Measuring States of Railway Overhead Lines and Pantograph

To Verify the Safety & Collecting Performance of Electric Trains

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[Railway overhead line]

[Pantograph on the train]

Background of Technology Development

• Sufficient safety and current collecting performance for the contact wire of electric railroad and the pantograph are required because the railway overhead lines and pantograph with high voltage (AC 25kV) and high current flow may cause component damage or insufficient power supply due to interference or disconnection of the train.

Technology Overview

• The is a dynamic state measurement system that can measure contact force, displacement, acceleration, and temperature in railway overhead lines and pantograph with high voltage and high current and transmit measurement results to the ground wirelessly.
• The current collecting performance evaluation system based on measuring the arc that occurs when contact loss between a pantograph and a railway overhead line occurred

Technology Realization

• **Dynamic state measurement system a pantograph and a railway overhead line**
- It consists of the sensors installed on electrically pressurized railway overhead line and the pantograph, signal processing unit, wireless transmission unit, and signal processing unit installed on the ground that is not pressurized.
- This measures the contact force between the railway overhead line and the current collector, and the piezoelectric force of the full-off fitting when traveling without electric shock or electrical noise, and wirelessly transmits it to the ground signal processing unit.

• **The current collecting performance evaluation system based on measuring the arc that occurs when contact loss between a pantograph and a railway overhead line occurred**
- The current collecting performance evaluation system installed on the roof of the railway rolling stock consists of device detecting arc and video monitoring system
- Disconnected arcs can be measured regardless of day and night, and the contact loss rate, contact loss time, current collecting current, train speed, generation position of contact loss, and the operation range of pantograph are analyzed from the measurement data.

Characteristics of the Technology Developed

The limitation of existing technologies

• Measuring the dynamic state of railway overhead line and pantographs in an environment where high voltage and high current flow poses a risk of electric shock, and received signals contain much electrical noise.
• Since sunlight contains UV components, it is difficult to ensure reliability of the measurement results of the contact loss rate such as different measurement results day and night.

Characteristics of the technology developed

• It satisfies the requirements of CENELC-EN 50317, which is a verification criterion for measuring current collecting performance, and it is possible to measure the contact force between the railway overhead line and pantograph and the piezoelectric volume of the full-off fitting sector.
• It satisfies the requirements of CENELC-EN 50317, which is a verification criterion for measuring current collecting performance, and it is possible to measure the contact-loss arc between the railway overhead line and pantograph and analyze the contact loss rate.

Technology Readiness Level

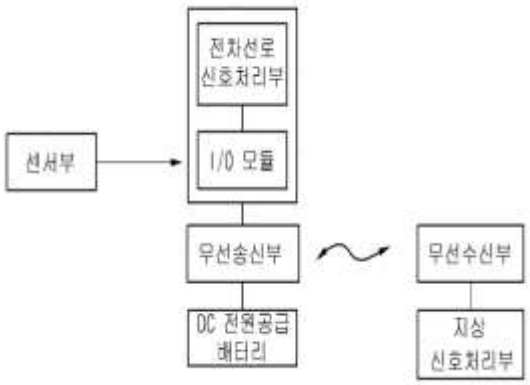
TRL1	TRL2	TRL3	TRL4	TRL5	TRL6	TRL7	TRL8	TRL9
Basic principles and experiment	Technology concept formulated	Experimental proof of concept	Component and/or system validation in lab	Performance test of trial manufactured goods	Performance test of pilot-level prototype	Reliability evaluation of pilot-level prototype	Certification and standardization of prototype	Commercialization

※ TRL 9 : Commercialization
Technology development is completed

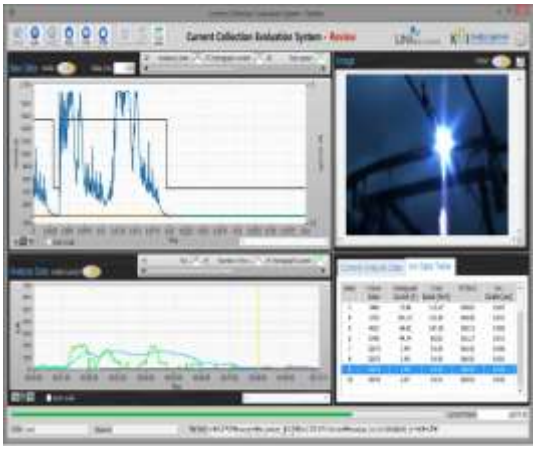
Application Fields of Technology

Safety management of railway overhead lines and pantograph and current collecting performance evaluation

Main Drawings and Photos



[Configuration of a dynamic state measurement system under high voltage and high current conditions]



[Configuration of verification system for measuring current collecting performance based on measure the contact-loss arc]

Current State of Intellectual Property Rights

No.	Patent Name	Date of Application	Patent No.
1	Real time measuring system for states of railway overhead lines and pantograph under live electric conditioning	2005-12-28	10-2005-0131961 711737
2	Collecting Status Test Technology Based on Detecting Arc	2014-04-30	10-2012-0121578 10-1392710