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Bauer Gear Motor

Bibby Turboflex

Boston Gear

Delroyd Worm Gear

Formsprag Clutch

Guardian Couplings

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Industrial Clutch

Inertia Dynamics

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Lamiflex Couplings

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Matrix

Nuttall Gear

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Stromag

Svendborg Brakes

TB Wood's

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Warner Electric

Warner Linear

Wichita Clutch

# Motors and Drive Systems in the Water Industry



An Altra Industrial Motion Company

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*The water industry provides one of our most vital resources right to our doorstep, but the processes that are required to maintain this service are numerous and provide many challenges in terms of efficiency and reliability. One of the crucial components within the water treatment and delivery process is the humble electric motor, which along with its associated drive systems, provides the power necessary to keep the cycle in motion.*



It has been estimated that as much as 90% of all industrial electrical energy consumed within the water industry is used to drive an electric motor.

Markus Kutny, Product Manager for Energy Efficient Solutions at Bauer Gear Motor, explains the benefits of improved motor efficiency and how to achieve lower running costs...

It has been estimated that as much as 90% of all industrial electrical energy consumed within the water industry is used to drive an electric motor, making efficiency the highest priority in order to effectively manage rising energy costs. However, with water treatment a truly 24-hour process, reliability in an extremely challenging environment is another key factor.

## **Maintaining Standards**

Many markets identify minimum standards for equipment and processes operating within the water treatment sector in order to minimize any disruption of service. In the UK market, there is a specific set of standards, known as WIMES, the Water Industry Mechanical and Electrical Specification, which define the minimum standards of performance and construction for electric motors and associated controls. The specifications were laid down after consultation between the UK water companies motor and drive train component, manufacturers and suppliers and are updated on a regular basis in order to keep pace with design improvements and best working practices.

With applications involving motors that run continuously, any improvement in energy efficiency will have a very significant effect in reducing running costs. In recent years, the majority of emphasis has been on the improvements which have been made in electric motor efficiency, in part due to the changing regulations which have focused manufacturers and customers alike.

The introduction of IE3 regulations and the anticipated arrival of IE4 presents an opportunity for the water industry to embrace the latest in electric motor technology and also appreciate the cost savings that can be made. Manufacturers have developed new designs that will go beyond the required efficiency levels and enable operators to achieve significant savings in running costs.

While the legislation for IE3 came into force in January, 2015 for motors above 7.5 kW, some manufacturers, including Bauer, already offer an IE4 Super Premium Efficiency product, even for applications in potentially explosive atmospheres. However, some end users are cautious about investing in higher levels of efficiency because of the price differential between a traditional design and say that of an IE4-rated permanent magnet synchronous motor (PMSM). These concerns

can be addressed by examining the scale of the cost savings, looking at the return on investment (ROI) and ensuring that any new motor is properly specified for the application.

PMSMs offer considerably improved efficiency when compared to induction motors, especially under partial load conditions, with proven energy savings of over 30%. They also have significantly higher power density, which, for geared motors, yields higher system efficiency with minimal installation volume.

### Further Improvements

However, in terms of the overall efficiency within a drive system which is powered by electric motors, the mechanical system also needs to be considered, as it possesses a significant potential for optimization. Integrated geared motor designs remove the need for a coupling and bearing, thereby providing a close-to-perfect transmission efficiency. Equally, helical bevel gearing should be considered over worm gearing as it is more efficient and provides a longer service life in most applications.

In many cases, the drive systems for settlement tanks, filter beds and thickeners can benefit from improved mechanical efficiency, and the investment cost is soon recovered through a greatly reduced total cost of ownership. By working closely with manufacturers, new drive systems can be developed from a modular product range to precisely match the requirements of each application. In this way the electric motor will provide long-term reliability with maximum efficiency and reduced running costs.

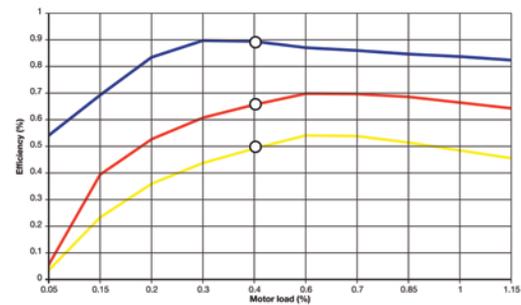
Further improvements can be made by focusing on the drive coupling, a crucial link between the electric motor and driveshaft, which can have a significant influence on the performance of the equipment. Couplings are designed to accommodate shaft misalignment, which may be present when one of the connected shafts is located near a self-aligning bearing, or when an unsupported, intermediate shaft is placed between the driver and the load.

Couplings capable of overcoming true angular misalignment include the single universal joint with its capacity to handle large offsets and torsional damping. Depending on the application, maintenance requirements and torque specification, the design of the coupling should be carefully scrutinized to ensure reliable performance as well as ease of maintenance. Specifying a coupling incorrectly can lead to inefficient power transmission as well as increased maintenance costs.



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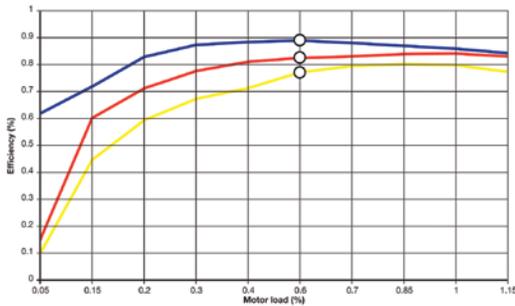
ASM & PMSM 5.5kW: IE2 - IE3: 6Hz



<b>Example:</b>	<b>12% Speed</b>	<b>Savings in Euro</b>
Load	approx. 40%	ASM-Technology
Running time	2.900 hr/Year	IE2 to IE3 ca. 519 €/Year
Power costs	0.15 €	PMSM-Technology
		IE2 to IE3 ca. 922 €/Year
<b>Energy costs</b>		
ASM IE2	~ 2,075 €/Year	■ PMSM IE3 ■ ASM IE3 ■ ASM IE2
ASM IE3	~ 1,556 €/Year	
PMSM IE3	~ 1,153 €/Year	

At 40% load PMSM IE3 motors can save up to 45% on energy costs compared to an ASM IE2 motor.

### ASM & PMSM 5.5kW: IE2 - IE3: 25Hz



<b>Example:</b>	<b>50% Speed</b>	<b>Savings in Euro</b>
Load	approx. 60%	ASM-Technology
Running time	2.900 hr/Year	IE2 to IE3
Power costs	0.15 €	approx. 121 €/Year
		PMSM-Technology
		IE2 to IE3
		approx. 245 €/Year
<b>Energy costs</b>		
ASM IE2	~ 1,840 €/Year	■ PMSM IE3 ■ ASM IE3 ■ ASM IE2
ASM IE3	~ 1,719 €/Year	
PMSM IE3	~ 1,595 €/Year	

At 60% load PMSM IE3 motors can save up to 15% on energy compared to an ASM IE2 motor.

### Improving Efficiency

Operating efficiency has a very significant effect on running costs, with a typical IE2, asynchronous motor consuming 100 times its purchase price in electricity costs within its lifetime. Examining the mechanical efficiencies, and making significant improvements in this one area, can result in a reduction in the overall power requirement from the electric motor. By installing a smaller motor, which is connected to a more efficient mechanical drive, the overall effect is to reduce energy consumption and improve reliability by using matched components.

When specifying drive systems for applications within tough environments, it is important to speak to a solutions provider with the experience to understand the implications of each individual scenario.

Altra Industrial Motion has been helping wastewater equipment manufacturers and treatment facilities worldwide increase their efficiency while reducing costs and downtime. The companies within the group such as Bauer Gear Motor, TB Wood's, Bibby Turboflex and Boston Gear provide full drivetrain solutions for the wastewater industry, with a comprehensive offering of couplings, geared motors, speed reducers, torque-limiting devices, and belted drives.



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