ABSTRACTS OF PAPERS PRESENTED AT INTERNATIONAL CONFERENCES

The abstracts of papers published in this magazine pertain to research projects conducted all over I.R. Iran, including those papers which have been printed previously in reputable scientific publications, and are not limited to the Sharif University of Technology. The Editor would be happy to include abstracts, in future editions, of all scientific papers presented by researchers throughout the country, with a view to keeping the academia and professionals informed about research activities carried out by Iranian scientists.

A PACKAGE FOR SYSYEMATIC DESIGN OF ACOUSTO-OPTIC DEFLECTORS*

B. Rashidian
B. Zarin-Rafie
Dept. of Electrical Engineering
Sharif University of Technology

ABSTRACT

In this paper, a software package for design of bulk wave acousto-optical (AO) spatial light deflectors is reported. This package consists of a main program and the following modules:

A database of acousto-optic materials, a program for coordinate transformation, a multi-layer transducer analysis program with the capability of matching layer and matching circuit design, an acousto-optic interaction analysis program and a user friendly interface.

The heart of the package is the acousto-optic interaction program based on rigorous coupled wave analysis in anisotropic media. The polarization of input optical beam can be TE, TM, or mixed. The beam can have either uniform or Gaussian intensity

profile.

The user chooses the bandwidth, central frequency, laser wavelength and polarization, the preferred AO material and, then, the program provides all the geometrical parameters of design and plots the result of its simulation. The program accepts constraints on spatial resolution and transit time, also.

Several examples using both single and multi-frequency problems have been implemented using this package. An example comparing a result of this package with a previously reported one will be addressed in this paper.

At present this package is restricted to single element transducer designs.

COMPENSATION OF SOURCE INDUC ED INTENSITY NOISE IN OPTICAL NETWORKS*

F.Behnia
M.Tabiani
Dept. of Electrical Engineering
Sharif University of Technology

ABSTRACT

In this paper, a method of compensation for the source induced intensity noise in links and WDM networks employing noncoherent sources is proposed. Numerical analysis shows that using this method, probabiliy of error reduces substantially, permitting higher signaling rates and/or more simultaneous network users with a given error threshold.

STUDIES ON DEGRADATION OF PETP IN MECHANICAL RECYCING**

M. Forounchi
Dept. of Chemical Engineering
Sharif University of Technology

ABSTRACT

The effect of reprocessing on poly (ethylene terephthalate), PETP was studied. While mechanical properties showed slight decrease, the weight-average molecular weight M_w dropped more notably. Blends of 20 w/w % recycled PETP with virgin PETP showed practically the same mechanical properties and M_w as virgin PETP. The results suggest that mechanical blending can be used for recycling purposes without sacrificing the useful properties of virgin PETP.

CATALYTIC CONVERTER PERFORM ANCE IN DUAL FUEL (NATURAL GAS/ DIESEL) ENGINES***

N. Sallamie
M. Kazemeini
M. Soltanieh
Dept. of Chemical Engineering
Sharif University of Technology
M.D. Checkel
Dept. of Mechanical Engineering
University of Alberta, Canada
A. Badakhshan
Dept. of Chemical and Petroleum Engineering,
University of Calgary, Canada
M. Zheng
E.A. Mirosh
Alternative Fuel Systems Inc
Calgary, Canada.

ABSTRACT

The diesel-engined vehicle is a critical part of the transportation system supporting modern industrial societies. Desired economical and technical aspects

reliability, simplicity, long term durability and derivability are some of the advantages of these engines. They are also a major consumer of petroleum fuels and a major contributor to urban air pollution. The search for alternative fuels has been encouraged by both the limited supply of petroleum and the severe local pollution problems in some countries. The ideal replacement for diesel fuel would be the one retaining the advantages of such engines. The dual fuel approach reduces diesel consumption by replacing most of the injected diesel with natural gas (up to 90%) which is premixed with the intake air. Lower C/H ratio of natural gas, combined with cycle efficiency, allows about 15% lower carbon dioxide emissions and, thereby, less green house gases. On the other hand, cleaner combustion of the dual fuel system results in less lube oil contamination, thus, longer overhaul intervals.

A small amount of diesel fuel is injected to ignite the natural gas which resists autoignition even at diesel compression ratios. Natural gas is one of the most abundant, economic and widely distributed alternative fuels, so it has the potential of significantly reducing diesel consumption. Dual fuel engines using a smart controller can optimize the ratio of the ntural gas and diesel fuels to simultaneously provide normal engine output, low fuel consumption and low emissions. In spite of attractive features of this idea including reduction of NOx and particulates, high concentration of CO and unburned hydrocarbons (HC), mostly composed of methane, there is an important burden imposed upon the system at low to intermediate torques. In this work, based upon the oxidation of CO and unburned HC's, through experimental results, application of a monolithic oxidizing bifunctional catalytic converter as a novel complementary for the dual fuel (natural gas / diesel) engine is introduced. A novel method called switching, is used to keep high temperatures across the converter and take advantages of the corresponding desired conversion for hydrocarbons.

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BOUNDEDNESS OF SOLUTIONS OF

SOME nTH ORDER DIFFERENTIAL EQUATION *

D. Shadman
Dept. of Mathematical Sciences
Sharif University of Technology

ABSTRACT

We are concerned with the behavior of the solutions of the differential equation $x^{(n)} + \sum_{i=1}^{n-1} pi(t)fi(x^{(i)}) = g(t)$. We shall present sufficient conditions, under which, the solutions of the equation are bounded. The method employed makes use of a positive definite energy function, constructed with the aid of certain auxiliary functions. The idea has been used by several authors in relation to a certain class of second order differential equations. Some results on the regularity and asymptotic behavior of the solutions are also obtained.

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NUMERLCAL INVESTIGATION OF FORCED-CONVECTION HEAT TRANSFER IN A VENTURI-TYPE ANNULAR FLOW **

B. Farhanieh
Dept. of Machanical Engineering
Sharif University of Technology

ABSTRACT

Turbulent-convection fluid flow and heat transfer characteristics in a venturi-type annular flow were numerically investigated for localized high heat flux cooling applications. The governing equations were solved numerically by a finite-volume method for elliptic flows in complex geometries using collocated variables and cartesian velocity components and the results were obtained for different cases. The velocity

vector plots showed a complex flow pattern which gave a physical understanding of the governing phenomena. Large enhancement of the transfer coefficient was obtained at lower hydraulic diameters which caused a lower pressure drop.

A 2-D NUMERICAL MODEL FOR FLOW SIMULATION IN RADIAL TURBOMACHINERIES*

M.S. Sadeghipour
A.F. Najafi
Dept. of Mechanical Engineering
Sharif University of Technology.

ABSTRACT

The objective of this investigation has been to develop a computer code to simulate fluid flow in radial turbomachineries.

For this purpose, the ARDC2D Euler code has been used as the source code. This is a two dimensional finite difference code which uses the Beam-Warming implicit method to solve the compressible external flow.

Proper modifications are made in the code to convert it to an internal flow code, and, also, to include the effects of the rotating control volume.

The modified code was first verified by simulating flow in a rotating channel for which analytical solution exists. Then, it was used to simulate incompressible flow in a radial fan.

ACCURACY OF THE RICCATI TRANSFER MATRIX METHOD IN ROTOR DYNAMIC ANALYSIS **

M. Beahzad
Dept. of Mechanical Engineering

B. Mehri
Dept. of Mathematical Sciences
Sharif University of Technology.

ABSTRACT

This paper illustrares the theory behind the development of a General form of a numerically accurate and stable software for determining the lateral natural frequencies, mode shapes, stability and unbalance response of multi-shaft rotor bearing systems, which may be gear coupled and supported on flexible anisotropic bearings, such as hydrodynamic bearings, as well as rigid rolling elements. Gyroscopic effects, shear deformation and hysteretic damping are included in the analysis. To achieve the improved accuracy and numerical convergence to all relevant roots of the characteristic equation, the Riccati transfer matrix is utilized rather than the traditional transfer matrix approach.

This more accurate approach introduces poles into the characteristic equation. After cancellation of all poles, convergence to all relevant roots is guaranteed. In this study, two different methods of handling in-span conditions are presented and it is proven that after elimination of poles the Riccati transfer matix method and the transfer matrix method have the same characteristic equation. However, with even 25% increase in average computation time, the Riccati transfer matrix method remains more accurate, due to a different method of calculating the characteristic equation.

STAGEWISE MODELING OF LIQUID-LIQUID EXTRACTION COLUMN (R.D.C)***

D. Bastani
A.R. Nazemi
Dept. of Chemical Engineering
Sharif University of Technology

ABSTRACT

A stagewise forward mixing model considering coalescence and redispersion of drops was used to predict the performance of Rotating Disc Liquid-Liquid Extraction Contactor. Experimental data previously obtained in two R.D.C. columns of 7.62cm diameter, 73.6 height and 21.9 cm diameter, 150cm height were used to evaluate the model predictions.

Drop-side mass Transfer Coefficients were predicted applying Handlos-Baron drop model and Olney's model was used to predict drop velocities.

According to the results obtained the followings could be concluded:

1) If the height of coalescence and redispersion ie:h=h $p\dfrac{\phi p}{\phi}$ could be estimated, the stagewise forward mixing with coalescence and redispersion model will accurately predict the column height and efficiency.

2) The stagewise modeling predictions are highly dependent on the number of stages used.

3) Application of continuous phase mass transfer and axial dispersion coefficients (K_c & E_c) obtained from the solute concentration profile along the column height, will predict the column performance more accurately than the Calderbank-Moo-Young (for k_c) and Kumar- Hartland (for E_c) correlations.

THE KINETICS OF PH-INACTIVATION OF PENICILLIN G ACYLASE OBTAINED FROM VARIOUS SPECIES OF *ESCHERICHIA COLI* STRAINS[*]

A. Kheirolomoom
Dept. of Chemical Engineering
M. Kazemeini
M. Vossoughi
Biochemical and Bioenvironmental
Research Center
Sharif University of Technology
M. Ardjmand
Dept. of Chemical Engineering
Islamic Azad University
V. Kasche
Arbeitsbereich Biotechnologie
Technische Universitat Hamburg-
Harburg, Germany.

ABSTRACT

A modified model was proposed for the pH-inactivation rate constant of penicillin G acylase obtained from various species of Escherichia coli.

A new approach was applied and a new parameter called steric factor defined to obtain the more precise description of the pH- inactivation rate constant. The parameter is used as the measure of the conformational rigidity of the enzyme with respect to pH. The proposed model accuracy was verified and compared with the reported models.

The analysis of the experimental data indicates that the assumption of the so-called steric factor and the model is consistent with the theoretical principles of the pH-inactivation reaction. The model can be used for pH-inactivation studies of other biocatalysts by determining its parameters.