; the amount of energy required will always remain constant. Therefore the technology required for making dishwashing more efficient is to improve the insulation on the machine to maximise the heat generated, reduce the amount of water required per cycle, and recover the wasted heat that is discharged to atmosphere and drain. In addition the removal of any dissolved minerals will ensure that the machine stays efficient.

Water that is high in dissolved minerals, specifically calcium and magnesium is described as hard. Hard water is not a health risk, but a nuisance because of its tendency to cause mineral build-up in pipe work and on heating elements, which reduces the efficiency of the system. Together with the poor performance of detergents and rinse agents when using hard water compared with soft water makes water treatment a necessity. It is worth noting that the cost of detergents and rinse agents over a five to seven year period can easily amount to the original price of the dishwasher.

To obtain good results, you have to use clean water so it is worth looking at machines with an effective filtration and wash system incorporating anti-blocking jets, as these will on average consume 30% less water while significantly improving the quality of the wash. This will save on the energy to heat the water as well as providing considerable savings on both detergents and rinse agents. The higher through-puts provided by incorporating the improved wash will also provide the potential to minimise on labour costs.

There are four main types of dishwasher that are typically used in the foodservice industry. Small operations preparing up to 40 covers may be able to use an undercounter machine. The next step up in dishwasher size is the pass through single rack machine which can process between 90 and 110 covers, followed by the rack conveyor and flight machines. The information detailed above applies equally to all four types, the differences begin to appear when we look at heat recovery.

When considering a pass through single rack machine, it is worth considering a fully enclosed insulated hood as this offers potential savings of up to 3 Kw per hour. The hood should remain enclosed on all four sides when open to prevent steam venting on to the back wall and ceiling, this means that no ventilation canopy is required; however the area will require 30 air changes per hour.

Drain heat recovery is normally found on pass through single rack machines, this is when fresh rinse water is heated from 15°C – 45°C using waste heat from the machine drain water. The rinse water is drained from the machine through a pipe that is enclosed within the water inlet pipe and heat from the rinse drain pipe is transferred to the incoming cold water. This provides savings on average of between 4 Kw - 6 Kw per hour.

Heat exchangers are usually found on rack conveyor and flight machines and comprise of a system using cooling coils, where steam is drawn efficiently from the wash chamber. The heat recovered through a contra-flow principle is used to heat the fresh water intake up to 50°C saving around 9 Kw.

A heat recovery system based on heat pump technology gives three advantages, no direct connection is required to the ventilation system, the system recovers up to 59% of the energy used by the machine and it improves the working environment. The cool air leaving the outlet is between 13 and 19 can be passed back into the room.

Commercial dishwashing machines installed in hotels, restaurants, public houses, and other premises where the items to be washed are for catering, are classified as Fluid Category 4 in the current regulations. However when the machines are installed in residential or day care establishments where healthcare is provided for the residents or visitors it becomes Fluid Category 5. It should always be confirmed by the manufacturer that the machine selected is WRAS approved and the inlet and discharge protection is adequate for the location. It is worth remembering that a machine which does not incorporate the correct level of protection must have it provided as part of the installation and this can add considerable cost.

When purchasing a dishwashing system it is always advisable to seek professional help as the layout of the machine, its associated equipment and fabrication can have a major impact on the efficiency of the system and on the labour required to operate it.

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