

Overview

MindSphere Application – Arc Analyzer

Cloud-based georeferenced catenary diagnostic for overhead contact lines

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The passing of section insulators and overhead crossings often leads to arcing and thus to increased wear on both the overhead contact line and the pantograph.

The MindSphere application Arc Analyzer visualizes the appearance of arcs where they are common in your power supply system. Consequently it creates the transparency necessary to be able to draw specific conclusions on the condition of your overhead contact line system.

Benefits

- · Increased asset availability due to early problem detection
- Reduced maintenance duration and increased maintenance efficiency through specifically planned inspections
- Comprehensive knowledge gain in various operational situations through continual, daily use on regular vehicles
- Analysis of root causes by evaluating the field data
- Georeferenced detection of highly weared areas due to the precise assignment of location and measurement data
- Involvement of all available vehicles possible due to an easy way of retrofitting the measurement system



Arc Analyzer – The solution for your digital future

As a result of daily operation, vehicles can determine important field data that lay the foundation for representative statements regarding the condition of the overhead contact line system. In that manner arcs, that are detected between the contact wire and the metalized carbon collector strips, serve as an indicator of wear. Due to the enormous temperature that is released during their appearance they result in an increased amount of wear on the overhead contact line as well as on the pantograph. For maintenance reasons this aspect should be considered by the operator.

The Arc Analyzer enables to capture and afterwards analyze the arcs. The field data is made available to the user at any time via an industrial cloud application. This transparency provides a better understanding of the operation of the overhead contact line system, while at the same time it supports the early detection of critical problem areas.

Is my data of any significance?

To benefit from the possibilities of digital solutions, the first step lies in establishing a connectivity to collect field data. Our connectivity solution can easily be retrofitted on already existing vehicles. It reliably detects arcs and collects their technical properties. Using a secure connection these datasets get transfered to MindSphere, the open IoT operating system from Siemens. That is where the Arc Analyzer application is available to the user.

Today, the challenge is to gain transparency on the overhead contact line network in a fast and uncomplicated way to prevent the appearance of potential problems. The Arc Analyzer application automatically evaluates the field data and presents it in a user-friendly manner. In this way the user gets the opportunity to understand where problems arise in the overhead contact line system at any time. This information can be used to identify correlations, which ultimately lead to increased network availability and reduced maintenance cost.

Our data-based solution represents the current state of the overhead contact line network. The data transfer is executed completely, correctly, quickly and without any additional effort. This way the application creates more flexibility in cooperation for those responsible and involved. The ability to automatically collect relevant data allows specialists at any time to carry out analysis and to give support in the event of problems. This can happen no matter where they are.

Information availability

User-friendly dashboards enhance understanding and intuitive work with the data.

A responsive design allows access to the data, no matter what device might be currently available. The information is accessible to all users at the same time.



Colored markers denote the critical areas in the network by priority



Overview

Keep track of critical locations in your network. The frequency of occurring arcs is used as an indicator to calculate the areas with a high amount of wear. These areas will be shown in the overview map. An algorithm developed by Siemens Mobility determines the degree of priority by evaluating the different properties of the arcs. Particularly critical areas get prioritized high and are depicted by the red color. Less critical areas are shown in orange. In addition the existing stations and the network system is illustrated.

Extended analysis of the selected area in the detail view

Detail view

The detail view enables the property analysis of the arcs at a certain location in more detail. Defined as relevant properties are current, voltage, arc intensity and duration, the direction of travel and the speed of the train. In addition, the frequency of arcs (arc rate) and intensity over time (i²t) are calculated, to illustrate possible correlations.



MindSphere

MindSphere is the open IoT operating system from Siemens. Designed as a secure and scalable end-to-end solution for the industry. It connects products, substations, rail vehicles and rail systems to unlock the potential of your IoT data. By connecting your rail vehicles and rail infrastructure to the digital world, MindSphere offers powerful industrial applications with advanced analytics and digital services to drive the productivity and efficiency of your entire business.

Data Analytics

The used algorithm calculates the areas in the overhead contact line system that involve particularly high wear. Siemens Mobility uses its many years of experience and expertise in the railway electrification industry to create and further develop the computation.

The more vehicles get equipped with the data collection solution, the more significant the results will get.

Data Collection

The measurement system embodies several sensors, a data logger, the location device and the LTE modem. The arc radiation is measured by a UV sensor without having any direct contact. The location device determines the position and speed of the vehicle, while the vehicle's power is measured in the main power line inbetween the panto-graph and the vehicle's main switch. The data logger is used for storing and pre-processing the data, which is then send to the data receiver via a LTE modem. The only interface inbetween the measuring system and the vehicle is the 24 V power supply. That way this system can easily be mounted onto already existing vehicles.



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Security information

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously main-tain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.

For more information about industrial security, please visit: http://www.siemens.com/industrialsecurity.