PAAVAI ENGINEERING COLLEGE

(Autonomous Institution)

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(Accredited by National Board of Accreditation, New Delhi & NAAC (UGC) with 'A' Grade)

Paavai Nagar, NH - 7, PACHAL, NAMAKKAL - 637 018.Tamil Nadu

04286-243038, 58,88 & 98 Fax: 04286-243068 Email: pecprincipal@paavai.edu.in website: http://pec.paavai.edu.in

TO WHOMSOEVER IT MAY CONCERN

This is to certify that 30 faculty members of Paavai Engineering College has published books and conference papers in national and international conference during the academic year 2020-2021.

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Certificate of Presentation

Awarded to
GOKULNATH K, Paavai Engineering College

for presenting a research paper titled
EXPERIMENTAL ANALYSIS OF ALTERNATE REFRIGERANT MIXTURES IN REFRIGERATION SYSTEM

at the International Virtual Conference on APPLIED SCIENCE, TECHNOLOGY MANAGEMENT AND LANGUAGE STUDIES (ASTMLS - 2020) on 11th & 12th December, 2020.

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Coordinator
Dr. D. Senthilkumar
Professor & Head / Mechanical, Dean - Students Affair
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Convenor
Dr.S.Chandrasekar
Dean - Research and Development
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Patron
Dr. S.R.R. Senthilkumar
Principal
Sona College of Technology

ICMMM2021

Certificate of Participation

This certificate is awarded to **Mr. Gokulnath K,** **Assistant Professor, Department of Aeronautical Engineering** *from* **Paavai Engineering College, Namakkal-18, Tamilnadu., India.** *in recognition of oral and technical presentation titled* **Performance Estimation and Redesign of Horizontal Axis Wind Turbine (HAWT) Blade.** *in ICMMM 2021,* ***3rd INTERNATIONAL CONFERENCE ON MATERIALS, MANUFACTURING AND MODELLING*** *held in VIRTUAL MODE on 19h - 21st Mar 2021.*

Dr. Anthony Xavior M
Organizing Chair

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In Association With
American Society of Mechanical Engineers, Vellore Institute of Technology (VIT), India

Certificate

International Conference on
Chemical, Mechanical and Environmental Sciences

ICCMES 2021

25th & 26th, March 2021

This Certificate is presented to

P Karthikeyan

Department of Aeronautical Engineering,
PAAVAI Engineering College, Namakkal

for the research paper titled **"Three-dimensional computational analysis of transverse injection in a supersonic combustor"** in the International Conference on Chemical, Mechanical and Environmental Sciences (ICCMES 2021) held at **KPR Institute of Engineering and Technology, Coimbatore, Tamilnadu, India.**

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Certificate of Presentation

This is to certify that Dr/Mr/Ms **G. Sasi** of **Paavai Engineering College (Autonomous), Namakkal** has presented a paper entitled **Fuel-air mixing characteristics using opposed fuel jet for the flame stabilization in the subsonic combustion regime** in the International Conference on Advances in Materials, Computing and Communication Technologies **'ICAMCCT 2021'** organized by **ANNAI VAILANKANNI COLLEGE OF ENGINEERING,** Kanyakumari, on 10th April 2021.

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Certificate of Presentation

This is to certify that Dr/Mr/Ms **P. Prasanna** of **Paavai Engineering College (Autonomous), Namakkal** has presented a paper entitled **Design and analysis of hat stiffener using glass fibre and aluminium** in the International Conference on Advances in Materials, Computing and Communication Technologies **'ICAMCCT 2021'** organized by **ANNAI VAILANKANNI COLLEGE OF ENGINEERING,** Kanyakumari, on 10th April 2021.

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Certificate of Presentation

This is to certify that Dr/Mr/Ms **K. Gokulnath** of **Paavai Engineering College, Namakkal** has presented a paper entitled **Experimental investigation of shock wave and boundary layer interaction on the external transonic flow over an airfoil** in the International Conference on Advances in Materials, Computing and Communication Technologies **'ICAMCCT 2021'** organized by **ANNAI VAILANKANNI COLLEGE OF ENGINEERING,** Kanyakumari, on 10th April 2021.

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Certificate of Presentation

This is to certify that Dr/Mr/Ms **R. Aravind** of

Paavai Engineering College, Namakkal has presented a paper entitled

Control of shock wave boundary layer interaction Using bleed suction in hypersonic vehicle

in the International Conference on Advances in Materials, Computing and Communication Technologies **'ICAMCCT 2021'** organized by **ANNAI VAILANKANNI COLLEGE OF ENGINEERING,** Kanyakumari, on 10th April 2021.

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Certificate of Presentation

This is to certify that Dr/Mr/Ms **R.Nallapan** of **Paavai Engineering College (Autonomous), Namakkal** has presented a paper entitled **Stress and fatigue analysis on sandwich panels** in the International Conference on Advances in Materials, Computing and Communication Technologies **'ICAMCCT 2021'** organized by **ANNAI VAILANKANNI COLLEGE OF ENGINEERING,** Kanyakumari, on 10th April 2021.

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International E-Conference on Recent Developments in Engineering & Technology

(ICRDET'21)

CERTIFICATE OF PARTICIPATION

This is to certify that Prof/Dr./Mr./Ms./Mrs. K SHARMILA DEVI

of PAAVAI ENGINEERING COLLEGE, NAMAKKAL has presented a paper

on EXPERIMENTAL INVESTIGATION OF CONCRETE BY PARTIAL REPLACEMENT OF CEMENT USING MESQUITE AND RICE HUSK ASH

in International E-Conference on Recent Developments in Engineering & Technology organized by Dhaanish Ahmed Institute of Technology on 3rd April 2021.

CONVENOR PRINCIPAL CEO

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Department of Civil Engineering

Organize

NATIONAL WEB CONFERENCE

Certificate of Presentation

This is to certify that Dr./Mr./Ms. **S.RAJESWARI** of **Paavai Engineering college** has Participated / Presented a paper entitled **Strength and durability study on GPC** during National Web Conference on **"Recent Innovations and Advancements in Civil Engineering (RIACE-2K20)"** organized by Department of Civil Engineering, Kongunadu College of Engineering and Technology, Thottiam on 12/06/2020.

HoD/ Civil | **Dean (R & D)** | **Principal**

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E-mail: info@dhaanishcollege.in, website: www.dhaanish.com

International E-Conference on Recent Developments in Engineering & Technology

(ICRDET'21)

CERTIFICATE OF PARTICIPATION

This is to certify that Prof/Dr./Mr./Ms./Mrs. **RAJESWARI S** of **PAAVAI ENGINEERING COLLEGE, NAMAKKAL** has presented a paper on **EFFECT OF ADDITION OF MAGNESITE DUST AS A PARTIAL REPLACEMENT OF FINE AGGREGATE IN PERVIOUS CONCRETE** in International E-Conference on Recent Developments in Engineering & Technology organized by Dhaanish Ahmed Institute of Technology on 3rd April 2021.

CONVENOR PRINCIPAL CEO

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Rasipuram - 637 408, Namakkal Dist., Tamil Nadu, India.

Department of Civil Engineering

organized

NATIONAL CONFERENCE ON INNOVATIONS IN CONSTRUCTION MATERIALS (VIRTUAL)

Certificate of Participation

This is to certify that Mr. M. RAJKANNAN, AP/CIVIL

has ~~participated~~ / Presented a paper entitled ANALYSIS OF RCC BEAM WITH GEOGRID USING ANSYS SOFTWARE.

National Conference on Innovations in Construction Materials (Virtual) *organized by Department of Civil Engineering, Muthayammal Engineering College, Rasipuram held on 15th April 2021.*

Co-ordinator

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VIT
Vellore Institute of Technology

International Virtual Conference on
High-Performance Materials for Energy, Environment & Healthcare in the Digital Era

30th June & 1st July 2020

Organized by

Centre for Materials Technology, School of Advanced Sciences,

VIT, Vellore - 632 014, India

CERTIFICATE

This is to certify that **Dr./Mr./Ms. B. Karthiga** of **PAAVAI ENGINEERING COLLEGE** has participated in International Virtual Conference on "High-Performance Materials for Energy, Environment & Healthcare in the Digital Era" organized by Centre for Materials Technology, School of Advanced Sciences, VIT, Vellore, India during 30th June & 1st July 2020.

KK

Dr. K. K. Cheralathan
(Organizing Secretary)

Dr. A. Mary Saral
(Convener & Dean, SAS)

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Dr. N.G.P, Kalapatti Road, Coimbatore-641 048.

Department of Civil Engineering

Certificate of Presentation

This is to certify that

N. Moorthy

has presented the paper titled " New Technique Construction Of Road Pavements in India For Permeable Pavements" in the National Level Web Conference on Recent Innovations and Advancements in Engineering & Technology (RIAET 2020) held during June 5-6, 2020 organised by the Department of Civil Engineering, Dr.N.G.P IT, Coimbatore.

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CONVENOR, HOD/ CIVIL

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PRINCIPAL

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Department of Civil Engineering

Certificate of Presentation

This is to certify that

S.Gayathri

has presented the paper titled " Experimental Study on Behaviour of Cold Formed Steel Lipped Angle Columns" in the National Level Web Conference on Recent Innovations and Advancements in Engineering & Technology (RIAET 2020) held during June 5-6, 2020 organised by the Department of Civil Engineering, Dr.N.G.P IT, Coimbatore.

Dr.P.MUTHUPRIYA
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Dr.K.PORKUMARAN
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SRM TRP ENGINEERING COLLEGE

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Tiruchirappalli District ,Tamilnadu

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Virtual National Conference on Artificial Intelligence in Mechanical and Civil Engineering (NCAIMC-2020)

Certificate

This is to certify that the following paper has been presented in the "Virtual National Conference on Artificial Intelligence in Mechanical and Civil Engineering" (NCAIMC-2020) held on 4th July 2020.

Title of the paper : **SPLICE CONNECTION USING RAILWAY STEEL TRUSS BRIDGES.**

Author : **Mrs. J. UMANAMBI , PROFESSOR**
PAAVAI ENGINEERING COLLEGE

Mr.S. MANIMARAN
Coordinators

Mr. K. SURESHRAJA
Convener

Dr. B. GANESH BABU
Principal

SL.: SRM TRPEC/ NACIMC-2020 /03

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Tiruchirappalli District ,Tamilnadu

SRM GROUP OF INSTITUTIONS TRICHY

Virtual National Conference on Artificial Intelligence in Mechanical and Civil Engineering (NCAIMC-2020)

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Title of the paper : **SPLICE CONNECTION USING RAILWAY STEEL TRUSS BRIDGES.**

Author : **Ms. S.GAYATHRI , ASSISTANT PROFESSOR**
PAAVAI ENGINEERING COLLEGE

Mr.S. MANIMARAN
Coordinators

Mr. K. SURESHRAJA
Convener

Dr. B. GANESH BABU
Principal

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Tiruchirappalli District ,Tamilnadu

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Virtual National Conference on Artificial Intelligence in Mechanical and Civil Engineering (NCAIMC-2020)

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This is to certify that the following paper has been presented in the "Virtual National Conference on Artificial Intelligence in Mechanical and Civil Engineering" (NCAIMC-2020) held on 4th July 2020.

Title of the paper : **SPLICE CONNECTION USING RAILWAY STEEL TRUSS BRIDGES.**

Author : **Mr. M.RAJKANNAN , ASSISTANT PROFESSOR**
PAAVAI ENGINEERING COLLEGE

Mr.S. MANIMARAN
Coordinators

Mr. K. SURESHRAJA
Convener

Dr. B. GANESH BABU
Principal

SL.: SRM TRPEC/ NACIMC-2020 /03

Sl.No.:AITCECON098

Adithya Institute of Technology

Accredited by NAAC

National Conference on

Structural, Architectural, Building and Automation in Sustainable Engineering-SABASE2020

3 & 4 June, 2020

CERTIFICATE

This is to certify that

N.MOORTHY

Paavai Engineering College

has actively participated and presented a paper on

"Experimental Investigation on Flexural Strength Behaviour of Reactive Powder Concrete".

Organized by
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In Collaboration with

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INSTITUTION'S INNOVATION COUNCIL

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RASTH-2021

International Conference on Recent Advances in Applied Sciences, Technology & Health (Virtual Mode)

Abstract Booklet

Theme: ENVIRONMENTAL SCIENCE AND TECHNOLOGY

Organised by

SRM Research Institute,

SRM IST. Kattankulathur. India

March 03-05, 2021

THEME: ENVIRONMENTAL SCIENCE & TECHNOLOGY

KEYNOTE SPEAKERS

Prof. S.N Tripathi, IIT - Kanpur

Prof. Daniel D Snow Univ of Nebraska, USA

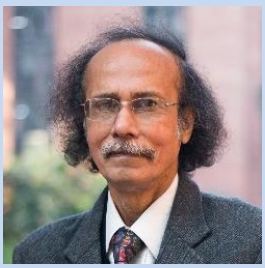
Prof. B.Loganathan Murray State Univ, USA

Prof. Jagabandhu Panda, NIT Rourkela

Dr.Magdelena Urbaniak Univ of Lodz, Poland

Special Issue: Bulletin of Environmental Contamination and Toxicology

POLICY EXPERTS



Dr. S K Sarkar TERI

Mr. Satish Sinha Toxics Link

Mr.Pankaj Kumar UNIDO

Dr.Girija Bharat Mu Gamma Consultants

INVITED SPEAKERS

Dr.Richa Kothari Central Univ of Jammu, IN

Dr.Vladimir Beskoski Univ. of Belgrade, Serbia

Dr. Siddharth Sankar Das, VSSC, Thiruvananthapuram

Dr.Zaffr Hashmi COMSATS Univ Pakistan

Dr.Rehana Shaik IIIT, IN

Mr.Vinod.P.G GeoVIn Solutions,IN

Contact
Dr. Paromita Chakraborty
Convener
Email: paromita.rasth2021@gmail.com
rasth2021@srmist.edu.in

Meeting link: https://zoom.us/j/92772463201?pwd=bnBiVkxQQ3dSbGhzL3ErMU9uSW03QT09
Meeting ID: 927 7246 3201
Passcode: 014380

International Conference on Recent Trends in Applied Sciences Technology and Health (Virtual)

Final Program Schedule (All times in IST)

3-5 March 2021

SRM Institute of Science and Technology, Kattankulathur, Tamilnadu, India

DAY 1 (March 3 2021) COMMON SESSION	
FORENOON	
TIME	EVENT
09.30 AM - 10.40 AM	INAUGURATION of RASTH-2021 & DPRC-2021 **Webinar ID - 850 4565 1560** **Passcode - 654321** **Join the meeting: https://srmist-edu-in.zoom.us/j/85045651560**
10.45 AM – 11.45 PM	**Key note Lecture: *Mr. Vijay Reddy, & Dr. Shubhra Dutta, Research Intelligence, Elsevier*** **Title: "Writing an Effective Research Paper**
11.45 PM – 12.45 PM	**Key note Lecture: *Prof. Chandrabhas Narayana, Director, Rajiv Gandhi Centre for Biotechnology, Thiruvananthapuram*** **Title: "Raman Spectroscopy for Energy, Environment and Health"**
12.45 PM – 02.00 PM	Lunch Break
03.00 PM – 07.00 PM	**E- POSTER SESSION - 1**

THEME: ENVIRONMENT

PROGRAM SCHEDULE

DAY 2 (March 4 2021) PARALLEL SESSION	
FORENOON	
Keynote **Chaired by Dr. Paromita Chakraborty & Dr. Sanjay Mehta, SRMIST**	
TIME	EVENT Join Meeting: https://zoom.us/j/92772463201?pwd=bnBiVkxQQ3dSbGhzL3ErMU9uSW03QT09
09.25 AM – 09.30 AM	**Welcome Address by Dr. Paromita Chakraborty**
09.30 AM – 10.15 AM	***Key Note Talk*** ***Prof. Daniel Snow, University of Nebraska, Lincoln, USA*** ***"Antibiotics, Emerging Contaminants and their analytical techniques"***
10.15 AM –11.00 AM	***Key Note Talk*** ***Prof. S.N Tripathi, IIT Kanpur*** ***"Comprehensive understanding on the air pollution and its sources over the Indian metropolitan cities"***
11.00 AM – 11.05 AM	Short Break

Invited Talk Session Chaired by Dr Sanjay Mehta, SRMIST	
11.05 AM – 11.50 AM	***Invited Talk Prof. Jagabandhu Panda, NIT Rourkela "Boundary layer modelling and prediction"***
11.50 AM – 12.30 PM	***Invited Talk Dr. Siddharth Sankar Das, VSSC, Thiruvananthapuram "Role of the tropical cyclone on stratosphere-troposphere exchange processes"***
	Oral Presentation by Selected Senior Research Scholars
12.30 PM – 12.40 PM	*Mr. Ramesh Reddy, SRMIST, Kattankulathur*
12.40 PM – 12.50 PM	*Mr. Sachin Philip, SRMIST, Kattankulathur*
12.50 PM – 01.00 PM	*Mr. Aravindhavel, SRMIST, Kattankulathur*
01.00 PM – 01.30 PM	Lunch Break
AFTERNOON	
Invited Talk Session Chaired by Dr. M.R. Ganesh & Ms. Sija Arun, SRMIST	
01.30 PM – 01.50 PM	***Invited Talk Mr. Vinod, Managing Director, GeoVin Solutions "GIS and Remote Sensing applications in Environmental Sciences"***
	Oral Presentation by Early Career Researchers
01.50 PM – 02.05 PM	***Dr. Oluwarotimi Michael Olofinnade, Covenant University, Nigeria "Sustainable plastic waste management: Application of waste plastic in construction materials towards preventing marine plastic pollution"***
02.05 PM – 02.20 PM	***Dr. Sanjenbam Nirmala Khuman, Ulsan National Institute of Science & Technology, South Korea "Fate and risk assessment of organochlorine pesticides in Sunderban mangrove, India"***
02.20 PM – 02.35 PM	***Dr. Omkar Gaonkar, Toxicslink, Delhi "What's in the Diaper? The issue of phthalates in diapers"***
	Oral Presentation by Selected Senior Research Scholars
02.35 PM – 02.45 PM	*Ms. Anshika Singh, CSIR-NEERI, West Bengal*
02.45 PM – 02.55 PM	*Mr. Christopher Olson ,Florida Agricultural and Mechanical University*
02.55 PM – 03.05 PM	*Mr. Atin Kumar Pathak, Sri Mata Vaishno Devi University, Jammu*
03.05 PM – 03.15 PM	*Ms. Kristina Joksimović, University of Belgrade, Serbia*
03.15 PM – 03.25 PM	*Mr. Balasubramanian Prithviraj, SRMIST, Kattankulathur*
03.25 PM – 03.35 PM	*Ms. Moitraiyee Mukhopadhyay, SRMIST, Kattankulathur*
03.35 PM – 03.45 PM	*Mr. Vamshi Krishna, Osmania University, Hyderabad*
03.45 PM – 07.00 PM	**E-POSTER SESSION**

DAY 3 (March 5 2021) PARALLEL SESSION	
FORENOON	
Keynote	
TIME	EVENT Join Meeting: https://zoom.us/j/92772463201?pwd=bnBiVkxQQ3dSbGhzL3ErMU9uSW03QT09
09.25 AM – 09.30 AM	**Introductory Remarks by Dr. Paromita Chakraborty**

09.30 AM – 10.15 AM	**Key Note Talk** **Prof.B. Loganathan, Murray State University, Kentucky, USA** **"Global Contamination Trends of Persistent Organic Chemicals "**
Invited Talk Session Chaired by **Dr. P. Purushothaman & Prof. R. Sivakumar, SRMIST** Join Meeting: https://zoom.us/j/92772463201?pwd=bnBiVkxQQ3dSbGhzL3ErMU9uSW03QT09	
10.15 AM – 10.45 AM	***Invited Talk*** ***Dr. Richa Kothari, Central University, Jammu, India*** ***"Constructed wetlands and biological processes: An on-site wastewater treatment option for sustainable environment in integration with science and technological approaches"***
10.45 AM – 11.15 AM	***Invited Talk*** ***Dr. Yasar N Kavil, King Abdulaziz University, Saudi Arabia*** ***"Improper face mask disposal and environmental problems- An Implication of COVID-19 and the Current Status"***
11.15 AM – 11.30 AM	Short Break
11.30 AM – 12.00 AM	***Invited Talk*** ***Dr. Zaffar Hashmi, COMSATS University, Pakistan*** ***"Arsenic levels and biomethylation genes abundance in Paddy soils from Pakistan"***
12.00 AM – 12.30 AM	***Invited Talk*** ***Dr. Rehana Shaik IIIT, Hyderabad, India*** ***"River Water Quality Modelling under Climate Change"***
12.30 AM – 01.00 PM	***Invited Talk*** ***Dr. Vladimir Beskoski, University of Belgrade, Serbia*** ***"Perfluoroalkyl and polyfluoroalkyl substances – from environmental challenge to environmental solution"***
01.00 PM – 01.30 PM	Lunch Break
01.30 PM – 02.00 PM	***Invited Talk*** ***Dr. Magdelena Urbaniak, Univ of Lodz, Poland*** ***"A Nature-based solution for removal of organic compounds from land-water ecosystems"***
AFTERNOON	
	PARALLEL SESSION-3 (Energy & ENVIRONMENT)
Moderator: Dr. Girija Bharat	
02.00 PM – 03.00 PM	***Policy Arbitration Session*** Webinar ID - 882 2219 5159 Passcode - 654321 **Join the meeting**: https://srmist-edu-in.zoom.us/j/88222195159
COMMON SESSION	
03.30 PM – 04.30 PM	***Valedictory Session*** Webinar ID - 882 2219 5159 Passcode - 654321 **Join the meeting**: https://srmist-edu-in.zoom.us/j/88222195159

Dr. Paromita Chakraborty
Convener- RASTH-2021(ESNT)
Associate Professor
Department of civil engineering,
Leading environmental science and
Technology lab in SRM research institute,
SRMIST

Convener Message

It is an honour to convene the three-day International Conference on "Recent Advances in Applied Sciences, Technology & Health" (RASTH-2021). The motivation for such an event arises with the global concern for environmental preservation in terms of natural resources and increasing focus on environmental pollution prevention and conservative strategy for a sustainable future. As an academician, one would realise that addressing the knowledge gap for solving these problems is never a one man's job. RASTH brings together a diverse range of personalities such as international experts including scientists, professors, policy makers, non-governmental organizations, industry experts, public health professionals and young researchers under one roof to assimilate varied facets of one common problem. The theme "Environmental Science and Technology" emphasises on core areas including Air, Soil and Water Pollution, Atmospheric Transport Modelling and Satellite Imagery, Remediation Techniques, Policy, Legislature and Governance, Water Resources and Management, Waste Management, Remote Sensing and GIS Applications, Biodiversity and Climate Change and Environmental Monitoring and Engineering. This international conference is purely aimed at knowledge sharing and academic interaction to improve clarity within the scientific community that is ardently working towards finding solutions for these issues. I convey my sincere thanks to the management of SRMIST for funding the event, realising its relevance and importance. I also extend my heartfelt wishes to the organising committee for coming together and organising this event at such a magnificient scale.

Paromita Chakraborty

EFFECT OF SUSTAINABLE ENERGY SOURCES FOR LFC OF SINGLE AREA MULTI SOURCE POWER SYSTEM

D.Boopathi[1], S.Saravanan[2], K.Jagatheesan[3], V.Kumarakrishnan[4], G.Vijayakumar[5]

[1,3,4] *Paavai Engineering College, Namakkal, Tamilnadu, India*

[2,5] *Muthayammal Engineering College, Rasipuram, Namakkal, Tamilnadu, India*

Abstract

In this article Load frequency control (LFC) scheme has been involved to control the frequency oscillation in single area electric power system consists of suitable energy (wind) source with fuel cell and battery energy sources during emergency situation. To perform the LFC, a Proportional – integral – derivative (PID) controller has implemented as secondary controller. Particle - swarm – optimization (PSO) technique is also involved in this article to acquire optimal controller gain parameters of the PID controller. The trial and error (conventional) method based integral (I), proportional integral (PI), and proportional – integral – derivative (PID) controllers result were compared to find the superior controller to maintain the system output quality. The proposed PSO technique optimized PID controller performance is compared with conventional method based PID controller results. The suggested optimization technique based controller performers better than conventional method based controller in various time domain parameters like settling time, peak over and under shoot.

Key word: Particle – Swarm – Optimization, PID controller, Frequency stabilization, frequency deviation, Load frequency control.

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PSO Optimum Design-PID Controller for Frequency Management of Single Area Multi-Source Power Generating System

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Abstract

In this article, Particle Swarm Optimization (PSO) tuned Proportional-Integral-Derived (PID) controller is proposed for frequency management of a single area multi-source power generation unit. The power system comprises of both renewable and non-renewable energy sources which includes thermal, solar and wind power generating units. In this work, Integral (I), Proportional -Integral (PI), and PID controllers are utilized as a subsidiary controller to regulate frequency deviation of the power system during unexpected load variation. The gain values of the controller are tuned by applying conventional (trial and error) scheme and PSO technique. Conventional method tuned Controller tuned using conventional method shows that PID controller provides superior response over I and PI controller response. Subsequently, PSO is implemented to tune PID controller gain values. To demonstrate the superiority of the PSO-PID controller, the output response is compared to the conventional tuned PID controller result. It is obvious from the comparison, the PSO-PID controller is provides fast settling time with minimal frequency overshoot and undershoot at various loading conditions.

Keywords

Particle Swarm Optimization Proportional-Integral-Derivative Frequency regulation Frequency deviation Settling time

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Appendix [3, 24]

T_{PS} = 20 S, K_{PS} = 120, T_g = 0.08 S, Tr = 10 S, K_r = 0.5 (p.u), Twt = 0.5 S, T_{pv} = 1.5 S, K_{wt} = 1 (p.u), K_{pv} = 1 (p.u), T_t = 0.3 S, R = 2.4.

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Abstract

Ant colony optimization technique (ACO) is proposed for frequency regulation of single area power generating network. The proposed system consists of thermal power generating system with reheater, turbine, governor, hydrogen aqua electrolyzer (HAE), and fuel cell (FC). Proportional–integral–derivative (PID) regulator acts as an auxiliary regulator to maintain the frequency deviation during unexpected load demand. The proposed PID controller gain values are tuned by utilizing ACO tuned PID regulator with ITAE objective function. To show the superiority of the ACO technique and the performance, responses were equated with conventional method PID controller's results for the identical power network. The dynamic performance of the suggested ACO-PID regulator gives improved response over conventional PID in terms of quick settling time.

Keywords

Ant colony optimization Proportional–integral–derivative controller Fuel cell Hydrogen aqua electrolyzer Frequency regulation

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Annexure 1

P_w = 2000 MW, f = 50 Hz, $T_{g1} = T_{g2}$ = 0.03 s, $T_{t1} = T_{t2}$ = 0.3 s, $K_{r1} = K_{r2}$ = 0.5, K_{AE} = 0.002, T_{AE} = 0.5 s, K_{FC} = 0.01, $T_{r1} = T_{r2}$ = 10 s, T_{FC} = 4 s, $R_1 = R_2$ = 4 p.u/MW, $B_1 = B_2$ = 0.425 p.u/MW, $K_{p1} = K_{p2}$ = 120, $T_{p1} = T_{p2}$ = 20 s.

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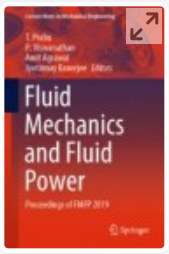

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Experimental Investigations on Heat Transfer Enhancement in Double Pipe Heat Exchanger Using PT-SCA and PTT-SCA Twisted Insert Profile

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Abstract

The continuous rise in the price of energy and the materials has necessitated industries to gear-up their efforts in modifying the heat exchangers for higher outputs. The proposed work on heat exchanger considers technical aspects such as heat transfer modes, pressure-drops, long-lasting performance along with economic aspects. The compactness in size and minimizing energy requirement is significant in the design of tubes for improved heat transfer. In heat exchanging devices, the heat transfer rate could

be enhanced by generating disturbance in the fluid flow thereby breaking the thermal boundary layers that hinder effective heat exchange. But such a process would require increased pumping power. Hence, this work attempts to achieve improved heat transfer rate in a double pipe heat exchanger (DPHE) of counter-flow type that consumes economical pumping power and involves a technique in which inserts of varied profiles are used to disrupt the flow in the tube. The different types of insert profiles used include Plain Tape (PT), Plain Tape Step-Cut Arc (PT-SCA), and Plain Twisted Tape Step-Cut Arc (PTT-SCA) to study their performance in heat exchange rate. The effect of an insert is that the heat transfer surface gets enlarged for convection and creation of turbulence in the fluid flow, both contribute for increased heat transfer. PTT-SCA insert provided the higher thermal enhancement for DPHE.

Keywords

Heat exchanger

Plain tape step-cut arc (PT-SCA)

Plain twisted tape step-cut arc (PTT-SCA)

Pressure drop **Counter-flow** **Tube inserts**

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