Controlling whole life costs throughout the water cycle
For over 20 years ABB has been at the forefront of water industry innovations, with our dedicated water specific variable-speed drives through to our recently launched WIMES-compliant motor. We have helped guide the industry to better understand the true cost of ownership of drives and motors when applied to pumps, blowers and other applications. And we have expressed the importance of life cycle services to ensure a pump system will operate effectively for the next 20 years and beyond. All of which ensures that water utilities can continue to deliver positive outcomes, yesterday, today and tomorrow.

How the drive-train affects outcomes
ABB is able to provide the complete drive-train including variable-speed drives, motors, generators, bearings, couplings and gearings for all applications ranging from pumps, blowers, mixers and many more.

ABB’s portfolio includes:
- Low voltage variable-speed drives
  - Single drives up to 2800 kW
  - Multi drives up to 5600 kW
- Medium voltage variable-speed drives
  - 315 kW up to 27,000 kW
- Low and medium voltage squirrel cage motors
- Synchronous reluctance motor (SynRM) and drive packages
- Converter transformers
- DC drives
- Slip-ring motors (wound rotor induction motors)
- Secondary rotor starters
- Soft starters
- Power factor correction
- Harmonic filters
- Mechanical power transmission products
- Scalable PLCs
- Human machine interfaces (HMIs)
Controlling whole life costs throughout the water cycle
The true cost of ownership

Cost of ownership – or whole life cost - has been, traditionally, the purchase price plus the cost of running. But this view is to overlook the most important cost associated with ownership: the cost of not running.

Capital costs
This is quite simply the initial purchase price of the drive-train.

Cost of running
A key element of operational cost is the energy used by the application (see page 8). It is also about looking for ways that variable-speed drives and high efficiency motors can improve productivity (see page 9). What should not be included here is the cost of maintenance. Contrary to current thinking, spending on maintenance does not increase the whole life cost; it does the complete opposite!

Cost of NOT running
This is the most overlooked aspect of ownership. What is the cost to your outcomes of interruption to a process? It can be wide ranging, from downtime through to loss of customer reputation. The important aspect here is how to minimise the cost of not running. Often companies rely on a rapid response to failures. But what if the risk of failure was eliminated in the first place? The cost of maintenance is always less than the cost of failure. So a structured maintenance regime offered by a reliability assessment (see page 10) drives down the whole life cycle cost.
ABB defines four distinct phases of a drive-train’s life cycle. As each product that makes up the drive-train enters each phase, announcements are distributed some six months in advance of the change.

**Secure uptime throughout the drive-train life cycle**

ABB follows a four-phase model for managing the life cycles of the component parts of a drive-train: active, classic, limited and obsolete. The services offering is defined for every component part, separately. The availability of individual services depends on the component’s life cycle phase.

The four-phase life cycle management model provides customers with a transparent method for managing their investment in the drive-train. In each phase, customers clearly see what life cycle services are available, and more importantly, what services are not available. Decisions on upgrading, retrofitting or replacing the component parts can be made with confidence.
Whole life cycle value chain

Proactive maintenance programmes for all elements of a drive-train keep you competitive by minimising disruption to your motor-driven applications.

Motor-driven applications found throughout the water and wastewater sector have a high degree of reliance placed upon them and often perform critical duties and have a high in-service value. A failure of any part of the drive-train can result in loss of production and revenues, as well as having safety and environmental consequences. To reduce the risk of failure, each element of the drive-train - whether a variable-speed drive, motor, bearing, coupling or gearing - must be properly maintained at the right times in their life cycle. The services offered by ABB span the entire life cycle, from the moment a customer makes the first enquiry to disposal and recycling of each component. Throughout the value chain, training, technical support and customised contracts are also available.

<table>
<thead>
<tr>
<th>Pre-purchase</th>
<th>Order and delivery</th>
<th>Installation and commissioning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy assessment</td>
<td>Express delivery</td>
<td>Installation service</td>
</tr>
<tr>
<td>Productivity assessment</td>
<td>Parts OnLine</td>
<td>Commissioning service</td>
</tr>
<tr>
<td>Reliability assessment</td>
<td>Drive registration service</td>
<td>Drive registration service</td>
</tr>
<tr>
<td>Engineering customisation</td>
<td>Start-up service</td>
<td>Drive Exchange service</td>
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<tr>
<td>Harmonic surveys</td>
<td></td>
<td></td>
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<tr>
<td>DriveSave</td>
<td></td>
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<tr>
<td>Thermal surveys</td>
<td></td>
<td></td>
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<tr>
<td>Selection/Dimensioning</td>
<td></td>
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<tr>
<td>Warranty</td>
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</tr>
</tbody>
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<tr>
<th>Contracts</th>
<th>Technical advice</th>
<th>Training</th>
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<td>Hardware upgrade</td>
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<tr>
<td>Control upgrade</td>
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<td>Retrofit service</td>
<td></td>
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<td>Drive Exchange service</td>
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<td>Drive replacement service</td>
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<td>Drive Exchange service</td>
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<tr>
<td>Disposal and recycling service</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hire drives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SamiStar upgrade kits</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Authorised Value Providers

Our partner network delivers sales, support, service and engineering expertise in seamless cooperation with ABB. Being strategically located throughout the UK and Ireland, our partners bring ABB’s products and services directly to your site along with the same technical knowledge and back-up, combined with the best equipped repair and maintenance facilities in Europe. All providers undertake extensive and on-going training in all aspects of motors, drives and services. This provides the consistency of support, wherever in the UK and Ireland you are located.
In all motor-driven applications there are opportunities to improve energy efficiency by considering all aspects of the drive-train, from variable-speed drives and electric motors through the entire mechanical power transmission.

But how do you know which applications can offer the fastest return on investing in a more efficient drive-train? In just half-a-day, an ABB energy assessment will rapidly show the huge energy savings possible.

**Benefits include:**

**Lower energy bills**
Reducing the speed of a pump, fan or compressor with a variable-speed drive will often save 30-50 percent of the energy, while savings of up to 80 percent can be achieved in some cases. Energy savings translate directly into lower energy bills, freeing up capital for investment elsewhere.

**Unrivalled energy efficiency**
Operating electric motors with variable-speed drives, brings lower reactive power consumption, high efficiency of 98 percent and minimised need for air conditioning in electrical rooms. This means less investment in electrical network compensation devices, such as filters as well as reduced harmonic distortion to the electrical network.

**Reduced CO₂ emissions**
An assessment highlights potential pollution levels and gas emissions such as CO₂ reductions so that local environmental regulations can be fulfilled. Variable-speed drives also qualify for the UK government’s Enhanced Capital Allowance scheme, making companies eligible for tax relief.

**How it works**

- **Outlining the scope**
  An ABB-certified engineer visits your facility to identify location of the applications, an inventory of motors, any health and safety restrictions, as well as anything unusual that might affect the energy profile.

- **Monitoring and data collection**
  The load profile and energy data of the identified applications are measured to determine the energy consumption or process requirements.

- **Data analysis**
  We analyse the findings including an estimate of present energy usage and carbon dioxide emissions, areas of potential savings and payback time if an investment is made in drives and/or motors.

- **Recommendations**
  We prepare an action plan highlighting applications that can save the most. The figures will be normally translated into annual savings, and there will be detailed recommendations for suitable drives or motors.

- **Optional services available**

- **Implementation**
  Using the recommendations from the energy assessment, we can help with the installation and start-up or commissioning of the drive and motor.

- **Verification and follow-up**
  Once new equipment is fitted, we track the actual savings against the predictions shown in the report. This will also help justify the investment in drives and motors.
Productivity Assessment

An efficiently operating drive-train brings reduced installation, operation and maintenance costs. The high reliability and reduced mechanical stress on electric motors leads to maximised uptime and greater productivity.

A productivity assessment will identify which applications can most benefit from improvements in the drive-train.

Benefits include:

**Higher process quality and reliability**
The world leading motor control method, direct torque control (DTC), ensures extremely high control accuracy. DTC behaviour in abnormal situations is excellent, being able to handle efficiently, short supply voltage breakdown, heavy torque variations, motor already rotating and cable short-circuits.

**Increased productivity and throughput**
An assessment helps ensure that production speed and capacity can be increased and end product quality enhanced while operating costs are reduced. Components within a drive-train have many features that help productivity including short repair time, alarms before malfunction and diagnostics to help personnel locate any faults.

**Minimal mechanical wear**
Using the drive-train more efficiently and eliminating overcapacity reduces stress and strain on machinery, meaning less maintenance will be required.

How it works

**Outlining the scope**
An ABB engineer or one of ABB's Authorised Value Providers visits your site to understand the environment. The assessment looks at variable- and constant-torque loads, their control methods and where improvements be made.

**Monitoring and data collection**
ABB will collect data that will help determine those applications that may be running inefficiently. The engineer will look not only at fixed-speed motors but also any drives currently being used, to see if the application is running at maximum efficiency.

**Data analysis**
We analyse the findings and identify potential productivity improvements, such as enhanced optimisation opportunities, increased production throughput, maximised process up-time and reduced wastage.

**Recommendations**
An action plan is prepared, comprising an Executive Summary and a detailed engineer’s report, highlighting applications that can benefit the most from using drives and motors. The figures will be translated into monthly savings, and there will be detailed recommendations for fitting drives and motors, including costs and payback times.

**Optional services available**

**Implementation**
We can help with the installation and start-up or commissioning of the drive and motor.

**Verification and follow-up**
Once new equipment is fitted, we track the actual savings against the predictions shown in the report. This will also help justify the investment in drives and motors.
Securing outcomes means that every part of your process needs to run uninterrupted, with no unexpected surprises. Predictability saves time, cuts costs and ultimately keeps your business effective.

A reliability assessment considers all aspects of your drive-train installation and gives you powerful knowledge to determine exactly where your process stands, now and in the future.

Benefits include:

**Match maintenance to criticality**
A reliability assessment combines the drives’ maintenance status with their criticality to the process or application. This provides key information to determine the current state of your plant and how it will evolve over time.

**Maximises profit**
Service budgeting can be optimised as the total plant’s maintenance actions can be planned in advance, thus reducing unexpected interruptions. The uptime of critical applications, in particular, will improve dramatically.

**Suitable for all variable-speed drives**
We offer reliability assessments for all drives, no matter what their brand or life cycle stage.

How it works

**Drive registration**
Before any assessments can be carried out, every drive needs to be registered. During registration, the drive’s criticality can also be defined and customer identification and application date will be entered.

**Getting started**
We collect and prepare all applicable data on your drives, along with detailed service history and environment of the installation. Together with the invaluable insight of on-site professionals, we gather all the crucial data about your technical infrastructure.

**Digging deeper**
We go into detail with each drive, with information including age, location, business impact, effects of operating environment, service history, as well as all additional third party servicing and part replacements.

**Making sense of the data**
The report collates all the information which allows us to produce a detailed maintenance plan designed to target your available budget for your process or plant.

**Forward planning**
We provide you with a comprehensive report that goes in-depth with the current and future state of your process. Getting detailed information helps you plan both future investments and maintenance more effectively, with the related schedules, budgeting and execution. It also helps you to prioritise and tackle any imminent future defects.
Controlling whole life costs throughout the water cycle

Achieving energy efficiency, improving productivity and reliability

Celtic Anglian Water
Application: Storm tank return pumps. Ringsend Wastewater Treatment Plant.
Challenge: To eliminate blockages of the site’s six storm tank return pumps caused by ragging.
Solution: Installation of an ABB ACQ810 drive for water and wastewater featuring an intelligent pump-cleaning technique that enables the drive to automatically perform preventive maintenance on the pump.
Benefit:
– Elimination of ragging
– System running more cost effectively
– Reduced labour and maintenance costs

Northumbrian Water
Application: Advanced Anaerobic Digester (AD) system, Bran Sands Sewage Treatment Works.
Challenge: To stop foaming of liquid in the site’s three digester tanks caused by absence of speed control on the pumps.
Solution: Low voltage AC drives were supplied to achieve a form of pump control that would prevent the foaming.
Benefit:
– Increased efficiency of the AD system
– Reduction in energy use
– Cost saving of £100,000

Severn Trent Water
Application: Dry well flow pumps, Wanlip Sewage Treatment Works.
Challenge: To achieve compliant flow rates of 550 litres per second (l/s) on six dry well flow pumps. Problems with ragging had caused flow rates to drop to 400 l/s. Under storm conditions, temporary pumps were needed, increasing operating costs.
Solution: 75 kW ABB Industrial drives with intelligent pump cleaning software were installed on all pumps.
Benefit:
– £100,000 reduction in energy costs
– Compliant flow rates of 550 l/s achieved

Yorkshire Water
Application: Pumping Control System, Blackburn Meadows Water and Sewage Treatment Works.
Challenge: Update pumping control system due to problems with installed DC drives on six transfer pumps that required increasing amounts of maintenance.
Solution: Six ACS 2000 AC drives with ABB AC motors. The motor-drive combinations provide a direct-to-line solution with an active front end to enable transformerless operation. Meanwhile, medium voltage drives were selected instead of low voltage drives due to the long cable lengths and overall project costs including the electrical distribution system, variable-speed drives and motors.
Benefit: Reduction in whole life cycle costs primarily due to reduced maintenance.