CASE STUDY
Anglian Water
by Samotics

Reaping the fruits of a proactive maintenance strategy: How Anglian Water prevented unplanned downtime and a subsequent pollution incident using Samotics’ predictive analytics.
“Water is our business. We handle with care and we don’t cost the earth.” That’s the mission of the UK water utility Anglian Water. Located in the east of England, Anglian Water supplies nearly seven million customers every day with access to clean water and water recycling services. With a strong commitment to the environmental and social prosperity of the region, Anglian Water is the first utility provider to weave this purpose into the company’s constitution. This puts public interest at the heart of Anglian Water’s operations, ensuring that environmental and social priorities will be considered for generations to come.

The same principles guide Anglian Water’s objectives in asset performance management. To make sure it can supply clean drinking water and recycle it safely, today and in the future, with minimum impact on the environment, Anglian Water is committed to maintaining and enhancing its operational assets’ health and performance. For that, the company invests in various projects, including in new innovative technologies to monitor its remote assets in both water and water recycling. The insights provided, in turn, help the company shift from time-based manual inspections to a more proactive maintenance strategy – benefitting customers, the environment and the bottom line.

As part of this improved maintenance strategy, Anglian Water partnered with the Netherlands-based technology company Samotics, a leading provider of real-time actionable insights to optimize performance and energy efficiency of AC motors and rotating equipment. Through AI-powered algorithms and a technique called electrical signature analysis (ESA), Samotics offers Anglian Water a robust and high-quality failure detection technology coupled with performance and energy insights to help the company eliminate unplanned downtime, reduce risk, lower costs and save energy.

Anglian Water operates more than 1,000 water recycling centres and over 140 water treatment works spread over a large geographical area, with many of its critical operational assets in very remote and hard-to-reach locations. Prior to deployment, Anglian Water sat down with the Samotics team for an in-depth assessment to determine where the predictive technology would provide the most value in the specific conditions of its network sites.

It was quickly determined that Samotics’ AI-based asset health monitoring system SAM4 could help Anglian Water tackle unique challenges in monitoring its fleet of submerged equipment. Because SAM4 uses a suite of techniques to analyze a motor’s electrical signature, its sensors install inside the motor control cabinet (MCC) by design. That allows the water utility to capture reliable and actionable asset health and performance data at a distance, without being anywhere near the submerged asset.

These remote capabilities take away the need to regularly lift submerged equipment for inspections, enabling the Anglian Water team to switch from time-based maintenance to a more proactive approach.

As a result, a wide range of assets, including borehole pumps, inlet screws and aeration rotors, spread across more than 25 sites are now under 24/7 monitoring of Samotics’ AI-powered algorithms that can detect and classify developing faults at a very early stage.

Annesley Crisp, Senior Project Manager, Research and Innovation, Anglian Water

“With our submerged equipment that we have been unable to reliably monitor before, we relied on time-based routine inspections or reactive maintenance, standby equipment and mitigation. Thanks to SAM4, we can now reliably and remotely monitor not only the condition but also the running characteristics to understand if assets are still performing efficiently. Being efficient lengthens the life of the asset, saves energy and reduces operational risk.”

Tom Rust, Technology Development Manager, Anglian Water

“We’re always striving to increase the reliability and efficiency of our facilities and critical assets. To do that sustainably, we are moving toward a more proactive maintenance approach, where data-driven and actionable insights are crucial to make positive business decisions.”

Annesley Crisp, Senior Project Manager, Research and Innovation, Anglian Water
Anglian Water supplies over 1 billion litres of water every day to more than 2 million households and 110,000 businesses. To provide clean water, the company relies on biological water treatment processes that remove soluble organic material and ammonia. To facilitate these biological processes, an ample amount of oxygen is required so that microbes can remove pollutants. That’s where aeration systems come in and play a significant role. Aeration rotors are critical components within these aeration systems; their blades trigger the mixing of the water and the turbulences bring the air to the lower layers of the water stream.

Aeration rotors are essential assets within continuous wastewater recycling processes, making them assets of high criticality. So if downtime occurred in any aeration rotor, it would instantly reduce site capacity. This could result in a loss of service to customers and major environmental risks through pollution incidents. Because of the aforementioned points, receiving early warnings about developing failures has a significant impact on Anglian Water’s operations, which are illustrated by the two following SAM4 case studies.

### Fault detection case study 1

**Early warning of mechanical unbalance in an aeration rotor enabled maintenance to be planned at an optimal time**

In July 2021, SAM4’s AI-driven algorithms started flagging the rotor at one of the Anglian Water sites for signs of mechanical unbalance and/or looseness. The system notified Anglian Water of the developing failure (Figure 1), but since SAM4 was able to catch it at an early stage, no immediate action was required. Two weeks later, a vibration measurement confirmed the alert sent out by SAM4.

![Figure 1. SAM4’s algorithms picked up sporadic increases of spectral energy around the motor’s rotational frequency, indicating mechanical unbalance. The system notified the Anglian Water team (at the vertical black line) about the developing failure and provided them with insight into the failure mode and criticality.](image-url)

**Analysis**
- **Mechanical failure**
- **Indicator:** Rotational frequency
- **Failure mode:** Mechanical unbalance

**Recommendation:**
SAM4 has been detecting an increase of spectral energy at the rotational frequency of the motor, which is an indicator for mechanical unbalance. This means that the blades are not perfectly balanced. We will update you if severity increases.
For the next 3 months, SAM4 continued to monitor the rotor’s condition, which exhibited sporadic energy increases. In December, a good opportunity came up to carry out maintenance, during which the Anglian Water team replaced the rotor’s motor, coupling and gearbox. When Anglian Water inspected the assembly that was taken out, they found a clear unbalance in the rotor, which again confirmed SAM4’s initial notification. After these replacements, the rotor went back to its normal operation (Figure 2).

Based on SAM4’s real-time asset health data, the Anglian Water team could take timely action, preventing a catastrophic failure, which could have led to extensive downtime, high maintenance costs and a potential pollution event.

Fault detection case study 2
Continuous real-time insight into the health of the aeration rotor enabled the team to take steps to mitigate risks.

In October 2021, SAM4 sent out a high-priority alert for the rotor at one of the sites, indicating a sudden increase of energy around the rotational frequency and pointing to signs of mechanical unbalance and/or looseness (Figure 4). At the time, SAM4 had only been installed on the rotor for two weeks. Due to the severity of the developing issue, the system immediately urged the Anglian Water team to inspect the asset at the earliest opportunity and advised to prepare component replacements. Several days later, a vibration measurement confirmed that there was a looseness in the motor and gearbox assembly.
Relying on SAM4’s data and recommendations, the Anglian Water team planned immediate remedial works to ensure that the asset kept running. After the intervention measures, the asset’s condition slightly improved, which was visible in SAM4 data (Figure 4). However, it didn’t fix the underlying failure. So for the next 1.5 months, SAM4 continued to monitor the rotor’s condition, which showed that the energy intensity kept gradually rising.

On 10 December, SAM4 detected another sharp increase, indicating that the failure progressed to the next stage (Figure 5). The system notified Anglian Water and put the asset on red alert. Over the next few days, the values remained high, which prompted the system to send a follow-up alert, this time pointing to energy rise around bearing-related frequencies. On 14 December, the Anglian Water team received a notification that the rotor would fail shortly.

However, because the rotor needed to keep operating to ensure that the water recycling site remained at full capacity, it wasn’t possible to immediately take out the asset for maintenance. This unfortunately resulted in the asset breaking down on 15 December, before an opportunity came up to do repairs. While the rotor was not operational, SAM4 closely monitored other assets on site to give Anglian Water site teams confidence in the mitigation and temporary processes put in place.

On 11 March, the Anglian Water team found an opportunity moment when they could install a new rotor assembly. As soon as the asset went back into operation, it was immediately visible in the SAM4 data (Figure 7).

"Samotics was spot on with the rotor failure at one of our WRC sites. The root cause was exactly as SAM4 predicted. Based on SAM4 insights, we were able to carry out remedial works and keep the unit running for compliance. Even though it failed in the end, SAM4 was 100% correct and enabled us to take actions to mitigate risks."

Tom Rust, Technology Development Manager, Anglian Water
Anglian Water avoided high costs using Samotics’ predictive analytics technology

By accurately signaling developing aeration rotor failures, Samotics helped Anglian Water take timely action to prevent catastrophic failures and prepare actions to mitigate risks. In turn, this helped the water utility to raise its water recycling sites’ efficiency and reliability, so it could continue to recycle water effectively and return it safely to the environment.

Additionally, the Anglian Water team was able to save a lot of extra costs. Because the team knew months in advance of an impending failure, maintenance could be planned at the most optimal time, preventing a lot of unplanned maintenance-related costs. For example, a full replacement of the rotor would have been much more expensive than just replacing a specific failing component. And if the rotor failed and there were no spare parts available, the team would have needed to rent emergency equipment, raising costs even further.

Finally, with Samotics’ insights, the Anglian Water team successfully minimized the risk of potential pollution incidents, safeguarding the quality and availability of water supplies for customers. This also helped the company prevent associated financial impacts.

Anglian Water savings from early warnings of developing aeration rotor failures

<table>
<thead>
<tr>
<th>Cost type</th>
<th>Cost savings (GBP)</th>
</tr>
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<tbody>
<tr>
<td>Partial instead of full asset replacement</td>
<td>£18k</td>
</tr>
<tr>
<td>Mitigation efforts (technician time, operational capacity)</td>
<td>£20k</td>
</tr>
<tr>
<td>Temporary equipment rental</td>
<td>£37k</td>
</tr>
<tr>
<td>Cat. 2 pollution fine</td>
<td>£60–350k</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>£135–425k</strong></td>
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Successfully implementing a proactive maintenance strategy for long-term efficiency and reliability of water and water recycling

To continue delivering sustainable water and water recycling services to an increasingly growing area, Anglian Water is committed to exploring new digital approaches to improve every part of its business. That also includes bold objectives when it comes to maintaining operational assets’ health and performance. One big initiative currently underway is to move to a more proactive maintenance strategy that will enable the company to achieve long-term reliability and efficiency of its water and water recycling to benefit customers, the environment and the bottom line.

By implementing Samotics’ predictive technology, Anglian Water gains real-time insights that help the company to successfully implement a proactive maintenance strategy and work in a more data-driven way. As a result, Anglian Water eliminates unplanned downtime, reduces risk, lowers costs and saves energy, ensuring it can continue meeting the region’s current and future water needs while minimizing its impact on the environment.

“The level of insight we receive from Samotics on our critical assets’ health and performance enables us to successfully move toward a more proactive maintenance strategy.”

Charlotte Stewart, Senior Smart Water Engineer, Water Services, Anglian Water