ABSTRACTS OF PAPERS IN ENGLISH

ANALYTICAL SOLUTION OF MASS EQUATION, NONLINEAR SPRING WITH EFFECTIVE WIND FORCE UNDER DYNAMICAL LOAD

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Abstract

In this paper, green function and transfer function are used for analytical solution of mass equation, nonlinear spring with effective wind force. This equation has been used to model space structure, wing and all of the structures used at high altitude. Furthermore this equation is applied frequently in modeling foundation similar to nonlinear spring and the equation is better solved analytically where answer of the analytical solution is similar to the mechanical action.

A CAE SIMULATION MODEL FOR THERMAL MODELING OF VEHICLE PASSENGER COMPARTMENT

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Abstract

In this paper a CAE model for vehicle climate control system is presented. The mathematical model provides engineers a cost effective analysis tool to design, develop, and optimize the vehicle interior climatic conditions. The present mathematical model predicts the lumped temperature and lumped humidity variations inside the passenger compartment under design and operating conditions. The transient nature of the passenger cabin average temperature, average interior mass temperature and humidity are modeled using three coupled non-linear ordinary differential equations based on mass and energy balance. The validated model is further used to test the effects of variations in certain vehicle structure, air conditioning parameters and composite materials properties in order to investigate the influence on the temperature patterns inside the compartment.

The comparison of simulation results with the existing experimental data well proves the validity of work.

DETERMINATION OF HEATING CONDITIONS IN PLATE FORMING PROCESS BY THE FLAME BENDING METHOD

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Abstract

In industry, the flame bending process is used to shape steel work pieces. Forming of beams and plates of the steel structures are examples of the process applications. In most cases, this process is manually done by skilled technicians. Employing parametric studies in this paper, effects of the effective parameters on the process are evaluated. For the process simulation, a thermo elastic-plastic analysis is applied. Conducting the numerical simulations and using dimensional analysis, input variables are determined. Then, using multiple regression, effective variables as well as relationship between heating parameters and residual curvature of the plate are extracted. The relation proposed here can be used to predict the magnitude of the plate deformation and to study the process automation.

MOTION PLANNING AND SIMULATION OF A CREEPING ROBOT ON SLOPE

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Abstract

In this study, creeping motion as a natural locomotion mode and creeping motion of a snake-like robot on slope are studied. A snake like robot is designed by inspiring nature and snake's creeping motion, and is referred to as creeping robot. In this paper, a n+2 DOF creeping snake-like robot and its kinematics and dynamics are analyzed. Since in real situations a snake-like robot must pass through rough terrains and slopes, its motion on the slope is modeled and its equations of motion are obtained by Newton-Eulers method. Also, a software simulator is designed for simulation and analysis of a creeping robot. This software is used to find the optimum motion parameters of creeping robot locomotion on the slope with different angles. Optimization criterion in motion planning with efficient motion minimizes the frictional

power loss. These results indicate a simple relationship between velocity, slope angles, and motion optimum parameters. The obtained efficient parameters are applicable to motion planning, controller design, and Neural Network training for the design of a creeping snake-like robot.

ANALYTICAL SOLUATION OF CONTACT PROBLEM BETWEEN A TILTED WEDGE AND A HALF-SPACE

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Abstract

Different parameters of asymmetric contact problem between an elastic wedge and a half-space have been introduced in this paper. These parameters include distribution of contact pressure and lengths of contact zones due to frictionless normal loading. For each parameter, verification of the results have been specialized and checked with the available results of the symmetric problem. Method of approach is analytical and is based on the singular integral equations. In this method, the boundary conditions of the problem are stated as some singular integrals and distribution of the contact pressure is specified. Then, with the use of the equilibrium equations and the consistency conditions of the singular integral solution, the lengths of the contact zones are determined.

EXPERIMENTAL STUDY OF SWIRL SPRAY PATTERN

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Abstract

An experimental investigation of the flow field of pressure swirl atomizers for different pressure drops is performed. Two experimental methods are employed. The spray formation, spray cone angle, and breakup length at low injection pressures are delermined by means of visual study. For higher injection pressures, the velocity components and size of the droplets are measured along and perpendicular to the axes of the spray by using Phase Doppler Anemometer. Self-similar behavior of mean axial velocity profile is obtained. A correlation is developed relating SMD of droplets to the pressure drop.

EFFECT OF NON-LINEAR k-ε TURBULENCE MODEL ON THE SPRAY PERFORMANCE IN A TWO-PHASE FLOW

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Abstract

In this paper, two-phase gas-liquid flow together with the turbulent non-linear k-ε model has been studied for the first time. The spray flow affects the gaseous environment and makes it turbulent. The turbulence intensity is influenced by the movement of droplet and its velocity. In this study, a new turbulent non-linear k-ε model, SUGA, has been employed. Second order and third order models of the non-linear k-ε are simultaneously studied and the

outcoming results are compared with the ones of the standard k-ε model. The consequent results of this research shows that in some parts of the chamber with the rotating flow, considering the rate of rotation, the non-linear k-ε model works better than the standard one and leads to results closer to the experimental data. In this article, the main emphasis is on the comparison of standard k-ε model and the non-linear k-ε model and their effects on the rate of evaporation and penetration of the droplets. Results show that the non-linear k-ε model is more capable than standard one when the velocity gradient in axial and radial directions change intensively. The flow close to the boundary, corners of the chamber and around the spray can be analyzed better than before. In this study, it is also revealed that the second and third order non-linear k-ε models can work out better than the standard one and their results are closer to the experimental observations.

SYNTHESIS AND STUDY OF MORPHOLOGY OF LEAD OXIDE-SULFATE COMPOUNDS ($PbSO_4$.nPbO) AND INVESTIGATION OF THERMAL DECOMPOSITION OF LEAD SULFATE

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Abstract

The compounds $PbSO_4$. PbO & $PbSO_4$.3PbO (by synthesis) and $PbSO_4$.PbO, $PbSO_4$.2PbO,$PbSO_4$.4PbO (by thermal treatment) were prepared in this lab and their characterization is make by X-ray. Investigation of morphology of all of the compounds is made by electron microscopy below 4500. The thermal properties of $PbSO_4$ investigated in the range of 25-1000°C. It is shown that this compound is decoposed at 950°C in lead oxide.
This results are confiremed by XRD methods.

PERFORMANCE COMPARISON OF HORIZONTAL-FLOW ANAEROBIC IMMOBILIZED SLUDGE (HAIS) AND UASB REACTORS USING A SYNTHETIC SUBSTRATE

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Abstract

Performance of fixed-bed and suspended-growth high-rate anaerobic reactors has been investigated in this study. Two 2-L and 3.3-L Horizontal-flow anaerobic immobilized sludge (HAIS) reactors were filled with polyurethane (PU) and polyethylene (PE) beds with surface to volume ratios of 1100 and 1250 m^{-1}, density of 700 and 12 kgm^{-3}, and bed porosities of 0.42 and 0.28, respectively. The 3.3-L upflow anaerobic sludge blanket (UASB) reactor was filled with granular sludge with a VSS concentration of 45 g/l and both sets of reactors were operated at 30±2°C. Synthetic glucose-based substrate was the main carbon source (COD of 1750±250 mg/L) feeding both sets of reactors. The concept of quantitative CT number in terms of Hounsfield units (H), which is approximately linearly related to the mass density of the attenuating tissue and materials in objects in Computed Tomography Scanning (CT-Scan) technology, was used to characterize HAIS reactor contents including biofilm, media, and biogas. The results confirmed satifactory performance of HAIS in providing suitable environmental conditions for biomass growth and retention during the short startup period of 25 days. At the optimum period of operation, the loading rates of reactors were: organic loading rate (OLR) of 13±6g COD/L.d and F/M: 1.34±0.82g COD/g VSS.d in UASB; surface loading rate (SLR) of 28±12g COD /m^2.d and

F/M: 1.72±0.77g COD/g VSS.d for HAIS-PU; and SLR of 23±14g COD/m^2.d and F/M of 1.52±0.99g COD/g VSS.d for HAIS-PE. For these loadings, the observed COD removal efficiencies and biogas productions were: 64.3±15.2 % and 1771±704 mL/d for UASB; 63.5±17.5 % and 1160±400mL/d for HAIS-PU; and 61.6±18.6 % and 1018±645 mL/d for HAIS-PE. It was found that UASB operation with granular sludge and more efficient gas-liquid-separator (GLS) has a better performance than both HAIS reactors containing immobilized sludge and two gas collectors in different shapes: perforated tube (HAIS-PU) and sheet (HAIS-PE). Performance of HAIS-PU was better than PE possibly due to higher bed porosity (ε) of HAIS-PU (ε=0.42) compared to HAIS-PE (ε=0.28). Channeling effects for low bed porosity reactors can be the main factor responsible for such performance.