Hygiene and more – meeting the design challenge

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The principal function of an industrial washing machine is to deliver the highest possible levels of hygienic cleaning. Today, however, meeting this fundamental requirement is no longer enough. Users now also demand economical operation and minimal environmental impact.

Designers of industrial washing equipment for use in food related applications face a tough task. Achieving the excellent cleaning and sanitising performance that end users require to meet their own needs and to satisfy current demanding legislative requirements is, in itself, a considerable challenge.

Add to this the need to keep operating costs to a minimum – something that is more important than ever in the present tough economic climate – and the ever growing pressure to reduce the environmental impact of washing operations, and it is clear that those designers have to be increasingly resourceful and innovative to give end users what they want.

When the design and operation of a traditional washing machine is subjected to expert analysis, however, it soon becomes apparent that there are many areas where improvements can be effected. The measures needed to implement these improvements broadly fall into two categories: those related to the basic design of the equipment, which often have their roots in continuous research and development, and application specific measures that may be relevant only to the project currently in hand.

New technology

Let us start by considering improvements in the first category, which usually depend on the intelligent application of new technologies, rather than uncritically relying on systems and techniques that have been used in the past. When it comes to modern washing machine design, the maxim of "It has always been done that way and it has always worked, so why change it?" is far from satisfactory. Consider, for example, a very basic

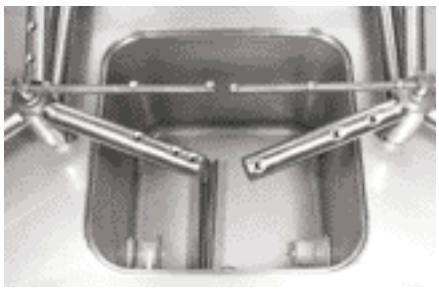
An IWM rackwasher.

function – the control of water levels in the machine's tanks. Traditionally, this has been achieved by a simple ball valve and float system, akin to that used in a domestic lavatory cistern.

Almost everyone knows from their own experience that this form of control is imprecise and prone to frequent failures. It is directly driven by the movement of the float as the tank fills, so the valve necessarily closes slowly. Not only does this mean that the flow cut-off point is poorly defined, it also results in rapid erosion of the valve seating. The overall effect of these shortcomings is that tanks with ball valve level control frequently end up being overfilled, sometimes to the point where they overflow. Clearly this is very wasteful of water.

The solution is to use electronic sensors to monitor water level, and electrically operated valves to control the flow of water. The sensors are accurate and dependable, while the valves have a snap action that

Internal area of a cabinet machine.



means that they offer precise cut off control, and that they only spend milliseconds in the partially closed state where most erosion occurs.

Electronic control, which with modern control components can be provided easily and inexpensively, gives a whole range of other opportunities for enhancing machine performance, such as the implementation of 'no work, no wash' functionality.

This might be used, for example, in a machine where the items to be washed are transported on a conveyor through a rinse tunnel, to ensure that the supply of rinse water is automatically cut off when the conveyor stops or there are no items present in the tunnel. Such an arrangement again reduces the machine's water usage by preventing water from being unnecessarily spent to drain.

Modern electronics

In fact, the 'no work, no wash' principle can be extended further. It is perfectly possible to incorporate sensors that detect whether particular functions of the machine, such as the in-feed and out-feed conveyor systems, are currently being used. If the functions have not been used for a predetermined length of time, arrangements can be made for them to be automatically turned off or put into a quiescent energy and/or water saving mode.

Modern electronics can help in other ways to improve the energy efficiency of washing machines. In traditional designs, conventional single speed motor starters are invariably used throughout. This means that motors always have to run at full speed, so there is no possibility of accurately matching the speed of the motor to the requirements of the application.

In many cases, equipment such as extract fans and conveyors actually operate more effectively when running at reduced speed and, of course, reducing the speed of a motor reduces its energy requirements.

For this reason, the manufacturers of the best industrial washing machines are increasingly making use of electronic variable speed drives in their products.

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And there is an extra bonus benefit to variable speed operation. Equipment running at reduced speed is subject to less wear than if it was always operating at full speed. It will, therefore, require less maintenance and will ultimately have a longer working life.

Of course, it is not only advances in automation and electronics that offer opportunities for energy and cost savings in the operation of industrial washing machines – the washing technology itself is capable of improvement.

For example, developments in the detergents used for domestic laundry over recent years have allowed washes to be performed at lower and lower temperatures without compromising their effectiveness. This naturally begs the question of whether it would be possible to develop low temperature washing systems for industrial applications.

Cold water wash trials

The answer, as it turns out, is yes. IWM has recently carried out extensive 'cold water wash' trials in conjunction with a leading developer and manufacturer of detergents for commercial applications, and A. F. Blakemore, a major user of distribution crates of the type predominantly intended for the transport of packaged grocery items and loose vegetables. Most of the crates selected for the trial had light soiling consisting principally of dust and traffic film, but some had heavy soil deposits.

In all cases, the cold washing trial produced results that independent observers confirmed were as good as, or better than, the results obtained with standard detergents at the high temperatures normally used for washing. After low temperature washing, the crates were clean, glossy in appearance and almost completely dry.

The cold wash process works at a nominal washing temperature of 25°C. In practice, this means that minimal heating of the feed water is needed initially, with the temperature of the washing solution subsequently being maintained by heat from the machine's pumps.

The benefits offered by low temperature washing depend, of course, on the application. However, it has been estimated that, in a typical installation with a machine that runs just 20 hours per week, the new process has the potential to cut energy costs by as much as £20,000 per year, as well as reducing the environmental impact of the washing operations. Up to this point, the measures described for enhancing the efficiency and economy of industrial washing machines have related largely to the intelligent application of technology. There are, however, some much more basic facets of machine design that amply repay a little attention.

Cold water wash trials.

For example, it is essential to ensure that the machine's tanks are sized correctly for the application. The entire tank capacity of the machine will always need to be drained down at intervals as part of the normal machine cleaning routine. To avoid wasting water, it is important, therefore, to use the minimum size of tank that is consistent with efficient washing.

Further water savings can be achieved by recovering water from a fresh water rinse and using this to top up the tanks. Even something as seemingly unrelated to water usage as filtration can have a significant effect, since specifying the correct filtration reduces the frequency with which the tanks need to be drained.

Let us turn now from measures that affect the basic design of the washing machine to application specific measures. Naturally, these will vary considerably from project to project, so it is only possible to give a few general examples of possibilities.

Application specific measures

In applications where the items to be washed are likely to be heavily soiled, the use of a pre-wash stage is often beneficial. Usually operating at ambient temperature, the pre-wash will remove most of the soiling before the detergent process completes the clean. As a result, detergent wash can be shorter and less intensive, which means that less detergent is needed because the wash tank remains fresher for longer and, where a hot wash is used, less energy is needed to heat the wash water.

In some cases, it is even possible for the overflow from the fresh or final rinse sections to be plumbed back into the pre-wash tank, thereby re-using the water and diluting the pre-wash water to keep it fresh.

Depending on the application, tanks and sumps can also be provided to recover rinse water, thereby reducing to an absolute minimum the machine's fresh water consumption. While all of the measures discussed so far have been largely the responsibility of the machine manufacturer, users of industrial washing machines also have a very significant part to play in ensuring the on-going effective operation of their equipment while achieving optimum energy efficiency and protecting the environment.

Without doubt, the most important requirement is to keep the machine clean and properly maintained. It does not take a lot of insight, for example, to see that a heating element covered with scale will operate very inefficiently and use a lot more energy than a clean element. Running a machine with worn out or defective components is a sure way to impair efficiency while increasing running costs and environmental impact.

The best washing machine suppliers will, of course, supply detailed information and training on how best to look after their machines, and users are strongly recommended to take advantage of these options. It is also well worth considering a regular service contract with the manufacturer, as this is the best guarantee that the machine will be maintained in tip-top condition and that it will always be operating at peak efficiency.

Extra benefits

As we have seen in this article, the best of modern industrial washing machines can provide efficient washing that meets the most demanding of food industry standards, while reducing environmental impact to a level that simply cannot be matched by older equipment. For these reasons, it is worth giving serious consideration to replacing older washing plant, but there are also other very sound reasons for taking this step.

Remember, for example, that reducing water and energy usage does not just protect the environment; it also means lower running costs. This is a particularly important consideration in these hard pressed times, and it is worth bearing in mind that the cost savings can mean that the new plant pays for itself in a surprisingly short time.

It is also worth noting that some industrial washing machines, by virtue of their efficient use of energy and water, now qualify for the government's Enhanced Capital Allowances (ECA) scheme. This means that 100% of their capital cost can be offset against corporation tax in the first year, making them an even more attractive investment.

A further consideration is that modern industrial washing machines are invariably more compact than their predecessors. Installing a replacement machine will, therefore, free up valuable factory floor space which can, in very many cases, be put to profitable use.

The conclusion has to be that, in spite of the present tough economic climate, now could be a very good time to carry out a detailed review of your washing operations and requirements.

As part of this process, it is useful to seek advice from an experienced supplier, such as Industrial Washing Machines, about the ways in which the latest equipment could offer benefits for your organisation.

Remember that, with washing equipment, a comparatively small investment is often the key to unlocking substantial continuous cost savings! ■

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