

SI-Cluster

Prioritisation of replacement at pipe level, is it satisfactory?

Typically pipe rehabilitation models calculate a priority number for each individual pipe in the network. The number is based on the relation between different pipe characteristics (age, diameter, material, surroundings, etc) and failure data as shown in Figure 1. By doing so the way a pipe is registered in the GIS has great influence on the model results. Looking at groups of pipes (clusters) gives new insights: it appears that clusters of pipes with similar characteristics show different failure behavior. Pipes with the same material, diameter and age situated in neighborhood A may show different failure behavior from a group of pipes in the next neighborhood. The cause is often unexplained, it may be the soil, the contractor, or any other reason.



Figure 1. A drinking water pipe network with different individual pipes and historic failures (red asterisks).

Spatial Insight

Spatial Insight is a Dutch data science consultancy focusing on the management of underground assets. We combine GIS expertise with data science and asset management expertise. The 10 staff team represents a century of experience in the Dutch water sector and has a strong passion to solve the needs of utility companies with data driven solutions. Spatial Insight is considered a leading consultancy in the Dutch home market.

SI-Cluster

SI-Cluster analysis is built upon Spatial Insight's proprietary pipe rehabilitation model that assumes that pipes with similar characteristics will show similar failure behavior. This rather obvious assumption has proven to be very powerful. By comparing all possible clusters, we identify clusters of the optimal size with -on average- the highest priority in terms of pipe rehabilitation. In terms of execution of pipe rehabilitation this is really beneficial: projects of a certain attractive size and most efficient reduction of NRW and/or leakages are highlighted.

For the part of the network shown in Figure 1, Figure 2 shows the cluster of pipes with the highest contribution -as a group- to the number of leakages. The cluster may include an individual pipe with a lower priority but this will be replaced as well.

Spatial Insight BV
Nieuwe Gracht 45
2011 ND Haarlem
The Netherlands
spatial-insight.com

KvK 64763382



Figure 2. The selected cluster that contributes most to the total number of leakages

Data preparation

Preparing the data for cluster analysis may require substantial efforts, but obviously this depends on the way data is stored and organised within the organisation. For users of Spatial Insight's Asset Data Integrator (ADI) or BestNet, configuration of cluster analysis is free of charge. In other cases, typically 50 hours of data preparation needs to be undertaken.

Data security policy

Data has become an important asset of each utility company, and most utilities apply strict data policies. We can run cluster analysis on a virtual machine within the domain of the client, or on our own (Microsoft Azure) servers. By the way we have configured our servers, we operate within the ISO27001 standard for information security. Both the asset and failure, as well as the results of SI-Cluster analysis are the utility's property and that's how we deal with the data.

Requirements

To prepare the data for SI-Cluster, the different data-sources need to be accessible. We experience that end-users of pipe rehabilitation models need to convince ICT managers to give access to internal data with a positive mind-set. Some of the steps in data transformation and integration may be similar to activities that normally cause worries so early buy in from internal teams is key to project success.

Limitation of carbon footprint

Spatial Insight intends to limit the carbon footprint of its operations. Therefore, we want to limit our travel movements. We can deliver the majority of our work from distance, but prefer to work with your local trusted consultants to deliver our services. We propose only to fly in to build trust.

Next step

We hope and trust that SI-Cluster analysis will contribute to the demand for data driven asset management. We are pleased to explore how we can integrate SI-Cluster in your asset management approach.

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