PRESS RELEASE
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25 things you may not know about drives

Drives have been a key technology for industrial engineers for many years but Matt Handley of Mitsubishi Electric thinks they can be underappreciated. Here he highlights some of the interesting facts about them.

1. Drives save energy. Especially on variable torque loads such as fresh water pumps or cooling fans. On these load types, affinity laws describe the relationship between speed and other variables. The power-speed relationship is also referred to as the 'cube law'. Controlling the flow by reducing the speed means that for a 20% reduction in speed up to 50% of the energy can be saved. Modern drives feature energy optimisation functions, automatically adjusting on the fly to maximise energy savings. Often the biggest saving comes if a drive can be used to stop a motor altogether or reduce its speed to a very slow idle over a large part of its duty cycle.

2. Pumps are often run at full speed, with the flow being controlled using a mechanical restrictor valve. It is far more energy efficient to fit a drive and vary the pump's speed. The same can be said of fans and louvers. In recent years HVAC engineers have started fitting drives to their many pumps and fans, with most achieving significant energy savings immediately.

3. Drives can be set up to run automatic profiles. For instance, you may want a centrifuge to start slowly and accelerate gently to a first set speed, then quickly ramp up to full speed and hold this for a set time before decelerating fairly quickly to a very slow speed (which assists the tipping out of the contents), then finally stop altogether.

4. The example in (3) is a time based motion profile but speed changes can also be implemented with other signals, such as a load change, a moving object breaking a light beam, a temperature variation or a safety alert.

5. Motors, their gearboxes and the equipment they are driving can be subjected to shock loads on start up. A drive can provide a soft starting solution, which ensures for example, a heavily loaded conveyor or a mixer in a viscous liquid comes up to speed relatively slowly. (The term 'relatively slowly' can cover a range from a fraction of a second to several minutes, depending on the application).

6. Drives can start loads that are already spinning, even in the wrong direction. A typical example would be a large tunnel ventilation fan which is turning slowly in the natural air flow; a drive can be set up to sense this speed and match it before engaging.

7. Drives benefit from tuning after installation.

Mitsubishi Electric Europe B.V. /// Travellers Lane /// Hatfield /// Hertfordshire /// AL10 8XB /// UK ///
Tel: (01707) 276 100 /// Fax: (01707) 278 695 /// Email: automation@meuk.mee.com ///
Web: www.mitsubishi-automation.co.uk /// UK Web: automationsolutions.mitsubishielectric.co.uk

Some drives are fitted but never tuned so may provide little by way of user benefits. Some get only basic tuning, others get a thorough tuning. The best are regularly retuned and this is usually done automatically during normal operations.

8. If used with a feedback device such as an encoder, a drive can often perform at a level of precision that rivals servos.

9. In energy saving applications returns on investment on the purchase of a drive can be as quick as 6-24 months. The expected life of a drive is over 10 years, so substantial lifetime cost savings are achievable.

10. As a carbon reducing technology, Enhanced Capital Allowances are available on drives. This effectively reduces their purchase price, speeding up the return on investment. For details see http://www.carbontrust.com/

11. Drives can work in a standalone mode but also have high level communications capabilities, so are suitable for use in automated systems; computer integrated manufacturing, machine to machine communications, the Internet of Things and Industry 4.0 installations.

12. The high speed lifts used to service the upper floors of skyscrapers use finely tuned drives to accelerate the cars up to a great speed, then slow them down and park them precisely at floor level, while providing passengers with an incredibly smooth ride. When the CTF Financial Centre in Guangzhou, China, is opened next year the lifts will ascend at 20m/sec, three times the speed of those in New York's Empire State Building. Originally skyscrapers were constrained to about seven storeys because the steam driven lifts were so slow.

13. A drive can temporarily run a motor at above its rated power. This means motors can be sized for normal duties, rather than having to be oversized to cope with possible but rare overloads. This can lead to significant energy savings. Up to 95% of motors installed today may be oversized.

14. Total global energy saving potential of drives in use today is reckoned to be 500 Terawatt hours.

15. The power circuits in a large drive generate considerable amounts of heat as a by-product. In the past this tended to be simply vented to atmosphere but increasingly it is being captured via a heat exchanger and put to work, say preheating water for hand washing.

16. The biggest drive in the world is probably one used in a giant wind tunnel built by NASA to test space vehicles and capable of running at transonic speeds.

17. Drives make cloud computing possible! The massive data centres that host cloud computing need intelligent and adaptable ventilation to constantly optimise the surrounding air temperature and quality.

18. Some of the world's biggest installations of drives are theme parks, which use many, many drives in rides, water pumps, ventilation fans, animatronics, travelators, escalators, car park barriers and security gates. They are also used behind the scenes in air conditioning, conveyors, automated equipment & commercial kitchen equipment.

19. Cruise liners and commercial ships seem to get bigger every year. However they are now more manoeuvrable than ever, thanks to rotatable, inverter driven thrusters which allow vessels to turn within their own length.

20. Drives are embedded into HVAC units around the world. They are also vital components in electric vehicles and photovoltaic systems where they work to convert DC current to AC.

21. Large buildings such as office blocks and hospitals can consume huge amounts of energy in heating, cooling, lighting, plumbing, access control etc. Moves now afoot to reduce their carbon footprints have potential to reduce global warming considerably. Drives are an essential technology in this field.

22. The inverter is generally thought to have been invented by Harry Ward Leonard in 1891. (Born in Ohio and a sometime-employee of Thomas Edison, he filed over 100 patents and died while attending the US Institute of Electrical Engineers Annual Dinner in 1915). His DC-to-AC power conversion method used rotary converters or motor-generator sets, and some remained in use until recently. Modern drives began to evolve around about 1970 but it was 10-20 years before electronics and power electronics technologies achieved the levels of capability required for drives to become commonplace.

23. Drives can be installed directly at the motor due to high IP enclosures, providing an easy retrofit solution.

24. Drives can be run backwards to act as energy generators. This technique is likely to become more common as a regenerative energy saving technique.

25. Drives are used extensively in film and theatre for moving stage, scenery and people. When you next sit down to watch that lavish West End production, just have a little think to yourself about what technology is involved in moving all that scenery around….

About Mitsubishi Electric

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With around 124.000 employees the company recorded consolidated group sales of 39.3 billion US Dollar* in the fiscal year ended March 31, 2014.

Our sales offices, research & development centres and manufacturing plants are located in over 30 countries.

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Further Information:

Website: https://gb3a.mitsubishielectric.com/
Website: www.mitsubishielectric.com
Email: automation@meuk.mee.com
Facebook: www.facebook.com/MEUKAutomation
Twitter: twitter.com/MEUKAutomation
YouTube: youtube.com/user/MitsubishiFAEU

Editor Contact
DMA Europa Ltd: Bob Dobson
Tel: +44 (0)1798 861677
Web: www.dmaeuropa.com

Email: bob@bobdobson.com

Reader Contact
Mitsubishi Electric Europe B.V. Automation Systems Division: Chris Evans, Marketing & Operations Group Manager
Tel: +44 (0) 1707 288769
Fax: +44 (0) 1707 278695
Web: gb3a.mitsubishielectric.com
Email: automation@meuk.mee.com