MINIMISE THE FINANCIAL AND REPUTATIONAL RISKS OF UNPLANNED DOWNTIME

The impact of unplanned downtime in production environments can be far-reaching. The financial losses when output is interrupted can be huge in some industries. As well as volumes of the end-product falling short, there can be wasted materials and ingredients, high short-notice repair costs and, in some cases, contractual penalties. On top of financial impacts, there can be reputational damage, which can lead to lost business and trust.

Minimising the potential for unplanned downtime is, therefore, an important factor, and in this guide, we explore some of the ways you can reduce the risk of your electromechanical equipment, and in particular motor-driven systems, causing such an interruption.

INSTALLATION

Proper motor installation will give a good foundation for its operation and minimise the potential for downtime.

As a starting point, it's important to select a reputable supplier. Ask for recommendations from industry peers, colleagues or trade associations such as the Association of Electrical and Mechanical Trades (AEMT). Reviews, references and testimonials for potential suppliers can help, as can verifying any certifications and accreditations.

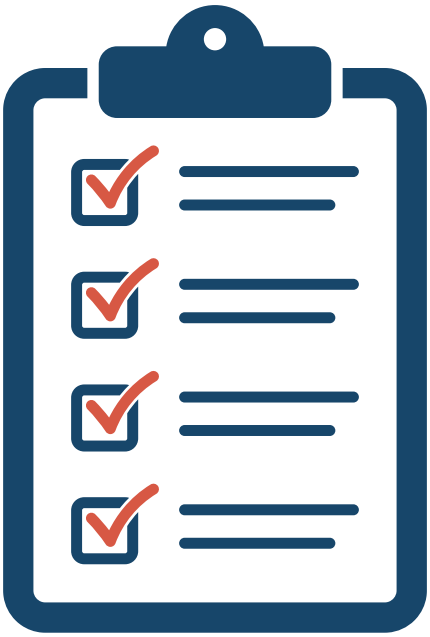
When selecting the specific motor to be used, it is essential to ensure that it is suited to the application. The load type should be determined, as should the duty cycle. The power requirements should be established, and a motor with a power rating slightly above this should be chosen in many cases. The speed and torque requirements should also be established, considering torque at both startup and during operation. The operating environment should also be considered, including aspects

such as ambient temperatures and other factors, including the presence of airborne particles or moisture.

When it comes to the actual installation, several factors come into play. It is vital to consult the manufacturer's documentation and follow any instructions given. A motor must be correctly aligned and firmly secured. This means ensuring a solid, stable base or coupling for the motor that will minimise any potential vibration and wear. The shafts on the motor and driven equipment should also be accurately aligned, typically with specialist laser alignment equipment. Plus, all electrical connections should be as direct and secure as possible, with relevant electrical tests performed as a check. Before operating the motor, an initial lubrication should be carried out to the manufacturer's specification, and then, as a final check, the motor should be energised and run up to speed to identify any possible issues.

ROUTINE MAINTENANCE

A well-documented and recorded routine maintenance programme can ensure the smooth running of a motor-driven system, prolong a motor's operational life and help maintain efficiency levels. The exact requirements of a routine maintenance programme will differ from one



application and motor type to another. Some systems need daily and weekly checks, while others will have longer intervals. However, there are tasks common to many motor types and applications and should be carried out at short-, medium- and long-term intervals.

Checks to be carried out more frequently include a general cleaning of dust, oil or other dirt, a visual inspection for any leakage of oil or grease from the bearings and, if necessary, a top-up of oil or grease levels in any bearings, and an examination of all electrical

connections to ensure they are secure.

Medium-term tasks can include visual inspection to check for any signs of external damage, corrosion, or leaks, checking the motor's mounting to ensure it is secure and examining the condition of cables, connectors, and terminal boxes. Accumulated dust, dirt, and debris should be cleaned from the motor's exterior using brushes or compressed air, while the cooling system, including the cooling fins and fan, should be cleaned to ensure effective heat dissipation. A check for any unusual noises that might indicate bearing problems should be carried out, while any signs of excessive vibration or heat, which can also be signs of bearing wear, should be investigated. Bearings should also be lubricated to the manufacturer's recommendations, ensuring not to over-lubricate.

Typically carried out less frequently are measuring and recording the motor's insulation resistance using a megohmmeter and measuring and recording motor winding resistances to ensure they are within specified limits. Vibration analysis should be carried out to detect imbalances, misalignments, or other mechanical issues with the results compared with baseline measurements to identify any anomalies. While thermal imaging with a thermal camera can identify hotspots in the motor, which can indicate issues like electrical imbalances, bearing problems, or cooling system inefficiencies. It is also important to periodically check the alignment of the motor and its load to detect any shift from the initial setup.

SPARES OPTIONS AND STORAGE

In many circumstances, quick, easy access to a good stock of spares will help to minimise downtime in the event of any issue, or where planned maintenance is carried out. The exact spares to hold will be governed by several factors, including their cost, availability from the supply chain and the impact of downtime. However, several areas need to be considered where motors are kept as spares.

Motors should be stored in a clean, dry environment with a stable temperature wherever possible. They should also be isolated from any vibration as, over time, even low levels of vibration can cause damage to bearings, which can lead to problems when the motor is put into service. Regular shaft rotation also helps to reduce bearing wear on any one point of the bearings, helping to prolong their life. The AEMT advises that shafts are rotated at least once a month, with the shafts of larger motors turned more often.

Finally, lubrication needs to be considered. Oil-lubricated motors should have their oil flushed and replaced before going into storage and again before being commissioned. Motors that utilise re-greaseable bearings should be regreased on average every year or so when in storage, while it should be recognised that if the motor employs sealed bearings, it is very likely that if not in operation for an extended period – say two years – the grease inside the bearing will separate and will not work optimally when required to start turning again.

Working with a service and repair specialist to manage your spares inventory on your behalf can be beneficial. They can ensure the equipment is kept in a suitable environment and manage the ongoing maintenance.

GOOD QUALITY REPAIRS

How motor repairs are carried out can affect the potential for downtime within a motor-driven system. A motor that has been repaired to a high standard will be more reliable and have a longer life than one that has not. It will also be more efficient in some cases. It is therefore recommended to work with a repair partner that follows the repair standard, *BS EN IEC 60034-23:2019 Rotating electrical machines - Repair, overhaul and reclamation*. The standard establishes the benchmarks for repairing rotating equipment, maintaining efficiency levels, high standards of quality control and improving efficiency in associated pieces of equipment.

The standard covers many other aspects of the repair process. It sets out requirements for the maximum temperatures used in an oven to burn off old windings to prevent damage to the steel laminations. It covers which insulation grades should be used, the approach to rebuilding bearing seats, the selection of replacement bearings and grease, and a range of other factors.

IEC 60034-23 also sets out what tests should be carried out on a motor before and after it is repaired and how the test equipment should be maintained and calibrated.

In line with the repair standard, a good motor repairer should have

a repair specification they can give customers, showing what will be done. And when the motor comes back from repair, there should be an accurate record of what has been done, including certificates covering aspects such as balancing, vibration measurement, tolerances, and surge test results.

CONDITION MONITORING

A powerful way to prevent downtime is to deal with any potential issues as they emerge and before they can develop into a serious fault. Condition monitoring is the process of continuously or periodically assessing the performance and health of equipment. Advanced sensors and diagnostic tools make it possible to detect subtle changes in a motor's performance, temperature, vibration, and other critical parameters. These changes, often imperceptible to the human eye or ear, can be early warning signs of potential issues.

For instance, increased motor vibration might indicate misalignment or bearing wear. A temperature rise could indicate cooling system failure or insulation breakdown. By catching these signs early, maintenance teams can intervene proactively by making minor adjustments or scheduling planned maintenance. This not only prevents unplanned downtime but also extends the motor's lifespan.

Many condition monitoring systems on the market today are relatively straightforward to install and set up, but the selection of sensors appropriate for an application and operating environment, and their positioning on the equipment being monitored, does require a degree of knowledge and experience. In addition, the data collected by the sensors is only as good as how it is analysed, interpreted and presented by the software controlling a condition monitoring system. To this end, it is recommended to work with a company experienced in motor systems, their setup, maintenance and monitoring when considering installing a condition monitoring system.

And it should be remembered that as

good as condition monitoring solutions are today, they are not a cure-all solution. Don't fall into the trap of assuming that with a condition monitoring system set up, you can ignore your motor-driven systems. An experienced operator periodically 'walking the line' is still extremely valuable.

SUMMARY

With the many types of industrial motors available and the vast array of applications, there is no one-size-fits-all solution to minimising downtime caused by a motor failure. However, by following the points outlined above – good installation practice, well-planned routine maintenance, careful management of spares inventories, having high-standard repairs and implementing condition monitoring – the risk of unplanned downtime and all that goes with it can be reduced.

Contact your supplier or repair specialist to find the best options for your specific situation. Details of electromechanical repair specialists in your area can be found on the AEMT website at **tinyurl.com/AEMTmembers**

For more resources to help you reduce unplanned downtime in your motor driven systems, visit: tinyurl.com/AEMTdowntime