

Asset Performance Management

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The optimisation fast track for utilities

Abstract

In the midst of the digital transformation, having access to data and being able to utilise it are key elements to success in a modern, globalised world. Optimising your asset strategy using data-driven decisions helps you to reduce risks and optimise asset strategies.

Using a modern Asset Management solution built on advanced machine learning algorithms, utilities can achieve the insights needed to gain a broad view of their assets and influence crucial decisions.

Introduction

Getting started on Asset Management doesn't have to mean a huge investment or large projects involving many consultants. Instead, an asset management approach using data and tools that allow for data accessibility across the organisation can be implemented incrementally, thereby lowering the entry bar and allowing for agile solutions that can adapt to changing requirements and embrace new technological possibilities.

Asset-intensive organisations such as utilities have great potential for implementing an asset management approach, but at the same time, they are under critical financial regulation and have to balance investments. This is why implementing cloud-based software solutions with an easy setup and immediate value creation is an effective way to cover new ground with limited financial risk.

Utilities as early adaptors

In the 1960s and 1970s, rapid urban expansion led to large investments in water and wastewater infrastructure. Now, some 50 years later, the lifespans of these network pipes are almost over and utilities face a tremendous task refurbishing their networks to ensure continued operation and prevent breaks and any subsequent inconvenience to consumers.

At the same time, utilities must comply with increasingly rigorous regulations and are, in many cases, subjected to significant cutbacks. A third issue is the growing climate and environmental risks. These factors are uncontrollable in nature and so predicting their consequences is crucial. Resilience towards these challenges is a priority for utilities worldwide.

In summary, utilities have to do more with less. The need to make operations more efficient warrants the use of Asset Performance Management (APM) strategies.

Asset Performance Management

Asset-intensive organisations such as utilities can benefit greatly from applying APM-based decision strategies. According to Gartner, by 2020*, 60 per cent of asset-intensive organisations will be using APM software to optimise the performance of their most critical assets .

Asset Performance Management (APM) encompasses the capabilities of data capture, integration, visualisation and analytics tied together for the explicit purpose of improving the reliability and availability of physical assets. APM includes the concepts of condition monitoring, predictive forecasting and reliability-centred maintenance.

Gartner, Definition of Asset Performance Management

Asset Performance Management addresses several of the key challenges that utilities face today:

- Climate and environmental risks
- Regulatory compliance
- Reducing operational and maintenance cost
- Failure of critical assets
- Unscheduled activities

In the absence of Asset Management, the executed strategies and best efforts may be inconsistent or randomly chosen. Apart from the obvious risk of applying a less-than-optimal strategy, efficacy evaluations and justification of a particular strategy will be compromised when deciding on strategies using an unsystematic basis. The right APM solution will have a great impact in these situations as it allows utilities to incrementally adopt an asset management strategy.

Digital transformation

In the context of Asset Management, the digital transformation is the process of incorporating digital tools to support business functions and is about bringing the organisation's data into play. There is a wealth of existing data currently accessible to utilities. Gathering these data, extracting relevant features and comparing performance, condition etc., provides new insights and improves utilities' ability to navigate the digital transformation. Failing to keep up with the digital transformation can have a large financial impact because an organisation's profit is related to its digital maturity**.

*Gartner, Market Guide for Asset Performance Management Software, June 2018
(<https://www.gartner.com/doc/3880166?ref=mrktg-srch>)

**McKinsey & Company, Digital Europe: Realizing the continent's potential, June 2016 (<https://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/digital-europe-realizing-the-continents-potential>)

Therefore, the insight gained from making the available data accessible can be used to uncover trends and unseen potentials. This paves the way for more advanced analytics and drives the digital transformation further, enabling utilities to discover the true potential of their data.

Available data

Following the digital advances of the last 30 years, utilities started to gather and refine their data. Today, most utilities have accumulated data on almost all of their physical assets, but utilisation of this information is impeded by two factors. Firstly, the abundance of data can lead to data overload, where huge amounts of irregular data overwhelm any effort to create an overview and relevant features are drowned by an excess of information. Another problem is the emergence of data silos, in which the use of different data sources and programs that don't integrate well causes data to be isolated, preventing any possible synergies.

Poor data – not an issue

Using APM solutions allows for a quick and relative mapping of potential data quality issues. What may be a lack in local data, will be compensated through network effects from other utilities. Hence to get started with an APM based strategy is possible even without full data availability.

Two new sources of data, having grown rapidly over the last decade, are IoT and sensors. Utilities are investing in devices that are connected and able to provide real-time insight and immediate reporting on conditions and performance. Real-time data combined with legacy software and public open data provide unique possibilities in an analytics context.

Further, to stimulate the demand and value in data, there is a growing tendency in governments worldwide and especially in Europe to release open data. These data allows for new insight and business opportunities to arise with massive data^{***}.

Risk and criticality

When applying APM in an impact-based approach, we not only consider risk of asset failure, but the consequences of a possible failure as well. Take, for instance, pipe failure in a wastewater network. The effects of a pipe failure may vary greatly, depending on the number and type of consumers (e.g. hospitals, sensitive industry) serviced by this pipe, their vicinity to ecologically vulnerable areas etc.

^{***}<https://www.europeandataportal.eu/en/dashboard#2017>

An impact-based perspective offers a far better basis for risk analysis and decisions on refurbishment as the risk of major incidents is a concern usually on a par with economic considerations.

Preventive vs. Predictive paradigm: An example

Shifting from preventive to predictive maintenance strategies can open new possibilities of financial optimisation. One instance where changing from a preventive to a predictive paradigm may prove to be very beneficial is the issue of deciding when to replace pipes in a network.

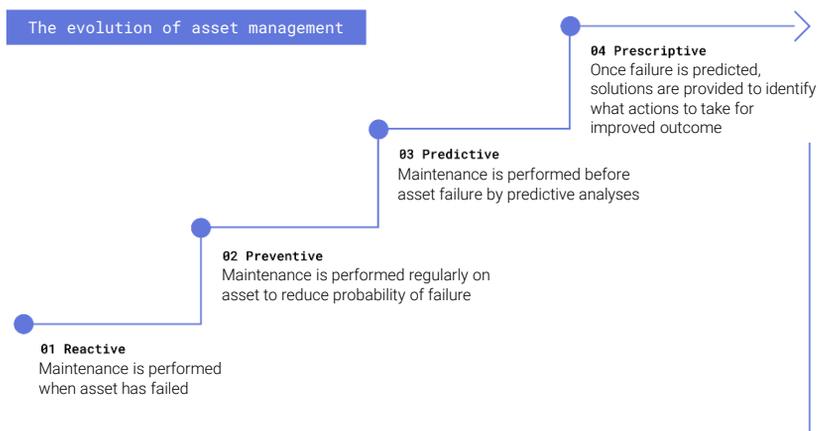


Figure 01
Asset Management has undergone a rapid evolution with technology and data driving solutions that offers predictive analyses to optimize maintenance.

Traditionally, network pipe replacement is prompted by one of the following: pipe age exceeding a given number of years; or network pipe failure (break). This approach has two disadvantages. Firstly, replacing pipes at a fixed age means replacing pipes that, in many cases, could have continued to function, with little or no loss of performance, for several years. Secondly, this approach is no guarantee against failures occurring before the end of the expected lifetime, resulting in great inconvenience to consumers and increased ad hoc repair costs.

Another strategy for pipe replacement is to regularly inspect the pipes and replace the pipes that are categorised as being in poor condition. This method is effective, but inspections are expensive and only give the condition of a fraction of the network, at a single point in time. Inspections therefore have to be repeated regularly to keep track of the network condition. Monitoring the entire network often enough to be able to prevent breaks isn't financially viable, so you must either choose a different method for estimating the network condition or employ an effective strategy for prioritising which pipes to inspect.

Solution

Advances in Artificial Intelligence (AI) and Machine Learning (ML) are offering new possibilities that can help utilities gain additional insights from their data such as evaluating risk of failure or estimating conditions in uninspected network pipes.

The assessment of risk and the balancing of operational and capital investments are critical to asset owners and so are core elements of the asset strategy in a utility. Possession of the data and tools required to know when and where to look for the optimal refurbishment project is crucial to an asset strategy.

Artificial Intelligence constitutes the ability of computers to do jobs that were otherwise reserved for humans, such as inferring knowledge from a dataset and generalising these inferences to a broader context.

Machine Learning deals with this type of generalisation so that a computer can learn from data in much the same way that a human does. A Machine Learning algorithm is fed a subset of the available data so that it may learn of patterns in the data. The remaining data is used to test the ability of the algorithm to correctly guess features of the test data.

A dynamic, modular solution: data|APEX

Formulating a good Asset Management Strategy is now much easier. The readiness in the market for adopting new technologies and the availability of data makes it possible to introduce dynamic Asset Performance Management solutions.

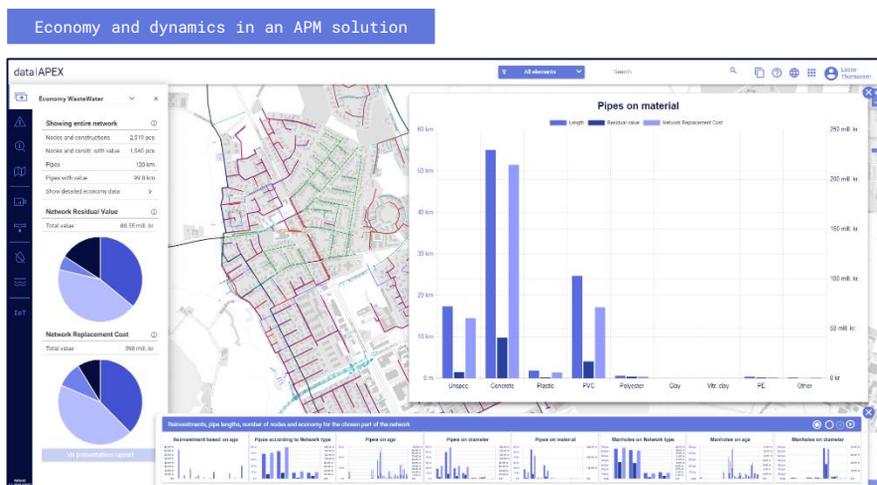


Figure 02

Using software solutions that integrates dynamic data allows for continuously updated insights and action planning based on latest facts.

The data|APEX platform consists of a set of standard analyses and a range of specialised modules. This is to reflect the fact that any Asset Management strategy must be individually tailored to the organisation based on their business and the specific conditions driving their priorities. For this reason, the data|APEX platform allows the organisation to choose the functionality that is critical to them.

With a background in the Danish utility sector, the data|APEX platform is developed based on a thorough understanding of the challenges modern utilities are facing. It is this foundation that, combined with machine learning algorithms, enables utilities to fully profit from their data.

Danish Utilities – Best in Class

Data and digitization in Danish utilities are well known elements of daily business. For more than 40 years water, waste water and energy utilities have actively generated and used data. This, through strong and well proven data models which have resulted in high consistency and transparency in the sector, provides a strong foundation in developing data driven analytics.

Allowing clients to see and navigate the various analyses presented and visualised using maps and network structures provides a unique opportunity to obtain the insights and understanding necessary to make qualified decisions.

One of the major qualities of modern management software is the adoption of strong visuals. data|APEX offers a unique visualisation for optimised asset strategy which is intuitive and easy to understand through a web-based cloud platform.

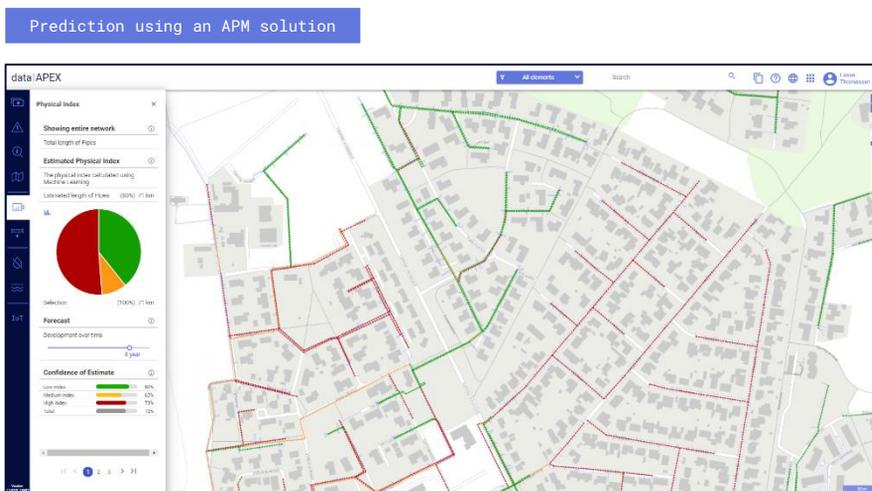


Figure 03
Using predictive software solutions allows for optimised planning of maintenance and future investments.

To reap the full benefit of adopting an APM product, it is vital that a solution becomes embedded in the various organisational processes. If the problem of data silos is to be overcome rather than enlarged, the APM product must support organisational workflows and integrate with the systems already in place. The data|APEX platform integrates smoothly on top of existing systems and supports various types of data, making it very easy to adopt and incorporate into existing procedures.

The flow of information within an organisation is crucial to the unity of the organisation. When an organisation is handling large amounts of data, these will usually exist in different ecosystems, each with their own tools, formats etc. These ecosystems represent data silos – inaccessible structures between which data moves poorly or not at all. The impact of these data silos on the organisation as a whole is that of segregating different areas of the organisation into isolated compartments, each with their own stream of information.

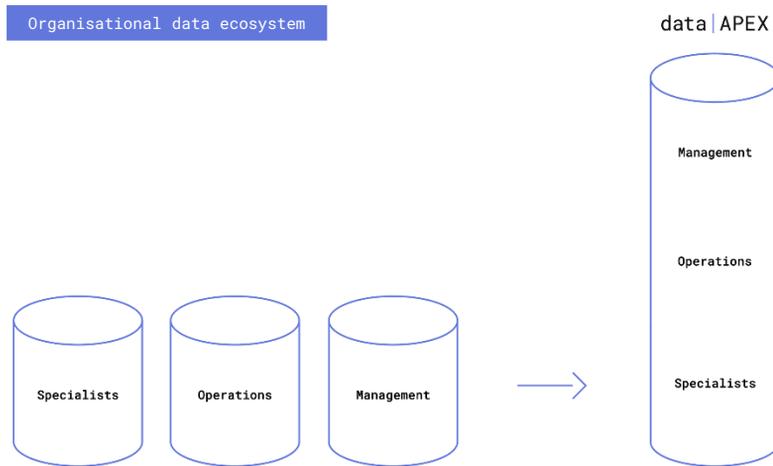


Figure 04
The data|APEX platform lies on top of the existing systems, presenting data from the entire organisation and making data available to everyone, thereby providing a common point of reference. data|APEX can therefore serve as a dialogue tool, presenting activities and results from the top of the organisation to the bottom and vice versa.

To drive a proactive asset management strategy, it is essential that decisions are made based on up-to-date information. A dynamic approach is necessary if the organisation is to continuously adapt to and keep track of new developments.

The data|APEX platform is offered as a cloud-based web service and as such provides well-maintained functionality with a minimum of consultancy services and client-specific integrations.

Recommendation

A natural first step towards better utilisation of the data already available to utilities is to gather and present relevant findings from these data.

The primary outcome of data|APEX is helping utilities making optimal decisions. The solution supports asset strategies with prioritised recommendations for e.g. refurbishment, by balancing conditions and financial liability in a certain project area with criticality in terms of consumer influence. This is a unique way of prioritising using visual means.

Scenarios and recommendations, formulated on a sound technical basis, provide decision-makers with the tools necessary to steer the organisation's focus and potential.

APX10

Phone: +45 87 38 61 66
Email: info@apx10.com

APX10 A/S
Jens Juuls Vej 16
DK-8260
Viby J
Denmark

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