

2013 KRRI TECHNICAL PAPERS


Abstracts

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Journal Info.

Journal of the Korean
Society for Railway

Vol. 16 No. 3

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Abstract

The maintenance of an urban transit vehicle accounts for 60-70% of total costs over its entire life cycle, so it is critical to reduce maintenance costs and extend the life times of urban transit EMUs (electric multiple units) through research. For these researches, the reliability and availability data management system was constructed through the case study of several industries in the domestic and international in the field of reliability centered maintenance system. And we created a system to manage reliability and availability data for use in urban-EMU maintenance. In this work, we identified the major functions needed to successfully develop the system. Here we report the successful development of a reliability and availability data management system for maintenance of urban transit vehicles.

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Journal Info.Journal of the Korean
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Abstract

In the case of the existing train control system, the driver monitors the condition of the vehicle through a composite controller device that displays various information on a screen in the vehicle. However, when problems arise such as car trouble, it is difficult for the drivers to take action immediately. In addition, maintenance personnel have to manually save data one by one after storing the vehicle to analyze control information of the main devices such as the brake controller and auxiliary power. To improve these points, a system that sends and receives all information in real time should be established by installing a sensor communication network and a surveillance system. This study attempts to improve the safety and maintenance of rail vehicles by suggesting a standardized method for train control and surveillance system.

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Journal Info.

Journal of the Korean
Society for Railway

Vol. 16 No. 5

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Abstract

This study describes impact test methods for a rolling-stock windscreen executed in Korea and Europe. Airpressurized impact test equipment for the front windscreens of high speed trains was designed and manufactured. The equipment is capable of launching a projectile at 500km/h, in accordance with EN 15152's impact test method. Calibration of the test equipment was conducted to find an equation relating air pressure and projectile velocity. Specimens (1000mm×700mm) having similar specifications with the front windscreens in metro and conventional trains were used to conduct impact tests with this equipment to research the impact characteristics of the screens according to the impact velocity.

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Journal Info.Journal of the Korean
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Vol. 16 No. 1

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Abstract

Because excessive interior noise when riding a high-speed train leads to annoyances, fatigue and stress for passengers, interior noise reduction methods should be considered. In particular, a high-speed train operated in various operation environments, and in South Korea, these include open fields and tunnels. Therefore, a specific study about changes in interior noise characteristics according to different environments is necessary. For this reason, the interior noise characteristics on a KTX train and on the KTX-Sancheon train were analyzed from noise measurements using microphones in this paper. Vibrations on the axles, bogies and floor were also measured, and these areas are structural paths for interior noise. From this research, the interior noise characteristics according to the driving speed were deduced and the effects on interior noise by driving environments such as open fields and tunnels were investigated. Furthermore, the effect on interior noise by axles, bogies and floor vibrations were analyzed from a transfer function analysis.

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Journal Info.

Applied Mechanics and
Materials
Vol. 420
2013. 9

Abstract

This paper describes the structural analysis, load tests and combined stress of the bogie frame. It seeks to identify the structural safety of the bogie frame when the bogie is assembled on the train and a train service is implemented. The bogie consists of the bogie frame, suspension, wheels, brakes and transmission, etc. The bogie frame can be considered as the most important part of the bogie. The analysis and tests were evaluated using JIS E 4207 standards and performance test standards for urban rail vehicles.

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Journal Info.Journal of the Korean
Society for Railway

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Abstract

Pressure waves are generated and propagate in tunnel when train enters a tunnel with high speed. Compression wave due to the entry of train head propagates along the tunnel and is reflected at tunnel exit as expansion wave. While expansion wave due to the entry of train tail propagates along the tunnel and is reflected at tunnel exit as compression wave. These pressure waves are repeatedly propagated and reflected at tunnel entrance and exit. Severe pressure change causes ear-discomfort for passengers in cabin and micro pressure wave around tunnel exit. It is necessary to analyze the transient pressure phenomena in tunnel qualitatively and quantitatively, because pressure change rate is considered as one of major design parameters for an optimal tunnel cross sectional area and the repeated fatigue force on car body. In this study, we developed the characteristics method based on fixed mesh system and boundary conditions for crossing trains and analyzed with X-t diagram. The results of simulation show that offsetting of pressure waves occur for the special entry condition of crossing train.

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Journal Info.International Journal of
Fatigue

Vol. 55

2013. 10

Abstract

The contact fatigue damages on the rail surface, such as head check, squats are one of the growing problems. Fracture of rail can be prevented by removing the crack before it reaches the critical length. Therefore, the crack growth rate needs to be estimated precisely according to the conditions of the track and load. In this study, we have investigated the crack growth behavior on rail surface by using the twin-disc tests and the finite element analysis. We have verified the relationship between the crack growth rate and the variety of parameters as cracks grow from the initiation stage.

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Journal Info.Journal of the Korean
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Vol. 16 No. 4

2013. 8

Abstract

According to the measured results of KTX brake squeal noise in this study, high level brake noise occurred in a wide frequency range, 100~18,000 Hz. To identify the sources of the brake squeal noise, unstable vibration modes due to brake disc/pad interaction were analyzed under various conditions by the finite element method. Complex eigenvalues for a brake unit with a disc and four pads were obtained. It was found that the real parts of the complex eigenvalues, that is, unstable vibration modes, were closely related to friction coefficients, pressure on the brake cylinders, elastic moduli of the components, and other conditions.

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Journal Info.Journal of the Korean
Society for Precision
Engineering

Vol. 30 No. 7

2013. 7

Abstract

The reduction unit is one of the most important components for the railway vehicle because of transmitting the torque of motor to the wheels. Its faults for high-speed train are caused by the damage, fatigue and wear of gear and these have a bad effect on the vehicle running safety seriously during operating train. So, fault diagnosis system for reduction unit is needed in order to keep the vehicle running safety. The vibration diagnosis technology through the analysis of vibration characteristics is known the most effective method for the fault diagnosis. In this paper, we analyze the vibration parameters (Kurtosis, Crest factor) of the reduction unit on the normal condition for the high-speed train using two test methods (driving gear test, full-vehicle test). Also, in order to estimate the gear with faults, we measure vibration parameters on defective gears using specimen tester.

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Journal Info.

Journal of the Korean
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Engineering

Vol. 30 No.7

2013. 7

Abstract

The gear-reduction units of Korean high-speed trains consist of a motor reduction unit, an axle gear box reduction unit, and a tripod joint shaft. A reduction gear unit is a gearbox used to reduce the rotational speed of the input shaft to a slower rotational speed on the output shaft. This reduction in output speed helps to increase torque. Defective reduction gear units in high-speed trains are caused by damage to the gear or by gear fatigue. To diagnose potential problems, it is important to know the vibration characteristics of the reduction gear units. In this study, we analyzed the vibration characteristics of reduction gears under various conditions. The test setup included a full-scale test rig to evaluate reduction gear under both normal and extreme operating conditions.

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Journal Info.Journal of the Korean
Society for Railway

Vol. 16 No. 4

2013. 8

Abstract

The vibration characteristics of railway vehicles are very complex because they are not only dependent on vehicle and track conditions but also on operating conditions. Vibration can cause the failure of rolling stock equipment. To verify that the quality of rolling stock equipment is acceptable, it should be able to withstand vibration tests of reasonable magnitude and duration. There are many standards for vibration and shock tests of equipment in Korea. In this paper, we have reviewed and compared the standards (KS R 9144, R 9146 and IEC 61373) for vibration and shock tests.

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Journal Info.

Scientific Reports

Vol. 3

2013. 9

Abstract

This work demonstrates an anisotropic increase in resistivity with decreasing width in single crystal tungsten (W) nanowires having a height of 21 nm. Nanowire-widths were in the range of 15-451 nm, with the anisotropy observed for widths below 50 nm. The longitudinal directions of the nanowires coincided with the $\langle 100 \rangle$, $\langle 110 \rangle$ and $\langle 111 \rangle$ orientations of the body centered cubic phase of W. The resistivity increase was observed to be minimized for the $\langle 111 \rangle$ -oriented single crystal nanowires, exhibiting a factor of two lower increase in resistivity at a width of 15 nm, relative to the thin film resistivity (i.e., an infinitely wide wire). The observed anisotropy is attributed to crystallographic anisotropy of the Fermi velocity and the resultant anisotropy of the electron mean free path in W, and underscores the critical role of crystallographic orientation in nanoscale metallic conduction.

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Journal Info.Applied Mechanics and
Materials

Vol. 365

2013. 8

Abstract

A mechanical system to detect the static wheel weight of the railway bogie using hydraulic pressure has been designed. Wheel weight can be acquired by a pressure sensor mounted on the hydraulic pressure distributor and displayed by a wheel load indicator with a resolution of 0.1 KN when the hydraulic pressure induced from the hydraulic hand pump lifts a wheel by mechanical components connected with the hydraulic pressure cylinder. The measurable wheel load is 100 KN. Also, a height indicator which is attached on the wheel using a magnet shows the elevated height of the wheel from the rail.

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Journal Info.

Advanced Materials
Research

Vols. 753-755

2013. 5

Abstract

The objective of this study is to propose the effective method of reducing the maximum contact pressure at the contact edge of press fitted shaft by optimizing the location and the size of stress relief groove in hub face. Finite element analysis was performed in order to determine the contact pressure and stress state on a press fitted assembly and optimization were applied to select optimal size and location of stress relief groove. In order to reduce the cost of optimization design, approximation optimization method is used and the optimum results obtained by Sequential Quadratic Programming and genetic algorithm are compared. Optimized results show that the maximum contact pressure at the contact edge of press fitted shaft with optimal stress relief groove decreased about 30%. And the both optimization algorithms can effectively reduced the maximum contact pressure at the contact edge of press fitted shaft.

Development of an integrated sensor module for a non-invasive respiratory monitoring system

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Journal Info.

Review of Scientific
Instruments

Vol. 84 No. 9

2013. 9

Abstract

A respiratory monitoring system has been developed for analyzing the carbon dioxide (CO₂) and oxygen (O₂) concentrations in the expired air using gas sensors. The data can be used to estimate some medical conditions, including diffusion capability of the lung membrane, oxygen uptake, and carbon dioxide output. For this purpose, a 3-way valve derived from a servomotor was developed, which operates synchronously with human respiratory signals. In particular, the breath analysis system includes an integrated sensor module for valve control, data acquisition through the O₂ and CO₂ sensors, and respiratory rate monitoring, as well as software dedicated to analysis of respiratory gasses. In addition, an approximation technique for experimental data based on Haar-wavelet-based decomposition is explored to remove noise as well as to reduce the file size of data for long-term monitoring.

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Journal Info.

Journal of the Korean
Society for Precision
Engineering

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2013. 7

Abstract

This paper presents the development of a condition monitoring system that monitors the operating conditions of a reduction unit, such as the bearing temperature, gearbox vibration, and gear oil deterioration, and notifies the operator of potential problems or abnormal conditions. A series of field tests on high speed rail and conventional lines was performed to identify the characteristics of temperature rise and vibration levels on the reduction unit during operation. The monitoring system was designed based on the proper sensor selection, measurement method, and signal analysis to optimize the interface with the operating system of high speed trains. Application of this monitoring system to high speed trains will play an important role in their proper maintenance and safe operation.

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Journal Info.Journal of the Korean
Society for Nondestructive
Testing

Vol. 33 No. 3

2013. 6

Abstract

This paper describes development of a high speed Doppler OFDI system for non-invasive vascular imaging. Doppler OFDI (optical frequency domain imaging) is one of the phase-resolved second generation OCT (optical coherence tomography) techniques for high resolution imaging of moving elements in biological tissues. To achieve a phase-resolved imaging, two temporally separated measurements are required. In a conventional Doppler OCT, a pair of massively oversampled successive A-lines is used to minimize de-correlation noise at the expense of significant imaging speed reduction. To minimize a de-correlation noise between targeted two measurements without suffering from significant imaging speed reduction, several methods have been developed such as an optimized scanning pattern and polarization multiplexed dual beam scanning. This research represent novel imaging technique using frequency multiplexed dual beam illumination to measure exactly same position with aimed time interval. Developed system has been verified using a tissue phantom and mouse vessel imaging.

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Journal Info.

Journal of the Korean
Society for Precision
Engineering

Vol. 30 No. 7

2013. 7

Abstract

The service conditions of railway vehicle have become more difficult in recent years due to increased speed. Faulty components in the railcars may result in service interruption, or in extreme cases, derailment. Thus, it is important to diagnose and monitor the main components of railcars. Temperature monitoring is one of the basic methods used to diagnose abnormal conditions in the main components of railway cars, such as in bearings, reduction gears, and traction motors. In this study, we developed a monitoring system for the main components, using an infrared thermography technique. This technique has the advantage of infrared thermal camera imaging of temperature contours in the components. Various hardware and software components of the monitoring system are used to acquire the sensor data, to identify potential problems in railway vehicle operation.

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Journal Info.Journal of the Korean
Society for Railway

Vol. 16 No. 1

2013. 2

Abstract

In this study, the natural frequency and damping ratio of a four-harness satin woven glass/epoxy composite material are evaluated by means of modal tests and a finite element analysis. To achieve this goal, glass/epoxy beam specimens with different lengths and thicknesses were manufactured via autoclave curing. In the test, the maximum damping ratio was found to occur at the lowest test frequency. As the test frequency increased, the damping ratio decreased exponentially to a critical value. After that value, the damping ratio increased gradually to the maximum test frequency.

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Journal Info.

Renewable Energy

Vol. 54

2013. 6

Abstract

A new approach was developed to estimate the probabilistic distribution of the residual strength of honeycomb sandwich structures subjected to impact-induced damage. The model was derived from the assumption that the residual strength is a function of the static strength of the unimpacted sandwich structures and the impact damage of the impacted structures. The probabilistic distribution of the residual strength was calculated from the probabilistic properties (mean and variance) of the strength of the unimpacted laminates and the impact damage at a given impact energy. The model was experimentally verified by using an experimental program for a Nomex[®] honeycomb core sandwich structure. The experimental program included a series of impact and three-point flexural tests to generate the residual strength of a sandwich structure. Theoretical predictions on the probabilistic distribution were in conformance with the experimental results.

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Journal Info.

Advances in Materials
Science and Engineering

Vol. 2013

2013. 11

Abstract

This study is focused on the verification of the key idea of a newly developed steel-concrete composite bridge. The key idea of the proposed bridge is to reduce the design moment by applying vertical prestressing force to steel girders, so that a moment distribution of a continuous span bridge is formed in a simple span bridge. For the verification of the key technology, curvature changes of the bridge should be monitored sequentially at every construction stage. A pair of multiplexed FBG sensor arrays is proposed in order to measure curvature changes in this study. They are embedded in a full-scale test bridge and measured local strains, which are finally converted to curvatures. From the result of curvature changes, it is successfully ensured that the key idea of the proposed bridge, expected theoretically, is viable.

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Journal Info.

Transactions of the
Korean Society of
Mechanical Engineers A
Vol. 37 No. 6
2013. 6

Abstract

In this study, curve responsiveness was assessed based on the lateral force and running safety was evaluated based on the wheel unloading ratio and derailment coefficient, which is the ratio of the wheel load and the lateral force. The evaluation of the curving performance and running safety of the new high-power electric locomotive showed that the derailment coefficient appeared higher when the wheel-set was set to the front of the train instead of being placed backward, and the maximum value of the derailment coefficient was recorded as 0.572 on the Gyeongbu line. Furthermore, the lateral force increased in curved sections, and it appeared to be proportional to the curve radius. Meanwhile, a maximum axis lateral force of 77.6 kN was recorded on the Taebaek line, and the wheel unloading ratio was 47.6% on the Yeongdong line. Finally, the running safety at the maximum speed as well as the through-curve performance of the curve radius satisfied the required standards.

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Journal Info.Reliability Engineering
and System Safety

Vol. 117

2013. 9

Abstract

The purpose of this study is to improve the efficiency, reliability and safety related to railroad maintenance tasks through an evaluation of the consequences of failures. The brake system was selected based on the failure data obtained from railroad vehicles in operation as one of the safety systems in railroad vehicles. The failure causes, failure effects, and the criticality of the failure mode were drawn for 62 failure modes of the braking system through the use of an FMECA for the 30 sub-devices having primary functions. The various maintenance tasks for the braking system were categorized into the 62 failure modes and failure consequences using the FMECA and the logic of maintenance decisions. Braking systems manufactured by the same manufacturer and operated by two different operators were studied in an effort to analyze preventive maintenance and to evaluate the adequacy of preventive maintenance tasks for the 62 failure modes. Based on results of the evaluation of these preventive maintenance tasks, new maintenance tasks were proposed, and concrete cost-cutting effects were determined from the calculation of the maintenance time and expected costs, using a preventive maintenance template developed specifically for railroad vehicles.

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Journal Info.Advanced Materials
Research

Vol. 716

2013. 4

Abstract

The wheel/rail contact is characterized by high contact forces and small contact areas. Although the standard of railway wheel has sustained, the damages of railway wheel have been occurred in service running. The railway wheel damage can be divided into three types; wear, contact fatigue failure and thermal crack due to braking. In curves, especially, large sliding on the contact patch occurs at the wheel tread and flange. Due to this sliding, wear increases in the wheel/rail contact under the dry condition. To reduce wear, more durable wheel steels are required. In order to develop new materials and predict wear, It is important to understand the wear mechanism in wheel steels. In this study, we have investigated the wear characteristics of RSW1 railway wheel steel using twin disc wear testing. Also the comparative wear behavior of RSW1 and R7 wheel steel under rolling-sliding contact was performed.

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2013. 2

Abstract

The reduction unit is one of the most important components for railway vehicles because the torque of the motor must be transmitted to the wheels of the vehicle by the reduction unit. The faults in the reduction units of high-speed trains are caused by damage such as gear, fatigue. These have serious impacts on safety of the train during operation. To address this development of a system for monitoring, fault diagnosis of the reduction unit is needed to keep the vehicle running safely. Before that can be accomplished, it is most important to understand the vibration characteristics of the reduction unit in a normal state. Vibration diagnosis technology using characteristic-analysis of vibration waveform and frequency is known to be the most effective method for fault diagnosis. In this paper, we analyzed the vibration characteristics of the reduction units two Korean high-speed trains (KTX and KTX II), under normal conditions, by two test methods (driving gear test, full-vehicle test).

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Journal Info.

Journal of the Korean
Society for Precision
Engineering

Vol. 30 No. 10

2013. 10

Abstract

In general, lateral ride comfort of railway vehicle is mainly influenced by a secondary suspension placed between the bogie and carbody. Higher operating speeds of train results in increased vibration of carbody, which has a negative impact related to the ride comfort. To solve this problem, researches to replace the conventional passive suspension with (semi)active technology in the secondary suspension of a railway vehicle have been carried out. The semi-active suspension using the magneto-rheological damper is relatively simpler system and has advantage in maintenance compared to the hydraulic type semi-active damper. This study was performed to reduce lateral vibration acceleration of carbody related to ride comfort of railway vehicles with a semi-active suspension system. The numerical analysis was conducted by replacing passive lateral damper with semi-active MR damper, and robust control with the MR damper was applied to the 1/5 scaled railway vehicle model.

First Author

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Journal Info.

Journal of the Korean
Society for Railway

Vol. 16 No. 6

2013. 12

Abstract

Since PSDs(Platform Screen Doors) are set up at many subway stations, their design related to safety has become gradually important. In particular, the interference check with a running railway vehicle is the most important of performance indices because the collision between PSDs and vehicles can be dangerous for passengers in the car and on platforms. When the train comes into a station with a curvature, the passenger car has a large translational and rotational motion and the displacement is enough for coming in contact with PSD. The performance is affected by many design parameters such as rail design parameters and vehicle velocity. This study proposes dynamic analysis models for railway vehicles and rails. Some parameters were also considered in the models to determine their influence on the performance.

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Journal Info.Journal of Computational
Fluids Engineering

Vol. 18 No. 3

2013. 9

Abstract

The turbulent flow behavior of air supply and exhaustion in the Shin-gum-ho subway station is analyzed for ordinary and emergency state. The depth of Shin-gum-ho station is 43.6m which consists of the island-type platform(8th floor in underground) and a two-story lobby (first & second floor in underground). An emergency stairway connects between the platform and the lobby. Ventilation operation mode for ordinary state is set up as a combination of air supply and exhaustion in the lobby and platform, while for emergency state it is set up as a full air supply in the lobby and a full exhaustion in the platform. The entire station is covered for simulation. The ventilation diffusers are modeled as 95 square shapes of 0.6m×0.6m in the lobby and as 222 square shapes of 0.6m×0.6m and 4 rectangular shapes of 1.2m×0.8m in the platform. The total of 7.5million grids are generated and whole domain is divided to 22 blocks for MPI efficiency of calculation. Large eddy simulation(LES) is applied to solve the momentum equation and Smagorinsky model is used as SGS(subgrid scale) model. The time-averaged velocity fields are compared to experimental data and show a good agreement with it.

Manufacturing and testing of a GFRP composite bogie frame with straight side beam members

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Journal Info.

Journal of Mechanical
Science and Technology

Vol. 27 No. 9

2013. 9

Abstract

To replace a traditional steel bogie with a composite one, this study designed and manufactured a composite bogie frame made of glass fiber-reinforced plastics to be applied to the bogie of an urban subway train. To evaluate its structural behavior, the composite bogie frame was tested under critical load conditions encompassing vertical loads and a twisting load. The test revealed that the maximum strain measured under the vertical load corresponded to 16.3% of the failure strain of the GEP224 glass fabric/epoxy sample. According to a durability evaluation using Goodman diagrams, both the measured and the calculated stress data were within the endurance limit. Therefore, the composite bogie frame satisfied the structural safety requirements. The evaluation of the contribution of each load case clearly showed that the vertical and braking loads were the most critical load cases. Adding the braking load cases led to movement of the critical point from the inner joint to the outer joint due to the increased torsion.

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Journal Info.

Transactions of the
Korean Society of
Mechanical Engineers B
Vol. 37 No. 1
2013. 1

Abstract

Plate thermometers are used for measuring the radiative heat flux in high-temperature surroundings. The heat flux is calculated from the temperature measured at the back surface of the stainless steel surface of the meter. Heat fluxes from a Schmidt-Boelter gauge are measured as reference heat fluxes. A combined conductive coefficient is introduced to consider the heat loss to insulation, conduction through the stainless plate depth, and conduction from the non-uniform temperature of the plate of the plate thermometer. This coefficient is obtained using the repulsive particle swarm optimization.

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Journal Info.Applied Mechanics and
Materials

Vol. 365-366

2013. 8

Abstract

Finite element pre-processing of the railway axle box system is done to analyze heat transfer from the axle to the body. Model geometry which is same with the experimental specimen is designed and cleaned up: connection of adjacent surfaces is repaired; missing surface is created; complex geometry is broken down into simple shapes. Next, the axle box system, which is composed of the axle box, axle box cover, bearing, and axle is meshed with 3D solid element, and then mechanical properties of the materials are added on each components for thermal analysis. The whole model of axle box system has 226,776 nodes and 322,840 elements.

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Journal Info.

International Journal of
Automotive Technology
Vo. 14 No. 6
2013. 12

Abstract

The railway transportation system has much advantage in eco-friendliness, punctuality and safety compared to any other transportation system. Most of the railway system administrators have to control and operate under limited resources such as trains and facilities. It is necessary to control traveling time and energy consumption for efficient operation in the railway systems, because the board rate of passenger is inconstant with time variance. It is common that the shorter traveling time causes the greater energy consumption. In this study, a new optimization method considering operation time or energy consumption is proposed by using differential evolution algorithm and some cases are reviewed. The total energy change due to operation time variation are investigated by using the proposed optimization method for tangent and gradient track conditions. Both cases, the total energy decreases exponentially. However, because of gradient the total energy are saturated after a certain time for gradient track.

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Journal Info.Journal of Thermal
Science

Vol. 22 No. 2

2013. 4

Abstract

The present paper describes an optimization work to obtain the properties related to a pyrolysis process in the solid material such as density, specific heat, conductivity of virgin and char, heat of pyrolysis and kinetic parameters used for deciding pyrolysis rate. A repulsive particle swarm optimization algorithm is used to obtain the pyrolysis-related properties. In the previous study all properties obtained only using a cone calorimeter but in this paper both the cone calorimeter and thermo gravimetric analysis (TGA) are used for precisely optimizing the pyrolysis properties. In the TGA test a very small mass is heated up and conduction and heat capacity in the specimen is negligible so kinetic parameters can first be optimized. Other pyrolysis-related properties such as virgin/char specific heat and conductivity and char density are also optimized in the cone calorimeter test with the already decided parameters in the TGA test.

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Journal Info.

Advanced Materials
Research

Vol. 716

2013. 4

Abstract

A method to simulate rolling contact wear in a rail surface was developed using the finite elements method and numerical analysis. A two dimensional finite elements model was used in order to reduce the calculation time and boundary conditions to prevent excessive deformation of a wheel and a rail were applied. A numerical analysis of rail wear at rolling contact was predicted using the Archard's equation. In addition, the characteristics of rail wear with the increasing speed of vehicle were analyzed. Results show that there was not a large difference in the depths of wear on the rail head with increasing vehicle speed, but the wear on the rail gauge corner increased with increasing vehicle speed.

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Journal Info.Journal of the Korean
Society for Railway

Vol. 16 No. 3

2013. 6

Abstract

A submerged floating railway is an innovative tunnel infrastructure passing through the deep sea independent of wave and wind so that high speed trains can run on it. It doesn't depend on water depth and is cost effective due to modular construction on land. The construction period can be reduced drastically. This paper introduces the concept design of a submerged floating railway, and for securing safety, proposes a method to analyze the structural behavior of the body in case of collision with a submarine. The theory of a beam with an elastic foundation was used to calculate the equivalent mass of the body so that the perfect elastic collision could be applied to calculate the collision velocity. The maximum deformation and bending moment was analyzed based on energy conservation. To verify the results, a collision analysis using a finite element analysis code was made. Comparing the results confirmed that this simplified collision analysis method gives enough accurate deformation and bending moment to be used for actual estimation in the initial design stage.

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Journal Info.

Key Engineering
Materials
Vols. 525-526
2013. 7

Abstract

This study is an experimental research on using stainless steel car body structure for urban railway vehicles. The car body used in the experiment was made of stainless steel. To evaluate the structural characteristics and safety of the stainless car body, static load test was carried out by means of "Performance Test Standard for Electrical Multiple Unit" with the reference code JIS E 7105. The structural safety of the car body was evaluated by implementing vertical load, horizontal compressive load, twist load, and 3-point support tests. Test results verified that the structural safety of a car body was very stable and safe under design load conditions.

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Journal Info.Transactions of the
KSNVE

Vol. 23 No. 11

2013. 11

Abstract

An accurate railway environmental noise prediction model is required to make the proper solution of the railway noise problems. In this paper, an engineering model for predicting the noise of conventional passenger cars is presented considering the acoustic source strength in octave-band frequencies and the propagation over grounds with varying surface properties. Since the formation of a train can be variable, the source strength of each locomotive and passenger car was estimated by measuring the pass-by noise and analysing the wheel-rail rolling noise. Some validation cases show on the average small differences between the predictions of the present model and the measurement results.

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Journal Info.Journal of the Korean
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Vol. 16 No. 3

2013. 6

Abstract

Rolling noise is an important source of noise from railways; it is caused by wheel and rail vibrations induced by acoustic roughness at the wheel/rail contact. To reduce rolling noise, it is necessary to have a reliable prediction model that can be used to investigate the effects of various parameters related to the rolling noise. This paper deals with modeling rolling noise from wheel and rail vibrations. In this study, the track is modeled as a discretely supported beam by regarding concrete slab tracks, and the wheel vibration is simulated by using the finite element method. The vertical and lateral wheel/rail contact forces are modeled using the linearized Hertzian contact theory, and then the vibration responses of the wheel and rail are calculated to predict the radiated noise. To validate the proposed model, a field measurement was carried out for a test vehicle. It was found that the predicted result agrees well with the measured one, showing similar behavior in the frequency range between 200 and 4000 Hz where the rolling noise is prominent.

The design of hydraulic brake control system used on blending brake function

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Journal Info.

The Transactions of the
Korean Institute of
Electrical Engineers

Vol. 62 No. 12

2013. 12

Abstract

The bogie of monorail vehicles applies rubber wheel system not steel wheel system. In addition, The structure of the bogie is very complicated because vehicle operates on the elevated road and vehicle drives with wrapping the guide way. When the monorail vehicle applies air brake system, lower device of vehicle may be complex and some devices may be limited. On the other hand, hydraulic brake equipment is compact and not weighing. Braking force is also outstanding compared with air brake so the hydraulic brake equipment is suitable for monorail vehicle. Also urban transit system such as monorail, applies mixed system both friction brake and electric brake in order to save electric energy. But application case of hydraulic brake in the country is very rare because hydraulic brake have difficulty in satisfaction of control requirement and maintenance. Therefore, this study suggests ways to design hydraulic brake system with blending brake for monorail vehicle and applies the ways to future monorail.

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Journal Info.Journal of mechanical
Science and technology

Vol. 27 No. 9

2013. 9

Abstract

Friction stir welding is a solid-state welding method commonly used for aluminum alloy or lightweight metal. It has the advantages of low welding strain, high welding quality, and low residual welding stress while requiring no protection gas. Welding strain analysis of friction stir welding using finite element analysis has been the subject of many studies that focused on the substance fluid using three-dimensional computational fluid dynamics; however, this approach is inefficient for large structures and requires much time for analysis. To address this drawback, this study proposes a faster method for analyzing extruded aluminum material that exploits the advantages of the inherent strain-based equivalent load.

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Journal Info.

Journal Korean Society
for Precision Engineering

Vol. 30 No. 7

2013. 7

Abstract

Driving gear units can be affected by various problems, including those associated with external or internal defects in the bearing, problems with the lubricant oil, high-loading of the railway, and frequent impacts generated by rail joints. Temperature monitoring is a basic method in diagnosing abnormal conditions in the reduction gear and other components. This paper describes a new wireless monitoring system for the temperature diagnosis of abnormal conditions of the reduction gear. Integrated circuit (IC)-type temperature sensors were installed in the reduction gear box of a high-speed railway car. The temperature data from the reduction gear were acquired and analyzed in situ during high-speed rail operation. Analysis of these data was used to alert the driver and/or maintenance personnel when problems occurred.

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Journal Info.Journal of the Korean
Society for Railway

Vol. 16 No. 2

2013. 4

Abstract

Track irregularities is one of the key factors influencing the running behavior of trains. In order to ensure safety and ride comfort of train, the criteria for track irregularities should be adequately established regarding vehicle velocity, vehicle characteristics, characteristics of the track recording car, and measurement interval. Also, track maintenance should be carried out thoroughly according to the criteria for managing track irregularities. Numerical analysis was conducted to investigate the influence of track alignment on the running behavior of Korean high speed train(KTX). Various wavelengths and amplitudes of lateral alignment were considered as parameters for this study using the Vampire program, a vehicle dynamics modeling package in railway environment. Derailment, lateral load, bogie acceleration and body acceleration of numerical analysis results due to alignment were investigated. Finally, the influence of the alignment on safety and ride comfort for the KTX was evaluated. This study indicates that alignment irregularities have significant impacts on running safety, and that the criteria used to manage alignment irregularities should be restrictive to ensure the running safety of the KTX.

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Journal Info.Earthquake Engineering
Society of Korea

Vol. 17 No. 6

2013. 11

Abstract

According to natural frequency of soil, characteristics of earthquake responses of an isolated containment building in nuclear power plants are examined. For this, earthquake response analysis of seismically isolated containment buildings in nuclear power plants is carried out by strictly considering soil-structure interactions. The structure and near-field soil are modeled by the finite element method while far-field soil by consistent transmitting boundary. The equation of motion of a soil-structure interaction system under incident seismic wave is derived. The derived equations of motion are solved to carry out earthquake analysis of a seismically isolated soil-structure system. Generally, the results of this analysis show that seismic isolation significantly reduces the responses of the soil-structure system. However, if the natural frequency of the soil is similar to that of the soil-structure system, the responses of the containment buildings in nuclear power plants rather increases due to interactions in the system.

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Journal Info.International Journal of
Rock Mechanics and
Mining Sciences

Vol. 59

2013. 7

Abstract

Boundary conditions are one of the important aspects that must be controlled or properly modeled in experimental and numerical analyses. In multiaxial compression tests, adapted for a scaled model test investigating model rock behaviors, boundary behaviors are crucial to producing proper and accurate test results. This is especially true of compression tests, where the types of loading platen in contact with the specimen influence the boundary condition. When using the dry steel platen often adopted for compression tests, a stress rotation occurs at the specimen/loading platen interface, and this deviates stress distribution inside the specimen. The frictional restraint distorts the expected test results. In this paper, a new type of loading platen is introduced and compared with dry steel platen. The newly developed loading platen is a roller-supported steel piston loading platen and consists of 45 mm long steel pistons, 6 mm diameter shaft-type rollers, and a frame that holds the pistons and shafts. The piston is designed to withstand buckling failure and follow the local deformation of a specimen through the rotational movement of the rollers. A sliding-block test was conducted to compare the frictional behavior of a dry steel platen and a roller-supported steel piston platen. A typical dry steel platen shows that the coefficient of friction is in the range of 0.19 to 0.23. The frictional characteristic varies, with confinement and shear deformation. The sliding-block test for the roller-supported steel piston loading platen shows no deformational mismatch between the specimen and the loading platen, and this result indicates no frictional restraint along the specimen/loading platen boundary. In addition, a biaxial compression test was conducted to show the translation of the steel piston following local deformation of a specimen. Different degrees of translation were monitored from steel pistons near the top, middle and bottom of the specimen. This observation shows that the steel pistons follow the local deformation of a specimen and produce almost zero frictional restraint.

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Journal Info.

Journal of the Korean
Geotechnical Society

Vol. 29 No. 9

2013. 9

Abstract

An alternative design method of existing methods based on elastic theory the design method of roadbed considering plastic deformation of roadbed and stress-strain at roadbed materials with the cyclic loading of trains passing. The characteristics of the developed design method considering traffic load, number of cyclic loading and resilience modulus of roadbed materials can evaluate elastic strain as well as plastic settlement with allowable design criteria. The proposed design method is applied to standard roadbed section drawing of HONAM high-speed railway considering design conditions such as allowable elastic and plastic settlement, train speed, the tonnage of trains. As a result, required levels of resilience modulus model parameter (A_E), unconfined compressive strength, types of soil material were evaluated.

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Journal Info.Computer Methods in
Applied Mechanics and
Engineering

Vol. 263

2013. 8

Abstract

A methodology for dynamic analysis of a poroelastic layered half-space is proposed. A poroelastic layered half-space is discretized with regular thin layers to a certain depth. Below the layers, continued-fraction absorbing boundary conditions (CFABCs) which are accurate and effective in modeling wave propagation in various unbounded domains are applied in order to represent the infinite extent of the half-space. With the representation, a spectral decomposition which is an effective approach in the solution of wave-propagation problems is utilized. Green functions of a poroelastic layered half-space are obtained accurately with the proposed numerical model. The Green functions can be applied to various dynamic problems in the half-space including foundation dynamics and soil-structure interaction problems.

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Journal Info.Journal of the Korean
Geotechnical Society

Vol. 29 No. 1

2013. 1

Abstract

The critical velocity effect on railway trackbed means the amplification of vibration energy when the train running-speed and group velocity of ground surface wave are superimposed. It is called a pseudo-resonance phenomenon of time domain. In the past, it was not issued because the train speed was low and the ground group velocity was higher. But since the high-speed train is introduced, critical velocity reported causing a track irregularity. So far, theoretical analysis has been performed because of the complexity of formation process. However it requires reasonable consideration which is similar to actual track and trackbed conditions. In the present paper, finite element analysis to verify the critical velocity effect is performed considering each track structure and trackbed supporting stiffness. As a result, the deformation amplification caused by the critical velocity effect is verified to analyze each supporting stiffness and track system.

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Journal Info.

Transportation Research
Record

No. 2374

2013. 11

Abstract

The High-Speed Line (HSL) in Korea has been in service since 2004 with the maximum design speed and operating speed of 350km/h and 300km/h, respectively. Recently, Korea has completed a development of HEMU-430X (High Speed Electric Multiple-Unit, 430km/h eXperiment) with the maximum design speed and operating speed of 430km/h and 400km/h, respectively and is waiting for a trial run on a conventional HSL. In this study, we tried to predict wheel load fluctuations (WLFs), which are one of the key factors affecting acceleration to speeds over 400km/h. To accurately understand the WLFs in the high-speed range greater than 400km/h, we performed field 10 running tests twice using the KTX-Sancheon trains on the Gyeongbu HSL. They travelled between Gwangmyeong and Daejeon at the maximum running speed of 302 and 335km/h, carefully measuring WLFs with the telemetry system (the radio data transmitter and the receiver system) at varying speeds. Based on probabilistic data analysis using a Gaussian function, the WLF (σ/Pst), normalized non-dimensional parameter, at speeds of 400km/h and 500km/h was modeled into quadratic functions. The WLFs at the speed of 400km/h and 500km/h were predicted as 0.356 and 0.512, respectively. Additionally, effects from structures that greatly impact WLFs, such as turnouts, transition zones, and loose sleepers, were evaluated quantitatively. Among them, turnouts had the greatest impacts on the WLFs.

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Journal Info.

Journal of KOSHAM

Vol. 13 No. 5

2013. 10

Abstract

Earth pressures acting on a short rigid foundation during overturning failure were measured by a real-scale load test. A cast-in-place concrete foundation with square section of 1.0 m width and 2.2 m embedded depth was equipped with 11 earth pressure cells. Moment was applied to the pole supported by the foundation until overturning failure occurred. Earth pressure distribution between the foundation and soil was compared with those from the existing theories to verify their validities. In the measurement result, increase of earth pressure on the upper foundation was found in comparison with the theories, that was caused by the soil compaction at the ground surface. A Simplified distribution of vertical soil pressure on the foundation for the reasonable design was proposed.

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Journal Info.Earthquake Engineering
Society of Korea

Vol. 17 No. 6

2013. 11

Abstract

In this study, the capability of an existing analysis method for the fluid-structure-soil interaction of an offshore wind turbine is expanded to account for the geometric nonlinearity and sea water drag force. The geometric stiffness is derived to take care of the large displacement due to the deformation of the tower structure and the rotation of the footing foundation utilizing linearized stability analysis theory. Linearizing the term in Morison's equation concerning the drag force, its effects are considered. The developed analysis method is applied to the earthquake response analysis of a 5 MW offshore wind turbine. Parameters which can influence dynamic behaviors of the system are identified and their significance are examined.

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Journal Info.The Journal of Korean
Geosynthetic Society

Vol. 12 No. 3

2013. 12

Abstract

By changing from ballasted track to concrete slab track, new type railroad subgrade is strongly required to satisfy strict regulations for displacement limitations of concrete slab track. In this study, sensitivity analysis was performed to assess the design characteristics of new type reinforced railroad subgrade, which could minimize residual settlement after track construction and maintain its function as a permanent railway roadbed under large cyclic load. With developed design program, the safety analysis (circular slip failure, overturning, and sliding) and the evaluation of internal forces developed in structural members (wall and reinforcement) were performed according to vertical installation spacing and stiffness of short and long geotextile reinforcement. Based on this study, we could evaluate the applicabilities of 0.4 H short geogrid length with 0.4 m vertical installation spacing of geotextile as reinforcement and what the ground conditions are for the reinforced railroad subgrade. And also, we could grasp design characteristics of the reinforced railroad subgrade, such as the importance of connecting structure between wall and reinforcement, boundary conditions allowing displacement at wall ends to minimize maximum bending moment of wall.

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Journal Info.Journal of the Korean
Society for Railway

Vol. 16 No. 4

2013. 8

Abstract

In railway construction, superimposition of horizontal and vertical curves has critical effects on the running stability and the ride comfort of vehicles as well as on construction costs. In this study, running safety, ride comfort, and track acting forces were analyzed by a numerical analysis using the VAMPIRE program according to cases of superimposition of vertical and horizontal curves. From the analysis results, it was found that running safety, riding comfort, and track acting forces in the case of superimposition of vertical and horizontal curves as well as vertical and transition curves meet all of the criteria. Also, in the case of the superimposition of vertical curves and curvature change between horizontal transition curves and circular curves meet all of the criteria.

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Journal Info.Journal of the Korean
Society for Railway

Vol. 16 No. 1

2013. 1

Abstract

Based on Korean railway design standards, the thicknesses of the reinforced roadbeds of conventional and high speed railways are different, and so too, for the size distribution of the ballast particles. Accordingly, considerable cost would be required to increase operating speeds of conventional lines, in particular related to changing from a ballasted track system to a ballastless one. In this study, applicability of a roadbed which supports conventional ballasted track, for use as a ballastless track for a high speed rail line was examined. A reinforced roadbed for a conventional railway is 20cm thick, and the type of material used for a conventional reinforced roadbed is M-40 (crushed gravel for road embankments). A dynamics test was conducted to evaluate the occurrence of the permanent settlement of the track substructure. These results suggest that, without changes to the track substructure, an operational speed of 400km/h is feasible with a ballastless track. This result; however, is from laboratory experiments. Further studies, such as numerical analyses or field validation, are required.

Experimental fatigue evaluation of welded connections in cantilevered steel sign structures

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Journal Info.

ASCE Journal of
Structural Engineering

Vol. 139

2013. 12

Abstract

Cantilevered steel sign structures, commonly used to support freestanding signs, are flexible, have a low damping, and can be prone to fatigue-type failure due to wind-induced vibration. A sleeve connection involving horizontal ring plates with two-sided fillet welds welded to the upper pipe and slot welds to connect the lower ring plates to the lower pipe is commonly used to splice the upper and lower pipes of different diameters. While the majority of these structures have performed well in long-term use, some structures have been damaged or destroyed due to cracking at the weld toe of the sleeve connections. A testing program was developed to evaluate the relative fatigue life of conventional and alternative connection details. Testing demonstrated that conventional welded connections had a low fatigue life. A revised sleeve connection detail incorporating a one-sided fillet weld detail at the critical joint was effective in enhancing the fatigue performance. Replacing slot welds by cement grouting the gap between two pipes significantly increased the fatigue life. Using a welded cone to provide a smooth transition between the pipes also showed an improved performance. A tapered slip-joint connection that requires no welded joints between the pipe sections provided the best fatigue performance.

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Journal Info.Journal of the Korean
Society for Railway

Vol. 16 No. 5

2013. 10

Abstract

Here we report the results of an experimental laboratory test to verify the applicability to railway bridges of a PSC I girder of which the upper flange thickness was increased to improve sectional performance. The thicker this flange is, the further upward the neutral axis is moved. If in this way the span length can be increased to 40 m long, the bridge may be constructed with four girders instead of five. Therefore, construction cost could be lowered by reducing the weight of the long span structure due to increased sectional efficiency. It was also necessary to be certain that the dynamic performance of this relatively flexible structure would be applicable to railway bridges. Therefore numerical analysis, as well as static and dynamic tests, was carried out for a full-size PSC I girder. Based on these results, it was verified that the performance of the PSC I railway bridge satisfied the performance criteria of the design code.

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Journal Info.Journal of the Korean
Society for Railway

Vol. 16 No. 4

2013. 8

Abstract

In general, it is difficult to measure dynamic responses of a bridge with stepwise increasing speed of a train during commercial service on a high speed railroad. However, before opening the 2nd stage of the Gyeongbu high speed railroad, there was an opportunity for field tests and measurements of the bridge with stepwise increasing speed (from 170km/h to 315km/h). The measured responses were compared with the results of a developed bridge/train interaction analysis. Although good agreement was found throughout almost the entire range of speeds, relatively large differences were found in the vicinity of the critical speed at which resonance behavior of the bridge occurs. To investigate the cause of this, reanalyses are performed with re-estimated damping ratios from field tests.

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Journal Info.The Journal of Korean
Geo-Environmental
Society

Vol. 14 No. 10

2013. 10

Abstract

In this study, we constructed the test embankment with four kinds of sections(2 kinds of bottom ash; tire shred-bottom ash mixture, weathered soil) in field and had been monitoring the behaviour of the test embankment and change of ground water quality for 1 year. In the geotechnical aspects, there was no relative difference of deformation in 4 test materials section and we could not see the possibility of the strength-reduction of coal ash materials by freezing inside of the embankment. In addition, no settlement was observed in the test sections because the base soil of the test sections was rigid enough that no consolidation was occurred. In the examination of water quality, all of the heavy metals and negative ions were detected below the drinking water standards except for sulfate(SO₄²⁻). In the beginning of measurement, higher concentrations of sulfate from 4 test sections were detected than drinking water standard for 20 days after beginning of the test but the concentrations decreased below the drinking water standard after 50 days after the tests.

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Journal Info.Sciences in cold and
arid regions

Vol. 5 No. 4

2013. 8

Abstract

An active application of a concrete track is expected for the future construction of railroads. For successful concrete track construction and operation in earthwork areas, the residual settlement should be reasonably controlled by using an appropriate method. The maintenance for excessive settlement is very difficult on the operating line because the maintenance method is very restrictive. The objective of this study is to introduce pressurized rapid-hardening cement grouting (PRCG) method to restore a subsided concrete track without any adverse effects on train operation. This method involves the use of special types of materials (very quick hardening and middle-hardening mortar), compact grouting equipment, and a special construction process. In spite of the extremely restrictive environment, this method has been demonstrated to be very effective and reasonable through laboratory and field tests.

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Journal Info.Journal of the Korea
Academia-Industrial
Cooperation Society

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Abstract

The moment responses of electric pole foundations for a railroad were investigated using real-scale load tests. Large overturning moments were applied to two square rigid piles with a 1.1 m width and a 2.2 m embedded depth. Two different installation methods-with and without a form-were applied to evaluate the influence of the form work on the moment capacities of the foundations. The reduction of ground strength caused by the excavation without a form is more pronounce than the decrease of frictional strength due to the smooth concrete surface with a form. From the test results, it is found that the current design method which applies a proportional coefficient to consider the effect of a form work is not appropriate. When the normal and frictional stressed is considered separately, the effect of a form work can be estimated reasonably by reducing the friction angle between soil and foundation by 20%.

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Journal Info.Journal of the Korean
Geotechnical Society

Vol. 29 No. 11

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Abstract

Electric pole foundations for overhead catenary system of railroad should be designed so that they may resist significant overturning moment but relatively small vertical forces. Also they should have proper shapes to be installed at restricted narrow areas adjacent to railroad track. In this paper the moment responses of rectangular pole foundations according to their shapes were investigated numerically. A three-dimensional finite element method was developed and verified so that the numerical behaviors of the foundation resisting the overturning moments were compared reasonably well with those from an existing real-scale load test. The influences of aspect ratio, varying section with depth and loading directions for rectangular section were investigated using the developed numerical method. From the numerical results, the optimized shapes of pole foundation for more effective and economic installation adjacent to railroad track are proposed.

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Journal Info.International Journal of
Steel Structures

Vol. 13 No. 2

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Abstract

This paper presents a more rational calculation of the minimum stiffness required for transverse stiffeners of stiffened concrete filled tube (CFT) compression panels. As longitudinal stiffeners are essentially compression members, transverse stiffeners are required to control the effective length. Both the longitudinal stiffener and transverse stiffener subdivide the compression panel in a grid pattern so the relatively thin plate can carry the induced compressive load in the most efficient manner. However, the provisions for the required rigidity of transverse stiffeners in the literature are inconsistent in general and in particular; do not exist in the case of the concrete filled compression panels. Here, the parameters that govern the behavior of the transverse stiffeners are identified theoretically using the column buckling approximation. In order to calibrate and quantify the analytical equations developed, incremental nonlinear analyses were performed on a large number of finite-element models. The numerically collected data were then used to validate the equations developed.

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Journal Info.

Soil Dynamics and
Earthquake Engineering

Vol. 48

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Abstract

A stochastic thin-layer method is developed for the analysis of wave propagation in a layered half-space. A random field of shear moduli in the layered system is considered in terms of multiple correlated random variables. Expanding the random moduli and uncertain responses by means of Hermite polynomial chaos expansions and applying the Galerkin method in the spatial as well as stochastic domains, stochastic versions of thin-layer methods for a layered half-space in plane strain and antiplane shear are obtained. In order to represent the infinite half-space, continued-fraction absorbing boundary conditions are included in the thin-layer models of the half-space. Using these stochastic methods, dynamic responses of a layered half-space subjected to line loads are examined. Means, coefficients of variance, and probability density functions of the half-space responses with a varying correlation coefficient of the shear moduli are computed and verified by comparison with Monte Carlo simulations. It is demonstrated that accurate probabilistic dynamic analysis is possible using the developed stochastic thin-layer methods for a layered half-space.

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Journal Info.Journal of the Korean
Society for Railway

Vol. 16 No. 4

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Abstract

This paper systematically analyzes the dynamic effects of structure approaches which are expected to have direct effects on train loads - according to the train's acceleration as the area under consideration is located in a section where acceleration of high speed railway vehicles and the train's operating speed happens. In addition, through an examination of the dynamic train loads, dynamic behavioral characteristics of embedded structures and structure approaches were analyzed and a numerical analysis has been carried out in order to evaluate the performance of track subgrade and the safety of the structure. As a result, we reach the conclusion that the dynamic effects by train loads is low, but somewhat high vertical acceleration occurs.

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Journal Info.

Journal of the Korea
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Abstract

The wheel-rail interaction forces are influenced by the velocity of vehicle, wheel load, alignment(curve radius, cant etc) and track irregularity. On the running speed up test, for the securing stability of track structure, it is required to evaluate the influences for track and influential factors. Recently, the HEMU 430-X, which was developed by Next Generation High-Speed Rail Development R&D Project, achieved 421.4km/h in a test run of Daegu-Busan section of the Gyeongbu high speed rail on March in 2013. On Test-Bed Section(Gongju-Jeongeup: K.P. 100~128km Osong starting point) of Honam-high speed line, speed-up test over 430km/h will be conducted. According to the running speed-up of newly-developed vehicle, the analysis of track forces is required for outer rail by the increase of dynamic force and centrifugal force of vehicle. In this paper, the vehicle speed variation on HSL line is evaluated by TPS analysis considering the tractive effort of HEMU 430-X, tested running resistance and alignment of Honam HSR. And the track forces are evaluated by centrifugal force and impact factor on curved track.

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Journal Info.

Journal of the Korean
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Vol. 29 No. 7

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Abstract

In the element test for coarse granular materials, the grain size distributions of the materials are often adjusted, in case the grain size of coarse material in the field is larger than the available maximum grain size of the laboratory test equipment. In this study, we carried out the large cyclic triaxial test to evaluate the effect of the grain size distribution adjustment on Young's modulus in small to intermediate strain level. The test results showed that the coarse granular materials with the adjusted grain size distribution underestimated Young's modulus of the original materials. The difference of Young's modulus was larger in small strain level than in intermediate strain level.

The influence of track irregularities on the running behavior of high-speed trains

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Journal Info.

Journal of Rail and
Rapid Transit

Vol. 227 No.1

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Abstract

Irregularities in railway tracks influence the running behavior of trains; large irregularities can result in poor ride comfort and in some cases derailment. Thus, it is important that the relationship between track irregularities and the running behavior of trains is identified and criteria for track irregularities are adequately established. However, the questions of how track irregularities affect the vehicle responses that determine running safety and ride comfort and how the wavelength and amplitude of each track irregularity influence the vehicle responses are barely addressed in the literature. This paper reports the results of computer simulation studies that were performed to investigate the influence of the longitudinal level, alignment and cross level of track irregularities on the running behavior of the 300 km/h KTX (Korea Train Express) train. A straight track was assumed in the calculations to ensure a focus on the effect of track irregularities. Track irregularities with various wavelengths and amplitudes were modeled using the VAMPIRE program; a vehicle dynamics modeling package that is widely utilized to study railway environments. Simulations on the effects of derailment coefficients, lateral loads, bogie acceleration and body acceleration created by track irregularities were performed to evaluate how the track irregularities affect the safety and ride comfort of the KTX. The results of the simulations indicate that track alignment has a significant impact on running safety whereas longitudinal level does not have any significant impacts.

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Journal Info.Journal of the Korean
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Abstract

The suppression of residual settlement is required on earthwork sections as concrete track is introduced. Use of pile-slab structure is one of the settlement restraining methods applied on soft ground. The slab distributes the upper embankment load and piles transfer the load from the slab to the stiff ground. While this method is very effective in terms of load transfer, it has not yet been established for dealing with the vibration transfer effects and interaction characteristics between a structure and the ground. It is possible that vibration caused by a moving train load is propagated in the upper embankment, because the slab acts as a reflection layer and waves are multi-reflected. In this present paper, wave propagation generated by a moving train load is evaluated in the time and frequency domains to consider a roadbed structure using an artificial impact load and field measured train load. The results confirmed the wave reflection effect on the pile-slab structure, if the embankment height is sufficient, vibration propagation can be stably restrained, whereas if the height is not sufficient, the vibration amplitude is increased.

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Journal Info.Geotechnical Testing
Journal

Vol. 36 No. 3

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Abstract

In this study, a new large-scale triaxial testing apparatus was constructed and calibrated. To verify the new testing system, synthetic specimens were prepared and tested by three different testing methods: tests using the newly constructed large-scale triaxial testing apparatus, resonant column/torsional shear tests, and free-free resonant column tests. Young's moduli of the synthetic specimens measured by the three methods were compared, providing comparable results. In addition, cyclic triaxial tests were performed under various experimental conditions on coarse grain materials. Two series of parallel graded samples were prepared by mixing crushed rock. The samples were tested using the new triaxial testing apparatus under various testing conditions. The influence of grain size, loading pattern, loading frequency, and fine contents were analyzed and discussed.

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Journal Info.The Korean Institute of
Electrical Engineers

Vol. 62 No. 2

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Abstract

In this paper, the design of PRT vehicle power supply system is discussed. Since there is no power feeding line facilities in PRT system under development, the PRT vehicle must have its own energy storage device on board. For the energy storage device, ultra-capacitor bank is applied due to its fast charging capability and long life time. Charging the Ultra-capacitor bank is performed by wireless inductive power transfer system. The capacitor bank is charged up in less than 10 seconds when the vehicle is traveling by passenger stations. In this paper the design of the ultra-capacitor bank and the wireless inductive power transfer system for the PRT vehicle are discussed. Tests are conducted for the both system and the result shows the efficiency of the wireless inductive power transfer system is higher than 80%.

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Journal Info.

The Transactions of the
Korean Institute of
Electrical Engineers
Vol. 62 No. 12
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Abstract

An overhead catenary system is the one of the main subjects for increasing speed in electric railway. When a vehicle increases the speed over 350km/h, vibrations and wave propagation reflections occur severely. Therefore, the system suitable for the speed are needed. A wave propagation speed of contact wire is the main criteria to determine the tension for the system. Therefore, a train speed is restricted below 70% of wave propagation speed of it in European railway code. In this study, we measured a strain and uplift of contact wire while HEMU-430X train is operated for the speed-up trial test in Kyungbu high-speed railway. The measured strain and uplift are analyzed with wave propagation speed according to the speed-up. The more a train speed reaches to a propagation speed, the more measured strain is high. Through the study, an experimental approach is performed about the code which a train speed is restricted below 70% of wave propagation speed of it

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Journal Info.The Korean Institute of
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Vol. 62 No. 11

2013. 11

Abstract

This paper compares power losses between voltage controlled before and after using power conversion device in AC feeding system. For this purpose we present voltage control procedures and criteria and model high speed line and train using PSCAD/EMTDC to compare power losses in various feeding condition. Power losses of the simulation result in power control before and after in single point feeding system was reduced maximum 0.37 MW(23.8 %) and average 0.23 MW(20.5 %) when one vehicle load operates maximum load condition. When three vehicles operate maximum load condition in one feeder section, power losses after voltage control was reduced 1.03 MW(49.5%) compared to before voltage control. And, power loss of parallel feeding system is reduced the average 0.08 MW(7.2 %) compared to the single feeding system. In conclusion, adaptive voltage control method using power conversion device can reduce power losses compared with existing method.

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Journal Info.International Journal of
Advanced Manufacturing
Technology

Vol. 67

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Abstract

Wireless sensor networks (WSNs) have recently extended application areas to numerous sectors such as industrial automation, military applications, transportation systems, building management, and environment surveillance. In particular, WSNs provide flexible, reliable, cost-effective solutions to monitor the real-time status of automated manufacturing facilities. A facility-specific WSN for reliable monitoring and efficient management of industrial facilities is called the facility sensor network (FSN). In general, industrial facilities run various electromagnetic devices causing electromagnetic interference (EMI), which disturbs wireless data communication. To obtain accurate and reliable data in such environments, the FSN needs to deal with the EMI by proper deployment of sensor nodes and their validation and fusion. This paper proposes a data processing protocol, called Interfered Sensor Data Processing Protocol (ISDPP) to handle the EMI affecting wireless communication. ISDPP is developed with a data fusion algorithm and an exponentially weighted moving average/fuzzy logic-based error detection method to obtain reliable information from the FSN. To evaluate the performance, experiments in various settings are performed in a test-bed manufacturing facility. The experimental results indicate the interfered data, and outliers can be filtered out even if unexpected interferences occur in the facility. The FSN with the ISDPP can provide efficient real-time monitoring solutions for various industrial applications.

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Journal Info.The Korean Institute of
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Vol. 62 No. 10

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Abstract

This paper proposed new real time catenary impedance estimation technique using synchronized power data from the measured data of operating vehicle and substation for catenary protective relay and fault locator setting. This paper presented estimation equation of catenary impedance using synchronized power data between substation and vehicle of AT feeding system for the performance verification of the proposed technique. Also AC feeding system is modeled through power analysis program and performance was verified through simulation according to various load changes. We verified that average 2.38%(distance equivalent 23.8 m) error appeared between the proposed estimation equation of catenary impedance and power analysis program simulation output in no connection double track system between up track and down track. Furthermore, We confirmed that estimation error is bigger depending on the increasing the substation distance and vehicle impedance using only using vehicle current when calculating vehicle impedance in connection double track system between up track and down track. But, We confirmed that the proposed technique estimated accurately catenary impedance regardless of vehicle impedance and distance from substation.

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Journal Info.

The transactions of the
Korean Institute of
Electrical Engineers
Vol. 62 No. 7
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Abstract

In this study we deal with design procedures for the flywheel energy storage system that has the capacity to store the regenerative energy produced from the railway vehicles. The flywheel energy storage system (FESS) stores the regenerative electrical energy into the high speed rotational flywheel, by conversion the electrical energy into the mechanical rotational energy. Thus the FESS is composed of the energy conversion components, such as the motor and generator, mechanical support components, such as the rotational rotor, the magnetic bearings to support the rotor, and the digital controller to control the air gap between the rotor and the magnetic bearings. In this paper the design procedures for the rotor operating at the rigid mode and the magnetic bearings to support the rotational rotor without contact are presented.

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Journal Info.Journal of Electrical
Engineering and Technology

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Abstract

This paper presents design procedure of the magnetic bearings used for high-speed electric machines and flywheel energy storage systems. Magnetic bearing can be categorized by innerrotor type and outer-rotor type according to the position of the rotary disc. These two types are applicable based on application environments such as application space, required attraction force, and controllability. Magnetic bearing is generally designed based on the ratio (geometrical coefficient or geometrical efficiency) of pole width to rotor journal radius but proper ratio is only decided by the analysis. This is the difficulty of the magnetic bearing design. In this paper, proper design technology of the inner-rotor type and outer-rotor-type eight pole magnetic bearings is introduced and compared with the FEM analysis results, which verifies the proposed design procedure is suitable to be applied to the design of the magnetic bearings for the industrial applications and flywheel energy storage system

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Journal Info.Journal of the Korean
Society for Railway

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Abstract

The research about the Korean integrated wireless network for railways is in progress. The network integrates and complements the various railway functions. In addition, the network is trying to change from wire communication to radio communication. The activities for the railway frequency acquisition are also in progress for the implementation of the network. This paper analyzes the problems for the Korean railway communication networks. The problems revolve around the dispersed network structure, the limited functions, the different communication methods, the technology limitation for the communication methods, and the usage of the non-licensed band. Subsequently, we explain the current state and trend for the foreign communication of the railways. This paper suggests improvement plans for the problems and also explains the expected efficiency for the improvement plans.

A study on the routing of onboard oriented control system by operation scenario

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Journal Info.

Journal of International
Conference on Electrical
Machines and Systems

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Abstract

The railway developed countries in Europe, Japan such as ERTMS Regional, FFB, COMBAT, it is the stage of development or testing the train control system for the signal system of branch interval of low density. Similar to the signal system used by the mainline and branch sections of low density domestic portions not suitable in terms of maintenance operational efficiency in accordance with the installation and operation in many cases. Therefore these low-density branch railway lines required that oriented train control system of wireless communication to improve the operation efficiency and line side equipment controlled on board the train. In this paper, We was published a route on setting is the operation of the new on-board oriented train control system for controlling a line converter of the train so that it is possible to improve the operational efficiency of the branch of the low density.

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Journal Info.

The Korean Institute of
Electrical Engineers

Vol. 62 No. 7

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Abstract

A research on thermal analysis method is conducted for the characterization of heat generation during operation of Interior Permanent Magnet Synchronous Motor(IPMSM) for Light Railway Transits(LRT) in this paper. Efficient cooling of the heat generated in the IPMSM is important because the excessive heat generated from the winding, core and permanent magnet makes it harder for a long time continuous operation of IPMSM. Therefore, in order to analyze the heat generation characteristics of the 110kW-class IPMSM as advanced research for application the IPMSM to the cooling device, the heat transfer coefficients for each component of the 110 kW-class IPMSM were derived and the thermal equivalent network was configured to perform the thermal analysis in this study. Finally, the 110kW-class IPMSM prototype is made and a comparative verification between the test data and the thermal analysis results through its various performance tests are carried out.

A study on the water-cooling jacket design of IPMSM for railway vehicles

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Journal Info.

The transactions of the
Korean Institute of
Electrical Engineers

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Abstract

In this paper, the basic design study of a water-cooling jacket, which have reported no cases for applying to railway traction motors so far, were conducted for applying to Interior Permanent Magnet Synchronous Motor (IPMSM) for railway vehicles. The basic thermal characteristics analysis of the 110kW-class IPMSM was performed by using 3-dimensional thermal equivalent network method. The necessary design requirements of the water-cooling jacket were derived by analyzing the results of the basic thermal properties. Next, the thermal characteristics analysis technique was established by using the equivalent model of the solenoid-typed pipe to be installed on the inside of the water-cooling jacket for 110kW-class IPMSM. Finally, a design model of 6kW-class water-cooling jacket was derived through the analysis of various design parameters.

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Journal Info.Journal of the Korea
Academia-Industrial

Vol. 14 No. 6

2013. 6

Abstract

In this study, to understand the technology development trend of super-speed maglev, the patents applied by major countries are analyzed. And based on the analyzed results, the domestic technology development direction are suggested. For patent analysis, the major technologies for super-speed maglev are classified into 14 parts. Then, through the quantitative analysis method such as number, increase rate and share rate, the overview of technology development and focused parts by each country are investigated. Also through the qualitative analysis method such as concentration degree, citation index and market share index, the technology level and market securing ability of each country are anticipated. Considering the analyzed results and technology development trend, the domestic technology development direction such as priority development fields and methods are proposed.

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Journal Info.

The Transactions of the
Korean Institute of
Electrical Engineers

Vol. 62 No. 4

2013. 4

Abstract

We have analyzed influence of potential rise in negative bus, which caused by decrease of power feeding line insulation, upon protecting method of DC ground protection device which detecting potential rise between negative bus and ground in order to detect ground fault in the rubber wheel system. For this purpose, we proposed negative potential equation between negative bus and ground and calculated negative potential according to system condition changes by estimating power feeding line insulation changes in steel wheel system and rubber wheel system, and equalizing DC power feeding system when ground fault occurred. Also, in order to estimate negative potential of real system, we modeled the rubber wheel system, and simulated normal status, grounding fault occurrence and power feeding line insulation changes. In normal status, negative potential did not rise significantly regardless of vehicle operation. When ground fault occurred, negative potential rose up over 300V regardless of fault resistance. However, we also observed that negative potential rose when power feeding line insulation dropped down under $1M\Omega$. In conclusion, our result shows that in case of rubber wheel system unlike steel wheel system, relay will be prevented maloperation and insulation status observation can be ensured when ground over voltage relay will be set 200V ~ 300V.

An apparatus design for the vehicle control scheme in personal rapid transit system

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Journal Info.

Journal of Mechanics
Engineering and Automation

Vol. 3

2013. 5

Abstract

A new transportation technology known as personal rapid transit (PRT) is being developed by multiple different companies around the world, and one system is under commercial operations in the United Kingdom. Each design is different, but they all share a need to operate many automated transit vehicles at very close headways. Safe operation will require a level of control an order of magnitude above any current transit system. As a result, new techniques will be needed for the development and testing of the mechanical and control systems. In this paper an apparatus for developing and testing a PRT vehicle control scheme is demonstrated. This system is composed of independent modules that represent virtual vehicles, a central control system, a man-machine interface and a monitoring device. It can be used to implement and to evaluate the designed vehicle control algorithm. The vehicle control algorithm is designed and simulated in a combined simulation platform that consists of Matlab/Simulink and Labview Simulation Interface Toolkit. Simple operational scenarios are proposed for the testing of the proposed vehicle control apparatus.

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The Transactions of the
Korean Institute of
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Abstract

In this paper, analysis method for current collection performance based on real-time current of catenary system is proposed. An innovative method based on track-side of railway system is used for measurement of currents for overhead contact line during the collection with pantograph. The evaluation of a qualitative ratio for current collection performance were conducted using proposed algorithm under various conditions such as laboratory and track-side. To check the validity of our approach, we compared between calculation results from current of contact wire and measurement results from arcing of pantograph using simulator in laboratory conditions. The results show that the behavior of current collection performance were analysis from currents of overhead contact line in AC electric railway system.

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Journal Info.

Journal of International
Council on Electrical
Engineering

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2013. 7

Abstract

Contactless systems use electromagnetic fields to transport power from railway substation to the traction system. The proto type of inductive power transfer (IPS) system has been developed in order to use train power feeding. It is based on a contactless transformer with a fixed coreless primary and different secondary core like E shape and U shape. The primary coil is supply with 50 kHz current which produces a magnetic flux in the secondary core. Further this flux induces a current in the secondary coil. This paper presents results of experiment for developed inductive power transfer system experiments. The IPS has a large air gap, so it is required a high magnetization current and compensate the leakage flux of primary and secondary coil. The proto type IPS has an air gap with range 1 to 5 mm and core material is ferrite with maximum power of 5 kW. The power supply to IPS is designed by constant current control inverter with compensation capacitance. We measure inductance of IPS and coupling coefficient in order to calculate the compensation parameter according to variable air gap. The analysis of output for the proto type IPS is performed regarding different loads.

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Journal Info.The Transactions of the
Korean Institute of
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2013. 4

Abstract

Depending on the operating characteristics, track circuit is installed for the purpose of control directly or indirectly of the signal device, point switch machine and other security device. These are mainly used for train detection, transmission of information, broken train detection and transmission of return current. Especially, the return current is related to signal system, power system and catenary line, and track circuit systems. It is one of the most important component shall be dealt for the safety of track side staff and for the protection of railway-related electrical system according to electrification. Therefore, an accurate analysis of the return current is needed to prevent the return current unbalance and the system induced disorder and failure due to an over current condition. Also, if the malfunction occurred by the return current harmonics, it can cause problems including train operation interruption. In this paper, we presented measurement and analysis method at return current and it's harmonics by train operation. By the test criteria, we evaluated for safety. Hereafter, it is expected to contribute to the field associated with it.

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Journal Info.Journal of international
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2013. 9

Abstract

The PRT (Personal Rapid Transit) system is a new personal transportation system in accordance with the requirements of the passengers. Although this PRT system was proposed a long time ago, it did not hold the limelight due to the several limitations in technology. However, the research and development has been active again recently thanks to the development in technology and the review on its applicability as the means of transportation linking to the urban transit system. Although most of these recent studies in relation to the PRT are focused on the hardware such as PRT vehicles or track structures, etc., the operational aspect of it is more important than that of any other means of public transportation. Therefore, among studies on operational aspect of this PRT system, this paper shows the result of study on technology in relation to the movement of vehicle to the station where it was called by the passenger through interface of the wayside control center with the vehicle control system in case where the passenger calls a vehicle at the station.

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Journal Info.

Journal of the Korea
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Abstract

The Personal Rapid Transit(PRT) system has been highly interested in future transportation developments due to its on-demand and optimized door-to-door transport capability. However, the major impediments to the commercialization of PRT are the high cost for construction of infrastructures as opposed to the small transport capacity and difficulty in defining the role of PRT in building a balanced transportation system. In this study, the vertical transfer device for the PRT vehicle is developed to provide more flexible and better compatible urban mobility services between means of transportation, which is expected to meet particular demands in a particular environment. This apparatus was initially designed based on the basis of vertical circulating conveyors with steel chains, which is frequently used in logistics. Its advantages are capable of the non-stop loading and reduced head-way time. Most importantly, it was intensified by the additional idea to ensure the stable and reliable transfer of the PRT vehicle fully loaded with passengers. The 1/10-scale prototype was successfully tested to demonstrate a fundamental mechanism of vertical transfer and identify unexpected user requirements prior to a real manufacturing process.

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Journal Info.

Journal of the Korean
Society for Railway

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Abstract

This research aims to conduct a study on the feasibility of the LTE communication method for developing a dedicated integrated railway wireless network. An empirical analysis was carried out by establishing a dedicated integrated railway wireless network in an approximately 12km section between Illo station and Daebul station on the Honam line. Korean wireless communication methods for railway safety are different depending on each line, which makes it difficult for railway workers to cooperate with. This causes various problems. There is the ever-present risk of accidents due to call disconnection between wireless communication systems, frequency interference from commercial networks, and crosstalk. This study verified the feasibility of the 4th generation communication system, LTE, over the dedicated integrated railway wireless network as a solution for the above mentioned problems. The result shows this communication system exceeded existing performance standards of Europe GSM-R in every test item despite the location constraint of train tracks on the base station establishment.

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Journal Info.

The Transactions of the
Korean Institute of
Electrical Engineers
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Abstract

In a section of AC electric railway, a phase between the sections is different although voltage levels supplied from substations are the same. Therefore, section insulators have been installed to electrically divide between the sections. Two different types of section insulator, namely an overlap type and insulator type, are used. In Korean high-speed lines, overlap type section insulator has been adopted. And, insulator type is used in conventional line. The overlap type has the advantage of having no speed limit, but has the disadvantage of requiring long section length. However, the insulator type has the advantage of section length, but also has the disadvantage of having speed limit. In Korean conventional line, an insulator type one relies on the import and there is some problem with wear. In this study, we developed the insulator type section insulator which adopts Teflon tube insulation material. The Teflon material has advantage of the excellent electrical characteristics and wear-resistance characteristics for a longer expected life than that made of existing FRP. In order to compare wear characteristics between the materials, wear tests with reciprocal wear tester are performed. And dynamic behavior tests between the insulators and pantograph are also performed for showing its better dynamic characteristics.

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Journal Info.

Journal of the Korean
Society for Railway

Vol. 16 No. 6

2013. 12

Abstract

To improve the efficiency and safety of railway systems, the train control system has considerably evolved from the ground-equipment-based control system (e.g. track circuit, interlocking system, etc.) into the on-board-equipment-based control system. In addition, this train control system enables the rolling stock to intelligently control the trackside facilities by introducing information and communication technologies (ICT). Accordingly, since the ICT-based train control system simplifies the railway system (i.e. the heavy ground-equipment can be removed), an efficient and cost-effective railway system can be realized. In this paper, we perform a feasibility test of the ICT-based train control system using a simulation. To this end, we implement a test-bed consisting of prototype machines of on-board/ground equipment and introduce an integrated operation scenario for the train control. The simulation results satisfy all the requirements of train operation according to the scenario and show the effectiveness of the proposed train control system.

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031-460-5438

Journal Info.International journal of
automation and power
engineering

Vol. 2 No. 2

2013. 2

Abstract

Railway signaling system requires the high level of safety since these have to ensure safe operation of the train. According to these reason, safety-related regulations for railway signaling systems are internationally standardized. To secure the safety required by international standards, the hazard control is necessary with system lifecycle, and the hazard identification is needed to hazard control. To draw this hazard which is the basis of whole hazard control, there are very many techniques such as PHL(Preliminary Hazard List), PHA(Preliminary Hazard Analysis), HAZOP, FMEA(Failure Mode Effect Analysis), etc. in the activities and methods. The PHA and HAZOP method is recommended for hazard analysis at IEC standards, but this method has several unsuitable problems to apply to railway signaling system. In this paper we recommend the modified HAZOP method, which would be suitable for analyzing safety of the railway signaling systems. And also an example of PHA and this method applied to real system is also included.

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Journal Info.The Korean Institute of
Electrical Engineers

Vol. 62 No. 12

2013. 12

Abstract

This study aims to implement an instrumentation system measuring and analysing real-time data of information flow between respective subunits composing train control system as the performance evaluation method for wireless communication based urban railway train control system under development for a Korean model. It analyses system functional requirements regarding subsystems composing wireless communication based train control system and test items for functions presented in each specification and examines data and measurement point for measuring according to test items in order to implement an instrumentation system. And, it clearly defines requirements of an instrumentation system to avoid malfunction or error in operation of train control system. It reviews data processing method and display method for effective analysis of data flow between respective subunits with measured data, designs and makes an instrumentation system. Ultimately, it applies to a performance test of train control system and makes sure an instrumentation system in normal working order.

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Journal Info.

The Transactions of the
Korean Institute of
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Vol. 62 No. 6

2013. 6

Abstract

Uplift of contact wire and dynamic characteristics between pantograph and contact wire are key interaction performance of OCS (Overhead Catenary System). These two evaluation items are the approval criteria for the performance between OCS and pantograph. A telemetry system or DAQ (Data Acquisition) System based on wireless communication make it monitor a dynamic behavior which is measured directly in a 25 kv like parts. While permissible working time is too short time to install is too long. In this paper, it is described that optimization the telemetry measurement system for OCS and increasing accuracy, easy adaptation, and faster handling can be also achieved through the study.

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031-460-5116**Journal Info.**

The Korean Institute of
Electrical Engineers

Vol. 62 No. 6

2013. 6**Abstract**

In this paper, we present a deterioration judgment model of urban rail power equipment using driving history, the frequency and number of failures. In addition, we have developed a deterioration judgment program based on the derived failure rate. A deterioration judgment model of power equipments on metro system was designed to establish how much environmental factors, such as thermal cycling, humidity, overvoltage and partial discharge. The deterioration rate of the transformers followed the Arrhenius log life versus reciprocal Kelvin temperature (hotspot temperature) relation. The deterioration judgment program is linked to the online condition monitoring system of urban railway system. The deterioration judgment program is based on the user interface it is possible to apply immediately to the urban rail power equipment.

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Journal Info.Journal of the Korean
Society for Railway

Vol. 16 No. 2

2013. 4

Abstract

In this paper, research on the thermal analysis method is reported for the characterization of heat generation while operating an Interior Permanent Magnet Synchronous Motor (IPMSM) for railway vehicles. Efficient cooling of the heat generated in the IPMSM is important because the excessive heat generated from the winding, core and permanent magnets increases the difficulty of continuously operating an IPMSM over long time periods. Therefore, in this study, in order to analyze the heat generation characteristics of the IPMSM for advanced research in the application of IPMSMs to cooling devices, the heat transfer coefficients for each component of the IPMSM were derived and the thermal equivalent circuit was configured to perform thermal analyses. Finally, the validation of the suggested thermal analysis method was performed through comparison with the heat experimental data of an IPMSM prototype.

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Journal Info.

The Journal of Korea
Information and
Communications society

Vol. 38C No. 5

2013. 5

Abstract

In this paper, we have designed and implemented an obstacle detecting device based laser radar. It is an alternative to solve through problem analysis of that are currently operated safety equipment and status research of domestic railway crossing. It is target to improve the safety and reliability of the rail traffic through effective obstacle detection at crossing account for a large proportion of train accidents. suggest a system to overcome the problems caused by aging and limitation of existing safety equipment. Design a crossing obstacle detection device that utilizes laser radar scanner, proved this through performance evaluation and testing of the prototype.

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Journal Info.The Transactions of the
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Vol. 62 No. 9

2013. 9

Abstract

The reason of train location detection is generally the train interval control between the railway stations and the train path control in the railway station yard in order to avoid train collision. It is very important to know the train location for shortening the train headway, and improving the efficiency of railway maintenance as well as the safe operation of trains. Therefore, the accurate detection of train location is the prerequisite technology in railway signalling system. The track circuit and the wheel sensor of rolling stock have been used to detect the train location widely in urban railway as well as high speed train. The track circuit is continuously monitored by electrical equipment to detect the absence of the train and the tachometer and encoder is used for the wheel sensor to measure the train speed. But speed sensor failures are frequent due to the extremely harsh operating conditions encountered in rail vehicle. The CBTC(Communication based Train Control) system has been used in urban railway system recently. But the installation of CBTC system is very high and the modification of design is difficult. This paper deals with the feasibility of new train location detection method using magnetic sensors.

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031-460-5409

Journal Info.IEEE Transactions on
Wireless Communications

Vol. 12 No. 12

2013. 12

Abstract

We consider energy harvesting cognitive radio networks in which a secondary transmitter harvests energy from ambient sources or wireless power transfer systems while opportunistically accessing the spectrum licensed to the primary network. The primary traffic is modeled as a time-homogeneous discrete Markov process, and the secondary transmitter may not be able to operate continuously due to sporadic and unstable energy sources. At the beginning of each time slot, the secondary transmitter thus needs to determine whether to remain idle so as to conserve energy, or to execute spectrum sensing to acquire knowledge of the current spectrum occupancy state. It also needs to configure the spectrum sensor detection threshold to achieve an effective tradeoff between false alarms and misdetections. This sequential decision-making, done to maximize the expected total throughput, requires the joint design of a spectrum sensing policy and a detection threshold under the energy causality and collision constraints. We formulate this stochastic optimization problem as a constrained partially observable Markov decision process (POMDP), and then convert it to a computationally tractable unconstrained POMDP. Numerical results show that the proposed approach enables efficient usage of the harvested energy by exploiting the temporal correlation of the primary traffic.

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Journal Info.Journal of Electrical
Engineering & Technology

Vol. 8 No. 1

2013. 1

Abstract

This paper presents performance comparison between concentrated winding and distributed winding of IPMSM (Interior Permanent Magnet Synchronous Motors) which is recently used for lightweight railway applications. Motors are designed on various schemes and analyzed by using FEM (Finite Element Method) instead of EMCNM (Equivalent Magnetic Circuit Network Method) in order to take into account saturation and non-linear magnetic property. The overall performance such as torque, torque ripple, losses, demagnetization, efficiency, power density and so on are investigated in detail at the rated and maximum operating speed. The results of the analysis found that both concentrated and distributed winding IPMSMs are promising candidates for high power railway traction motor.

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Journal Info.International journal of
software engineering and
its applications

Vol. 7 No. 3

2013. 5

Abstract

Recently, the railway system is advancing to be intelligent according to the development of computer technology, and especially, many functions of train control system which are cores to the railway system are being operated by the software. Accordingly, the source code testing to validate safety of the railway train control system software becomes to be more important, and related international standards highly recommend(HR : Highly Recommended) inspections on the source code also. For this purpose, studies in relation to the development of source code validation tool were started from several years ago in Korea. To verify the applicability of validation tools developed as a part of these studies, the applicability test was performed for the railway signaling system being applied to the domestic railway. This paper drew the result of application test for this actual source code of train control system being applied to railway sites and analyzed its result.

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Journal Info.Journal of the Korean
Society for Railway

Vol. 16 No. 5

2013. 10

Abstract

In metropolitan railway systems, the average commuting time keeps increasing as the scheduled speed increases, and this leads to a decline of rail service usage and competitiveness. Therefore, effective express operation for urban trains is required to improve the scheduled speed. In this study, based on the obtainable time shortening efficiency and economic viability, several express operations are suggested for urban railways and these suggestions are compared by considering high performance trains with acceleration/deceleration and maximum speed improvement. As a result, the optimum express system, which can minimize the cost for sidetrack construction, is suggested.

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Journal Info.

The Transactions of the
Korean Institute of
Electrical Engineers
Vol. 62 No. 3
2013. 3

Abstract

A neutral section is installed around feeding substation(SS) and sectioning post(SP) that M phase and T phase are isolated in AC feeding system. Electric Train under "Notch OFF" is operated by inertia within the neutral section. It causes disturbing the operation of electric trains for speed drop and driver's mistakes. A automatic changeover system with thyristor recently have taken under development. In the paper, It is introduced the configuration of train detection system and performance testing on automatic changeover system.

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Journal Info.

The Transactions of the
Korean Institute of
Electrical Engineers
Vol. 62 No. 8
2013. 8

Abstract

In this paper, the analysis of inspection period based on reliability is suggested in the field of traction power system. Even though there are several maintenance models, the most commonly used maintenance assessment has been focused on time based maintenance in real traction power systems. The maintenance intervals are selected on the basis of long-time experience. It ensures high availability and exact planning of staff. Reliability centered maintenance, which evaluates criticality and severity of each failure mode, achieves the operation, maintenance, and cost-effective improvement that will manage the risks of equipment. This paper deals with electrification in railway inspection frequency and applied reliability based inspection frequency instead of constant intervals. The distribution function of failure rate in traction power system belongs to Weibull function. Also, the fault data and the number of installed equipments for electrifications are collected. The failure history is investigated and classified in detail. Though these complicated procedures, it contribute to extend equipment lifetime and to reduce maintenance costs.

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031-460-5235**Journal Info.**

Journal of the Korea
Academia-Industrial

Vol. 14 No. 10

2013. 10**Abstract**

In position detection for super speed maglev propulsion control, the influence of position signal delay and transmit cycle on propulsion power degradation is investigated analytically and validated by test bed experiments. As a solution to the problem caused by signal transmit, position signal compensation and estimation method is proposed and applied to the test bed. Through experiments, it is confirmed that by adapting the proposed method, the propulsion power is increased remarkably, which results in acceleration and velocity performance improvement. This method could be effectively applied to position detection system of Korean super speed maglev which is under development.

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Journal Info.The Transactions of the
Korean Institute of
Electrical Engineers

Vol. 62 No. 10

2013. 10

Abstract

The resent developed high speed train called HEMU-430X (Highspeed Electric Multiple Unit - 430km/h eXperiment) recorded a 421.4 km/h in Kyoungbu high speed line in Korea. A verity of measurement systems are used to check the performance between pantograph and catenary system. An innovative measurement system is adopted to check the current of catenary wire in the track side during HEMU-430X test running. This paper presents the measurement results of catenary current in kyoungbu high-speed line and describe its utilizing technology in the experimental results of catenary current. In order to analyze field testing results, the current ratio between contact and catenary current have been analyzed by means of Carson-Pollaczek equation. And the current wave forms between catenary and contact wire are presented based on the simulation results.

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Journal Info.The Transactions of the
Korean Institute of
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Vol. 62 No. 9

2013. 9

Abstract

This paper presents an analysis methods for current collection quality in catenary system by means of video image based monitoring system. Arcing is the sparking at the interface point between pantograph and contact wire when the electric trains have traction current values at speed. Percentage of arcing at maximum line speed is measurable parameters for compliance with the requirements on dynamic behaviour of the interface between pantograph and contact wire in accordance with requirement of IEC and EN standards. The arc detector and video is installed on a train aim at the trailing contact strip according to the travel direction. The arc detector presented and measured verity of value such as the duration and power density of each arc and the video image is measured a image when the arc is occurred in pantograph. In this paper we analysis of video image in accordance with power density of arcing from arc detector and compared with video image and power density of arcing so as to produce quality of arcing from image.

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Journal Info.

International journal of
environmental monitoring
and analysis

Vol. 1 No. 1

2013. 2

Abstract

A Zigbee-based ubiquitous sensor network (USN) has many industrial applications and provides flexible measuring environments. In particular, the USN system can replace existing measuring devices in harsh environments such as subway stations. To monitor the intensities of various pollutants and air qualities in subway tunnels, this study applied the USN technique. A novel wireless sensor module, PMX, was designed and manufactured to simultaneously detect PM₁₀ and PM_{2.5}. Measurements were conducted at a subway station in Seoul. The PM concentrations using PMX were measured, analyzed, and compared with those obtained using an established commercial dust spectrometer (Grimm Aerosol Technik, 1.109). The measurements were performed from 24 March 2010 to 9 April 2010. PMX and the dust spectrometer measured PM₁₀ levels of 98.3 and 40.7 $\mu\text{g}/\text{m}^3$, respectively, and PM_{2.5} concentrations of 86.5 and 16.6 $\mu\text{g}/\text{m}^3$, respectively. The monitored PM levels were investigated in a bimodal form during the sampling period. The PM₁₀ and PM_{2.5} average correlations between PMX and the dust spectrometer were $r^2=0.81$ and $r^2=0.97$, respectively. The two systems showed a similar time series trend, even though the measured values differed. A simple correlation analysis of the two data groups showed coefficients of determination of 0.7 for PM₁₀ and 0.9 for PM_{2.5}. The PMX data were mostly concentrated around the trend curve. Therefore, calibration of PMX data was required prior to use in the field. For the calibration, simple linear regression and nonlinear regression were used. The resulting correlation coefficients of simple linear regressions were 0.8 for PM₁₀ and 0.9 for PM_{2.5}, whereas those for nonlinear regressions were 0.7 for PM₁₀ and 0.9 for PM_{2.5}. The higher correlation coefficient for PM₁₀ by the nonlinear regression indicates that it is the better method for calibrating the system developed in this study.

Effect of ventilation type on the trajectory of coughed particles in a hospital ward

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Journal Info.

Particle and Aerosol
Research

Vol. 9 No. 2

2013. 6

Abstract

One of purposes in this study was to confirm the behavior of coughed particles under different ventilation conditions. Three types of ventilation systems were applied for this experiment and the properties of coughed particles were measured using computational fluid dynamics (CFD) in an intensive care unit. The changes of total airborne particles for each case showed different trends according to the ventilation type and time, but the deposited particles were similar in all conditions. Although the time taken for 50% of the particles to be deposited was the fastest in case 2, the portion of deposited particles after 300 seconds was only 5% in all conditions. In case 1, a relatively small number of particles were deposited on the wall, but the particle exhaust and deposition on the occupants were the highest. In case 3, the downward ventilation was applied as that recommended by the US Center for Disease Control and Prevention (CDC) and showed different exhaust efficiencies according to the particle size.

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Journal Info.Environmental Science &
Technology

Vol. 47

2013. 10

Abstract

Biomass fuel is used for cooking and heating, especially in developing countries. Combustion of biomass fuel can generate high levels of indoor air pollutants including particulate matter (PM) and volatile organic compounds (VOCs). This study characterized PM and VOC emissions from cow dung combustion in a controlled experiment. Dung from grass-fed cows was dried and combusted using a dual cone calorimeter. Heat fluxes of 10, 25, and 50 kW/m² were applied. The concentrations of PM and VOCs were determined using a dust spectrometer and gas chromatography/mass spectrometry, respectively. PM and VOC emission factors were much higher for the lower heat flux, implying a fire ignition stage. When the heat flux was 50 kW/m², the CO₂ emission factor was highest and the PM and VOC emission factors were lowest. Particle concentrations were highest in the 0.23-0.3 μm size range at heat fluxes of 25 kW/m² and 50 kW/m². Various toxic VOCs including acetone, methyl ethyl ketone, benzene, and toluene were detected at high concentrations. Although PM and VOC emission factors at 50 kW/m² were lower, they were high enough to cause extremely high indoor air pollution. The characteristics of PM and VOC emissions from cow dung combustion indicated potential health effects of indoor air pollution in developing countries.

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Journal Info.

Journal of Mechanical
Science and Technology

Vol. 27 No. 6

2013. 6

Abstract

This study presents the results of heat-release-rate fire curve estimations for a type of intercity railcar. Three different approaches were used for the estimations and compared with a full-scale fire test of the car. Two approaches were based on the assumption of a specific burning rate of materials with the heat release rate per unit area (HRRPUA) and burning area decision method. The heat-release-rate fire curve from an actual railcar fire was measured using the ignition scenario in EN 45545-1. In the fire test, surface temperatures of every part of the interior were measured using the burning area decision for the summation method estimation. The third approach used the combustion and reaction heat for pyrolysis analysis of microscopic material. For the pyrolysis model, more sophisticated material property inputs are needed to achieve the same degree of curve accuracy. The differences and similarities between experimental fire curves and estimations were analyzed.

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Journal Info.

Water Air Soil Pollution

Vol. 224

2013. 8

Abstract

An electrokinetic technique was used to remediate As-, Cu-, and Pb-contaminated paddy soil in a real field on a pilot scale. A hexagonal electrode placement with one anode at the center and six cathodes at the vertices of the hexagon was installed in the field. After operation for 4 weeks, the average removal of Pb was 64.9 % in the top layer (0–0.4 m), 81.2 % in the middle layer (0.4–0.8 m), and 66.9 % in the bottom layer (0.8–1.2 m). The removal of As was 28.2% in the top layer, 43.2 % in the middle layer, and 24.5 % in the bottom layer. The removal of Cu was 17.7 % in the middle layer and was not observed in the other layers. The relatively high removal of Pb might come from the more labile fraction of Pb in soil compared to As and Cu. However, the circulation of anolyte using an alkaline solution to enhance removal of As failed because the electrolyte leaked between the anode and surrounding soil. Effective circulation might enhance the performance of the electrokinetic process.

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Journal Info.

Applied Chemistry for
Engineering

Vol. 24 No. 5

2013. 10

Abstract

We investigated the properties of impregnated activated carbons, a commercial adsorbent for the individual protection equipment, and examined CO adsorption and oxidation to CO₂. The surface area, pore volume and pore size were measured for four commercial samples using Brunauer-Emmett-Teller/Barrett-Joyner-Halenda (BET/BJH), and atomic compositions of the sample surface were analyzed based on SEM/EDS and XPS. Impregnated activated carbons containing Mn and Cu for fire showed the catalytic CO oxidation to CO₂ with a high catalytic activity (up to 99% CO₂ yield), followed by the CO adsorption at an initial reaction time. On the other hand, C: for chemical biological and radiological (CBR) samples, not including Mn, showed a lower CO conversion to CO₂ (up to 60% yield) compared to that of fire samples. It was also found that a heat-treated activated carbon has a higher removal capacity both for CO and CO₂ at room temperature than that of untreated carbon, which was probably due to the impurity removal in pores resulted in a detection-delay about 30 min.

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Journal Info.

Applied Mechanics and
Materials.

Vol. 284-287

2013. 1

Abstract

LiOH is known to be one of the most efficient CO₂ adsorbent because it reacts with CO₂ to form Li₂CO₃. However, LiOH still suffers from lack of enough hardness for practical use. In this study, various substrates, e.g., Al₂O₃, SiO₂, zeolite 5A, and activated carbon (AC), were modified with LiOH. Their X-ray diffraction patterns were investigated, and LiOH peak was observed from all prepared samples. CO₂ adsorption capacity of each prepared sample was measured by monitoring CO₂ concentration change during the adsorption process under constant CO₂ gas inflow condition. LiOH-modified Al₂O₃ and zeolite 5A showed good CO₂ adsorption performance, while LiOH-modified AC and SiO₂ showed relatively poor CO₂ adsorption. Al₂O₃ and zeolite 5A contains many basic functional groups of Al³⁺, which promote the neutralization reaction with acidic CO₂. The effect of carrier gas, carrier gas flow rate, initial CO₂ concentration, and amount of LiOH-modified Al₂O₃ loading was investigated. CO₂ adsorption performance was better when the carrier gas was N₂, because O₂ competes with CO₂ on LiOH. CO₂ adsorption performance was better with lower carrier gas flow rate, lower initial CO₂ concentration, and less loading of adsorbent due to the increase of contact time and contact points.

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Journal Info.Korean Society for
Computational Fluids
Engineering

Vol. 18. No. 1

2013. 3

Abstract

Personal Rapid Transit (PRT) is the emerging personal transport vehicle operating on the loop automatically. The PRT system utilize the electrical power from super capacity or battery, it is important to manage the power or energy. In this regards, the management of high temperature occurred by the operation of system is significantly important to prevent from serious damage of component. In this study, we studied the adequate shape of underbody which can reduce the heat accumulation by pickup coil and condenser using natural air cooling. We suggested the additional air pathway, air inlet and flow separator to decrease the temperature of the heat source components. It was found that suggested system can decrease the temperature of PRT under body by 16% during the static mode and by 10% during the running mode at 30km/h. It is expected that the findings of this study will feed into final design of newly built Korean PRT vehicle.

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Journal Info.

Lecture Notes in
Computer Science

Vol. 7652

2013. 6

Abstract

Many of conveniences are nowadays on the way to be smart; mobile phones, cars and power stations. Among them, mobile conveniences generate much of sensor data in company with the persons. Some of sensor data are required for processing at distant places in which the sensor data are aggregated, for capabilities of smartness. In the case of vehicles the sensor data are transmitted for malfunction detection and health monitoring of the vehicle in near future. The sensor data are substantially large in the amount of one vehicle's data by multiple kinds of sensors, and the amount of a number of vehicles' data gathered is huge to be received concurrently at some server. Further when the gathered data are to be aggregated in one system the management of the enormous data could determine the functionality of the system. In this work, a data abbreviation diminishes the amount to be transmitted, and the data negating a valid extent consist the majority of data to be aggregated exploiting the semantics of the sensor data gathered. This method is far different from the conventional compressions. The aggregated data are managed and displayed when necessary in one system tracing faulty cars in a region. Although the aggregated data are in a condensed form, complete ones are retrievable from the original server.

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031-460-5287

Journal Info.

Information journal

Vol. 16 No. 9(B)

2013. 9

Abstract

This paper describes the simulation framework of a commanding system for a group of autonomous vehicles circulating in the same driving zone. The commanding system arbitrates their driving routes to ensure efficient sharing of the roads within the zone. The framework contains the essential entities to be considered in building such a commanding system, which does not currently exist. The commanding system directs the driving of each autonomous vehicle remotely, providing a functionality that has not yet been properly addressed in academia or industry. Accurate tracking of the vehicle locations is essential to commanding the autonomous vehicles in the zone. Environmental limitations, however, restrain frequent updating of the vehicles' locations with real data coming from them. In this work, we examine the validity of calculating vehicles' velocities in order to maintain the accuracy of their locations within some level, by comparing simulated velocities to emulated velocities through a simulator. In calculating the velocity, pseudo-parameters are used in the simulation, which are derived from parameters generated in the low-level driving computation about which we already have knowledge and experience.

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Journal Info.Journal of the Korean
Society for Railway

Vol. 16 No. 2

2013. 4

Abstract

This paper presents an analysis of door design for the Ui LRT based on experiments to predict doorway flowtime and their analyses results. A similar railway vehicle (from Gimhae LRT) and operational conditions are utilized to assess the doorway flow-time through repetitive experiments. Design of the experiments consists of four scenarios, and the experiments are repeated 39 times in total. We use the results of the experiments to verify the design of doors of Ui LRT (e.g. the required number of doors and their width). Various statistical analyses are carried out for the flow-time with respect to the number of boarding/alighting passengers. We make three category levels of boarding/alighting passengers, and analyze the mean and variance for each category, and then carry out One-Way ANOVA to analyze how the number of boarding/alighting and onboard passengers impact flow-time. The results of this paper can be used for making decisions about doors of the LRT vehicle.

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031-460-5287**Journal Info.**

Communications in
Computer and
Information Science

Vol. 183

2013. 11**Abstract**

Dependencies, associations, correlations, and co-variances found out during big data analysis could unveil the basis of phenomena hard to understand. Recent paradigm of big data analysis has proven its potentiality with big data arose from social activities. Such big data could be generated in some engineering areas, since many kinds of sensors are equipped for researches in engineering. This work presents a scheme of an analysis against big sensor-data in a case of data measured on the railroad. The scheme is composed of procedurees for composite analysis comprised of engineering analyses and big data analysis. A role-based system diagram digests this data-intensive computing of the composite analysis.

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031-460-5467**Journal Info.**

Journal of the Korean
Society for Railway

Vol. 16 No. 1

2013. 3**Abstract**

This study analyzed passenger access and egress travel patterns related to a Korean regional railway station (Seoul station), then developed a binomial logit model. This model referred to bus and metro mode of access and egress during a national holiday (Chuseok 2009); obtained from transit smart card data. The results showed that 99% of passengers getting access to, or egress from, the regional railway station did so using less than two transfers, and that most passengers were more likely to choose a metro. However, the passengers that made access or egress trips near Seoul Station were more likely to take a bus. From the results of the mode choice model, it was found that the impact of travel time was greater than that of travel cost, in the choices made for both access and egress. Interestingly, the impact of travel time is much greater in choosing the mode of egress.

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031-460-5544**Journal Info.**

Journal of the Korean
Society for Railway

Vol. 16 No. 2

2013. 4**Abstract**

As a result of investment in railway safety focusing on passenger safety, the train accident rate has been reduced by half domestically and we have reached a high level of safety compared to other countries and other transportation modes. However, accidents related to staff are still at a high ratio compared to other countries. There have been few studies on staff safety and no relevant systematic safety measures have been implemented. More than 90% of staff fatalities occurred from rolling stock in motion and electrification, which are representative railway accidents. In this study, causes of accidents, and current safety measures for staff are analyzed focusing on trains in motion. The results can be utilized for developing new safety measures.

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Journal Info.Lecture Notes in
Computer Science

Vol. 7652

2013. 6

Abstract

The handheld computing device demonstrates its mobility nowadays, being furnished by distributed computing resources in a form similar to the thin client. The distributed computing systems such as Cloud supports user data with their storages implying that the users let their data be under control of the Cloud system. However it is not an acceptable premise to many users. For these users, an auxiliary storage subsystem is proposed in a new model of remote storage to mobilize the user data of external storages in this work. The iSCSI devices could be connected to the distributed computing system through the storage subsystem as needed. iSCSI is a recent, standard, and widely deployed protocol for storage networking, and the subsystem is able to accommodate many types of storages outside of the distributed computing system. The proposed subsystem could supply the user data at places near the distributed computing systems and showed an improved transmission of user data in the experimentation.

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Journal Info.

Korea Association of
Business Education

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Abstract

The composition of manufacturing capabilities has been one of the controversial issues in manufacturing strategies. Represented by Trade-offs vs Sand cone, researchers have examined an appropriate combination but remained inconclusive. In an effort to solve such a controversy, we propose the contingency approach integrating two research streams. Building on manufacturing strategies and transaction cost theory, this study investigates the relationship among transaction variables, the degree of capability centralization and the firm performance. Independent variables include asset specificity and uncertainty, while a dependent variable is the degree of capability centralization. Two moderators, long-term relationship and IT investment are introduced. Our model is derived from previous literatures and theoretical arguments, presenting the following propositions. First, transaction variables influence the degree of capability centralization. Second, long-term relationship and IT investment moderate the above relationship. Lastly, the fit rather than actual degree is associated with the firm performance. Our conclusion is that by considering transaction cost theory, manufacturing strategies can be more thoroughly explained, solving a long-lasting academic controversy. In addition, operations managers may understand their role as a strategic coordinator and be provided with the guideline on the choice of manufacturing capabilities.

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Journal Info.Journal of the Korean
Data Analysis Society

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Abstract

The neo-traditional, mixed land use neighborhood typically generates fewer auto trips compared to conventional neighborhood. The research question here is whether the common trip generation model based only on auto ownership and household size is adequate for the neo-traditional neighborhood. This study uses the Chow-test and the Bootstrap Chow-test to assess the similarity of travel behavior between a neo-traditional and a conventional neighborhood design. Results show that the common relationship between the number of trips and two explanatory variables, auto ownership and household size, cannot reveal the underlying relationship between neighborhood design and trip generation. Therefore, it is suggested that the commonly used trip generation model explained by auto ownership and household size needs to be replaced by an alternative model that is able to capture the travel behavior changes of neo-traditional neighborhoods.

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Journal Info.

Journal of the Korean
Society of Civil
Engineers

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Abstract

There have been noticeable developments for the optimization of the highway and railroad alignments with the IT and computerized tools. The designers expect that all of the quantitative design elements should be considered. This study developed a methodology which can be useful for the vertical alignment design. It provides an accurate “vertical control point” searching method, and makes the vertical alignment optimization more efficiently. The vector method makes the searching faster and calculates more accurate application sections. The results from this method generate more reliable vertical alignments than the conventional raster method for less computation time.

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Journal Info.Journal of the Korean
Society for Railway

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Abstract

Recently, the demand for rail freight has gradually decreased. In particular, the demand in Korea for open freight cars, which classification includes gondola cars, hopper cars and gravel cars has been significantly reduced. The role of gondola cars in the rail transportation market shrank to 14.5% in 2010 from 23.3% in 2001. The transportation demand of gondola cars in the long term is expected to be reduced further. Because some gondola cars have been converted to container cars and various containers are being developed to transport bulk cargo by container cars. However, gondola cars still play an important role in rail freight transport. Therefore, the management planning of gondola cars is needed in order to prepare for the long-term declining demand. In this study, we propose a future direction for the management planning of gondola cars through the effectiveness analysis of gondola cars operation.

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Journal Info.

Proceedings of the
Eastern Asia Society for
Transportation Studies

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Abstract

This paper proposes methods for efficient management of transshipment occurring between Busan North and New ports, and reviews space expansion strategies and cases of major ports overseas. It prospects that the growing trend in transshipment between the ports is not temporary but will continue in the long term and provides evidence for this prospect. It analyzes the phenomenon that transshipment between the ports is currently transported intensively through roads and estimates the scales of accompanying traffic congestion and environmental costs. It suggests restoration of marine shuttle and introduction of railway shuttle to solve the problems accompanying transshipment concentrated on road.

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Journal Info.Int. J. Production
Economics

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Abstract

We study a multi-product assembly production system in which individual components are made to meet various order types. We assume that orders arrive according to a Poisson process, but there is a fixed probability that an order requests a particular kit of different components. Under the CONWIP control mechanism, each component is produced by a flow line with several stations. To analyze this system, we develop an approximation algorithm based on a decomposition method. In the algorithm, a product-form approximation technique as well as a matrix-geometric method is used. Numerical results show that the accuracy of the approximation method is acceptable.

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Journal Info.Journal of Korean
Institute of Industrial
Engineers

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Abstract

In this study we consider a flow line CONWIP system in which two types of product are produced. The processing times of each product type at each station follow an independent exponential distribution and the demands for the finished products of each type arrive according to a Poisson process. The demands that are not satisfied instantaneously are either backordered or lost according to the number of unsatisfied demands that exist at their arrival instants. For this system we develop an approximation method to obtain the performance measures such as steady state probabilities of the number of parts of each product type at each station, mean waiting times of backordered demands and the proportion of backordered demands. For the analysis of the proposed CONWIP system, we model the CONWIP system as a two class closed queueing network with a synchronization station and analyze the closed queueing network using a product-form approximation method for multiple classes developed by Baynat and Dallery. In the approximation method, each subsystem is analyzed using a matrix geometric method. Comparisons with simulation show that the approximation method provides fairly good results for all performance measures.

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031-460-5074**Journal Info.**

Transportation &
Economy

Vol. 73 No. 11

2013. 11**Abstract**

Korea Railway has performed railway reform with vertical separation of railway by Railway Industry Development Basic Act in 2003. As a result, Korea Rail Network Authority(KR) is in charge of facilities department and Korea Railroad(Korail) is in charge of the management department. Because deficit which can be called structural problems is continuing after railway reform, a new railway reform has been reviewed now, introducing railway competition system. Policy to introduce competition in the railway business has promoted since the 1990s by the European Commission, but the problem has also been pointed out that many methods. In order to give a significant impact on people's lives and finances of the country not only railway management, the transformation of the railway operation has been required to study the experiences and lessons of other countries.

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Journal Info.Management Science and
Financial Engineering

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Abstract

An interesting puzzle in business practices is that although many researchers emphasize the benefits of a revenue-sharing contract, a wholesale contract has remained to be the most common contractual form. By introducing the concept of unobservable efforts, we examine the contractual efficiency of a wholesale contract and a revenue-sharing contract. The multi-task agency model and experimental design approach are used to analyze the relationship between the contractual efficiency and parameters. A major finding of our study is that a wholesale contract coordinates unobservable efforts, while it fails to coordinate the order quantity decision. Because unobservable efforts have mixed effects on the contractual efficiency, the superiority of contract type depends on parameters. This finding implies that a wholesale contract can be a competitive contract, especially when unobservable efforts are heavily involved. Our conclusion is that the current popularity of a wholesale contract is manager's rational response to complex supply chain environments rather than irrational behaviors.

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Journal Info.

Korea Logistics Review

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Abstract

Railway is generally known as an eco-friendly transportation mode and its role is very important in the national freight transportation system. However, the reality is that the competitiveness of railway freight is lower than the road and other mode of transportation. Even Bulk cement, the most transported item by railway is no exception. There have been various attempts to improve the competitiveness of railway logistics such as joint use of bulk cement cars and reforming operation of railway freight stations. But, railway logistics have a fundamental limitation like absence of door-to-door service, difficulties in intermodal system and etc. These limits are highlighted when handling the bulk cargo such as cement. In this paper, we analyzed the effects of introducing a newly designed container for the bulk cement to improve railway transport process and found that we can increase efficiency of railway logistics process by using the bulk cement container.

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