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Google Scholar (Avinash Alagumalai) ● Citations: 1066 ● H Index: 19 ● i-10 index: 25

Education

Jan 2016 – Dec 2019 Anna University, Chennai Ph.D., ***(Investigation on Sustainable Biodiesel Production and its utilization in a Reactivity Controlled Compression Ignition Engine)***

Sep 2013 – Jun 2015 Sri Venkateswara College of Engineering Sriperumbudur, Tamil Nadu, India
Internal Combustion Engineering, Master (M.Eng.), First class with distinction, CGPA 8.86 out of 10 (University second rank)

Aug 2009 – April 2013 K. S. Rangasamy College of Technology Tiruchengode, Tamil Nadu, India
Mechanical Engineering, Bachelor (B.Eng.), First class with distinction, CGPA 9.52 out of 10 (Gold medalist)

Experience (Academic)

Jun 2019-Present *Assistant Professor, Department of Mechanical Engineering, GMR Institute of Technology, Rajam-532127, Andhra Pradesh, India*

Jul 2015-May 2019 *Assistant Professor, Department of Mechanical Engineering, KPR Institute of Engineering and Technology, Coimbatore-641407, Tamil Nadu, India*

Languages

- Tamil — Native
- English — Fluent

Certificates and Awards

[1] Participated and presented Technical paper on **Bio-diesel production** at Velammal Engineering College, Chennai on 6th August 2011.

[2] Participated and presented technical paper on **Bio-diesel performance characteristics** at Excel Engineering College, Namakkal on 26th August 2011.

[3] Won **second prize** for presenting a technical paper entitled **Environmental impacts of Bio-diesel** in the national level environmental symposium conducted by Sona College of Technology, Salem held on 30th August 2011.

[4] Enthusiastically participated in the debate on **Fossil fuel crisis** conducted by Sona College of Technology, Salem, held on 30th August 2011.

[5] Secured **first prize** for presenting paper entitled **Experimental investigation of Pongamia methyl ester as fuel in CI engine** held at Hindusthan Institute of Technology, Coimbatore on 1st October 2011.

[6] Received **outstanding PG student award (2015)** at Sri Venkateswara College of Engineering, Sriperumbudur.

[7] Received **Innovative professional award** from Society of Professional Engineers, India on 28th August , 2016.

[8] Received **Young researcher award** from TOP Engineers, Chennai on 1st October, 2016.

[9] Received AUFAU International awards, 2016 under **Young scientist category**.

[10] Received **Bharat Ratna Mother Teresa Gold Medal Award**, 2016 by GEPRA.

[11] Received **All India Best agricultural Extension worker award –** 2016 from Society for the Advancement of Human and Nature.

[12] Acted as an **evaluator for National Children science congress –** 2016 organized by DST, Government of India.

[13] Received **Jagar Nath Raina Memorial All India Best Publication Awards –** 2017 from Society for the Advancement of Human and Nature.

[14] Acted as an **evaluator for National Children science congress –** 2018 organized by DST, Government of India.

[15] Clean Technologies and Environmental Policy **Top 25 Reviewer Award** 2018

[16] Renewable Energy Focus **Outstanding Contribution in Reviewing Award** 2018

[17] Industrial Crops & Products **Outstanding Contribution in Reviewing Award** 2018

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Publications

Google Scholar (Alagumalai Avinash)
http://scholar.google.co.in/citations?user=Oh9nklYAAAAJ&hl=en

Research Interests: *Biofuels, IC Engines, Nanotechnology, Machine learning*

Science Citation Index Expanded (SCI/SCIE) Journals

[1] **Avinash A**, Qin C, K E K V, Solomin E, Yang L, Zhang P, et al. Conceptual analysis framework development to understand barriers of nanofluid commercialization. Nano Energy 2022;92:106736. https://doi.org/https://doi.org/10.1016/j.nanoen.2021.106736.

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Reviewer

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[2] Energy Sources, Part A: Recovery, Utilization, and Environmental Effects, Taylor & Francis**.**

[3] Energy and Fuels, ACS publications.

[4] Biofuels, Taylor and Francis.

[5] International Journal of Ambient Energy, Taylor and Francis

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[8] Current Alternative Energy, Bentham Science Publishers

[9] Sustainable Energy Technologies and Assessments, Elsevier

[10] Renewable Energy Focus, Elsevier

[11] Clean Technologies and Environmental Policy, Springer

[12] Environmental Progress & Sustainable Energy, John Wiley & Sons, Ltd.

Editorial Board

[1] Editorial board-Scientific reports (Nature Publishing Group)

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[3] Editorial board -Nanotechnology for environmental engineering (Springer)

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[5] Junior Editorial board - Energy sources part A: Recover, Utilization & Environmental Effects (Taylor & Francis)

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[7] Editorial board- Resources, Environment and Sustainability (Elsevier)

DECLARATION

I do hereby declare that all statements made in the application are true, complete and correct to the best of my knowledge and belief.

Signature,
(Avinash)

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Conceptual analysis framework development to understand barriers of nanofluid commercialization

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ABSTRACT

Despite massive efforts in the field of nanofluids over the last two decades, nanofluids are primarily still used in a lab scale due to numerous controllable and uncontrollable barriers that impede their effective large-scale implementation. Nanofluids market uptake can be realized only when those barriers have been overcome. These barriers must be examined for their impacts on all aspects of nanofluids market adoption. In this study, barriers to the commercial applications of nanofluids in thermal energy technologies are identified in the literature and are assessed in consultation with experts in the field using a total interpretive structural modeling approach and cross-impact matrix multiplication applied to a classification analysis. It is discovered that most of the barriers are interrelated and can influence one another. Long-term stability issue is identified as the main driver in the effective implementation of nanofluids at commercial scale. Research in this direction might be able to help R&D institutions and researchers in this field to sort out the most influential barriers to nanofluids market uptake.

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Analysis of the limiting factors for large scale microalgal cultivation: A promising future for renewable and sustainable biofuel industry

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ABSTRACT

In recent times, microalgae are perceived as potential feedstocks for next generation biofuel production. However, their large scale cultivation and associated lipid recovery are confined by a number of factors. In this perspective, an endeavor has been made in this work to analyze the limiting factors for large scale microalgal cultivation by an analytical framework using interpretive structural modeling approach. The limiting factors were first identified through a comprehensive literature study and then, the interactions among the factors were formulated. Subsequently, the key factors that drive the system were identified by the multiplication properties of matrices principle. The results indicated that various operational and environmental factors would influence the mircroalgal culturing technology, the economy of fuel production and sustainability of the process. The study also showed that there were no autonomous and linkage factors indicating that no factors in this study with weak drive and weak dependence powers and all the factors considered were stable. Moreover, it was identified that the relevant policy mechanism with incentives and other supportive measures would benefit the growth of the algal biofuel industry. The present study can provide explicit information to support the growth of the sustainable biofuel industry.

1. Introduction

The rapid depletion of easily accessible fossil fuels, increasing population, environmental pollution and climate change effects stimulated interest in the exploitation of alternative fuels [1,2]. Among different alternative fuels, greater attention and potential interest have been shown towards the development of biofuels [3]. Biofuels are categorized as the first generation, second generation and third generation biofuels [4]. The first generation biofuels are not a renewable route towards energy independence [5]. Besides, the important lesson taught by the first generation biofuels is the sustainability concern, particularly, food vs. fuel dichotomy. On the other hand, studies have reported that the commercial production of the second generation biofuels is much more challenging than the first generation counterparts [6,7]. This includes challenges in pretreatment, production and purification technologies [8]. Third generation biofuels are generally obtained from the algal biomass [9]. It has been reported that no feedstock can match with algae in terms of quantity and diversity [8]. Although several studies have been conducted worldwide to investigate the potential of microalgae [10,11], there is a need to understand and assess the limiting factors for the large scale cultivation of microalgae.

To understand the limiting factors in large scale microalgal cultivation for viable biofuel (i.e. biodiesel) production, it is essential to understand the processes of algal screening, cultivation, environmental factors affecting algal growth, harvesting methods, lipid extraction techniques and finally, the synthesis of biodiesel. Different algal strains have varying lipid contents depending on their culturing circumstances. According to the available literature, more than 40,000 microalgae species have been identified and are mainly categorized into two groups, namely prokaryotes or cyanobacteria and eukaryotes [12]. In algal culturing, the open pond culturing is the widely adopted method due to the cost effectiveness and less maintenance requirements of the system. Besides, this system is much suitable for algae that can survive in both alkaline as well as salty environments [13,14]. Apart from the open pond cultivation system, closed photobioreactors are used to maximize the photosynthetic efficiency and biomass productivity. However, this

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Full Length Article

Experimental insight into co-combustion characteristics of oxygenated biofuels in modified DICI engine

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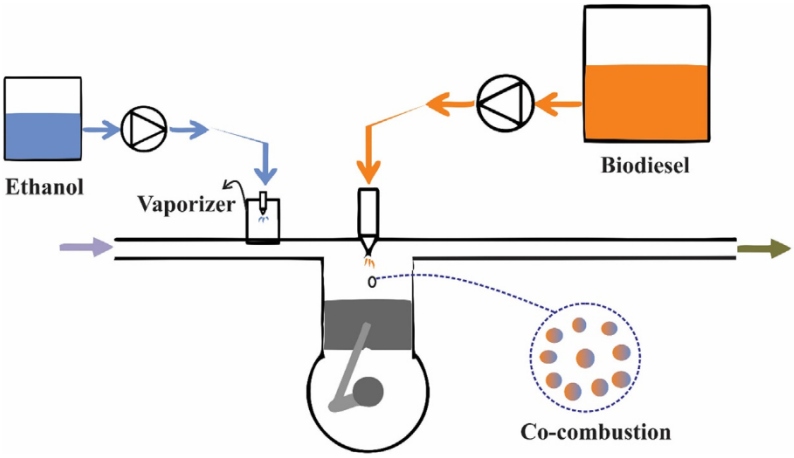
GRAPHICAL ABSTRACT



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Keywords:
Biofuels
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Co-combustion characteristics
Two-stage heat release

ABSTRACT

The co-combustion of fuel has substantial advantages when compared to normal combustion and it requires very little modification. In this perspective, ethanol supplement co-combustion with biodiesel is proposed. The co-combustion characteristics were studied by manifold induction of vaporized ethanol and direct injection of waste cooking oil biodiesel. A vaporizer system was fabricated to produce vaporized ethanol in a volumetric basis (10% and 20%, respectively). It was revealed from the experiments that with co-combustion of oxygenated biofuels, the combustion advanced and peak pressure shifted to TDC. The pressure rise rate decreased with the increase of vaporized ethanol induction and the maximum rate of pressure rise reduction was noted with biodiesel-20% ethanol induction which was 4% lower than biodiesel-10% vaporized ethanol induction. On the other hand, the maximum rate of heat release rate (60.24 J/°CA) was seen in biodiesel with 20% ethanol induction. Furthermore, the co-combustion studies disclosed a two-stage heat release pattern (low temperature and high

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Understanding the interaction among the barriers of biodiesel production from waste cooking oil in India- an interpretive structural modeling approach

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ABSTRACT

Regardless of fragile biodiesel market of the present day, it is foreseen that biodiesel will draw a lot of public interest throughout the world in the not too distant future. Among different feed stocks available for biodiesel production, waste cooking oil is under a major prospective for large-scale biodiesel production as it can cut down the fuel costs than other alternative feed stocks. However, there are several barriers that hinder large-scale biodiesel production from waste cooking oil. Also, there might be contextual relationships among those barriers. In this perspective, this paper aspires to identify the most influential barrier and to describe the interactions among different barriers influencing biodiesel production from waste cooking oil. For this reason, an interpretive structural modeling approach is employed to determine relationships among barriers. MICMAC analysis has additionally been carried out to classify the barriers based on dependence and driving power. The results indicate that vehicle access problem, lack of processing technology, inconsistent supply quantity and inadequate production facilities are the top-level barriers. Also, the results show that lack of political will, lack of incentives and lack of policy implementation play a very important role in the effective implementation of biodiesel production from waste cooking oil.

1. Introduction

Biodiesel - a realistic surrogate to diesel fuel has gained significant attention in recent years due to the brink of depletion of easily accessible fossil fuels and environmental catastrophes [1–5]. Because of widespread concern over the water-land-food nexus of first generation biofuels, a waste-to-energy system utilizing waste cooking oil has become very attractive in recent days [6,7]. Waste cooking oil can be recycled into useful industrial products such as biodiesel, soap, etc., [8]. In India, a large quantity of waste cooking oil can be collected from hotels, restaurants, hostel mess and even households. Indeed, a single branch of fast-food centre alone can generate as much as 15 L of waste cooking oil per day [9]. As a result, there is a necessity to connect with hotel chains and use the cooking oil which just gets wasted every day.

The biodiesel derived from waste cooking oil offer a great potential in attenuating emissions by releasing only biogenic carbon in the air and greater energy return on investment [10]. In contrast, to increase stakeholders and public involvement in waste cooking oil recycling, it is indispensable to identify what motivates to reprocess waste cooking oil. This includes a multifarious string of legal and market barriers such as government policies, subsidy, political support and consumer confidence [11].

Because of these barriers, there is a reluctance to adopt sustainable technology to convert waste cooking oil to renewable diesel fuel. On the other hand, analyzing these barriers will help a pilot biodiesel manufacturing industry to put into the operation of large-scale biodiesel production facility. It is indispensable to recognize the value of these barriers and their contextual relationships so that those barriers which hold up other barriers and those which are most dominated by few other barriers can be well recognized.

Based on the above considerations, an endeavor has been made in this work to critically examine the relationships among the barriers for large-scale production of biodiesel from waste cooking oil by Interpretive Structural Modeling (ISM) approach. Indeed, ISM

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Full Length Article

Prediction capabilities of mathematical models in producing a renewable fuel from waste cooking oil for sustainable energy and clean environment

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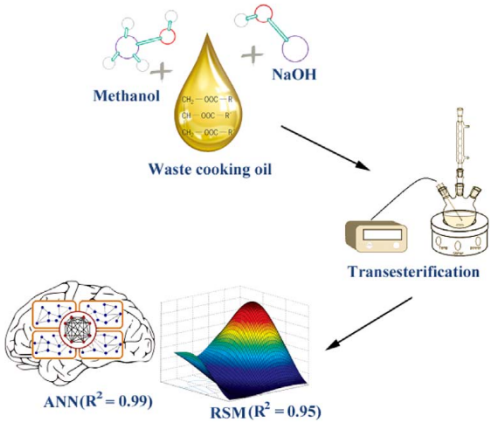
GRAPHICAL ABSTRACT



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Waste cooking oil
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ABSTRACT

The present work describes the comparison of biodiesel yield prediction by Response Surface Methodology (RSM) and Artificial Neural Network (ANN). The prediction models were developed based on three-level design of experiments conducted with waste cooking oil transesterified by varying four process parameters such as catalyst concentration, molar ratio, reaction time, and stirrer speed. The optimum reaction conditions were found to be 0.75% wt/wt catalyst concentration, 9:1 M ratio, 60 min reaction time and 500 rpm stirrer speed. For these optimum conditions, experimental fatty acid methyl ester (FAME) content of 95.05 ± 0.26% was obtained, which was in good agreement with the predicted yield. The RSM model was developed using Box-Behnken design and the ANN predictive model was developed using a feed-forward backpropagation neural network algorithm with 14 neurons in the hidden layer. The mathematical models of RSM and developed ANN were compared for biodiesel yield. The higher value of correlation coefficient (R^2 = 0.99) and lower value of root mean square error (RMSE = 1.97) for ANN compared to RSM (R^2 = 0.95 and RMSE = 2.71) evidently proved that ANN model is far better in predicting FAME content compared to the RSM model.

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