Pointers

- Lifts have largely moved over to high efficiency gearless (variable speed drive controlled) and machine room-less operation
- Ac induction motors are very slowly giving way to permanent magnet motors
- Low-power LED lighting and controls are optimising lift operation and energy usage
- Lift professionals argue that installing new lifts in place of 20–30 year old units can improve efficiency from circa 50–60% right up to 85%
- Some systems are available with electricity generation facilities to harness wasted energy for the grid

Modern lifts are taking advantage of recent electronic and electromechanical technology advances to improve efficiency and cut emissions. Brian Tinham examines the background

Uplifting engineering

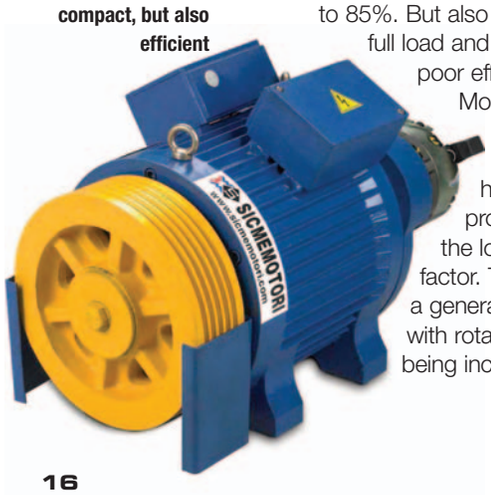
In terms of technology, nothing changes very quickly in the lifts and elevators industry, they say. But lift the covers and plant engineers that don't specialise in this sector might be in for something of a surprise. It's not just about the almost complete move now to high efficiency gearless (variable speed drive-controlled) and machine room-less lifts. Increasingly, there is also a shift away from conventional ac induction motors to more expensive, but more efficient and smaller permanent magnet motors. And there's more – such as low power LED lighting and controls better able to optimise lift journeys against demand.

Nick Mellor, engineering services manager with Pickerings Lifts, says it all translates into very significant energy savings that make some older lifts seem positively archaic. "Users, particularly those in the public sector, should be considering taking out some of their older equipment. We frequently come across lifts we installed 20 or 30 years ago that have had basic maintenance, but nothing more."

Clearly, those will be comparatively inefficient. "I'm not suggesting that users rip out perfectly adequate equipment, but when it does get close to the end of its life, they can look forward to a step change improvement in efficiency," says Mellor. He also draws our attention to the availability of spare parts. "I would suggest keeping existing lifts running, provided they are still maintainable. But when they come up for refurbishment, we're mostly not advising a simple like-for-like change. It's all about engineering in energy saving enhancements."

Putting a little detail on the potential gains, Mellor says: "Typically, we're talking about raising efficiencies at full load from maybe 50–60%, right up to 85%. But also lifts almost never operate at full load and the old induction motors had poor efficiencies at partial load.

Modern permanent magnet motors and drive arrangements are quite happy to deliver torque proportional to the current and the load, with a near unity power factor. The old systems would need a generator running continuously – with rotational and friction losses also being incurred continuously."



Modern lift drives are not only compact, but also efficient

John Miller, managing director of International Lift Equipment, agrees, adding only that, in some installations, changing over to gearless operation is still not practical, because of the rope arrangements and required load handling. "Most modern equipment is manufactured abroad for the new lift market, not just to suit UK refurbishments, so there are limits," he says. All of which indicates that old and new technologies are bound to coexist for some time yet. That said, he reveals an increasing appetite, particularly among local councils and hospitals, for gearless systems, because of their green credentials.

On some lifts, those green attributes extend even to electricity generation. Global Lift Equipment, for example, now offers its Eco Saver regeneration unit, aimed at returning power to the grid by enabling a second inverter drive to act as a generator. "The larger the load and travel, the more energy can be generated, so it's ideal for high traffic buildings, which can see 50% of their power consumption recycled back to the grid. We do a lot of work for municipal buildings and we recently won the contract for Paris Metro," explains international sales manager Daniel Williamson.

And it doesn't stop there: modern lift systems effectively sense the combined weight of their occupants and draw only the power required. Then, when not in use, they slip into stand-by or hibernate mode – switching off the lift car light, fans, landing displays etc, until the next call.

What about maintenance? Mellor accepts that plant engineers need "a step change" in skill sets, but counters that new machinery is also simpler – with, effectively, just a stator, rotor, bearings, drive shaft, drive sheave and a brake – which is now only a holding brake. "Mechanically, modern systems are very simple. Also, because they can be aligned in the factory, they're relatively easy to install and get right first time."

As for the sophistication of electronic drives – as opposed to the old machine rooms and fixed-speed (and latterly twin speed) motors and gears – he says merely that the job today mostly involves simply swapping out components. "On traction drives, in the old days, there was a lot of emphasis on checking the main bearings and the gear teeth – and that's a problem for today. How many plant engineers can still open up a gearbox and take it

apart? As the older guys leave, youngsters mostly aren't learning the old ways, so as long as old equipment is running smoothly, even if it's generating a lot of heat, they mostly leave well alone."

Standards and practices

But all this hasn't happened in an unregulated vacuum. The big ones for lift manufacturers have been the introduction of the revised EN 81 series of standards and, of course, the Machinery Directive – both of which mean that it's no longer enough simply to use 'good engineering practice' to make lifts safe, whether they be platform lifts, goods lifts, disabled access lifts or service lifts.

Looking at EN 81, International Lift Equipment's Miller points to subtle changes, some not formally published yet, that broadly require better, more detailed and risk-based controls and protection. "For example, under EN 81-1 prA3, there will be a clause that relates to unintended lift movement. The intention is to prevent lifts from moving away from a landing with the doors still open. So, if an older technology lift had worn brake shoes [modern lifts are braked electronically] or the brake failed to energise properly, then it has been possible to drive a lift though its brake.

"If that happens, it's due to poor maintenance, but, because to date there has been no requirement for monitoring switches, under such circumstances lifts might roll away until the safety gear kicks in. The new unintended movement clause will prevent that and the industry – including operators of existing lifts – will be mandated to comply over an 18-month transition period where refurbishments are concerned," explains Miller.

He also refers to the requirements for vandal-proof lifts under EN 81-71: 2005, particularly in areas that are largely unsupervised, such as on train stations and in blocks of flats. "It's not just about heavier duty equipment and doors, although these are essential. It's also about more rigorous prevention of access to motor rooms and landing doors etc, with categories dictating what approaches are required," he says. PE

Thorough examination

LOLER (Lifting Operations and Lifting Equipment Regulations 1998) prescribes the testing and inspection regime that must be adopted for lifting equipment. The main legal requirement is a statutory thorough examination – not just maintenance – by a 'competent person' to ensure that structural components and mechanical operation meet standards.

Frequency of thorough examination varies according to use, but for passenger lifts it is every six months and for load carrying lifts annual, although in extreme cases every six or even four months. Equipment also has to be examined following repair or replacement of structural components or after a change of chassis.

BS7121 Part 2 complements LOLER by stipulating additional tests four and eight years after first use and an annual 'load plus 10%' test.

However, Richard Short, sales director of Penny Hydraulics, warns that any thorough examination can only check the condition of the equipment on the day of the test. He advocates a 'safety first' approach, not only involving regular maintenance – which is also mandatory under PUWER (the Provision and Use of Work Equipment Regulations 1998) – but also daily checks.