SEW EURODRIVE

MANAGEMENT OF DRIVE TECHNOLOGY IN SEWAGE TREATMENT PLANTS

Guide for sewage works

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How can we ensure you have less to worry about?

A sewage treatment plant needs to keep operating, because the flow of waste water never stops. Modern-day plants are complex facilities with pumps, motors and control systems that need to work reliably around the clock. As a waste water technology specialist and sewage treatment plant foreman, this responsibility falls on you, as does the need to maintain an overview. Versatility is a must. You need to have a good knowledge of electrical and pipeline engineering, take care of machinery and its maintenance, and carry out laboratory tests. Your primary concern is ensuring the sewage treatment plant operates smoothly and in compliance with statutory guidelines. The waste water quality provides proof of this. The “moment of truth” arrives when the authorities measure the discharge values. Unsatisfactory results can lead to substantial fines.

Throughout the plant, electrical drives operate under high loads and in challenging environmental conditions. Any failure is both problematic and inconvenient. The inlet pumping station is especially vulnerable, because if a total failure occurs despite the screw pumps’ redundant design, waste water builds up at the entrance to the plant. Rapid action is then absolutely essential. Aerating the aeration tank is critical as well, because the bacteria are unlikely to survive for long if this fails.

Rapid intervention is also required if the scraper in the secondary clarifier stops working. Otherwise, sludge will accumulate.

Based on our experience:
Additional problems are caused by outdated technology for which there are no longer any replacement parts to make a direct swap. The fact that sewage treatment plants are repeatedly being renovated and modernized means there are all kinds of incompatible makes all over the place. Constantly changing regulations and new purification processes necessitate conversions and extensions, which creates a vicious circle.

As a plant foreman, you also have energy-efficiency issues to consider. Sewage treatment plants account for around 20% of municipal energy consumption – another area where action is required. Industry 4.0 is a further factor. This technical revolution is also having an impact on sewage treatment plants. Cutting-edge sensor technology and distributed intelligence promise to improve operational reliability and make life easier in ways previously undreamed of. Even if you currently still prefer to rely on your emergency pumps with a float bulb, you should discover and learn to appreciate the huge benefits of digital technology.

In-house or third-party repair?

As an experienced all-rounder and waste water technology specialist, you can take care of many repair and maintenance tasks yourself. The main benefit of this is speed – provided, of course, the right components and spare parts are in stock or are delivered as quickly as possible. And that's where the problems start.

Should I keep spare parts in stock?

Having a stock of spare parts so as to be able to act quickly in the event of an emergency is a good idea.
Basic wear parts are an example of "fast-moving" items that are regularly required, can be replaced with standard materials and place little strain on the budget. Complete drives are a different matter, though. Most plants operate drive solutions from a variety of manufacturers, depending on which specialist companies dealt with the individual process steps.

It soon becomes virtually impossible to know the details of all products. From the outside, it may seem like all drive solutions work in the same way, but a closer look reveals significant differences. Although standardized adapters and flanges are used to connect the gear unit and motor, you still need to have the right adapter in stock. Storing spare parts for too long can be detrimental in some cases. If a fault does occur, you will typically find that the very part you urgently require for a repair is not in stock after all…

What about ordering parts?

You know exactly which part needs to be replaced, but the supplier tells you it will have to be ordered and could take two weeks to arrive. As the person in charge, you deem that to be too long.

Dealing with the matter yourself involves a further risk, because not all manufacturers are prepared to accept a warranty claim if someone else has opened the gear unit cover. That then leaves you to bear the relevant costs.

How about maintenance contracts?

Rapid action is required in the event of plant failures. Operators and manufacturers can work together closely to reduce the unplanned nature of such situations. Maintenance agreements with manufacturers are one solution, but if a plant operates drives from a whole host of different manufacturers, you'll often hear the following excuse: "Our components aren't to blame."

We look after you

The best solution is a service provider that takes responsibility for all components, regardless of the manufacturer, and is also authorized to carry out repairs under warranty. SEW-EURODRIVE is just such a service provider. Below you will find details of the services from our comprehensive portfolio that provide you with effective support for the management of your plant.

- **24 h Service Hotline**
- **Inspection and Maintenance Service**
- **Repair Service**
- **Spare Parts Service**
- **Retrofit Service**
- **Condition Monitoring Service**
- **DriveRadar®**
- **CDM® Maintenance Management**

When your plant is showing its age…

Before: existing (third-party) gear unit on the worm shaft in Kleinsteinbach

After: X series three-stage helical gear unit including energy-efficient motor, motor adapter with torsionally flexible jaw-type coupling and a pin coupling

A breath of fresh air for sewage treatment plants

Many sewage treatment plants represent a similar level of development and have already been operating for 20 to 30 years. However, technology is continuously advancing, purification processes are constantly improving, and both regulations and requirements are changing. By 2040 at the latest, for example, every sewage treatment plant must have a fourth purification stage. Other areas currently requiring attention include pharmaceutical residues, microplastics, phosphate recovery, energy efficiency and Industry 4.0.

In addition to high system availability, ensuring your plant continues to operate with state-of-the-art technology as far as possible is also vitally important to you as the person in charge. To be on the safe side, SEW-EURODRIVE offers solutions such as a Retrofit Service to optimize your plant's availability and process reliability. Having state-of-the-art technology also cuts your energy costs. If you prefer, however, we can simply ensure individual plant components are working properly.

Real-life example:

In November 2014, the operator of the Kleinsteinbach sewage treatment plant decided to have SEW-EURODRIVE carry out a preventive inspection of its drive technology to ensure future system availability. Service experts from company headquarters in Bruchsal used a flexible video endoscope to assess the condition of gearing components and bearings. The endoscope's probe is introduced into the gear unit through small openings, so there is no need for it to be disassembled.

The high-resolution camera provides razor-sharp images of the interior. A visual inspection of the bearings and gear teeth, combined with video footage of the tooth flanks, ultimately enables a conclusion to be drawn about the condition of the drives. Signs of damage such as micro-pitting, pitting and fretting are identified at an early stage and appropriate measures can be decided on.

Based on the overall condition of the gearing components and the state of the gear unit lubricant, recommendations were made for the drives inspected. The gear unit of the screw pump at the interim pumping station was already exhibiting significant signs of wear. The gear and pinion of the output stage in particular had large pitted areas, which could have developed into larger flank ruptures and ultimately resulted in the total failure of the drive unit. Further drives with only minimal damage, such as the ones operating the intake pumping station and the scraper, were classified as not critical.

The diagnostic check ultimately prompted the operator to replace the existing gear unit (manufactured by a third party) with one of our industrial gear units. This involved replacing the original bevel-helical gear unit and belt drive with a three-stage helical gear unit. This unit was connected to the energy-efficient SEW-EURODRIVE DRN.. motor using a motor adapter with integrated, torsionally flexible jaw-type coupling. It was attached to the worm shaft using a pin coupling with elastomer elements to compensate vibrations and jolting. In addition, a backstop on the gear unit absorbs the reverse acceleration caused by the water gushing back when the motor is switched off.

That's how easy and straightforward a retrofit can be!

SEW-EURODRIVE as a partner – **scenario 1**

The Spare Parts Service

Imagine the following situation: As usual, you start your working day by taking a look at your sewage treatment plant's control station. The monitor indicates that a screw pump at the inlet has stopped working because the gearmotor has broken down. You immediately start looking for the cause. The fault appears to be in the gear unit, so you dismantle it with the help of your colleagues and start the troubleshooting process. You ultimately conclude that bearing X has got stuck and is preventing the gear from working. You decide to carry out the repair yourself, for which you need a new bearing.

There is an SEW-EURODRIVE DriveTag label barcode on the gearmotor's nameplate. You scan it using the app on your smartphone, which brings up an image of the gearmotor together with all its components. A few taps on your phone take you to the bearing X you require. Having already registered with SEW-EURODRIVE's online shop, you can simply add the bearing to your cart and flag the order as urgent. Ideally, the bearing is delivered the next day. In the meantime, you and your colleagues have removed the defective bearing X, so you can install the new bearing, reassemble the gear unit and fill it with oil.

Screw pump operation resumes, conveying waste water from the inlet up into the sand trap – problem solved!

More time for the important things

SEW Product ID plus

This app makes it easy for you to access all the relevant information about your product directly from your smartphone. We can also help you with product malfunctions. Simply scan the QR code on your product's DriveTag label or enter the serial number from the nameplate.

Your benefits at a glance:

- Guided troubleshooting for your product, including direct contact with our service team
- Direct access to important technical data about your product, visual inspections of the mounting position and access to specific documentation such as operating instructions

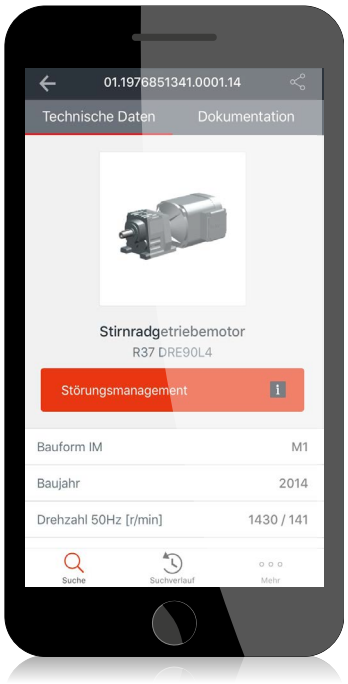
Delivery service

Our delivery service is geared to your specific requirements, with everything from standard and express shipping to delivery direct to your construction site by a courier.

Electronic delivery notification

Our electronic delivery notification service lets you know as soon as your delivery leaves our premises to keep you in the picture and give you time to make the necessary preparations for installing the part.

Want to know more?
Simply give us a call (+49 7251 75-3232) or send us a message (DriveBenefits@sew-eurodrive.de).



SEW Product ID plus

SEW-EURODRIVE as a partner – **scenario 2**

Operational reliability redefined

Once again, you start the working day feeling relaxed. A message pops up on the monitor telling you bearing X on the screw pump‘s gear unit is operating more sluggishly than usual. The message also contains a link to notify SEW-EURODRIVE‘s service team with a view to planning a replacement.

With a click or a tap, the service team receives a message telling them bearing X on the screw pump‘s gear unit at your sewage treatment plant is operating sluggishly. Based on the operating data also transmitted, the service engineers are able to predict when the bearing is likely to fail.

You get a call from the nearest SEW-EURODRIVE service technician and agree a date and time to replace the bearing. Together, you dismantle the drive, replace the bearing and reinstall it on the screw pump. Around two hours later, the engineer heads off again.

The SEW-EURODRIVE service team is available 24/7. It carries out maintenance and repairs on the company‘s own drive solutions and also on other manufacturers‘ drives without your warranty becoming invalid. If the situation at your plant is critical, we‘ll carry out the work as an emergency repair following consultation with you.

We‘re there for you

There are a great many service workshops, so there‘s bound to be one near you, but are they as quick and skilled as the original manufacturer? Is the workshop familiar with all types of gearmotors? Will your warranty remain valid in the event of a repair? And what else can this service partner offer you?

As you can see, choosing the right component and service partner is vital for high system availability. SEW-EURODRIVE‘s service team is familiar with such requirements.

We offer you services that extend far beyond the product in question. Our wide-ranging advice, combined with customized training and project planning tools, provide you with effective support during your day-to-day work. This includes energy consulting if you are looking to improve your sewage treatment plant‘s energy efficiency.

SEW-EURODRIVE offers commercial services, too, such as an interface to your order system and electronic billing, which makes life easier after a service intervention.

The company‘s service portfolio also includes a free hotline that is available 24/7, and advice on installing drives if you prefer to do this yourself.

As one customer put it: „A service like SEW‘s is exactly what we want and need. They even repair third-party drives. When tenders are up for renewal, SEW is our number one choice.“

Do you need help with Online Support?
+49 7251 75-3232
online-support@sew-eurodrive.de

An ideal solution – DriveRadar®

Set the right course now!

Sensors in our latest-generation drives measure various physical parameters such as temperature, eddy current, current consumption and vibrations. DriveRadar® is the name given to the SEW-EURODRIVE concept designed to provide an end-to-end digital map of drive components and system solutions to give you, the operator, a detailed insight.

It aims to determine the condition of systems on the basis of existing data that is collected during the operation of SEW-EURODRIVE drive systems. Cutting-edge data analysis (machine learning) based on a digital twin can be used to accurately predict imminent damage.
As a result, DriveRadar® can prevent unplanned stoppages and interruptions during operation, detect wear and minimize downtimes.

Online recording of operating parameters

- Provides transparency regarding the condition and operating behavior of drives (condition monitoring)
- Prevents malfunctions and unplanned stoppages/downtimes thanks to early warnings of critical system conditions or abnormal operating behavior
- Makes maximum use of component and system lifecycles
- Improves the ability to plan maintenance and repairs
- Ensures/increases the availability of components, equipment and systems

Example: gear unit diagnostics using thermal analysis

A thermal sensor installed in the gear unit measures the oil temperature and sends this information to an evaluation unit, which then calculates the time remaining until the next oil change for the specified oil type. The diagnostic unit takes into account the oxidation characteristics of the different oils under thermal stress. This is the ideal way to determine the remaining life of the gear unit oil and reliably indicate the right time for an oil change.

Benefits:

- Reduced oil costs
- Optimum utilization of oil service life
- Startup directly on the diagnostic unit (without a PC)
- Time until the next oil change is clearly visible
- Five different oil types can be configured
- Warning message when predefined limit values such as the maximum oil temperature are exceeded
- Permanent monitoring of oil aging
- Maintenance intervals can be planned individually

You yourself benefit from being able to monitor the condition of your equipment using the relevant apps on your smartphone, tablet or laptop.

Find out more about DriveRadar® and the condition monitoring system here:

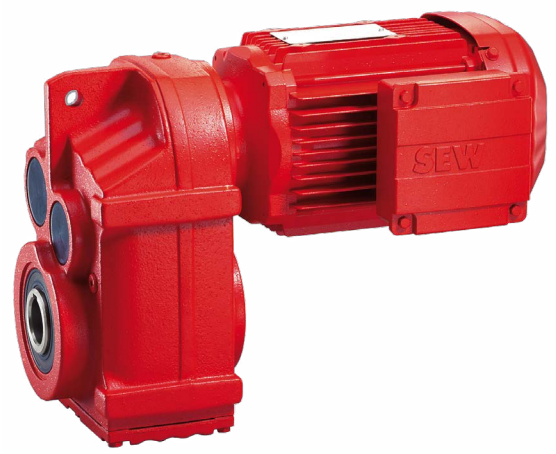
- www.sew-eurodrive.de/en/predictive-maintenance
- https://download.sew-eurodrive.com/download/pdf_u/24846937.pdf

Practical tips

What is drive technology?

Electrical drives should preferably be used at sewage treatment plants, normally in conjunction with a gear unit to reduce the rotational speed of the asynchronous motor and generate the relevant torque required.

There are many different applications in waste water treatment. The drives used – for the screw pumps at the inlet, for instance – are typically just as varied. Parallel-shaft helical gear units or X series industrial gear units with corresponding asynchronous motors may be utilized, depending on the space and power requirements. The same applies to the drives on the screens removing sludge in the sand trap, primary clarifier, aeration tank and secondary clarifier.



F series parallel-shaft helical gear units / gearmotors

Gear unit and motor details

Gear units

Parallel-shaft helical gear units have the advantage of being flat, which makes them more versatile – with a hollow shaft connection if the customer application provides a drive shaft, for example. If a great deal of power is required in a confined space, a helical gear unit is a better choice. Parallel-shaft helical gear units are highly efficient and have a wide torque range, which makes them economical and powerful solutions for continuous operation.

Large/industrial gear units should preferably be used for applications where the torque required is beyond the capabilities of a standard gear unit – on the septic tower or during thickening, for instance. Industrial gear units normally have a relatively compact design but offer a far wider upper torque range. They are used at sewage treatment plants with high population equivalents – if the screw pumps are designed for large volumes of waste water and a correspondingly high torque is required, or if correspondingly large amounts of feed or return sludge need to be removed, for example.

DRL.. series asynchronous servomotors

Motors

Design-related differences also apply to asynchronous motors.In most cases, the motors in operation at sewage treatment plants combine compact dimensions with high energy efficiency in line with their use. There are some application-specific differences depending on whether the motors are operating continuously – as at the inlet or in the case of the slurry screens during aeration and secondary clarification – or only intermittently, as in the case of primary clarification and some pumps.

It makes sense to use asynchronous motors with a high energy efficiency class such as IE3 for continuous operation. In the case of start/stop operation, motors with a lower efficiency class are also adequate. They are less energy efficient but are designed for exactly such applications.
The decision should definitely be left to an expert!

Things to bear in mind

Practical tips for routine work

Interval	Task
Daily	– Check the housing temperature • Mineral oil: max 90 °C • Synthetic oil: max. 100 °C – Check gear unit noise
Monthly	– Check the gear unit for signs of leakage – Check the oil level
After 500 hours of operation	– First oil change following startup
Every 6 months	– Check all the screw fittings and pipework for any leaks
Every 3000 operating hours, at least every 6 months	– Check the oil consistency – Fill regreasable sealing systems with grease – In the case of V-belt drives, check the belt tension and condition of the V-belt pulley and belt
At least every 12 months, depending on the operating conditions	– Check retaining screws are tightly secured – Check whether the gear unit surface is free of dust and dirt to ensure optimal gear unit cooling – Check the condition of the motor pump /ONP, replacing the filter element if necessary – Check the condition of the oil-water cooler /OAC/OWC – Check the condition of the oil-air cooler /OAP, replacing the filter element if necessary – Clean the oil filter, replacing the filter element if necessary – Check the condition of the water cooling cartridge /CCT – Check the condition of the water cooling cover /CCV – Check the breather and replace if necessary – Check the alignment of the input and output shafts – Check the condition and tightness of all rubber tubes (aging effects)

Interval	Task
At least every 3 years, depending on the operating conditions	– Change the mineral oil
At least every 5 years, depending on the operating conditions	– Change the synthetic oil
Varies (depending on external factors)	– Check the installed hose pipes – Clean the gear unit housing surface and the fan – Touch up or renew the surface protection / anti-corrosion coating – Replace the backstop – wear can occur, especially when operated below lift-off speed, so you should contact SEW-EURODRIVE to define maintenance intervals in the case of: • Output shaft speeds < 950 min1 – Check the built-in cooler (e.g. water cooling cover /CCT and water cooling cartridge /CCV) for deposits – Check the oil heater /OH (when changing the oil) • Are all connection cables and terminals tightened securely and free from

LET SEW-EURODRIVE LOOK AFTER YOUR DRIVE TECHNOLOGY

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