ETET-2020

21st October ~ 23rd October; 2021

NATIONAL CONFERENCE

ON

Emerging Trends In Engineering & Technology

CONFERENCE PROCEEDING

NIT, Bhubaneswar

Nalanda Institute of Technology, Bhubaneswar

Organized by

Department of Civil & Mechanical Engineering

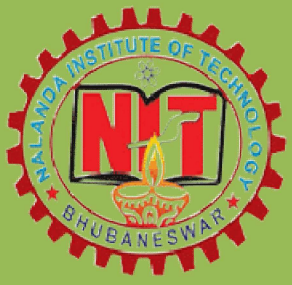
Nalanda Institute of Technology

Bhubaneswar - 752050

Emerging Trends In Engineering & Technology

21st Oct. – 23rd Oct. 2021

CONFERENCE PROCEEDING



Organized by

Department of Civil and Mechanical Engineering
Nalanda Institute of Technology
Bhubaneswar - 752050

LIST OF SPONSORS

Utakal Alumina International Limited

Citicon Engineers Pvt. Ltd

JEOL India Pvt. Ltd

Odisha Hydro Power Corporation Ltd

ABOUT THE CONFERENCE

Science and materials has continuously evolved through decades. ETET-2020 was organized in Oct- 2017 and was successful in capturing the development of materials and processing. Department of Civil and Mechanical Engineering, NIT, Bhubaneswar is organizing ETET-2020 to showcase recent advances in materials processing and applications. In keeping up with the research interest of the materials community, ETET-2020 will provide an update on scientific and technical aspects covering broad areas of interests in engineering materials, processing and applications.

ABOUT THE DEPARTMENT

The Department of Civil and Mechanical Engineering has been in existence since 2009 with the inception of the college with an initial intake capacity of 60 and is producing high quality technical manpower needed by industry, R&D organizations, and academic institutions. The intake capacity was enhanced to 120 in the year 2011.The Department has full fledged faculty members who are specialized in the fields of design, thermal, production and CAD/CAM. Laboratories are fully equipped to enhance the knowledge of the student, periodic industry trips and visits to various project sites are arranged. Special lectures and seminars are held on a frequent basis to assist them tailor in their particular areas of interest and trying hard to transform students of even mild talent to professionals in the mechanical and mechatronics field. Already more than 750nos of alumni have been produced so far, placed in different Government, private, Public & other sectors and some of them have pursued higher studies. However, with the progress of time, many more frontier areas of mechanical engineering have been taken up for active research.

ABOUT THE INSTITUTE

Established in the year 2009, Nalanda Institute of Technology (NIT) is one of the premier engineering colleges in the self-financing category of Engineering education in eastern India. It is situated at temple city Bhubaneswar, Odisha and is a constituent member of Nalanda Educational Trust. This reputed engineering college is accredited by NAAC, UGC and is affiliated to BPUT, Odisha. NIT aims to create disciplined and trained young citizens in the field of engineering and technology for holistic and national growth.

The college is committed towards enabling secure employment for its students at the end of their four year engineering degree course. (The NAAC accreditation in the year 2018 vouches for the college's determination and dedication for a sustainable learning environment). The academic fraternity of NITT is a unique blend of faculty with industry and academic experience. This group of facilitators work with a purpose of importing quality education in the field of technical education to the aspiring students. Affordable fee structure along with approachable location in the smart city of Bhubaneswar, makes it a preferred destination for aspiring students and parents.

The Institute works with a mission to expand human knowledge beneficial to society through inclusive education, integrated with application and research. It strives to investigate on the challenging basic problems faced by Science and Technology in an Inter disciplinary atmosphere and urges to educate its students to reach their destination, making them come up qualitatively and creatively and to contribute fruitfully. This is not only its objective but also the ultimate path to move on with truth and brilliance towards success.

Organizing Committee Members

PATRON:

Prof. Malaya Kumar Padhi
Vice-Chairman
Nalanda Institute of Technology

Director/ Principal
Prof. N.H.S. Ray

Jt. Organizing Secy.
Prof. (Dr.) M K Palo

Convener
Prof. (Dr.)B.P. Samal

Treasurer
Prof. Bhabagrahi Dash

Organizing Secy.
Prof. Sai Satyananda Sahoo

Jt. Treasurer
Prof. SoumyaRanjan Satapathy

NATIONAL ADVISORY COMMITTEE

Dr. B.P. SAMAL
Professor
Department of Mechanical and Industrial Engineering
Indian Institute of Technology
Roorkee

Dr. Mohit Law
Professor
Department of Mechanical Engineering
Indian Institute of Technology, Kanpur

Dr. S.S. Mishra
Professor
Department of Materials and Metallurgical Engineering
National Institute of Technology, Patna

Dr. Manas Kumar Behera
Institute Chair Professor
Department of Mechanical Engineering
Indian Institute of Technology,
Bombay

Dr. Priyabrata Sahoo
Professor and Head
Department of Civil Engineering
Indian Institute of Technology, Bombay

Dr. Laxmidhar Behera
Distinguished Visiting Professor
Indian Institute of Technology, Mandi

LOCAL COMMITTEE MEMBERS

Prof. Shakti Prasad Jena
Department of Mechanical Engineering

Prof. Satyaban Sahoo
Department of Mechanical Engineering

Prof. Sipra Mohapatra
Department of Civil Engineering

Prof. Edara Krishna Reddy
Department of Civil Engineering

Prof. Narottam Sahoo
Department of Computer Science Engineering

Prof. Shakti Charan Panda
Department of Computer Science Engineering

Prof. Manas Kumar Samantaray
Department of Mechanical Engineering

Prof. Dharamananda Barik
Department of Mechanical Engineering

Prof. Bikash Kumar Swain
Department of Electrical Engineering

Prof. Subhashree Tripathy
Department of Civil Engineering

Prof. Prativa Samal
Department of Civil Engineering

Prof. Rajendra Kumar Roul
Department of Civil Engineering

Prof. Suvendnu Mohan Kumar Basantia
Department of Electrical Engineering

Prof. Bipin Bihari Bhoi
Department of Basic Science
& Humanities

Prof. Prafulla Dwibedi
Department of MBA

Prof. Abhijeet Chhatar
Department of Civil Engineering

Prof. Pragyan Priyadarshini
Department of Civil Engineering

Prof. Ashish Kumar Das
Department of Civil Engineering

Conference Committee Management

1. **Reception Management**
   - Laxmipriya Nayak
   - Dipika Swain
   - Rasmita Swain
   - Jhuma Naik
   - Pallabi Priyadarshini

2. **Transit/Accommodation Management**
   - Chandaneswar Mohapatra
   - Nityananda sahoo
   - Sakta Ranjan Das
   - T. Rammohan Ra

3. **Seminar Hall Management**
   - Nabakishore Champia
   - Pravat Ranjan Mishra
   - Mousumi Nayak
   - Uttam kumar Nayak

4. **Catering Management**
   - Ranjan Swain
   - Nursingh charan Dalai
   - Dusmant Behera
   - Ranjan Swain

5. **Printing/Stationary Management**
   - Satish Kumar Pattanayak
   - Karunakar Nayak
   - Jatin Kumar Mohanty
   - Satyajit Mangaraj

6. **Design Team**
   - Gandhi Rath
   - Rabindranath Biradalai
   -

7. **Anchoring In Inauguration Ceremony**
   - Sambit Kumar Mohanty
   - Ranjita Patra

Conference Sub-Committee Management

- Pradeep Kumar Dash
- Shakta Ranjan Das
- Debashish Arup Sahoo
- Dipti Ranjan Pradhan

CHAIRPERSON'S MESSAGE

On behalf of the Organizing Committee, it is my great pleasure to welcome you to National Conference on Emerging Trends In Engineering & Technology (ETET-2020). In our endeavour to raise the standards of discourse, we continue to remain aware in order to meet with the changing needs of our stakeholders. The idea to host the ETET-2020 is to bring together Researchers, Scientists, Engineers, Scholars and Students in the areas of Civil and Mechanical Engineering. The ETE-2020 Conference will foster discussions and hopes to inspire participants from a wide array of themes to initiate Research and Development and collaborations within and across disciplines for the advancement of Technology. The conference aims to bring together innovative academic experts, researchers and Faculty in Engineering and Management to provide a platform to acquaint and share new ideas. The various thematic sessions will showcase important technological advances and highlight their significance and challenges in a worldof fast changes. I welcome all of you to attend the plenary sessions and invite you to interact with the conference participants. The Conference Committees will make any possible effort to make sure that your participation will be technically rewarding and a pleasurable experience.

I am looking forward to meeting you in during ETET-2020 and to sharing a most pleasant, interesting and fruitful conference.

With regards,

Prof. Malaya Kumar Padhi
Vice. Chairman
Nalanda Institute of Technology, Chandaka
Bhubaneswar, Odisha

PRINCIPAL'S MESSAGE

It gives me great pleasure to welcome you to the National Conference on "Emerging Trends In Engineering & Technology" (ETET-2020), which will take place from October 21–23, 2020.

This conference's goal is to spread knowledge among other educated people in addition to discussing current, hot topics in a certain field. Dramatic advancements have been made in engineering and technology over the years. I am hoping that ETET-2020 will turn out to be the most beneficial national conference devoted to showcasing the newest developments in engineering and technology.

We have asked eminent specialists to participate in the Technical Programs in order to give an exceptional technical level for the conference presentations. Technical seminars and keynote plenary sessions will be held.

I hope ETET-2020 will make you aware of state-of-the art systems and providea platform to discuss various emerging technologies in Civil and Mechanical Engineering.

With regards,
Prof. (Dr.) N.H.S. Ray
Principal
Nalanda Institute of Technology, Chandaka
Bhubaneswar, Odisha

CONVENER'S MESSAGE

The Mechanical and Civil Engineering Departments collaborated to conduct the distinguished National Conference on "Emerging Trends In Engineering & Technology" (ETET-2020) with the goal of sharing advancements in current technologies. The goal of ETET-2020 is to showcase the most recent findings and research in the fields of mechanical and civil engineering by scientists (preferable undergraduate and graduate students, research fellows, post-doctoral scientists, academicians, and working professionals). Prominent speakers who will concentrate on related cutting-edge technologies in the conference areas will give papers and research papers at the conference.

I wish all the success to the conference ETET-2020

With regards,Prof.
(Dr.) B.P. Samal

Professor and HOD of Mechanical Engineering
Nalanda Institute of Technology, Chandaka
Bhubaneswar, India

Contents

Using Cement Kiln Dust as a Sustainable Material to Stabilize Clayey Soil

[1*] *Mr.Bhabagrahi Dash,* [2]*Ms. Pramoda Priyadarshini Pradhan*
[1*]*Asst. Professor, Dept. of Civil Engineering, NIT BBSR,*
Asst. Professor Dept. of Civil Engineering, STAR, BBSR
[1*]*bhabagrahidash@thenalanda.com, pramoda1992@gmail.com*

Abstract
Reusing byproduct waste products that lead to significant environmental issues is one of the tenets of sustainability. The findings of a number of laboratory tests using waste cement kiln dust (CKD) as a soil stabiliser are presented in the current study. Four percentages of cement kiln dust (CKD) content—5, 10, 15, and 20 by dry weight of the soil—were applied to a clayey soil as a treatment. Several curing ages, including 1, 4, 7, 30, 60, and 90 days, were taken into consideration to explore the impact of the curing age on the behaviour of the treated soil. Based on the results of the compaction parameters, consistency limits, unconfined compressive strength, permeability, and durability (freezing-thawing), the rate of improvement of the treated soil was evaluated. The findings indicated a significant improvement in the investigated qualities, and it was determined that 5% by dry weight of the soil was the ideal level of CKD. In comparison to untreated soil samples, the unconfined compressive strength of treated soil samples with 5% CKD rose by 43% after one day and by 238% after 90 days of curing. For soil treated with CKD concentration of 5, 10, 15, and 20%, respectively, the plasticity index was decreased by 7.9, 26.3, 43.1, and 57.9%. The treated soil's coefficient of permeability was significantly decreased. Also, the results demonstrate that the treated soil's durability was much increased, and this improvement is proportional to raising the percentage of CKD content for both (freezing-thawing) and (wetting-drying)tests.

Keywords: by-product waste, cement kiln dust, soil stabilization, curing age, durability tests.

Introduction
The most often utilised building construction material is thought to be cement. The world's demand for cement is rising, creating enormous by-product wastes of cement kiln dust. The environment is endangered by the cement industry's annual exploitation of several natural resources to meet the demand for cement, which leads to the massive waste generation of CKD by-products. More than 3.4 billion tonnes per year in 2012, rising to 4.3 billion tonnes per year in 2014 [1-3]. According to research, between 0.6 and 0.7 tonnes of CKD are produced for every tonne of cement produced [4-6]. Since a significant amount of cement is produced each year, there are roughly 2.4–2.8 billion tonnes of CKD produced globally each year. In order to address this issue, research is being conducted worldwide to identify efficient use for cement dust, such as soil enhancement. It is shown that the chemical processes and hydration products in CKD are comparable to those seen in cement. Thus it is a possibility to use CKD as a cement substitute for large-scale city or national projects.

Digital Railway as a Prerequisite for Knowledge Management-Based Interactions between Business, Science, and Education

[1*] *Mr Biswaranjan Tripathy,* [2]*Ms. Adyasa Das*
[1*] *Asst. Professor, Dept. of Civil Engineering, NIT BBSR,*
Asst. Professor Dept. of Civil Engineering, NMIT, CTC
[1*] *tripathy.b8@gmail.com , dasadi77@gmail.com*

Abstract

The railway sector and the nature of railroad workers' jobs have undergone a significant transformation as a result of digital railway systems, sometimes known as "digital railways." The knowledge-based economy, knowledge management, and knowledge management technologies are all closely related to the digital changes in business and higher education, which in turn are closely related to the Digital Railway. In order to shed light on the location of the Digital Railway within the context of the digital economy, an ontology that is defined by cause-effect and aggregative linkages reflecting transformation chains in diverse realms of human activity is offered. The article makes the case that the concept of "a smart contract," which can be reduced to artificial intelligent agents acting as intermediaries to provide interaction between the non-human and human roles in a business process, is best understood applying to the role of the Digital Railway in changing mechanisms of interaction between industry and universities, which are also specialised research centres with closer ties to the industry. With the use of smart contracts, the Digital Railway might serve as a model for the creation of hybrid corporate intelligence based on the redistribution of knowledge about the industry between artificial intelligent agents and workers This viewpoint assumes that the formalisation of operational rules and regulations into a shared knowledge base in the form of ontologies is implied by the process of corporate informationalization as perceived through a system of artificially intelligent agents. The suggested concept can be applied at academic institutions where smart contracts might enhance professional development as a business activity.

Introduction

The research literature on the creation of a "smart" transportation infrastructure emphasizes how digital railway systems, often known as "digital railways" (DR), have fundamentally altered the industry's capacities and the character of railroad workers' jobs. At the same time, the digital economy's logical outcome is the DR. With the implementation of the DR projects, a considerable drop in the cost of moving people and products is anticipated, together with an increase in the transport mode's capacity. High-speed railroads have historically formed the DR core as a set of digital signaling, control, and communication technologies. A significant illustration of the integrated DR scientific and technology initiative is the United Kingdom. Similar initiatives are being carried out in the EU, the USA, Russia, China, Australia, and other nations.

A thorough analysis of pertinent literature indicates that the DR notion is subject to many interpretations. A shared semantic core can be found, though. Together, these technologies are causing fundamental shifts in all spheres of activity for railroad transportation companies and their competitors, including the social one. According to Jones [1], the DR is connected to the introduction of new technologies that fundamentally alter the operating principles, guidelines, and professional activities of railroad employees.

Impact of Deep Softeners on Soils with Heavy Mechanical Compositions and Challenging Meliorative Conditions, Including Irrigation, Salt Washing, and Cotton Yield

[1*] *Ms. Deepali Barik,* [2]*Mr.Abhijit Kumar Diwedi*
[1*] *Asst. Professor, Dept. of Civil Engineering, NIT BBSR,*
Asst. Professor Dept. of Civil Engineering, ABIT, CTC
[1*] *deepali001@thenalanda.com , diwediabhijit@thenalanda.com*

Abstract. The economics of high-quality saline washing and irrigation water for saline soils were studied in the paper by digging up medium-coarse soils with a mechanical composition of melioration, plaster, and salinity under the conditions of the Bukhara region. In the experiments, the field may be softened in three different ways: by ploughing at a depth of 35 cm in the first experiment, 60 cm in the second experiment, and 80 cm in the third trial. The standard for salt washing during the tests was set to 6480 cbm/ha in the first variant, 5210 cbm/ha in the second variant, and 5010 cbm/ha in the third variant. The 102 varieties used in the first experiments on irrigation in Bukhara ranged from 5821 cbm/ha for the control variety to 5284 cbm/ha for the second variant, and 5100 cbm/ha for the third version. Over the season, they received five irrigations. Due to the increase in cotton yield to 0.39 t/ha in variant 2 and 0.129 t/ha in variant 3 compared to the control, good grade cotton was collected concurrently. And the situation with land reclamation got better. In comparison to the control, variant 2 had 0.003 less chlorine ions in the active layer. In variants 2 and 3, the amount of dry residue fell by 0.058% and 0.063%, respectively.

Introduction

Both in Europe and in arid climate locations, densified soils are extensively found worldwide. According to the global gypsum situation, densified soils cover around 200 million hectares worldwide, mostly in arid regions. The typical high gypsum and threeraydi salinity of soils result in low fertility in these types of soils. The most urgent challenges of chemical reclamation, including those associated with technologies that require less environmentally friendly water and resources, are the development of new, contemporary approaches to the use of such lands in agriculture, the provision of water to arid areas, the assessment of the possibilities and expediency of improving their land reclamation, taking into account the complexity and costs of land reclamation measures [1, 3, 5, 9]. One of the key tasks in this regard is the development of techniques and technologies aimed at enhancing the productivity of saline, gypsum, irrigated soils as well as the cultivation of bio-improvement crops. The stagnation of agricultural output, their economic and political stability, and guaranteeing the food security of the population and nations of the world are some of the most crucial challenges. Significant economic costs and threats to humanity result from soil degradation. Various types of soil degradation exist in many countries, and they control the sorts of improvement. The selection of efficient methods to improve the fertility of saline and gypsum soils, irrigation during vegetation and novegetation periods, and proper water utilisation when using chemical preparations for salt washing continue to be critical problems. [1, 2, 6, 11, 21].

BIOFUELS MADE FROM ALCOHOL FOR INTERNAL COMBUSTION ENGINES

[1] Dr. monalisha mallick, [2]Mr. Sudeep Kumar Patra*
[1]Asso. Professor, Dept. of Civil Engineering, NIT BBSR,
Asst. Professor Dept. of Civil Engineering, GEC, BBSR
[1]monalishamallick@thenalanda.com, patrasudeep@gmail.com*

Abstract. It is acceptable to utilise alcohol biofuel (BF) in internal combustion engines (ICE). Analyzed are potential applications for methanol (CH3OH), ethanol (C2H5OH), butanol (4H9), and methyl ether. These alcohols and esters' experimental properties are discussed, and it is demonstrated that they have an ecological benefit over diesel fuel (DF).

Developed nations are forced to enact legal limitations on toxic and smoke emissions from vehicles due to the global environmental condition, particularly in large cities. For instance, 90% of all dangerous material emissions from all forms of transportation in Russia come from motor vehicles. As a result, the issues with road transportation's environmental safety are crucial to the nation's environmental security. This issue is becoming more significant and serious every year. There are over 5,000 big and medium-sized road transport businesses operating in Russia's transportation system that convey both passengers and freight. Changes in ownership and activity have minimal environmental impact. The average annual rise in vehicle emissions is 5%. Its value exceeds 10% in significant metropolitan centres [1–9].
With EG, each car releases more than 200 distinct substances into the atmosphere. Hazardous compounds found in EG are dispersed and changed in the atmosphere in predictable ways. Gravitational forces cause solid particles to settle on the surfaces underneath them. Total hydrocarbons (xHy), which are small particles and contaminants, are dispersed in the atmosphere through diffusion and take part in local physical and chemical interactions on certain regions' local territories. As a result, not only within the nation but also within the framework of the UN economic Commission for Europe, the standards are continuously updated. The current top focus in motor transportation is environmental requirements. The eco-friendliness of automobiles is being included by manufacturers at this same time, and it shouldn't deteriorate when they are in use [10–17].

Due to their higher efficiency, power output, torque, durability, and reliability compared to gasoline engines, diesel internal combustion engines (ICE) are indispensable in public transportation, heavy equipment, power production, agricultural, and industrial equipment. Yet the production of gaseous and particle air pollutants by diesel ICE is substantial. These emissions contribute to the spread of disease and can lower human immunity. [18-23].

STUDY OF TOXICITY OF DIESEL ENGINE ON ALCOHOL FUEL

[1*] *Dr. Sivasubramaniam,* [2]*Ms. Milan Mohanty*
[1]*Asso. Professor, Dept. of Civil Engineering, NIT BBSR,*
Asst. Professor Dept. of Civil Engineering, EATM, BBSR
[1*] *rdarakrishna@thenalanda.com , milanmm67@gmail.com*

Abstract. The study provides evidence in support of the use of alcohol fuels in diesel engines. It is demonstrated that the best emulsion to use to create alcohol fuel for a diesel engine contains the following ingredients: ethanol at a concentration of 25%, succinimide C-5A, a detergent dispersing additive, at a concentration of 0.5%, water at a concentration of 7%, and diesel fuel at a concentration of 67.5%. Experimental research on the impact of ethanol-fuel emulsion as a substitute fuel on the environmental properties of a diesel engine has produced some conclusive findings, which are described below. The exhaust pollutants from the diesel engine are reduced by 4.8 times less soot, 40.3% less nitrogen oxides, 26.6% less carbon dioxide, and 28.6% less carbon monoxide as a result of switching to an ethanol-fuel emulsion.

Introduction:

The current scientific, technical, and technological state of the domestic engine industry in terms of environmental, fuel, and economic indicators in the context of market relations and restrictions on the harmful environmental effects of components of combustion products of diesel engines forces engine-building plants to fundamentally restructure their technical policy while taking environmental regulatory requirements into account. Thus, it is essential to consider other energy sources that are not derived from oil. [1-3].

The use of alternative mixed fuels based on ethyl alcohol in transportation offers a solution to these issues because it enables the replacement of petroleum-based fuels, greatly increases the supply of raw materials for the production of motor fuels, and makes it easier to address the problems associated with the modernization of fuel systems in vehicles and stationary installations. The ability to obtain fuels with the necessary physical and chemical qualities enables deliberate improvement of the functioning of diesel engines, improving fuel efficiency and Lowering toxicity [4-6].

The Vyatka State Agricultural Academy conducted research on the conversion of diesel engines to run on ethanol-fuel emulsions based on the Department of heat engines, automobiles, and tractors (EFE) Studying the physical and chemical characteristics of the alcohol emulsion and how they affect the functioning of the diesel engine will help maximise the benefits of using emulsions as an alternative motor fuel. Ethyl alcohol and water, as well as diesel fuel and additives, are two mutually insoluble liquids that combine to form EFE, which is a dispersed system. The emulsion is an unstable system that has a persistent tendency to return to its initial (phase-divided) condition, which is previously predetermined by stabilityStability, or how long it takes for layers with varying concentrations to form once the emulsion is prepared, is largely dependent on the physical characteristics of the emulsion's constituent parts. [10-12].

It is necessary to use relatively inexpensive additives to enhance the physical and, of course, operational characteristics of ETE. These additives must fulfil the following criteria: completely burn in the engine without deposit formation; do not degrade the fuel's properties; increase the emulsion's stability; dissolve well in the fuel and its components; be stable; not too volatile; and persist in the fuel under various operating conditions. The additives that satisfy these parameters are responsible for succinimide C-5A. Succinimide C-5A is a member of the group of additives that disperse detergents. It is a concentration of succinic acid alkenylamide with a high molecular weight in oil. [13, 14]

Models for the Dispersal of Emergency Emissions from Petroleum-filled Railroad Tanks

[1*] *Ms. Edara Krishna Reddy,* [2]*Ms. Puja Priyadarshini Sahoo*
[1*]*Asso. Professor, Dept. of Civil Engineering, NIT BBSR,*
Asst. Professor Dept. of Civil Engineering, INDIC, BBSR
[1*]*rdarakrishna@thenalanda.com , sahoopuja@gmail.com*

Abstract: Basic distribution plans for pollutants have been created in the vicinity of a technical train stop at a distance of up to 1000 metres in all directions, taking into consideration all structures situated in the study area, in the case of the destruction or explosion of tanks with oil products. Based on an analytical evaluation of emergency outcomes, it was determined that in the event of the devastation or explosion of railroad tanks carrying oil products, 90 to 95% of commercial and public facilities would be situated in an area where the MPC would have been exceeded by 200 to 300 times. The upper limits for pollutant concentrations in parking lots and for flushing tanks used for the transportation of oil and oil products have been determined. The highest excess will occur at a distance of 300 meters from the tank car parking, where it is possible to exceed the MPC by 300 times for all priority polluting components. The calculation of the maximum allowable concentration of polluting components was done at a distance of more than 1000 meters in each direction of light from the source of emissions.

Introduction

After determining the amount of abnormal PC leaks caused by the container for storing and transporting oil and oil products bursting or losing its tight seal, the calculation of diffusive inflating of the PC by air flows was identified.

Priority contaminants that were leaked from tanks holding oil products have been calculated. Maps depicting the spread of pollutants in the event of the explosion or destruction of oil tanks for a range of up to 1000 metres in all directions have been created. The maps contain the information about specific

Principles of Waste-Free Technology Development and Application in the System of Recycled Water Supply and Water Purification

[1*] *Dr. Harish Chand Giri,* [2]*Ms. Sriya Subnam Mohanty*
[1*] *Professor, Dept. of Civil Engineering, NIT BBSR,*
Asst. Professor Dept. of Civil Engineering, SEARC, BBSR
[1*]*harishchand@thenalanda.com, sriya002@gmail.com*

Abstract. To minimize the impact on nature while maintaining the current level of productivity and quality, it is important to fundamentally alter the general approaches to environmental efficiency of production. Nowadays, long-term actions are adopted more frequently during the design and building phases in order to eliminate the causes of pollution in advance rather than to have its impacts in the future. This replaces the temporary measures intended to combat pollution's effects. The methods and tools that were formerly utilised to gather and get rid of industrial waste are now viewed as a passive method of protecting the environment. The issue is that the production process continues to produce about the same quantity of trash, which does not comply with the current environmental standards. The proactive strategy entails the development of cutting-edge low-waste and non-waste technologies that can effectively utilise raw materials in industrial processes and transform waste into readily recyclable components that are least detrimental to the environment. The paper takes into account the basic tenets that capture the core of the proactive approach to advancing industrial technology for environmental protection. It is primarily concerned with researching the characteristics of water purification and recycled water supply.

Introduction

A method of structuring technical operations known as "waste-free production" entails limiting or completely recycling manufacturing waste in order to obtain secondary material resources. Using technical systems with closed material and energy flows that are balanced in terms of their primary constituents is important for waste-free production. The example of electrochemical production can be used to demonstrate the balance of technical frameworks: the primary byproducts of the electrolysis of NaCl are NaOH and C12. The demand for the first product, however, is significantly higher, and in order to balance the technological plan to generate chlorine, such a plan contains procedures to produce organochlorine and other goods, which consume extra chlorine produced by electrolysis.

High-Pressure Common Rail Pumps Have Wear Difficulties

*[1]Miss. M Priyadarshini Sarangi, Dr. Harish Chand Giri
[1]Asst. Professor, Dept. Of Civil Engineering, SEARC, BBSR,
Professor, Dept. of Civil Engg, NIT, BBSR
*[1]mpriyadarshini89@gmail.com, harishchand@thenalanda.com

Abstract. The most vital parts of contemporary fuel injection systems are high-pressure pumps. A contemporary method that equips cars with either a diesel or a gasoline engine is common rail. The design of the pumps varies greatly depending on the fuel type and is more complicated for diesel engines that are more prone to wear. The parts that are worn out are those that are in constant contact, such as the plunger and hydraulic head assembly with valves and the driving shaft with roller and shoe. Wear is brought on by errors in the production process, poor use of the high-pressure pump, and other factors. Unsuitable material hardness, unsuitable coating, incorrect or incomplete machining, incorrect clearance or misalignment between components, unsuitable surface finish, dimensions outside of tolerances, unsuitable assembly process, unsuitable lubrication, contamination, or operating at high loads and temperatures can all be factors affecting wear. In this article, we'll identify, discuss, and highlight the several types of wear that common rail high-pressure pumps experience, emphasising how this wear affects the pumps' operation. By paying closer attention to the design details, manufacturing processes, and proper use of the high-pressure pumps, wear can be avoided.

Introduction

The majority of combustion engines in use today are outfitted with the high-pressure common-rail system, a contemporary fuel injection technology. It is made up of a high-pressure pump, injectors, a high-pressure accumulator (rail), and an electronic control unit (ECU) that regulates the entire system to ensure that the engine runs smoothly and emits little pollution [1]. The high-pressure accumulator can receive high-pressure fuel from the pump, a sophisticated device. By compressing the fuel at high pressures, pump components are put under heavy strains. The hydraulic head assembly and powertrain components are the pump's most strained subassemblies.

The driving shaft, roller, and shoe, which functions as the plunger to compress the gasoline in the compression chamber, make up the drivetrain. These parts are constantly in contact with one another and are lubricated by fuel. When the pump is running, it's possible that certain sections could lose their fuel film and experience extremely high friction, which would raise their operating temperature. It is obvious that this behavior causes wear.

The hydraulic head assembly, which includes valves and a plunger, transforms low pressure fuel into high pressure fuel. These valves have straightforward designs; the intake valve is made up of a spring, a stem, and a conical seat, while the outflow valve is made up of a spring, a ball with a spherical seat, and both [2]. Due to the plunger's motion compressing the fuel, the valves are subjected to cyclic loads and are more vulnerable to fatigue.

A Small Agricultural Producer's Use of Novel Technology to Increase the Efficiency of Honey Extraction

Miss Samata Pattanaik, Mrs.Pragyan Priyadarshini*
[1]Asst. Professor,Dept. Of Civil Engineering, REC, BBSR,*
Asst. Professor, Dept. of Civil Engg. NIT, BBSR
Psamata91@gmail.com, pragyanpriyadasini@thenalanda.com*

Abstract
In Russia, making honey and wax is regarded as a traditional form of agriculture that produces valuable, biologically active food for the populace as well as raw materials for the industrial sector. Numerous sources claim that the number of bees is rapidly declining every year. A relatively laborious method of gathering honey, in which a small percentage of the hive perishes, is one of the factors causing the population of bees to decline. The research explores the potential application of novel Australian Flow Hive technology, which enables free flow of honey downward. Honey is extracted with this technology without disturbing the bees, unlike traditional extraction methods. Durable plastic mobile honeycombs are the key component of a FlowHive beehive's technological secret. The vertical gaps are adjusted by one-half of a cell by twisting a particular knob, allowing the honey to flow through the cells, into a channel at the bottom of each frame, and out into a collection jar. In order to determine the efficiency of novel beehives in small agricultural output, the paper provides a collection of data. It proves that once put into practise, innovative hives not only boost earnings but also cut costs for essential production.

Introduction

Nowadays, the production of honey is carried out by over 5,000 businesses and 300,000 ardent farmers, individual business owners, and beekeepers. In Russia, annual production of honey is over 50,000 tonnes (the data has varied over the past 19 years). Beekeeping production by farm type experienced a dramatic fall as a result of agricultural changes. Instead of agricultural enterprises, households are the primary producers of commodities [1].

The number of bee colonies in agricultural operations was significantly reduced seven times beginning in 2006 compared to the prior decade, and the number is still fast decreasing. When comparing real honey consumption in Russia (0.4 kg per resident) to that of economically developed foreign nations (more than 2 kg per resident), it is clear that beekeeping cannot currently supply the demands of the population. Also, due to inadequate honey harvests brought on by harsh weather conditions and the recent global extermination of bees, the price of honey has increased significantly.

The Examination of the Environmental Friendliness of Energy Generation from Diverse Raw Material Sources

[*1] *Miss. Sushree Samita Pradhan, Mr. Soumya Ranjan Satapathy*
[1*] *Asst. Professor, Dept. of Civil Engg. AIET, BBSR,*
Asst. Professor, Dept. Of Civil Engineering, NIT, BBSR,
[1*] *sushree112@gmail.com, soumyaranjan@thenalanda.com*

Abstract. The article supports the requirement to evaluate the energy effectiveness of energy generation from different fuel types. The most important metrics for measuring the environmental effectiveness of fuel consumption in the production of electricity are established. A system is put out for judging how environmentally friendly different power generation techniques are. Results of the research are presented.

Introduction:

The consumption of primary energy and electricity has significantly increased in recent years as a result of the economy's inventive growth [1–7]. Oil, coal, gas, and uranium are currently the most sought-after materials for energy generation [8–15]. They will continue to be the primary energy sources in the ensuing decades (30, 23, 24, 12%, respectively). Nonetheless, it is clear that there is a finite supply of oil and gas. Only after several decades is their active use clearly obvious. A substitute for these raw material sources should be ready within this time [4, 5, 6, 16–19]. So, the creation of new technologies that enable the utilisation of renewable energy sources is required. Solar energy is one of them [19–28].

Five times as much energy comes from fuel energy sources as solar energy does on a yearly basis. Geothermal and wind power are still available. Almost all of the resources available to hydropower have already been mastered [29–31]. Small hydropower plants are the exception, and they are currently actively being resurrected. Nonetheless, they are unable to contribute much to the total amount of energy produced. Except for hydropower, the majority of renewable energy sources are low potential systems. This means that they cannot be used to produce the large energy capacity required for the operation of modern industry.

Creating a Second Freshwater Source Infrastructure Would Ensure That Coastal Areas Can Maintain Their Environmental Sustainability

[1*] *Ms. Monalisha Mohanty,* [2]*Mr Rakesh Kumar Nayak*
[1*] *Asst. Professor, Dept. of Civil Engineering, NIT BBSR,*
Asst. Professor Dept. of Civil Engineering, GITAM, BBSR
[1*]*monalisa001@thenalanda.com,rakesh91@gmail.com*

Abstract. The work is centred on the search for new fresh water sources for coastal areas using resource-saving technologies as well as the essential justification for the design and implementation of the suggested structures in real time. The Krasnodar region's coastal areas are identified as suitable locations for above-ground and subsurface freshwater reservoirs in the article. In the article, an innovative idea for the seasonal freshwater basin is developed in an effort to meet the needs of the people by collecting the volume required during the peak consumption season. Given the geological characteristics of the local area, the mountain gorges are chosen as the primary location for the pool. The outcomes of the analytical analysis will afterwards aid in optimising helpful solutions with the goal of moving forward with the practical application of the suggested and appropriate actions.

Introduction

During the 20th century, the topic of declining fresh water supplies has been seen as a pressing worldwide issue that needs special attention for a solution, as is well reflected in the academic literature [5, 6, 7]. This is especially true for border resort regions where environmental safety needs to be increased. More than 20% of the world's population, according to government statistics, resides in a region where fresh water is scarce [8]. The majority of them are in developing nations, where this issue is caused by the inadequate infrastructure used to get water from rivers and aquifers. All of this necessitates the development of freshwater supply expansion strategies. Many approaches to resolving this issue have been developed over many decades. This was accomplished by building an infrastructure of aqueducts, canals, and dams that could meet the needs of the inhabitants in a particular region. Engineering techniques for the provision of fresh water have made it possible to develop remote regions of our globe by removing the dependence of generated water bodies on their physical location. However, given the present patterns and rapid population expansion, the developed solutions are no longer able to properly address the full provision of fresh water.

These issue areas include parts of the Krasnodar Territory, particularly the coastal area with resort towns where water demand is highest in the off-season. Natural water resources based on natural sediments can be used to tackle this issue. At the same time, it's important to remember that the mountain gorges should be picked since they can handle more infrastructure that will supply water sources. The geographical characteristics of the Southern Federal District's scenery must also be taken into account.

Examination of the Diesel Engine's Environmental Indications While Operating On Methanol

*Mr. Biswanath Madali, Miss. Deepali Barik
[1*]Asst. Professor, Dept. Of Civil Engineering, SIET, DKL,
Asst. Professor, Dept. of Civil Engg. NIT, BBSR
[1*]Biswa_990@gmail.com, deepali@thenalanda.com

Abstract. Internal combustion engines have an increasing detrimental impact on the environment, which has led to a variety of global issues that have recently gotten much worse for humanity. Reducing the toxicity of engine exhaust emissions has become a global issue that affects all nations. Reducing the toxic content of diesel engines is an urgent challenge that the federal government is considering. Hazardous components of engine exhaust gases that enter the atmosphere are transported by air currents across great distances. The application of the most practical methyl alcohol use for a diesel engine is taken into consideration. The article offers a study of the main hazardous components and an overview of the primary ways of utilising methanol in engines. The efficiency of utilising methanol as a motor fuel was determined based on the findings of laboratory and bench investigations of various load and speed modes of a diesel engine running on methanol and diesel fuel. Data on the quantity of the main components in the exhaust gases were also acquired.

Introduction: The exhaust gases of internal combustion engines contain more than two hundred different individual hydrocarbons. Of particular importance are the emissions of benzene, toluene, polycyclic aromatic hydrocarbons. This group of highly toxic substances is formed as a result of pyrolysis of lightand medium fractions of fuel at high temperature. Such conditions occur during the working stroke near the cold surfaces of the cylinder with a lack of oxygen. These hydrocarbons belong to the groupof carcinogenic substances [1].

The next element that is formed in the exhaust gases is soot. Soot is a solid carbon particle with a size of 0.4...5 microns with low water content. Being in the exhaust gases, soot adsorbs on its surface hydrocarbons, including carcinogenic, and becomes toxic. Soot is formed as a result of pyrolysis of fuel molecules at high temperatures (over 1500 K) in conditions of a strong lack of oxidizer. The content of soot in the exhaust gases of the spark-ignition engine is insignificant. The problem of soot formation is most inherent in diesel. The combustible mixture formed in the cylinder of a dieselengine, in which the rate of combustion is mainly limited not by the rate of chemical reactions, but by the rate of mixing is limited by the diffusion of fuel vapors and air. As a result, zones with rich, stoichiometric and poor mixture are formed in the diesel cylinder [2].

Soot is not the only solid found in exhaust gases. Other solids are formed from sulfur contained in fuel, petroleum aerosols, and unburned fuel oil. In addition, exhaust gases may contain products of wear of the cylinder. All these substances have received the General name "solid particles".Nitrogen oxides are formed from nitrogen and oxygen in the air, which begin to react with each other at high temperatures (over 2000 K). The composition of engine exhaust gases depends on the type of engine (diesel or spark ignition engine), fuel type, additives and oils, engine operating mode, its technical condition, driving conditions and other factors.

Environmental Remote Monitoring Near a Nuclear Power Station

[1*]*Mr. Biswaranjan Samal, Ms Kumar Priyadarsini*
Asst. Professor, Dept. of Civil Engg. NIST, Berhampur,
Asst. Professor, Dept. Of Civil Engineering, NIT,
[*1]*biswaranjan003@gmail.com, priyadarsinikumkum@gmail.com*

Abstract: The technology for remote monitoring of the radiation characteristics of the surrounding environment and agricultural land around the nuclear power station is discussed in this article. It is suggested to use a radar station to identify radioactive deposits on the surface of the planet and in the atmosphere. Studies on radioactive pollution in the atmosphere and on agricultural areas are presented, along with their findings

Introduction: Experience from throughout the world demonstrates that each year, more and more electric energy is needed for the sustainable growth of civilization in a variety of directions. It is particularly necessary in the manufacturing and processing of agricultural goods as well as in personal life [1–9]. Study of social development trends [1–5] and environmental conditions [10–15] reveals that electric energy is usually produced in great quantities in a restricted area of the country. These locations contain significant cities, industrial facilities, tourist destinations, or extensive agricultural areas. These regions frequently experience challenging environmental conditions. Consequently, the most appropriate course of action is to look for ways to increase the production of electric energy while preserving the environment. Given the enormous amounts of power needed to remedy this issue, nuclear and solar energy are recommended [16–25]. The required power cannot be produced by other renewable energy sources. Hydropower is an exception, but it needs a lot of space and water resources [26–29]. When hydraulic engineering projects are carried out, agricultural areas sustain severe damage (they are flooded).

The first is universal, according to a comparison of nuclear and solar energy's potential. Large expanses and significant solar activity are necessary for solar energy. Therefore, it is illogical to compare the power of nuclear power to solar power [30–35]. As a result, nuclear energy is preferred in the majority of nations, including France [20, 21, 30, 32].

A Review of Approaches to Treating Drill Cuttings with Oil

Mr. Satya Prakash Mohapatra, Miss. Prativa Samal*
[1]Asst. Professor, Dept. Of Civil Engineering, JIET, CTC,*
Asst. Professor, Dept. of Civil Engg. NIT, BBSR
satyaprakashr@gmail.com, prativasamal@thenalanda.com*

Abstract. Oil and gas exploration is becoming more prevalent worldwide, which produces a lot of dangerous drill cuttings that contain oil. A number of oil-based drill cuttings disposal techniques are urgently needed since these oil-based drill cuttings are certain to represent a major hazard to the environment and public health. Nevertheless, there are few technologies that can adequately treat oil-based drill cuttings, which are generated under varied challenging settings, due to their complex composition and the increasingly strict emission rules. As a result, this report clarifies various locations' emissions regulations for oil-based drill cuttings. Also, a thorough comparison of several treatment approaches is provided, and the evolution of such approaches is explored by integrating real-world offshore and shale drill cuttings treatment examples of gas exploration.

Introduction: Oil-based drill cuttings, a by-product of drilling operations, have expanded dramatically as a result of increased oil and gas development in conventional and unconventional resources. For instance, the UKCS (United Kingdom Continental Shelf) produces more than 80,000 t of oil-based cuttings annually [1]. Nonetheless, many nations consider oil-based drill cuttings to be hazardous waste. They are not only challenging to manage, but inappropriate handling of them will seriously harm the environment and public health [2]. Hence, the handling of oil-based drill cuttings has turned into a global issue [3].

Presently, a number of techniques for treating oil-based drill cuttings have been developed, including thermal desorption, solvent extraction, solidification or stabilisation, and bioremediation [4]. Few solutions can, however, handle oil-based drill cuttings that are produced under a variety of difficult situations due to the complexity composition of those cuttings and increasingly strict emission rules.

This document initially describes the various emissions regulations for oil-based drill cuttings in the world's major geographical areas. The various approaches of treating oil-based drill cuttings are then enumerated and contrasted. Lastly, by merging real-world treatment examples for oil-based drill cuttings from offshore and shale gas exploration, the development trend of treatment approaches is explored.

A Comparison of Convolutional Neural Network (Cnn) and Support Vector Machine (Svm) Models for Hyperspectral Picture Classification

Mr. Subhransu Sekhar Rath, Mr. Soumya Ranjan Bhola*
[1]Asst.Professor, Dept. Of Civil Engineering, BCET, BLSR,*
Asst. Professor, Dept. of Civil Engg. NIT, BBSR
Subhra_119@gmail.com, soumyabhola@thenalanda.com*

Abstract. A technique model for the spectral categorization of hyperspectral pictures is presented in this paper. A suitable statistical support vector machine (SVM-Linear) architecture, support vector machine radial basis function (SVM-RBF), and Deep Learning (DL) architecture, which consists of principal component analysis (PCA) and convolutional neural networks (CNN), are used in the applied methodology to first extract neighbouring spatial regions before applying a soft max classifier. PCA is used to minimise the input image's high spectral dimensionality, noise, and redundant data. Given that it produces results that are comparable to each other, including hyperspectral image classification, the SVM-Linear, SVM-RBF, and CNN model is used to automatically extract valuable high-level features The presented methodology, however, uses PCA optimization for spatial regions to construct features that can then be used by the SVM and CNN model to classify hyperspectral images because the CNN and SVM models alone may not be able to extract features with different scales and to tolerate the large-scale variance of image objects. The Hyperspec-VNIR Chikusei datasets were classified experimentally, and the findings demonstrate that the performance of the proposed model is competitive with that of other DL and conventional machine-learning approaches. The SVM-RBF model has a 98.84% overall accuracy that is the best for the Hyperspec-VNIR Chikusei datasets.

1. Introduction

Due to the numerous and mixed features, particularly in diverse metropolitan environments, mapping land cover and land use (LULC) using remote sensing data has long been a challenge. Geographic Information System (GIS) applications, such as urban planning, environmental studies, natural hazard assessment, transportation management, and city designs, frequently use LULC information. Hence, there is always a need for precise, detailed, and high-quality maps. Although field surveying and remote sensing techniques have been the main methods for identifying land use features, in-field measurements of ground truth data collecting for attributing such features have always been a difficult step in terms of time, money, and the accuracy of the information. Given that it can provide rich spectrum and spatial information depending on the system type, hyperspectral imaging (HSI) is a hotly researched topic in the realm of remote sensing [1]. The use of numerous techniques, including kernel machines [2], morphological profiles [3, 4], and deep learning (DL) [5-7] in HSI classification has been thoroughly researched in recent years. The primary goal of research towards the creation of novel and sophisticated classification models is to increase classification accuracy, but

BENEFITS OF DRIP IRRIGATION FOR COTTON FIELDS ON SALTY SOIL IN THE REGION OF BUKHARA

[1] Mr.Soumya Ranjan Satapathy, [2]Ms. Anindita Swain*
[1]Asst. Professor, Dept. of Civil Engineering, NIT BBSR,*
Asst. Professor Dept. of Civil Engineering, GIET, BBSR
[1]soumyaranjan@thenalanda.com, swainanindita@gmail.com*

Abstract. This study compares the effects of adopting drip irrigation with traditional irrigation, starting with the current irrigation method utilised in cotton growing. Drip irrigation has benefits for cotton fields that are intended to conserve water and other resources, as shown by the example of lowering the percentage of losses and raising outputs and crop yields. Thanks to wear-resistant cast iron parts that increased equipment life, these irrigation conditions allowed for the collection and saving of water resources per acre as well as an increase in productivity and a decrease in water consumption for surface irrigation.

1. Introduction

The issue of conserving water resources for adequate crop irrigation in the country's arid regions during the dry seasons of the year has been a priority for the President and the government of theRepublic of Uzbekistan.

On July 10, 2020, the Concept of Water Resources Development for the Republic of Uzbekistan was developed. Drip irrigation will be employed on 600,000 ha of the 2 million hectares that will be covered by water-saving technology, according to the Republic of Uzbekistan's Strategy of Water Resources Development for 2020–2030. A 3.5–4 billion m3 (35–40%) annual water savings is equivalent to 298 thousand hectares. Some land that is currently unusable could be renovated [1]. According to analytical forecasts, of the 7.5 billion people who currently inhabit the planet, 1.1 billion of them deal with water shortages. In the nations using water-saving irrigation technology, notably Uzbekistan as the world's top cotton producer, there is an increasing demand for and focuses on the widespread deployment of drip irrigation systems as a result of population movement to the country's desert regions [2].

Despite a growing population and a pressing need to produce high crop yields, the country has enormous needs for water resources to meet agricultural requirements for field irrigation throughout Uzbekistan [3]. 60% of the water used to make cotton is supplied while the remaining 40% is lost, making water conservation one of the most important tasks for the Ministry of Water Resources, especially in cotton farming, which requires using techniques like salinization, conservation, and groundwater control as well as automation, processing, and technical means to achieve high crop yields in Uzbekistan all year long [4].

Transport Nodes' Evolutionary and Functional Development

[1*] *Mrs. Pragyan Priyadarshini,* [2]*Mr. Binayak Satapathy*
[1*]*Asst. Professor, Dept. of Civil Engineering, NIT BBSR,*
Asst. Professor Dept. of Civil Engineering, MITM, BBSR
[1*] *pragyanpriyadasini@thenalanda.com , binayak_09@gmail.com*

Abstract. The efficacy of the nation's entire logistics system depends on the calibre of decisions made about the development of terminal systems in the regions, which makes the research topic relevant. The status and growth of the transportation system directly affects the state and growth of the economy, agriculture, national security, and, in many ways, the welfare and convenience of the populace. Modern transport research has not yet fully studied integrated directions, the duties of which would be a multifactorial examination of such complex logistic entities as terminal networks. In order to analyse the characteristics of the creation and development of transport nodes, the scientific paper suggests an evolutionary-functional approach to the classification of transport nodes. According to J.-P. Rodrigue's thesis, the terminalistics pyramid and the hierarchy of its objects are present while taking into account the complexity and integration of the service as an adapted form. A four-stage modified Rodrigue-Notteboom model is proposed for railroad intersections. Investigated are the steps of the evolutionary-functional approach to the development of the transport hub. A proposal is made for a model for the development of logistical facilities (for example, Venlo Trade Port). The conclusion is that, while the expansion of transport hubs can be beneficial for companies unrelated to transportation and warehouse logistics, it will have social and financial consequences for these industries.

1. Introduction

Transport hubs have historically served as fully-fledged logistics facilities that perform a variety of tasks in addition to transportation and storage, such as advising, customs, distribution, expeditionary work, and others. In this regard, the primary objective of efforts in this field is the development of an efficient logistics network on the Russian railway network, the components of which will be integrated into Russian and international transportation systems, as well as the facilitation of domestic companies' entry into new, highly lucrative, high-tech markets for logistics services. It should be noted that the Russian Federation's government has included provisions for the building of terminals and logistics hubs in its Plan for the Development of Railway Transport in the Russian Federation through 2030. Since they consider the lower level of transportation equipment, the tasks of the proper development of the logistics market are vital for the overall transport system of Russia and logistics infrastructure in Russia, as well as the level

Utilization of Styrene-Butadiene Rubber (SBR) Polymer Replacement of Fine Aggregate in Concrete

[1] Mrs. Prativa Samal, [2]Ms. M Priyadarshini Sarangi*
[1]Asst. Professor, Dept. of Civil Engineering, NIT BBSR,*
Asst. Professor Dept. of Civil Engineering, SEARC, BBSR
[1]prativasamal@thenalanda.com, msarangi32@gmail.com*

Abstract. This study intends to investigate how the performance of no-fine aggregates made from lightweight concrete is affected by the introduction of styrene-butadiene rubber (SBR) polymer. This form of concrete is typically used for outside walls, infill panels, and partitions in framed constructions. Three concrete compositions (4:1, 6:1, and 8:1) with various aggregate/cement ratios were used. Each of these mixtures is made up of five sub-mixes with various polymer/cement mass ratios (0, 5, 10, 15, and 20%). After 28 days of water curing, tensile strength tests were performed on all concrete mixtures using a (30050) cylinder specimen. The test findings showed that for all mixtures, the polymer/cement ratio increased the strength of no-fine aggregate concrete. While the strength of the mix (M4-15) for water curing was (130)% greater than the control mix, the rate of development in a group ratio (4:1) for water curing when increasing the polymer (0-10)% was (192)% greater than the strength in the control mix. It suggests that the polymer's high void content explains why it performs better in less-than-ideal mixes.

Keywords: Styrene-butadiene rubber; splitting tensile strength; lightweight concrete; ANOVA.

Introduction

The primary goal of this study was to evaluate the representation of no-fine concrete made using porcelainized lightweight aggregate and modified with (SBR) polymer, as well as to suggest potential uses for this type of concrete. Aerated concrete, lightweight aggregate concrete, and no-fine concrete are the three important divisions that the commodities method broadly divides Lightweight Concrete (LWC) into [1], as illustrated in Figure 1. By incorporating foam bubbles into the cement matrix or the sand-cement grout, aerated concrete is created. A wide range of materials, including raw materials, raw produced materials, synthetic materials made from recycled byproducts, and agricultural waste, are utilised as lightweight aggregates in lightweight concrete [2]. No-fine concrete, as its name suggests, is concrete made just of cement, water, and coarse aggregate. As a result, no-fine concrete is an amalgamation of coarse aggregate particles that are individually covered in a 1.3 mm layer of cement paste [3-5]

Ways of Damless Water Intake Using Hydraulics

[1]Mrs. Sipra Mohapatra, [2]Mrs Smruti Smita Behera*
[1]Asst. Professor, Dept. of Civil Engineering, NIT BBSR,*
Asst. Professor Dept. of Civil Engineering, NP, Nayagarh
[1]sipramohapatra@thenalanda.com , beherasmrutismita00@gmail.com*

Abstract. The examination of the impact of the damless water intake on the hydraulic and alluvial regime of the river, whose channel runs through readily washed-out soils, is the focus of the paper. In the vicinity of the damless water intake, the dynamics of the river bed's morphometry and the hydraulic components of the flow are analysed. Functional relationships between the morphometric parameters of the channel and the hydraulic parameters of the flow were established as a result of the analysis of the data from long-term field studies and hydrometric measurements at the closest section to the damless water intake and in the area of the damless water intake of the Amudarya River. The dynamics of the Shezi coefficient, hydraulic resistance, and the channel roughness coefficient in connection with the hydrodynamic characteristic of the flow are established.

1. Introduction

Land reclamation, the development of irrigation in a hot region and global warming on the planet lead to an increase in water intake from natural drains. Especially if the region is characterized by a hot climate, then against the background of global warming, an increase in temperature is observed, which leads to a sharp increase in water consumption in the country's agriculture. Usually, of two methods: dam and damless water intake from the river, very often due to relatively lower construction costs, the second method is used. It should be noted that non-dam water intakes are quite simple in a constructive sense, require less construction costs, and have a lesser effect on the reformation of the river channel in the zone of influence of the head water intake as compared to the dam water intakes. The foregoing contributed to the introduction of efficient schemes of damless water intakes into the practice of hydraulic engineering in Uzbekistan [1, 2]. As a result of an increase in water intake from the river, intensive channel processes with an irreversible character occur throughout its flat part [3 – 7]. Channel processes, in turn, complicate the guaranteed volume of water withdrawal from the river and very often contribute to the ingress of more than the permissible amount of bottom and suspended sediments into the head structure and the supply channel of pumping stations [4 – 12]. Due to the complexity of managing these undesirable processes, the solution to this problem remains relevant. The object of the study is the channel of the Amudarya river in the area of the damless water intake in the Kaskad-Karshi Main Canal (KKMK) transporting water to the Kashkadarya valley. The KMK, consisting of six pumping stations, is a unique hydraulic engineering complex. In this complex, for the first time in the hydraulic engineering practice of Uzbekistan, powerful hydraulic units with axial pumps were installed, each with a capacity of Q = 40 m^3/s, with a head of H = 24m. The total withdrawal of water from the Amudarya with a damless water intake during the year is 5.1 km3. Together with water, bottom and suspended sediments with a volume of 12-16 million m3 enter the head structure. To reduce solid abrasive sediment particles entering with water through the pumps, a double expansion of the section of its channel for 2 km is provided in the head of the supply channel of the pumping station, where the speed of water flow decreases from I to 0.4 m / s, this provides intensive precipitation of the largest suspended particles (from 60% of the total solid runoff). Smaller ones are deposited on the rest of the 18-kilometer route of the channel of the supply channel, which is connected by a 1-kilometer-long settling tank. Cleaning of the channel of the bucket of the inlet channel is carried out depending on the water intake schedule throughout the year, as well as on the basis of the planned loading of dredgers. Maintaining the channel bed section in the design dimensions should ensure stable constancy of the nominal water horizons at the first pumping station of the KKMK, which ensures a stable operation of the pumps of the entire cascade, allows for rough adjustment of sediment, and the water taken for irrigation should adapt to the wayward nature of the Amudarya. Over the years of operation, significant changes have occurred. The current difficulties with water intake have led to a sharp drop in the water level; at the head first pumping station, they caused a violation of its operation mode (cavitation destruction of pumps, a decrease in water supply, an overconsumption of electricity, a decrease in the motor resources of pumping units, etc.). In this case, ensuring the highly efficient

CACO3 BIO-PRECIPITATION FOR BETTERING THE SOIL: A REVIEW

[1] Mrs.Subhashree Tripathy, [2]Ms. Rajashree Acharya*
[1]Asst. Professor, Dept. of Civil Engineering, NIT BBSR,*
Asst. Professor Dept. of Civil Engineering, GITAM, BBSR
[1]subhashree@thenalanda.com,sonaacharya@gmail.com*

Abstract. A cutting-edge and environmentally benign method for enhancing soil, bio-mineralization of calcium carbonates has lately gained popularity in the geotechnical engineering community. For enhancing granular soils, various bio-cementation techniques are used, such as microbially-induced CaCO3 precipitation (MICP) and enzymatic-induced carbonate precipitation (EICP). These approaches have been proposed as potential remedies for a variety of geotechnical problems because they are inventive, efficient, and sustainable when used in geotechnical engineering. Compared to EICP, MICP has been the subject of more investigation. Yet, urease derived from plants is believed to have several advantages over urease produced by bacteria when used in bio-cementation processes. The current study examines the mechanisms, potential application areas, associated advantages, and disadvantages of the bio-cementation procedures. It will also focus on methods involving the urea hydrolysis by urease that are utilised to precipitate CaCO3. The study's findings will help people better understand biotechnical systems and make sure geotechnical specialists are knowledgeable about this topic.

1. Introduction

The geotechnical qualities of soil are improved by biochemical activities that take place inside a soil matrix and precipitate calcium carbonate [1]. CaCO3 fills holes, roughens particles, and strengthens inter-particle bonding to reduce permeability while also increasing stiffness, strength, and dilatancy. The bio-mediated and bio-inspired ground improvement methods in geotechnical engineering have been developed to provide alternatives to traditional grouting techniques, which have a number of detrimental effects on the environment and the climate. Enzymatic induced CaCO3 precipitation (EICP) and microbial induced CaCO3 precipitation (MICP), the two most popular forms of bio-cementation procedures, both use urea hydrolysis to generate precipitation (ureolysis). MICP has gotten the most attention in the most recent study on bio-cementation methods for enhancing soil. It involves a biological procedure in which the bacteria are used to cause calcite precipitation between particle contacts in soil spaces by using urea hydrolysis. Another technique for precipitating CaCO3 is called EICP, which relies on a urease enzyme derived from plants. EICP is not affected by issues relating to the growth and activity of microorganisms, in contrast to MICP.

Using an Intelligent Method for Analyzing the Production of Irrigated Agricultural Crops

[1*]*Ms. Kumar Priyadarsini,* [2]*Mr. Chandan Khandai*
[1*]*Asst. Professor, Dept. of Civil Engineering, NIT BBSR,*
Asst. Professor Dept. of Civil Engineering, INDUS, BBSR
[1*]*priyadarsinikumkum@gmail.com , khandei_762@gmail.com*

Abstract. The essay explores the potential for intelligent systems to analyse the productivity of irrigated agrocoenoses to govern the programmed cultivation of agricultural crops. Standard information about agrometeorological conditions, technical specifications of irrigation systems and irrigation equipment, and data regarding the volume of water resources allotted for irrigation comprise the information support of the intelligent system. The obtained results offer a rigorous theoretical framework for addressing irrigation water distribution and irrigation regime operational management issues. They also make it easier to choose the best option for an irrigation system design solution and allow for the rational use of water resources in existing systems.

Introduction

The need for more effective management of the processes of cultivation of agricultural crops, including during reclamation works (construction of irrigation, drainage and anti-erosion systems, agroforestry, liming) was brought on by the development of new forms of economic relations in the agricultural sector of our country, the requirement to safeguard domestic producers from the expansion of foreign firms, and the increased interest of agricultural producers in the results of their activities.

In the sphere of research, there has been tremendous progress made in terms of practical applications of the challenge of managing agricultural cultivation operations better. The theoretical and practical findings in the areas of planned crop cultivation and intricate regulation of plant life variables created the methodological foundation for regulating these processes in Russian science. A thorough scientific solution hasn't yet been found for a variety of practical problems, including the efficient use of existing resources to produce high and sustained yields. The methodological strategies for managing the process of growing crops that have been put forth by some researchers do not adequately encourage the use of resource-saving technologies, fully account for the potential opportunities to increase the productivity of reclaimed land, and do not sufficiently contribute to the rational and efficient use of resources in agricultural production.

The development of expert systems and information technologies for managing the processes of agricultural production, as demonstrated by the results of scientific research and best practises in our nation and abroad, is the main direction of scientific and technological progress in improving the management of the processes of cultivation of agricultural crops on reclaimed lands. This type of profile of computerised systems and technologies enable the synthesis of traditionally divided decision-making processes by spheres of activity into a single purposeful process of managing the cultivation of agricultural crops in each farm, in each particular field. These systems and technologies are implemented at the intersection of branches of knowledge based on the laws of biology, physics, chemistry, and other fundamental sciences.

Development of Logistics Facilities along Transportation Routes

[1*] *Ms S.Madhumita Behera,* [2]*Ms. Rachita Padhi*
[1*]*Asst. Professor, Dept. of Civil Engineering, NIT BBSR,*
Asst. Professor Dept. of Civil Engineering, SIET, DKL
[1*]*sushreemadhumita@thenalanda.com , padhiracchu11@gmail.com*

Abstract. Contemporary economic practises demonstrate the expanding significance and influence of global transportation infrastructure. The degree to which the domestic transport and logistics market is integrated into the global market determines the geoeconomic status of the nation, the attractiveness of transit freight flows, and the rational management of the passage of foreign trade goods. Russian Railways lists the development of the Trans-Siberian Railway as one of its top goals for its operations through 2030. We'll presume that as it develops, the transit flow from Asia to Europe can switch from the sea to the rail. One of the tasks and the rebirth of the East-West transport route, stated by China as a comprehensive reform of the entire trade and economic model of Eurasia, is switching transit freight flows from the sea to rail. The ancient Great Silk Road, which has been in use since the second century, serves as the historical model for this idea of a new pan-Eurasian (and eventually transcontinental) transportation route.

Introduction

The priority development of the terminal-warehouse infrastructure that reflects the reality of the transportation and logistics sector is noted in the Russian Federation's Plan for the Development of Railway Transport until 2030 [1].

The concept of the "New Silk Road," which was introduced in China in September 2013, is the collective name for the "Economic Belt of the Silk Road" (SREB) and the "Sea Silk Road of the 21st Century" plans. The initial effort targets Eurasia, and Russia is participating in it. Its goal is to link Central Asia and Russia to the European continent via the Middle Kingdom. The second programme focuses on fostering cooperation with nations in East Africa, Europe, South and Southeast Asia [2]. China holds significant, if not leading, positions in a number of industrial sectors in the modern world; as a result, the topic of how to ship a sizable quantity of Chinese goods, particularly how to ship goods from China to Europe and back, has now taken on significant importance [3].

One of the Sustainable Activities Is the Backfilling of Building and Mining Debris

[1*]*Ms. Saraswati Priyanka Priyadarshini, Miss. Subhashree Soumya Harichandan*
[1*] *Asst. Professor, Dept. Of Civil Engineering, RIET, BBSR,*
Asst. Professor, Dept. of Civil Engg. NIT, BBSR
[1*]*Saraswati1351@gmail.com, soumyaharichandan@thenalanda.com*

Abstract. The development of human civilization creates a demand for building materials and energy sources. Deep and open pit mines are used to harvest a lot of resources. Mining operations obviously have a significant direct impact on the environment in the area (dewatering, landscape). When mining is done and the harvested goods are processed further, a lot of spoil material is created. Several difficulties surrounding the utilisation of waste from empty rocks, enrichment tailings, and demolition activities as a backfilling material in civil engineering should be examined. The quantity of the material to be used for fills or embankments, the cost of processing it before reuse, and the transportation's environmental impact must all be taken into account. The use of sustainable technologies may lower the cost of dumping mining waste in landfills and lessen the detrimental effects of mining operations on the local environment and quality of life for residents. When building waste material (debris) is taken into consideration, the same advantages can be seen on a lesser scale. The article discusses general working conditions for abandoned underground development projects in selected Russian regions as well as some observations made at various Polish construction sites where the operation of machines (such as rollers and impulse compactors) caused vibrations in nearby areasA fundamental shift in the idea of environmental protection is required in order to account for all aspects of the influence of geotechnology on the environment and nearby human activities during the extraction of minerals and to develop measures for the sensible use of natural resources. The management of natural resources must shift from being solely preventative, and a mathematical model of how geotechnology affects the environment must be created. In order to create a new generation of mining engineers and civil engineers who will take into account all the facets of sustainable and responsible work, it is also critical to increase the role of environmental issues in mining and civil engineering education at universities and specialised institutions.

Transforming the Railway Transport Management System to use Polygon Technology

[1*] *Mr. Rajendra Kumar Roul,* [2]*Mr.Abhijit Chhatar*
[1*] *Asst. Professor, Dept. of Civil Engineering, NIT BBSR,*
Asst. Professor Dept. of Civil Engineering, NIT, BBSR
[1*] *rajendraroul@thenalanda.com , abhijitchhatar@thenalanda.com*

Abstract. The country's transportation system development and the railway transportation system in particular, play a significant role in determining the sustainability of industrial complex development, economic growth, the country's international economic activity, and therefore the efficiency of its economy. Currently, the railroad sector carries out a variety of intricate socioeconomic tasks designed to modernize economic growth and quicken the pace of technical advancement in all associated sectors. Given the situation, the need for a full rethink of financial and economic ties in the sector and, as a result, the reform of the entire management system, became urgent.

1. Introduction

Currently, the current operating mechanism of the railway transportation system is being substantially altered, and completely new models of the economic mechanism are being produced.

It is difficult to manage the Russian Railway network, which has a long-standing topology and is a complicated structured system. It is important to consider both Russia's current position in the international arena and the procedures underway to reform the railway transportation system, which fundamentally alters the operational principles of the sector and necessitates a change in its management structure.

The Russian Railways network is currently actively implementing polygon technologies, the use of which will have a synergistic effect and improve the efficiency of these technologies' implementation in the context of the Russian Railways Holding's increased integration into global transport corridors.

The "Transit Traffic Support Program using the Trans-Siberian Railway" was approved by the Government of the Russian Federation in 1997 in light of the fact that the Trans-Siberian Railway was the most powerful transport corridor in the world and that it would be well-positioned to optimise its activities in the shortest amount of time for any transportation volumes, which in turn would entail the development of the railway network with the least amount of environmental impact.

As a result of the recent rise in freight flow to the Asian-Pacific region, there is now fierce competition among all interface systems for the different modes of transportation. More competition establishes strict guidelines for the development of the infrastructure for railway transport trunk processes and the ongoing deployment of innovative technologies.

Brilliant Green Dye Removal from Wastewater Using Electrochemistry

[1*] *Ms Suvashree Soumya Harichandan,* [2]*Ms. Aliva Das*
[1*]*Asst. Professor, Dept. of Civil Engineering, NIT BBSR,*
Asst. Professor Dept. of Civil Engineering, AIET, BBSR
[1*]*soumyaharichandan@thenalanda.com, msaliva990@gmail.com*

Abstract. One of the most often used colouring substances in numerous industrial industries, including the production of textiles, wood, and food, are dyes. This high rate of dye consumption poses one of the greatest threats to the environment and health organisations since these dyes wind up in water sources. The majority of dyes are regarded as highly toxic substances that are hazardous to both the environment and human health because they contain heavy metals, elements that cause cancer, chemicals that absorb oxygen, and other toxic substances that must be thoroughly treated before being released back into the environment. As a result, federal legislation mandates that all industrial facilities that discard effluents containing colours make sure all dyes are removed before returning their effluents to water sources. In order to comply with the necessary regulations, industries have used a variety of treatment techniques, including physical, chemical, and biological procedures. The primary treatment procedure in several businesses has recently become electrocoagulation. Using brilliant green dye (BG dye) as a model, this work is primarily concerned with employing the electrocoagulation (EC) method to remediate artificially coloured effluents from colouring chemicals. This dye was removed using an electrocoagulation reactor with aluminium electrodes using various initial pH (40–10.0), direct currents (DC) (244–732 mA), and spacing between electrodes (SBE) conditions (4-12 mm). The results showed that EC was very effective at treating coloured effluents; 95.3% of the BG dye was removed at treatment duration, SBE, DC, and pH of 30 minutes, 4 mm, 488 mA, and 7.0, respectively.

Introduction

A colourful, ionising, and aromatic ingredient that is chemically related to the materials being applied is referred to as a dye [1, 2]. The chemical compositions of dyes, sometimes referred to as colouring agents, vary. These chemical compositions are typically divided into five groups based on the chromophores in their structures: antraquinone, azo, indigoid, phtalocyanine, and arylmethane [2, 3]. On the other hand, there are additional classification systems that are less well-known. For instance, dyes are divided into organic and inorganic categories based on the presence of carbon atoms in their chemical structures, and they are also divided into natural and synthetic categories based on their source [1, 2, 4]. Dyes are regarded as a raw ingredient for many different businesses such as paints, paper, furniture, and food industries.

Improvements to Irrigation System Water Accounting

[1*] *Dr. Samaptika Mohanty,* [2]*Mr Alok Kumar Sarangi*
[1*] *Asst. Professor, Dept. of Civil Engineering, NIT BBSR,*
Asst. Professor Dept. of Civil Engineering, NIST, Berhampur
[1*] samapikamohanty@thenalanda.com , alok091@gmail.com

Abstract. The inaccuracy in measuring water flow is eliminated when open canals of on-farm irrigation systems are equipped with water metering devices that operate on hydraulic energy. The article also discusses the analysis of water metering in main canals and the use of hydraulic infrastructure. In the current state of agricultural growth, hydro-reclamation is given a special place as one of the main factors that ensure high, stable yields of agricultural products. Currently, when water has become a costly commodity, operational and objective water metering must be carried out, and hydraulic structures on the canals must ensure the provision of specified costs, in order for irrigation systems to operate rationally and efficiently. Mobile and stationary water metering points are used to regulate water usage in open canals used for irrigation systems.

1. Introduction

In contrast to other nations in Central Asia, the majority of the meteorological stations and hydrologic posts in Uzbekistan has been kept and are currently operational. From 1921, meteorological, hydrologic, and agrometeorological observations have been made in republican territory. Since 1972, environmental observations on the state of the soil, air, and water bodies have been made. The hydrological network in Uzbekistan consists of 38 river and 2 lake posts associated to 13 territorial hydrometeorological departments, 66 river and 3 lake posts related to 16 hydrological stations, 12 river and 5 lake posts related to 3 lake stations, and 10 transboundary monitoring posts. Posts with information that is needed to prepare hydrological forecasts and for international exchange number 16, 25, and the remaining 80.

The numbers of water metering points and their quality of technical condition have significantly decreased in recent years (WUP). In the Republic of Uzbekistan, the number of water metering sites has dropped from 1995 to 2018; gauging stations are only furnished with gauging rods and have antiquated measuring equipment, while the remainder are devoid of any measuring equipment. Only 17% of water metering points have power, and 90% of these sites have very basic communication with the dispensing point and no measuring automation. Due to factors including low measurement accuracy, a shortage of electricity at water metering posts, expensive gadget costs, and complexity in operation, current water flow monitoring equipment, both local and imported, is only of limited utility in irrigation canals. Water management organisations must equip the water metering point with technical tools that enable commercial water metering at a modern level. These tools must be straightforward, reliable, and non-volatile.

Evaluation of the Technical State of the Main Irrigation System Canal Bridge Crossings

[1*] *Ms. Saswati Sahoo,* [2]*Ms. Asish Kumar Das*
[1*] *Asst. Professor, Dept. of Civil Engineering, NIT BBSR,*
Asst. Professor Dept. of Civil Engineering, NIT, BBSR
[1*]*sahoosaswati351@gmail.com, asish002@thenalanda.com*

Abstract. The technical status of long-operated bridge crossings on the main canals of irrigation systems with growing loads must currently be evaluated properly and promptly. The article covers the history of the problem of estimating the residual resource of bridge constructions and considers structures with varied flaws and damages using the Abinsky irrigation system of the Lower Kuban as an example. It provides the values of the significant coefficients for the main irrigation system canals' bridge crossing structures as determined by the authors through calculations. The expected service life for irrigation systems was no more than thirty years. For example, in Krasnodar Territory, the primary irrigation systems have been operational for an average of more than fifty years. In many other sectors of industrial production, in addition to hydraulic engineering and the construction industry, the identification of the true worth of the residual resource is currently in high demand. Scientific and practical interest is primarily not only an understanding of the actual condition of the structure at the time of the survey, but also its alternative change, i.e. the forecast of its remaining resource, for more effective control over the technical condition of bridge crossings on the main canals of irrigation systems. An evaluation of the technical state of the bridge crossing structures on the major canal will reveal if they can continue to function over the long term, whether they require reinforcing, and whether they need to be rebuilt.

Introduction

The issue of the technical state of bridge crossings across major canals is currently particularly serious in the south of the Russian Federation since they have already developed their operational life over a lengthy period of operation. The service life of irrigation systems was only expected to be thirty years when they were designed, but today, on average, more than fifty years have passed since the main irrigation systems, for instance, of Krasnodar Territory, were put into operation. The Krasnodar Territory is one of the primary producers of rice and cattle products in our nation due to the good conditions for the high-intensity development of agriculture provided by fertile soils, adequate heat, and light. The east of the region experiences a sharp climatic transition from summertime drought to wintertime cold without snow. Precipitation totals differ significantly from year to year. In most winters, the snow cover in the region is comparatively thin and unstable.

Understanding the actual state of the structure at the time of the survey, as well as its alternative change, i.e. the forecast of its remaining resource, is of primary scientific and practical interest for more effective control over the technical condition of bridge crossings on the main canals of irrigation systems.. It takes major irrigation development to stabilize agricultural production and significantly boost its economic efficiency under such environmental and economic settings. The first reclamation partnerships were created in 1917 on Krasnodar Territory territories, and when the famine from the 1933 drought arrived in 1935–1936, they started to seriously participate in reclamation projects. Farmers were already making decisions on how to feed the nation and how to avoid droughts. Right now, there is a huge need for determining the true worth of the residual resource across many different sectors of industrial production, including hydraulic engineering and the building industry.

Metal Trusses and Load-Carrying Loads for the Depot's Long Spanning Rails

Ms. Subhralina Singh, Prof. Bhabagrahi Dash*
[1]Asst. Prof.Dept. of Civil Engineering, REC BBSR,*
Asst. Prof. DEPT. of Civil Engineering, NIT, BBSR
[1]Subhra001@gmail.com*,bhabagrahidash@thenalanda.com*

Abstract
A system of coverage is the most important constructive component of any large-span construction (roof). It determines the long-term quality of the building, ensuring spatial rigidity, the exterior of the building, the size and condition of the interior, the width of the span, the aperture of the necessary columns, determining the magnitude and quality of the sustained surcharge, and it also happens to be the most labor-intensive and expensive segment of the construction activities, accounting for between 30 and 40% of the estimated cost.

Introduction
In general, reinforced concrete girder constructions used for large-span structures behave well in compression and poorly in tension, necessitate increased staking and bracing, place additional strain on load-bearing structures, and increase the materials-to-output ratio, all of which have a significant impact on the construction's cost.

Cost-Benefit Analysis of Digital Information Exchange Technologies at Railway Transportation's Electric Power Facilities

[1*] *Ms. Suchismita Mallik, Mr.Abhijit Chhatar*
[1*] *Asst. Professor, Dept. of Civil Engineering, NIT BBSR,*
Asst. Professor Dept. of Civil Engineering, NIT, BBSR
[1*] *malliksuchismita1992@gmail.com* , [2] *abhijitchhatar@thenalanda.com*

Abstract
The JSC Russian Railways subsidiary Transenergo, one of the first in the world to implement a pilot project of a specialized traction substation of the railway transport, has electric power facilities. This article provides the economic assessment of the application of digital information exchange technologies at these facilities. A global, scalable, and uniformly operated information infrastructure is one of the objectives of the Digital Traction Substation project. Advanced equipment diagnostics, prompt condition-based repairs, increased reliability resulting from the duplication of information management and protection processes, and modelling and forecasting of equipment operating modes and condition all play a significant role in the economic indicators of the digital traction substation. In this paper, the authors make an effort to create methodologies for economic evaluation of the use of digital information exchange technologies at transportation-related electric power facilities and to identify the optimal level of digitization for traction substations.

Introduction

Presently, the advent of digital platforms—unified systems for managing knowledge, technology, and competencies—has become popular in economically developed nations. Accelerated use of digital technologies in the business and social spheres is one of the national development goals in the Russian Federation. The effective use of new digital technologies will define a country's and a company's level of global competitiveness.

The entire economy is currently undergoing a trend known as the digitization of technology and manufacturing processes. At the current stage of human evolution, the digitization of production processes plays an equally essential part to the automation and robotization of those processes. Many studies indicate that the use of new digital technology can boost corporate productivity by 40%.

In the Russian Federation and other nations, the idea of the digital economy has not yet reached its full potential. Nonetheless, the digital economy—an economic activity in which digital data serves as the primary production factor—is typically regarded as the economy of a new technological generation.

Railway transportation in the Russian Federation was also impacted by the digitization processes. A significant innovation initiative called "Digital railway" is being carried out by JSC Russian Railways. JSC Russian Railways has made the switch to minimally manned or autonomous technology for maintaining railroad infrastructure a top priority.

Influence of Laser-Induced Bubble Formation on Laser Chemical Machining

Atish Ranjan Baral[*], Manas Kumar Samantaray[2],
[1*]Professor, Department of Mechanical Engineering, ABIT,CTC, Odisha, India
[2]Assistant Professor, Department of Mechanical Engineering, NIT, Bhubaneswar, Odisha, India

*Corresponding author e-mail: baralatish_00@gmail.com

Abstract

A non-traditional processing technique called laser chemical machining (LCM) provides very accurate and exact ablation of metallic surfaces. Laser-induced heat activation of chemical interactions between electrolytes and a metallic surface leads to material ablation. Large variations in ablation quality, however, can happen when LCM is used to prepare metallic surfaces because to rising bubbles. It has not been looked into how bubble formation during laser chemical machining affects the quality of the ablation. Ablation tests on titanium and ceramic under various thermal process settings were carried out for a more thorough analysis of the bubbles. High-speed camera equipment was used to capture the studies. Using Matlab, the video sequences were evaluated. The size and frequency of the generated bubbles were examined. The findings demonstrate that both materials developed boiling bubbles during processing. Titanium also generates smaller bubbles, which can be distinguished from one another as process bubbles based on their size. Additionally, as both boiling bubbles and process bubbles were found during machining within the process window, it was discovered that undisturbed laser chemical ablation can be accomplished in the presence of a boiling process.

Keywords

Micro Machining, Laser Micro Machining, Laser Chemical Removal,Nucleate Boiling, Highspeed Videography

Introduction

Constantly smaller components increase the demands of industrial manufac- turing processes. Traditionally used manufacturing processes are increasingly reaching their limits in terms of complexity and size. Alternative machining processes, especially for metal workpieces, are the so-called non-conventional machining processes. Non-conventional machining processes are alternative machining processes, especially for metal workpieces and among them, laser chemical machining (LCM) is very important. Laser chemical machining combines the advantages of laser processing, such as precise and localized energy input, and the advantages of electrochemical processing with a gentle energy impact without significant heat impact [3], which is why the unprocessed microstructure of the materials is not affected.

In laser chemical machining, the workpiece is irradiated by a laser, which in- troduces local, precise and adequate energy in the form of heat into the work- piece. The workpiece is surrounded by electrolytes . Depending on the laser intensity applied and the spot size of the laser, the induced temperature fields on the workpiece change the electrochemical potential that an anodic material dis- solution is induced resulting in a material removal at the surface of the work- piece [6]. Within a suitable process window, a gentle ablation is generated without a de- tectable heat-affected zone and without remelting processes in the material, which is the main advantage of laser chemical machining compared to other la-ser based non-conventional ablation processes

Surface Oxide Protection of Si(111) in Solutionby the Surfactant Molecules

Bhagabat Prasad Hota[1*], Mr.Sanjay Kumar Raj[2],

[1*]Professor, Department of Mechanical Engineering, NMIT,Bhubaneswar, Odisha, India[2] Assistant Professor, Department of Mechanical Engineering, Nalanda Institute of Technology, Bhubaneswar, Odisha, India

*Corresponding author e-mail: bhagabat006@gmail.com

Abstract

It has been attempted to immobilize organic mono layer on semiconductor surface as functional materials. Silicon surface was especially noticed to de- velop highly efficient and functional devices, and the silicon devices were ex- pected for the immobilized surface with organic layer. Then we have at- tempted the immobilization by the mono layer on the hydrogen terminated silicon surface with the alkyl base indicated hydrophobic by using a surfac- tant. We have observed interactions of immobilized molecules and organic molecules adsorbed on hydrogen terminated Si(111), which is aerosol OT as known surfactant and 4-cyanophenol as shown amphipathic molecule. The aerosol OT inhibited oxidation of Si(111) surface by adsorption to the hydro- gen terminated surface to indicate hydrophobic. The 4-cyanophenol made the surface oxide by adsorption, and was desorbed by forming hydrophilic Si sur- face. In the case of the mixed solution by the aerosol OT and 4-cyanophenol, the aerosol OT controlled the surface oxidation on the hydrogen terminated Si against the 4-cyanophenol.

Keywords

Adsorption, Silicon, Hydrogen Termination, Amphipathic, *In-Situ* ATR-FTIR

Introduction

It has been attempted to immobilize organic mono layer on metal or semicon- ductor surface etc. as functional materials. Si surface was espe- cially noticed to develop highly efficient and functional devices, and the Si de- vices were expected for the immobilized surface with organic layer. The typically functional organic layer was known as a biological membrane, which is an am phipathic material in consisting of hydrophobic and hydrophilic bases. The structure has double layer, which the two phosphatides face mutually on the hydrophobic bases in consisting of two alkyl chains. It would show an ideal model to analyze the function of the biological membrane by replacing the unilateral phosphatide with a hydrogen terminated Si (H-Si) surface. The H-Si surface is obtained by etching Si wafer with HF and NH_4F solution to peel oxide layer on the surface. Then we have attempted the immobilization by the mono layer on the H-Si surface with the alkyl base indicated hydrophobic by using a surfactant.

Influence of Fine Zirconia Particle Shot Peening on Sliding Wear of Zirconia-Silicon Carbide Composites

Mr. Bhusan Bhabani Swain[*], Mr. Avaya Kumar Baliarsingh[2],
[1*]Professor, Department of Mechanical Engineering, TITE, Bhubaneswar, Odisha, India
[2]Assistant Professor, Department of Mechanical Engineering, NIT, Bhubaneswar, Odisha, India

*Corresponding author e-mail: bhabani88@gmail.com

Abstract

In this paper, the sliding contact fatigue wear performance of shot-peenedzirconia-silicon carbide composite (ZrO_2/SiC) plates in contact with silicon nitride balls under compressive residual stress in dry conditions was investi- gated in order to improve the wear resistance of ZrO_2/SiC friction parts. The wear resistance of ZrO_2/SiC plates after shot peening was higher than that of plates not treated with shot peening in sliding wear testing under Hertzian- contact. Due to fine Zirconia particle shot peening, the tetragonal phase crys- tal structure in ZrO_2 in the near-surface of ZrO_2/SiC plates was changed, and 1100 MPa compressive residual stress could be introduced into the near-sur- face layer of ZrO_2/SiC plates. The compressive residual stress was determined to be the main factor in the improvement of the sliding wear resistance of ZrO_2/SiC plates.

Keywords

Sliding Fatigue Wear, ZrO_2/SiC Composite, Shot-Peening,X-Ray

Introduction

Zirconia (ZrO_2) composites have great potential as moving parts in special situa- tions for machine elements or medical apparatus. They have low densities, high hardness, high temperature durability and biocompatibility [1] [2] [3]. Particu- larly the wear resistance is one of the most important properties for moving parts such as bearing or joints. Because severe wear at the contact areas in fric- tion zones of moving parts affects the device's lifespan and stable movement. Recently the tribological behavior on ZrO_2 was studied by many researchers [4] [5] [6] in order to evaluate the quality problems such as failure of ceramic's part. Mechanical sliding wear of ceramics under dry conditions is a process of contnuous micro-fracturing from many cracks, in fact, sliding wear related to frac- ture toughness. Hokkirigawa [7] proposed that the sliding wear of ceramics is related to both K_{eff} and P_{max} and crack length. In order to improve the friction surface of ZrO_2 composites reinforced by sil- icon carbide (ZrO_2/SiC) for practical use, this study focused on shot peening (SP). SP is a well-known surface treatment technique for improving fatigue strength of metal parts. In a typical SP process, a stream of small, hard spheres is shot at a treated surface

Pulsed Cold Metal Transfer Method Microstructure and Mechanical Characteristics of Al5052 - SS304 Dissimilar Weld Lap Joint

Dr. Atul[*], Mr. Sai Satyananda Sahoo,

[1*]Asso. Professor, Department of Mechanical Engineering, NIT, Bhubaneswar, Odisha, India

[2]Assistant Professor, Department of Mechanical Engineering, NIT Bhubaneswar, Odisha, India

*Corresponding author e-mail: atul@thenalanda.com

ABSTRACT. the method of pulsed cold metal transfer (P-CMT) welding thin sheet metal products made of aluminium (Al5052) and stainless steel (SS304). By low heat input and a less spattering welding joint, pulsed CMT technology enables the reduction of deformities and higher productivity. This is mainly because the electrode ER 4043 was moved carefully, resulting in a modest heat input. The purpose of this study was to use the pulsed CMT method to optimise the process parameters. In the fusion zone and heat impacted zone, the output parameter's tensile strength, microstructure, and microhardness were determined (HAZ). The intermetallic compound layer in the weld metal was prevented from forming and growing due to the extremely low heat input and the inclusion of Si, which increased the strength of the joint. The findings demonstrate that pulsed CMT in the dissimilar metal joint with good mechanical qualities can achieve no-spatter welding and minimal heat input during the welding operation..

KEYWORDS: Pulsed CMT, Dissimilar Metal Lap Joint, Microstructure, Mechanical properties.

INTRODUCTION

The aircraft and automobile industry has historically focused on weight saving, high performance materials. The increased economic pressures placed increasing emphasis on manufacturing costs and efficiency in recent years [1]. As such, the use of welding as a cost effective alternative to mechanical fastening is being widely considered within automobile may give a solution to realize the aluminium use in automobile [2]. The short-circuiting metal transfer is a suitable method because of its low heat input characteristics [3]. But the excessive spatter during the welding process also poses great problems to the producer [4]. A recent development in welding technology is the pulsed cold metal transfer (P-CMT) process which is ideally suited to welding Al and steel as dissimilar joint owing to the no-spatter welding process and low thermal input [5]. The pulsed CMT process is a modified metal inert gas welding process which was invented by Fronius Company [6]. The principal innovation is that the motions of the wire have been integrated into the welding process and into the overall control of the process [7]. The wire retraction motion assists droplet detachment during the short circuit, thus the metal can transfer into the welding pool without the aid of the electromagnetic force [8]. Then the heat input and spatter can be decreased greatly [9]. In order to reduce pollution and save energy, it is attractive to make car bodies lighter through introducing some aluminium parts to substitute for the previous steel structures [10]. Joining dissimilar metals such as aluminium and steel by fusion welding methods is known to be very difficult because of the formation of brittle intermetallic compounds which can deteriorate the mechanical properties of the joints [11]. The alloys have become some of the most widely used materials in such industries as the structural and transportation industries because of their good mechanical properties, including corrosion resistance, light weight, high strength, and high toughness and recycling capabilities [12,13]. Alloy 5052 and 6061 is one of the most widely used alloys [14]. This standard structure alloy, one of the most versatile of the heat-treatable alloys, is popular for medium- to high-strength requirements and has good toughness characteristics [15]. Applications for the alloy range from transportation components to machinery equipment applications to recreational products and consumer durables [16]. The Al alloy 5052 and 6061 has been used in the automotive industry [17], in marine frames and in pipeline and aircraft applications [18]. This type of aluminium alloy contains magnesium and silicon as its major alloying elements; they increase the strength of the alloy via precipitation

Modified control chart for monitoring the variance

Dr. Birajendu Prasad Samal[*], Mr. Priyabrata Sahoo,
[1*] Professor, Department of Mechanical Engineering, NIT, Bhubaneswar, Odisha, India
[2]Asst. Professor, Department of Mechanical Engineering, GIET Bhubaneswar, Odisha, India

*Corresponding author e-mail: birajenduprasad@thenalanda.com

ABSTRACT

Goal: The main objective of this research paper is to propose a chart, named S 2 Modified Control Chart, where the process variance is allowed to be larger than the in-control variance value until a 0 maximum value , as long as the process remains capable, in the sense that it produces a specified MAX (tolerated) small fraction of non-conforming items. Design / Methodology / Approach: The research methodology was quantitative approach with statistical analysis of simulated data, to assess the practical impact of variance increase in process control in terms of quality requirements.

Results: The analysis of the simulated data showed that by using the proposed S 2 Modified Control Chart the number of unnecessary interventions in the process could be decreased, contributing to improve its efficiency. Limitations of the investigation: The analysis assumed mean and variance known, which is unlikely to occur in real applications. Research considering unknown parameters is also in progress. Practical implications: It prevents unnecessary process stops and assessments for assignable causes if only a small increase in the process variance occurs, which helps to increase process efficiency and lower costs. The S2 Modified Control Chart only detects genuinely increasing process variances, which significantly increase the rate of non-conforming items being produced. Originality / Value: This paper introduces a new control chart to monitor the variance of quality characteristics being produced by capable processes, preventing process over control.

Keywords: Type I and Type II Errors; False Alarm Rate; Acceptance and Modified Control Chart; S2 Control Chart.

Ventilator Research and Development Using Air Pump Technology

Dr. Deepak Kumar Sethy[*], Ms. Saipriya Rout,

[1*]Asso. Professor, Department of Mechanical Engineering, NIT, Bhubaneswar, Odisha, India
[2]Assistant Professor, Department of Mechanical Engineering, NMIT Bhubaneswar, Odisha, India

*Corresponding author e-mail: deepakkumar@thenalanda.com

ABSTRACT

If a patient is unable to breathe on their own, a ventilator is a device that assists them. It's also frequently referred to as a breathing apparatus. When providing care for a patient with a lung condition, medical professionals actually wear ventilators, which are masks. A bedside device called a ventilator has tubes that attach to the patient's airways. Ventilators assist in supplying patients' lungs with oxygen. A plastic tube placed in the patient's lips directs the air down his or her windpipe. In this study, an air pump-based mechanical ventilator is created. An electrical air pump in the ventilator pumps air for the patients. A ventilator's Electronic Control Unit (ECU) can regulate the amount of air that patients receive. Three different adult, child, and infant patient types each have their own air volume and ratio settings. In this ventilator, patients can breathe in two different ways. Continuous Positive Airway Pressure (CPAP) is the first mode, and Volume-Assist Control is the second mode (V-AC). In order to validate the ventilator's parameters with laboratory tests, a prototype of the device has been made and several experiments have been conducted.

KEYWORDS

Ventilator, Patient, Breath, Medical, Air, Pump.

INTRODUCTION

Ventilators are widely used in the treatment of patients with respiratory as well as general lung disease. Many research projects on ventilators have been developed around the world. Medical device manufacturers are also constantly researching to improve the functions of their ventilator products. Currently, the world is facing to a serious COVID-19 pandemic. During this pandemic, people did not have time to produce medical equipment to supply worldwide. Especially the shortage of essential medical equipment for human fighting against COVID-19, such as masks, sanitizers and ventilators. It is this shortage of medical equipment that has caused a disaster in the treatment of COVID 19 patients. COVID-19 victims have died a lot in early 2020 in China, Italy, USA, Europe. Currently, the COVID-19 disaster is still complicated and causing many deaths for victims in India, Malasysia and Indonesia. During the facing with COVID-19 pandemic, many medical device manufacturing companies have development their vetilators. A research team at Massachusetts Institute of Technology introduce their simple MIT mechanical ventilator [1]. After that, the MIT mechanical ventilator has been developed by many resreachers in universities on the world. Honnor of Guangzhou Yueshen Medical Equipment Co., Ltd. developed their ventilators, such as advance mobile ICU ventilator with air pump, medical ICU ventilator SH300, ICU ventilator YSAV1100[2]. These ventilators have many improvements to suit the situation of COVID-19 patients. Hunan Beyond Medical Technology Co., Ltd developed a non-invasiveventilator for COVID-19 patients, model ResPlus B-30P [3]. This ventilator is mainly used for patients with mild to moderatere spiratory failure, no indication of emergency intubation, relatively stable vital signs and no taboo of noninvasive ventilation. It is used for early intervention andauxiliary evacuation of respiratory failure. This study presents a research and development of a non-invasiveventilator. A prototype of the ventilator is manufactured for validation in laboratory test at Hanoi Univercity of Science and Technology.

Examining How the Performance of a Single Stage Gravitational Water Vortex Turbine Is Affected by Intake Head and Water Pressure

Dr. Nabnit Panigrahi[*], Dr. Subhrajyotee Sahoo,
[1*]Asso. Professor, Department of Mechanical Engineering, NIT, Bhubaneswar, Odisha, India
[2]Asso. Professor, Department of Mechanical Engineering, KEC Bhubaneswar, Odisha, India

*Corresponding author e-mail: nabnitpanigrahi@thenalanda.com

ABSTRACT

The gravitational water vortex turbine (GWVT) is a 0.7 to 3 m low head micro hydropower plant that uses irrigation canals, rivers, and streams to generate energy. Due to its affordability, environmental friendliness, low head, low flow rates, minimal time, and lack of installation knowledge, the GWVT is a revolutionary technology in micro hydropower. The performance assessment of a single-stage GWVT constructed in a conical basin with curved blades is explored experimentally in the current work. On a single-stage GWVT, 25 tests based on DOE with two factors and five levels were conducted. Under varied head and flow rates, the output performance metrics, including brake torque, rotational speed, vortex height, brake shaft power, and mechanical efficiency, are examined. Additionally, under various head and flow rate conditions, the influence of the brake torque on the vortex height, rotational speed rpm, brake shaft power, and mechanical efficiency of single-stage GWVT is also explored. The results showed that all performance parameters of the GWVT, including brake torque, vortex height, rotational speed, and brake shaft power, performed better at 0.70 m head and 0.004 m3/s flow rates, while the overall performance decreased at higher flow rates of 0.006 m3/s and maximum head of 0.8 m. Moreover, the GWVT achieved a higher rotating speed and maximum vortex height at the optimal torque. At 0.70 m head and 0.004 m3/s flow rates, the single-stage GWVT's maximum efficiency of 54.44% is absorbed.

KEYWORDS

Renewable energy, Single-stage GWVT, Conical basin, Output power, Efficiency

INTRODUCTION

A gravitational water vortex turbine is a new addition to the family of a micro- hydro turbine system which can operate ina low head range of 0.7 m -3 m without needing a large water reservoir and dam construction. The GWVT is a milestone in micro-hydro turbine development due to its unique water aeration process. In the past, energy was needed to aerate the water, but now this technology produced energy through a water aeration process. The major components of GWVT include a conical or cylindrical basin with a bottom orifice, an upstream channel, and single or multi -stage runner blades, and a vertical shaft. The water passes through an upstream open channel and enters tangentially into a round basin to form a stable water vortex. This water vortex formation is responsible for power generation. A runner containing blades assembled in a basin is responsible for extracting mechanical power from a the vortex's energy.. The shaft of a runner is coupled with a generator to produce electricity. The water passing through a bottom orifice is returned.

Environmental Temperature and Crystal Structure Effects on Fracture Toughness and Thermoplastic Fabrication by Enclosure FDM 3D Printer

Dr. Nayak Himanshu Sekhar Ray*, Ms. Bhaba Ranjan Patra,

[1*]Professor, Department of Mechanical Engineering, NIT, Bhubaneswar, Odisha, India

[2]Asso. Professor, Department of Mechanical Engineering, NIST Berhampur, Odisha, India

*Corresponding author e-mail: nayakhimanshu@thenalanda.com

Abstract

Thermoplastic materials have been printed in three dimensions using fused deposition modelling (FDM), layer by layer, but interlayer adhesion needs to be carefully managed to achieve good mechanical performance and product integrity. The interlayer adhesion and characteristics of thermoplastic FDM 3D printing were examined in this study along with the impact of ambient temperatures and crystalline structure. The enclosed FDM 3D printer was used to print five different types of poly(lactic acid) (PLA) filaments, including both commercially available and lab-made materials. The temperature-controlled chamber controlled the ambient temperatures, which ranged from room temperature to 75 C with and without a cooling fan. Fracture hardness, morphology, and the degree of entanglement density all served as indicators of interlayer adhesion. In addition, PLA filament with high crystallinity has induced heat resistance, which could prevent filament clogging and successfully print at higher chamber temperatures. The ambient temperature increased with increased chamber temperature and significantly increased when printed without a cooling fan, resulting in improved interlayer bonding. The crystalline structure and dynamic mechanical properties of the 3D printed products were promoted when the chamber temperature was increased without a cooling fan, especially in PLA composites and PLA containing a high content of L-isomer. Although the PLA composite additives increased the degree of entanglement density and crystallinity in the 3D-printed products, they also caused an anisotropic characteristic that caused the interlayer bonding in the transverse orientation products to decline. The interlayer bonding in pure PLA products was enhanced by chamber temperatures rising over 40 C, which was supported by the higher fracture toughness. Moreover, PLA's amorphous structure can be seen to encourage molecular entanglement, particularly when printing at higher chamber temperatures both with and without a cooling fan.

Keywords: ambient temperature; crystallinity; molecular entanglement; interlayer adhesion, fracture toughness

Introduction

Computer-aided design (CAD) has employed fused deposition modelling (FDM) 3D printing for rapid prototyping, which prints thermoplastic materials layer by layer and creates laminated items. Due to the FDM 3D printing process' quick solidification, the laminated layers typically partially weld between the hot melt extruded and the printed layer on the substrate [2]. When compared to compression- and injection-molded items, the laminated layers of 3D-printed objects have weak interlayer adhesion, which lowers their physical and mechanical qualities. The material characteris-tics, processing conditions, and specifications of 3D printers are variable to optimize thequality of the laminated layer bonding and the performance of the printed products. Frone et al. improved the properties of poly(lactic acid) (PLA)/poly(3-hydroxybutyrate) (PHB)/cellulose nanocrystals (NC) nanocomposites prepared by compression molding,extrusion, and 3D printing. The reactive blending process improved interfacial adhesion between PLA/PHA matrix and NC with the combination of molecular orientation during extrusion of the filament, and the 3D-printed samples resulted in improved crystallinity and enhanced storage modulus as compared to the compression-molded samples. Ben- wood et al. reported the mechanical properties of PLA injection-molded and 3D-printed samples. In this research, the properties of the 3D-printed samples at a bed temperature of 105 ˚C have the most promising properties,

similar to those of the injection-molded samples except for the elongation at break. The poor layer bonding between the filaments of the FDM samples was compensated by their highly crystalline structure, which enhanced the notched Izod impact strength of the 3D printed samples, while the declination of elongation of the FDM samples was due to stress concentration on the filament bonding surfaces. The interlayer adhesion is the main drawback in FDM 3D printing and has been studied and developed to promote printability and properties of the 3D printed product.

Measuring Techniques for Roundness: A Comparative Experimental Study

Dr. P.Paulpandian[*], Mr. Dipabrata Banerjee,
[1*] Professor, Department of Mechanical Engineering, NIT, Bhubaneswar, Odisha, India
[2]Asst. Professor, Department of Mechanical Engineering, NIT Bhubaneswar, Odisha, India

*Corresponding author e-mail: dipabratabanerjee@thenalanda.com

ABSTRACT

One of the crucial characteristics of a machined workpiece is roundness. The performance and lifespan of the mechanical parts are significantly impacted by this parameter value. It is regarded as one of the variables that is most frequently utilised to control the intricate form of the workpiece. The necessity of developing techniques and tools for the control of form surfaces is determined by increasing demands on the workpiece's form accuracy. The evaluation of roundness error can be done in a variety of ways. The most significant and well-known of these techniques are the minimal circumscribed circle (MCC), maximum inscribed circle (MIC), least square circle (LSC), and minimum zone circle (MZC) (MCC). The current work offers an experimental assessment and comparison of the approaches used to calculate roundness error values. We base our experimental work on the calibration of the Ra-120 instrument. Using cylindrical mild steel specimens, the round test RA-120 equipment was used to measure the roundness error value using the four methods (LSC, MZC, MIC, and MCC). The primary conclusions of the suggested experimental inquiry demonstrate that the (MZC) approach delivers the lowest value for the measurement error of roundness, supporting the mathematical and theoretical findings in the literature.

KEYWORDS

Roundness measurement; least square method; minimum zone circle; maximum inscribed circle; minimum circumscribed circle.

INTRODUCTION

The circular feature is one of the most basic geometric elements of mechanical parts. In manufacturing environments, variations on circular features may occur due to imperfect rotation, erratic cutting action, inadequate lubrication, tool wear, defective machine parts, chatter, misalignment of chuck jaws, etc.[1]. Types of fundamental geometric forms typically encountered are straightness, flatness, cylindricity and roundness. Roundness (R) is a geometric property of a cylindrical workpiece, in which errors are caused in the geometry of the machine producing the part. Thus, deviations from a perfect circle are errors in macro-geometry rather than micro-geometry. The achievement of desirable value is a very critical process as the parts have already passed through many machining stages[2]. Whether roundness error can be evaluated accurately and efficiently or not will directly influence the mechanical products' performance and life. Therefore, there is a requirement to develop an automatic inspection method that will satisfy the needs of roundness inspection. Fairly extensive research in the area of roundness evaluation and inspection is still underway. Roundness measurements are used to evaluate and control the quality of cylindrical objects.

Mechanical and Corrosion Behavior of Stir Casting-Synthesized Aa7100/Fe2o3 Composites

Dr. Sai Gani Prasad[*], Dr. Bhabani Sankar Patra,
[1*] Professor, Department of Mechanical Engineering, NIT, Bhubaneswar, Odisha, India
[2]Asso. Professor, Department of Mechanical Engineering, TITE Bhubaneswar, Odisha, India

*Corresponding author e-mail: saiganiprasad@thenalanda.com

ABSTRACT

Researchers looked at how nano Fe2O3 affected the microstructure, mechanical properties, and 3.5% Nacl corrosion-fatigue interaction of the base metal AA7100. By using the stir casting method, the nano composites (1.5%,3%, and 4.5wt%/Fe2O3) were created. The matrix and nanocomposites' microstructure was investigated using an optical microscope. The optimal addition of Fe2O3 was discovered to be 4.5 weight percent, which resulted in dendritic refinement and uniform distribution, which contributed to the development of the mechanical and corrosion-fatigue criteria. The 4.5wt.% composite's mechanical properties (UTS and YS) were enhanced by 25.15 and 38.28%, respectively. While a 10.58% drop in ductility was noted. For the 4.5wt%/Fe2O3 combination, the increase in hardness was 10.28%. When compared to the matrix, the corrosion-fatigue interaction was greatly improved by the addition of 4.5 weight percent Fe2O3.

KEYWORDS: AA7100, nanoFe_2O_3, stir casting method, mechanical properties, corrosion-fatigue interaction, corrosion, AA7100/Fe_2O_3, stir casting

INTRODUCTION

Aluminum and its alloys have many applications such as in aerospace, transportation and marine industries because of their high strength and weight of light properties and good resistance to corrosion [1]. A very reactive metal is Aluminum, which is make a thin solid protective film of oxide which avoids the further than corrosion for the material. However, contacting with solutions including complex agents (i.e. halides), aluminum suffers limited corrosion different attempts were made to study. The influence of different ions on the electro chemical behavior and pitting corrosion of AL and its alloys [2-3] protecting aluminum via cover its surface with an organic layer is a good method for taking advantages of the mechanical feature of the metal whereas protective it from corrosion. Adhesion of the organic layers on aluminum it very poor and required round about pretreatment as chromating. There is a great request for an ecologically friendly surface handling because of the carcinogenic nature of chromate transformation layers [4-9]. Aluminum alloy 7100 has supposedly 0.25% chromium and 2.5% magnesium. It has good effort capability, good weld capability, medium static strength great fatigue strength, and very good resistance to corrosion mainly in marine atmospheres, and it has the low density and outstanding thermal conductivity to all aluminum alloys. It is usually utilized in forms of plate, sheet, and tube.

Building Orientation and Post Processing of Laser Powder Bed Fusion Process Generated Ti6Al4V

Dr. Soma Dalbehera[*], Ms. Poonam Swain,
[1*] Asst.Professor, Department of Mechanical Engineering, NIT, Bhubaneswar, Odisha, India
[2]Asst. Professor, Department of Mechanical Engineering, REC Bhubaneswar, Odisha, India

*Corresponding author e-mail: somabehera@thenalanda.com

Abstract:
One additive manufacturing (AM) technique utilised to create near-net-shaped engineering components for biomedical purposes, particularly in orthopaedics, is laser powder bed fusion, specifically selective laser melting (SLM). Because of its outstanding mechanical properties, high level of biocompatibility, and resistance to corrosion, Ti6Al4V is frequently employed in the production of orthopaedic implants utilising SLM. The main issues with this process, though, are brought on by the surface characteristics that must be able to encourage cell adhesion while also preventing bacterial colonisation. In order to provide products the distinctive traits that can enhance their usefulness and performance under specific working settings, surface modification is utilised as a post-processing technique. The purpose of this research was to create and analyse Ti6Al4V samples made by SLM with various building orientations in regard to the building plate (0 and 45). The findings show the long-term effects of production and post-processing on osteoblast attachment, mineralization, and osseointegration. The biocompatibility of the as-built specimens and the specimens after the passivation treatment was established, despite the fact that the anodization treatment result was cytotoxic. Also, it was shown that these kinds of 3D-printed surfaces mineralize more quickly with good post-processing.

Keywords: laser powder bed fusion; building orientation; anodization; etching; titanium; osseointegration

Introduction
The need for orthopaedic implants is anticipated to expand dramatically during the future decade. In order to support damaged tissues and bones and increase patient comfort, researchers in the field of orthopaedic implant manufacture have devised a number of solutions [1,2]. These orthopaedic implant options offer a number of benefits, such as a relatively low cost, less discomfort, and a speedy recovery. The market for orthopaedic implants will shift in the next years to less intrusive and more cheap methods of joint replacement surgery. Use of innovative production technology is essential to meeting this need [3-6].
AM is a contemporary technology that is constantly developing. AM, also referred to as 3D printing, enables scientists to produce items directly from computer blueprints. New three-dimensional items may now be produced in low to medium volumes more easily thanks to AM. The usage of various AM technologies, particularly in orthopaedics, has increased dramatically in the biomedical industry as a result of AM's capacity to create highly tailored products [7,8]. Selecting the best materials and AM processes is an essential component of employing this technology [9, 10]. The mechanical qualities of titanium and its alloys, particularly those provided by the surface, such corrosion resistance

REVIEW OF THE LITERATURE ON DIGITAL SUPPLY CHAIN MATURITY MODELS

MR. ABINASH SAHOO[*], Mr. Nirmalendu Hota,
[1*] Asst.Professor, Department of Mechanical Engineering, NIT, Bhubaneswar, Odisha, India
[2]Asst. Professor, Department of Mechanical Engineering, GIET Bhubaneswar, Odisha, India

*Corresponding author e-mail: birajenduprasad@thenalanda.com

ABSTRACT
Goal: Today, digital technologies have significant effects on supply chains as companies explore and exploit their opportunities. Digital supply chains promise advantages over traditional ones. A maturity model is a helpful tool to assess the current state of digitalization in supply chains and to guide companies towards implementation. The main goal of this paper is to investigate existing maturity models for digital supply chains and propose possibilities for future research.
Design / Methodology / Approach: A structured literature review is conducted to identify relevant maturity models. Those are analyzed regarding their type and emphasis on a specific supply chain function or certain digitalization dimension.
Results: There are found to be twenty-eight maturity models. Each of them focuses on a distinct digital technology or supply chain function. It becomes clear that there has been little research on other areas of supply chain digitalization because of the concentration on manufacturing (Industry 4.0). Moreover, not all aspects of digitization are covered in the majority of studies. In addition, greater in-depth analysis of the maturity models' quality, assessment, and use is required.
Limitations of the investigation: The conducted review is limited to two databases (Scopus and Web of Science). Two researchers conducted the analysis, which might lead to some bias. Furthermore, the analysis could be broadened and performed more in-depth to derive further insights.
Practical implications: Practitioners might use the presented overview of existing maturity models to identify a well-developed one that fits their desired application scenario.
Originality / Value: This paper provides suggestions for future research and highlights interesting and relevant topics to investigate.
Keywords. Digitalization; Supply Chain; Maturity Models; Literature Review

INTRODUCTION

In today's culture, digital technologies are essential and have a big impact on organisations and corporations. Big data and smart manufacturing are ubiquitous terms, and businesses work hard to find developing technologies and take use of them (Iddris, 2018). SCM, or supply chain management, is no different. More visibility, greater flexibility resulting from real-time information, and assuring customer response are some advantages of digital supply chains (SC) (Büyüközkan and Göçer, 2018). The advantages are credited to the utilisation of cutting-edge technology that transform conventional SC into digital SC (Iddris, 2018). Almost 350 participants participated in an online survey that Kersten et al. (2017) performed with participants from German manufacturing, logistics, trade, and consulting firms. 73 percent of the participants said that there are many prospects for growth due to digital transformation.

Academics and practitioners alike could benefit from roadmaps towards SC digitalization. Maturity Models (MM) can serve as a starting point for the digitalization process (Pullen, 2007).In an organizational context, the term maturity can be defined "*as the degree to which a process is defined, managed, measured, and continuously improved*" (Dooley et al., 2001: 23). MM are helpful tools and provide frameworks to determine the direction as well as priorities for further action. Despite the existence of many MM examining limited areas of SCM or specific digital technologies and even some first approaches to develop a MM for the digitalization of an entire SC, there is no consensus about how such a MM should look like (Reis et al., 2018).

Analytical Solutions of Dynamic Crack Models of Bridging Fiber Pull-Out in Unidirectional Composite Materials

Mr. Ajay Kumar Sahoo[*], Mr. Rajest Kumar Behera,
[1*] Asst.Professor, Department of Mechanical Engineering, NIT, Bhubaneswar, Odisha, India
[2]Asst. Professor, Department of Mechanical Engineering, NIT, Bhubaneswar, Odisha, India

*Corresponding author e-mail: ajaykumar@thenalanda.com

ABSTRACT

An elastic analysis of an internal central crack with bridging fibers parallel to the free surface in an infinite orthotropic anisotropic elastic plane was analyzed, and the crack extension should occur in the format of self-similarity. When the fiber strength is over its maximum tensile stress, the fiber breaks. By means of complex variable functions, the problem considered can be easily translated into Reimann-Hilbert mixed boundary value problem. Utilizing the built dynamic model of bridging fiber pull-out in unidirectional composite materials, analytical solutions of the displacements, stresses and stress intensity factors under the action of increasing loads Pt^5/x^5, Px^5/t^4 are obtained, respectively. After those analytical solutions were used by superposition theorem, the solutions to arbitrary complex problems were acquired.

Keywords: Composite Materials; Bridging Fibers; Analytical Solutions; Crack; Variable Loads

1. Introduction

It is well known that the matrix cracking as well as fracture process of the bridging fibers is one of the significant mechanisms of the cracking expansion in fiberreinforced composite materials, such as unidirectional fiber-reinforced brittle matrix composites [1,2], and threedimensional fiber-reinforced composites with an orthogonal fiber structure [3]. Literature [4] proposed an approach for the assessment of the distribution of the traction force for a crack with bridging fibers in an infinite, orthotropic elastic plane under a uniform remove tension stress. Most researchers, such as Woo, Lee and Tsai [5-7] etc, almost investigated static problems of composite materials; moreover, they obtained only numerical solutions. Literature [8] set up a model of bridging fiber pull-out, but it also acquired the numerical solutions under the static conditions. It is indispensable to consider the mechanical analysis of matrix cracking with bridging fibers, so as to evaluate the distribution of the axis traction force in each fiber. However, the fractures of composite materials often arise in dynamic conditions, so accordingly it is extremely important to research their fracture dynamics problems. In an orthotrpic medium, elastodynamics crack problems were studied and closed solutions were also gained, but bridging fiber pull-out problems weren't dealt with in literatures [9,10]. Bridging fiber pull-out is very complicated and cockamamie in dynamic fracture process of composite materials, so a lot of difficulty must be overcome in studying dynamic crack expansion problems on bridging fiber pull-out of composite materials. When composite materials occur in a crack, bridging fiber pull-out often exists ahead of the crack tips, and this is a frequent phenomenon.

Because the fiber failure is governed by maximum tensile stress, which appears at the crack plane, the fiber breaks and hence the crack propagation should occur in a self-similar fashion. The fiber breaks along a transverse line and therefore present a notch [8,11-12]. When a crack runs at higher velocity, bridging fiber pull-out still exists in the dynamic case of composite materials, which are more important than those in the statics.

The problem under consideration is that of a crack, moving in one plane, presumed to nucleate from an infinitesimally small micro-crack with maximum velocity from the start. This modality of symmetrical crack, running with constant velocity V in both the positive and negative directions of the x-axis, has been researched by

Corrosion Resistance, Mechanical Properties, and Microstructure of Aluminum Alloys as a Function of Cooling Rate

Mr. Avaya Kumar Baliarsingh[*], Mr. Shibsundar Rath,
[1*]Assisiant Professor, Department of Mechanical Engineering, NIT, Bhubaneswar, Odisha, India
[2]Assistant Professor, Department of Mechanical Engineering, BIIT Bhubaneswar, Odisha, India

*Corresponding author e-mail: avaykumar@thenalanda.com

ABSTRACT

Materials' mechanical characteristics and microstructure have a big impact on how useful they are. Aluminum alloy is widely employed in a variety of circumstances. The effects of cooling rate on the microstructure, mechanical characteristics, and corrosion resistance of the 6xxx-series aluminium alloy are examined in this study. A muffle furnace was used to melt the aluminium ingot before casting it into rods. By holding the moulds at various temperatures, the cooling rate was managed. Optical microscopy was used to analyse microstructural features. Standard techniques were used to analyse mechanical parameters such as impact strength, hardness, and tensile strength. Potentiodynamic polarisation was used to assess corrosion resistance. It was discovered that depending of the cooling rate, ferrite and pearlite phases with various morphologies and grain sizes dominate microstructures. Raising the cooling rate improved the alloy's mechanical characteristics, chemical homogeneity, microstructural refinement, and corrosion resistance.

Keywords: 6xxx Al, Cooling rate, mechanical properties, corrosion resistance, HCl

INTRODUCTION

The majority of uses for aluminium alloys depend on their mechanical characteristics, which are mostly determined by microstructure [1]. Due to its high strength and low density, 6xxx-series aluminium alloy is frequently utilised as structural materials in automobiles and aeroplanes [2]. While having high mechanical qualities, it has been found that 6xxx aluminium alloy does experience some type of corrosion attack, the repercussions of which result in fatalities as well as other negative economic implications [3]. A heterogeneous microstructure with intermetallic phases and precipitates that are often seen at the grain boundaries has been linked to the corrosion process in aluminium alloy [4]. With the use of copper as a die material to provide quick heat transfer during solidification, the effects of cooling rate on the mechanical behaviour of bulk casts of the A380 aluminium alloy have been studied. According to their findings, a quicker cooling rate increased the ultimate tensile strength [5]. Their research did not, however, look into how the cooling rate affected the alloy's corrosion behaviour. The relationship between the mechanical qualities of aluminium alloy and the reduction in solidification time has been demonstrated [6]. Moreover, it has been demonstrated that castings with a faster cooling rate produce castings with high yield strength, ultimate tensile strength, ductility, hardness, and impact resistance [7]. The influence of cooling rate on solidification behaviour of AA2618 aluminium alloy has been examined [8], [9] and [10]. They all concluded that under slow cooling conditions, the alloy was of complex microstructures with lots of eutectic compounds and that increasing cooling rate suppressed the formation of intermetallic Al9FeNi.

Research on the impact of cooling rate on the microstructure and corrosion behaviour of 6xxx alloy is rare, despite numerous attempts to improve the mechanical properties of aluminium alloy castings appropriate for application in the vehicle sector. Therefore, this study examines how the casting process's cooling rate affects the aluminium alloy's microstructure, mechanical characteristics, and corrosion behaviour.

REVIEW OF RECTANGULAR FINS' IMPROVEMENT OF HEAT TRANSFER

Mr. Dharmananda Barik*, Ms. Subhra Jyotee Hota,

[1*]Asso. Professor, Department of Mechanical Engineering, NIT, Bhubaneswar, Odisha, India

[2]Assistant Professor, Department of Mechanical Engineering, INDUS Bhubaneswar, Odisha, India

*Corresponding author e-mail: dharmanandabarik@thenalanda.com

ABSTRACT

Engineering appliances' heat generation has a negative impact on how the system operates and can lead to problems including short machine lifespans, frequent maintenance needs, and low system reliability.

Such issues have frequently been resolved using the passive cooling technique.This review article provides an economical summary of the heat transfer improvement technique using a rectangular f in. Many experiments and numerical studies on the improvement of heat transmission by rectangul ar fins have produced highly important findings. Several different kinds of rectangular fin structur es are simultaneously investigated in this article. It is revealed through reviewing the related literature that the highest value of equivalent heat transfer enhancement is found the increase in average heat transfer performance of inverted triangular notched fin 50.51% as compared with plane rectangular fin and the perforated fin total heat transfer rate increased by 38.9% compared to regular fin. Furthermore, by reduction of the optimal fin spacing, heat flux can be changed by 20% in standard rectangular fin when compared with regular fin spacing. Also cooling performance of the inclined rectangular fin with 60° of tilt angle is seen to be as 6% higher than solid rectangular fin. This article can be considered as a benchmark in the practical application for enhances the heat transfer rates.

Keywords: Heat Transfer Enhancement, Rectangular Fin, Active Method, Various Fin, Passive Method, Fin geometry.

INTRODUCTION

Heat generation of engineering appliances has bad effect in handling the system can cause the trouble, short life cycle of machines, frequent maintenance requirements and low reliability of systems. There are two methods are used tominimize the overheating problems. These are active and passive methods. In active methods, to maintain the enhancement mechanism of heat transfer external power is required. In passive methods, surface modification or geometrical shape changes are mostly performed in the existing material or additional devices like rough surface or extended surface are added in the system. In passive methods heat transfer rate is often increased by providing extended surfaces which increases the effective heat transfer area. This is done by adding fins, pins, or other extensions to the heat transferring surface. These methods have so many advantages than active methods so that it is preferred for widely used. As these have many advantages the fin arrays are commonly used in heat exchangers, air conditioning, chemical reactor and refrigeration systems and other application areas that require high heat flux removal rates. Basic methods of the heat transfer are conduction, convection and radiation.

Implications of Industry 4.0 to Companies' Performance: A Case Study

Dr. Naga Sai Prasad[*], Ms.Neha Manki,
[1*]Assistant Professor, Department of Mechanical Engineering, NIT, Bhubaneswar, Odisha, India
[2]Assistant Professor, Department of Mechanical Engineering, TITE Bhubaneswar, Odisha, India

*Corresponding author e-mail: nagasaiprasad@thenalanda.com

Abstract

Several inspection stations are present on modern mixed-model production/assembly lines, and the quality control tests conducted at these stations may result in the tested unit being sent to an off-line rework shop where the required repairs can be done before being reinserted back into the line. Because of this, the order (sequence) at which finished units depart the production/assembly line differs from the order in which they entered. The effects of these sequence or rank adjustments on mixed-model production lines, such automobile assembly lines, are particularly significant in terms of efficiency and balancing. In this study, we derive the probability density function for a given unit's rank change. For a deeper and more thorough examination of this rank shift phenomena, its impact, and the implementation of effective remedies to mitigate its disruptive impacts, having a precise understanding of this function's structure is a requirement.

Keywords

Mixed-model assembly line, Motorcar industry, Probability analysis

Advanced Thermal Study of Radiant Radiation in a Horizontal Tube for Sustainable Development of Three-Dimensional Conjugation Heat Transfer

Mr. Manas Kumar Samantaray[1*], Ms. Saipriya Rout,
[1*]Assisiant Professor, Department of Mechanical Engineering, NIT, Bhubaneswar, Odisha, India
[2]Assistant Professor, Department of Mechanical Engineering, MITM Bhubaneswar, Odisha, India

*Corresponding author e-mail: manaskumar@thenalanda.com

ABSTRACT:

Advanced analysis is done on the thermal behaviour of three-dimensional conjugate heat transfer in steady and transient modes in a horizontal pipe with fluid flow. A numerical method for three-dimensional conjugate heat conduction in a solid wall and heat convection in a laminar flow with radial radiation is developed by looking at a computational model of the solid-fluid domains. The gradient in temperature and heat flux of the solid-fluid domains are thought to be dependent on the thermal equivalent of conduction, convection, and radiation heat exchanges because the thermal loads on the pipe can be well quantified. Two different fluids—air and water—as well as an ordinary solid pipe made of annealed stainless steel are used to assess sustainability. The results of the thermal analysis are represented by a number of parameters in the steady and transient phases to emphasise the effects of three-dimensional conjugate heat transfer in conjunction with radial radiation on the fluid flow. These parameters include the temperature distribution, fluid flow, and velocity, as well as the heat flux from the environment. Eutrophication of the water and acidification of the air are two estimated environmental impacts of the pipe. The thermal analysis comes to the conclusion that convergent-divergent nozzles are among the engineering devices that are advised by computational modelling of the thermal loads.

KEYWORDS: Thermal analysis; Conjugate heat transfer; Laminar fluid flow; Horizontal pipe; Sustainability.

INTRODUCTION

In locations with solids and liquids, heat transfer is frequently governed by conduction, convection, and radiation mechanisms. These procedures are essential in thermal energy systems. Conjugate heat transfer is a result of the interaction between conduction in a solid wall and convection in a fluid flow. Conjugate heat transfer occurs in a variety of important engineering components, such as pipes, ducts, nozzles, diffusers, and microelectronic part. For a number of working situations, including heating and cooling systems, water treatment technologies, air conditioning, and filling and emptying portable tanks in homes, institutions, and centres, water and air are regularly used in industrial applications through a variety of pipes. A few of the problems with water and air fluxes include water leaks, air leaks, and water condensation outside of pipes in cold regions. If a piece of equipment is directly connected to a network of saturated water or compressed air ducts is where fluid leaks commonly occur. Fluid leaks are a common problem because of connections that drop and become loose due to cycling, opening, closing, and vibrating actions that cause expansion and contraction. The key variables that might be changed to find the optimal design include the pipe geometry, materials, or even the control of pressure and mass flow rate of the fluid flow on a computational modelling programme. Direct numerical simulations of fluid flow along with convection were conducted to study the differential heating process of a vertical channel. Their analysis concentrated on classifying solid-wall with fluid-flow systems. The features that significantly affect the walls are often responsible for the localised high thermal energy rates, the scientists found. The volumetric heat conduction issue is a different problem that has recently undergone experimental investigation and has been thoroughly studied in the literature for both two- and three-dimensionalscenarios.

Analyzing the temperature distribution of seamless low-alloy steel pipes as they are being hot rolled

Mr. Amiya Kumar Biswal*, Ms. Poonam Swain,
[1*] Asst.Professor, Department of Mechanical Engineering, NIT, Bhubaneswar, Odisha, India
[2]Asst. Professor, Department of Mechanical Engineering, REC Bhubaneswar, Odisha, India

*Corresponding author e-mail: amiyabiswal@thenalanda.com

A B S T R A C T

In the production of seamless steel pipes, the pipes must have good mechanical material properties so that they meet quality standards. To achieve these properties, the temperature inside the entire pipe should not fall below the limit of normalization immediately after rolling. It is difficult to monitor the quality during the production process by taking measurements, because the measured outer surface temperature does not indicate the tem- perature inside the pipe. A fast and accurate mathematical model was developed for this purpose. This model can be applied to predict the temperature distribution within the pipe cross section, depending on time required for the production. The section is viewed at points in the production process as the hot tubes are finished by rolling them and cooling them down with air. The predicted time-dependent cooling process must be known to deter- mine the steel pipe microstructure and its mechanical material properties in advance. The results are verified by comparing them with pyrometric and thermographic measurement data as well as with results calculated by using commercially available software. Good agreement is also shown for the calculation of various pipe dimensions.

Introduction

The global demand for steel pipes is high. These are often used to transport fluids such as water, which can be carried over long distances to supply households. Pipes are important components of an infrastructure. In refineries, large quantities of pipes are used to transport different fuels, oils and other fluids. High demands are placed on the material with re- gard to their corrosion resistance and structural as well as thermal load capacities. Pipes are also used in the automotive industry and for steel construction. The weight of these pipes is significantly lower than that of bar stock, although they have the same structural load capacity. Seamless steel pipes are used to transport fluids under pressure, e.g. in pressure vessels. The mechanical load capacity of seamless pipes is higher than that of welded. For this reason, seamless steel pipes are more likely to be used for oil drilling operations. Because of the continuous growth in the industries referred to above, the demand for steel pipes is constantly growing. pipes, a task which has previously been almost entirely ignored. This last step in the production is highly relevant, as it enables the desired me- chanical properties of the steel pipes to be achieved. The steel rolling process involved has to be carried out above a specific minimum term- perature. However, this temperature limit also cannot be greatly excee- ded, as this incurs more costs. Meeting these two targets necessitates making a trade-off, whereby the temperature limit of normalization is set as the optimum temperature. In order to approach the limit as closely as possible, but neither fall below nor exceed it, the entire temperature distribution within the pipe cross-section must be known. A mathemat- ical model was developed for this purpose. The objective was to use the model to perform online calculations, consuming as little computing time as possible, and to deviate from the measured values by no more than 2.5%.

A State-of-the-Art Analysis of 3D Printing's Use in Medical Applications

Mr. Priyabrata Mohanty[*], Rajesh Kumar Behera [2],
[1*]Professor, Department of Mechanical Engineering, RITE, Bhubaneswar, Odisha, India
[2]Assistant Professor, Department of Mechanical Engineering, NIT, Bhubaneswar, Odisha, India

*Corresponding author e-mail: rajeshbehera@thenalanda.com

Abstract- A variety of manufacturing techniques known as three-dimensional (3D) printing create physical models from digital data. 3D printing for the medical industry was considered a lofty pipe dream. Time and money, though, made it a reality. Today's 3D printing technology has a significant possibility to assist pharmaceutical and medical corporations in developing more specialised pharmaceuticals, enabling the quick creation of medical implants, and transforming how doctors and surgeons approach surgical planning. Anatomical models that are 3D printed specifically for a patient are becoming more and more important instruments in today's practise of precision medicine and for individualised treatments. The availability of 3D-printed implantable organs in the future is likely to shorten waiting lists and increase the number of lives saved. Even though additive manufacturing for the healthcare industry is still very much in its infancy, it is already being used in a variety of ways in the medical industry, which is already under tremendous pressure to perform at the highest level possible while also cutting costs. This industry will reap unparalleled advantages from this good-as-gold technology. The purpose of this analysis is to illustrate through a thorough investigation of 3D printing applications in the medical field both the benefits and limitations of this technology.

1. Introduction

The additive technique of 3D printing is one of many production processes now used by the sector. It is a method by which a three-dimensional solid object is created starting from a computer model, essentially of any shape. 3D printing for the medical industry was considered a lofty pipe dream. Time and money, though, made it a reality. Today's 3D printing technology has a significant possibility to assist pharmaceutical and medical corporations in developing more specialised medications, enabling the quick creation of medical implants, and altering how doctors and surgeons approach surgical planning [1]. There are several uses for this technology, but the introduction of 3D printing itself has been the medical sector's fastest-growing innovation [2].Five technical steps are required to finalize a printed model. They include selecting the anatomical target area, the development of the 3D geometry through the processing of the medical images coming from a CT/MRI scan, the optimization of the file for the physical printing, and the appropriate selection of the 3Dprinter and materials (Figure 1). This file represents the guidance for the subsequent printing, “slicing” that digital design model into cross sections. That “sliced” design is thensent to a 3D printer, which manufactures the object bystarting at the base layer and building a series of layers on topuntil the object is built using the raw materials that are needed for its composition. A patient-specific model with anatomical fidelity created from imaging dataset is finally obtained.

In this way, the 3D printing has the potential to sig- nificantly improve the research knowledge and the skills of the new generation of surgeons, the relationship between patient and surgeon [3], increasing the level of un- derstanding of the disease involved, and the patient-specific design of implantable devices and surgical tools [4–6] and optimize the surgical process and cost [7]. Nowadays, dif- ferent printing techniques and material are available in order to better reproduce the patient anatomy. Most of the available printing materials are rigid and therefore

Wire Arc Additive Manufacturing Effects of Wire Feeding Angle

Mr. Sanjay Kumar Raj[*], Ms. Smruti Ranjan Panda,
[1*] Asst.Professor, Department of Mechanical Engineering, NIT, Bhubaneswar, Odisha, India
[2]Asst. Professor, Department of Mechanical Engineering, EAST, Bhubaneswar, Odisha, India

*Corresponding author e-mail: sanjaykumar@thenalanda.com

ABSTRACT: A 3D printing technology known as wire arc additive manufacturing (WAAM) uses a welding arc to melt metal wire in order to produce metal objects. Reduced waste material, often known as the buy to fly ratio and lead production time, are benefits of WAAM. This study attempts to identify an appropriate range of process parameters for a stable and continuous single weld bead deposition of micro plasma based WAAM as the application of micro plasma arc welding is rarely used in the WAAM process. Consistent and predictable single bead creation is crucial for 3D printing to produce high-quality structures. Because the optimal welding parameters correspond to the final desired bead geometry, it is necessary to establish a solid relationship between the various process parameters. This study examined the effects of various process conditions on the created object geometry while using WAAM. In order to achieve continuous layering and minimise the variation in layer height, this study primarily focuses on wire feeding angles of 30° and 60° at combinations of different speeds. The outcome shows that inconsistent deposition is created at a wire feed angle of 30°. A more uniform deposition is obtained as a result of the wire feed angle being set to 60o. Also, it is discovered that a single layer's hardness rapidly diminishes away from the substrate.

KEYWORDS: Wire arc additive manufacturing (WAAM), 3D printing, additive manufacturing, micro-plasma arc welding

INTRODUCTION

Additive manufacturing (AM) has grown a great deal of attention due to its potential to replace conventional subtractive manufacturing and has revolutionized manufacturing industry [1]. AM technology is a promising alternative and gives more freedom to the designer over traditional manufacturing. In the next five years, AM technology for metal is expected to revolutionize many niche areas, save metal supply, and rise exponentially [2]. According to ASTM standard F2792, the wire arc additive manufacturing (WAAM) process is one of direct energy deposition, classified as the seven-key process AM [3]. Among the available AM for metal technology [4], WAAM under direct energy deposition (DED) provides compelling benefits in realizing large-scale metal parts, relatively costly consumption, and high deposition rate [5], [6]. WAAM produces 3D metal parts in a layer-by-layer form using an electric arc as a heat source to melt the metal wire and transfer it to the pool of liquid metal for producing a layer [7]. In WAAM, various arc processes can be used as an energy source, including gas metal arc welding (GMAW) [8], gas tungsten arc welding (GTAW) [9], and plasma arc welding (PAW) [10]. Among this technique, WAAM based GMAW is highly prospective and can produce big-scale components with relative

The Thermal Performance of the HAVC System's heat pipe heat exchanger

Mr. Satyaban Sahoo[1*], Mr. Ashish Das,
[1*]Assisiant Professor, Department of Mechanical Engineering, NIT, Bhubaneswar, Odisha, India
[2]Assistant Professor, Department of Mechanical Engineering, GITAM Bhubaneswar, Odisha, India

*Corresponding author e-mail: satyabansahoo@thenalanda.com

ABSTRACT

In order to reduce the energy consumption of (HVAC) systems without lowering the required temperature in the air-conditioning space, (HPHX) has been used and tested. The 40 heat pipes that make up the heat pipe heat exchanger (HPHX) are arranged in 4 rows, with 10 copper tubes in each row. The pipe had a length of 73 cm, an internal diameter of 1 cm, and an exterior diameter of 1.23 cm. Distilled water was poured into the heat pipe at a filling ratio of around 50% of the evaporator's volume. Many tests were carried out to assess the effect of air velocity on the difference in the temperature of the air entering and departing on the evaporator and condenser part of heat pipes for different quantities of heat flux. Also, The ratio of heat recovery in the evaporator as well as the efficiency of the heat pipe heat exchanger at various speeds (1 m/s and 2 m/s) were both calculated. According to the study, the temperature change in the evaporator and condenser will likewise rise as heat flow and air velocity rise (HPHX). The findings demonstrate that the efficiency of the heat pipe is increased by increasing the heat flow and decreasing the air velocity. Using 1400 watts of heat flux and 1 metre per second of velocity, the maximum efficiency was 0.646. The maximum value of heat recovery—923.4 watts at 2 m/s with 1400 watts of heat flux—and the condenser's inlet temperature of 29.2°C, along with the evaporator's output temperature of 31.7°C, were where efficiency was at its highest.

KEYWORDS

Heat pipe, HPXH, Heat recovery, Effectiveness, Taguchi Method

INTRODUCTION

Many investigations targeted at energy saving have focused on the thermosyphon (HPHE). Applications for heat pipe include cooling for rotary blade gas turbines, cooling systems for electronic components, thermal control for spacecraft, heat exchangers that function as recovery systems, solar energy energy sharing systems, and more . The thermosyphon (THE) heat exchanger is one of the best ways to recover lost heat. Several studies have been carried out to achieve thermal efficiency in order to guarantee the reliability and efficiency of the heat pipe heat exchangers. A straightforward experiment looked at the usage of a heat pipe heat exchanger to warm cars using exhaust gas. Yang et al (9) An experimental study on the thermal performance of a heat pipe thermosyphon filled with R-134a was conducted by Ong et al. A pilot study on coupled heat pipes and indirect evaporative air conditioning equipment was done for energy recovery systems. M. Francisco is just one example. The effect of HPHX on the effectiveness of an air conditioning system in a library building has been studied, claims Ahmad Zadehtalatapeh.

According to the study's results, the indirect evaporation system and heat pipe allow the return airflow to capture some of the energy, increasing energy requirements while reducing environmental impact. Hassan, M. A. conducted an experimental study to evaluate the thermal performance of HPHE using R410A, R134a, R22, and R407C as refrigerants. The R410A is recommended as a working fluid since it produces favourable results. Findings show that HPHE performs better than R22 and R134a in terms of effectiveness and environmental impact. To assess the conversion effectiveness of a two-row copper R22 heat pipe coil installed in the supply air unit, a pilot study was carried out. Inlet air temperature, facial speed of the air ratio, and filling influence are explored in relation to overall and plausible effectiveness, as well as neural posterior.

Impact of Corrosive Liquid on Trivalent Chromium over Aluminium Alloys

Mr. Sujit Kumar Panda[*], Mr Sai Satyananda[2],
[1*]Professor, Department of Mechanical Engineering, CEB, Bhubaneswar, Odisha, India
[2]Assistant Professor, Department of Mechanical Engineering, NIT, Bhubaneswar, Odisha, India

*Corresponding author e-mail: pandasujit@gmail.com

Abstract

Considering aviation and space sectors, aluminium alloys are commonly used due to its excellent mechanical and physical properties. Though satellite hard- ware is confined to controlled environment, it requires anticorrosive treat- ment over metal substrate followed by a systematic coating scheme. The tri- valent chromium coating was deposited over three aluminium alloys namely AA6063, AA7075 and AA6082. The variation in corrosion resistance property of trivalent chromium over each aluminium alloy has been studied in detail. The Neutral Salt Spray (NSS) test result shows that trivalent chromium coat- ing over AA7075 alloy is affected by pitting corrosion compared to other two alloys. In addition to that, NSS test also proves that thickness of the layer does not have any influence corrosion resistance property of trivalent chromium coating. Furthermore, ions in trivalent chromium coating was identified using Secondary Neutral Mass Spectroscopy (SNMS) and degradation of coating in a corrosive liquid studied using Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES) instrument to understand mechanism of corrosion. The results indicated that both coating and substrate is involved in corrosion process. The number of elements dissolved in to salt solution reveals the weak ionic bonding of coating towards substrates. In comparison, AA7075 alloy has weaker bonding than AA6082 and AA6063 series. The alloying elements such as zinc and copper are removed from substrate by corrosive solution.

Keywords

Trivalent Chromium, Chromate Conversion Coating, ASTM B117, Neutral Salt Spray Test

Rank Change Probability Distribution in MixedModel Production/Assembly Lines and Impact

Mr.Om Preakash Samal[*], Ms. Sitanshu Ch Jena,
[1*]Asso. Professor, Department of Mechanical Engineering, NIT, Bhubaneswar, Odisha, India
[2]Assistant Professor, Department of Mechanical Engineering, EATM Bhubaneswar, Odisha, India

*Corresponding author e-mail: omprakash@thenalanda.co.

Abstract

Several inspection stations are present on modern mixed-model production/assembly lines, and the quality control tests conducted at these stations may result in the tested unit being sent to an off-line rework shop where the required repairs can be done before being reinserted back into the line. Because of this, the order (sequence) at which finished units depart the production/assembly line differs from the order in which they entered. The effects of these sequence or rank adjustments on mixed-model production lines, such automobile assembly lines, are particularly significant in terms of efficiency and balancing. In this study, we derive the probability density function for a given unit's rank change. For a deeper and more thorough examination of this rank shift phenomena, its impact, and the implementation of effective remedies to mitigate its disruptive impacts, having a precise understanding of this function's structure is a requirement.

Keywords
Mixed-model assembly line, Motorcar industry, Probability analysis

Introduction

Most production/assembly lines with numerous workstations must now include a number of inspection or quality control stations in order to meet modern quality standards and criteria. In this situation, an inspection procedure could have one of two outcomes. The inspected unit either passes the inspection test and moves on to the next assembly line workstation, or it fails the test, in which case it should be removed and fixed in a rework shop or rework line. The unit then makes its way back to the main line. The device is returned either to the inspection station from which it was sent for repairs or to the workstation after that. Whether or not the repair shop does an equivalent inspection will determine this. In many instances, it is necessary that the unit requiring repair wait to be released from the repair facility until it has through a second inspection and passed the tests that led to its removal from the primary production/assembly line. A mixed-model production line introduces various product models into the line in a specified order, giving each unit or model a rank in the order. This order has been chosen to optimise the effectiveness of the line.

By Utilizing Nanofluids, Frusto-Conical Solar Collector Design, Fabrication, and Performance Research

Mr.Prasanta Kumar Nayak*, Mr. Bhagirathi Sahoo,
[1*]Assisiant Professor, Department of Mechanical Engineering, NIT, Bhubaneswar, Odisha, India
[2]Assistant Professor, Department of Mechanical Engineering, OEC Bhubaneswar, Odisha, India

*Corresponding author e-mail: prasantanayak@thenalanda.com

ABSTRACT

Using resources that were readily available locally, a frusto-conical solar collector was designed, built, and studied. Concentrator in a conical shape composed of 0.644mm-thick galvanised iron sheet. Insulating foam was gummed onto the interior side of the 10 mm thick cone form. The 0.3mm thick aluminium sheet was utilised to concentrate sun radiation onto the absorber. Studying the frusto-conical Solar Collector with Al2O3/H2O nanofluid in different concentrations in the absorber space is the main goal of this paper. The trials took place on various days, and the data were recorded with the appropriate local time.

Nomenclature:

Q_u Heat gain of water (W)

C_P Specific heat of the Water (J kg^{-1} $^oC^{-1}$)T_{fi} Inlet water temperature (^oC)

T_{fo} Outlet water temperature (^oC)

T Average receiver water temperature (^oC)T_w Mean film temperature (^oC)

T_a Atmospheric temperature (^oC)C Concentration ratio

A_a Aperture area (m^2)

A_r Receiver or Recover Area (m^2)

h_{wind} Heat transfer coefficient of wind (W m^{-2} $^oC^{-1}$) h_r Radiation heat transfer coefficient (W m^{-2} $^oC^{-1}$)h_i Inside heat transfer coefficient (W m^{-2} $^oC^{-1}$)

ρ Reflectance of the absorber surface

α Absorptance of the absorber surfaceε Emittance of the absorber surface

γ Intercept of the receiver

η Efficiency of the collectorσ Stefen-boltzman constant

U_O Over all heat transfer co-efficient (W m^{-2} $^oC^{-1}$)U_L Loss co-efficient (W m^{-2} $^oC^{-1}$)

F_R Heat removal factor

F‟‟ Collector efficiency factor

H_b Beam solar irradiance (Wm^{-2})

S Absorbed solar energy of the collector (Wm^{-2})D_O Outer diameter of the tube (m)

D_i Inner diameter of the tube (m)

K Thermal conductivity of tube material ($Wm^{-1}{}^oC^{-1}$)m Mass flow rate (kg/s)

Utilizing Event Tree and Fault Tree Analysis, a Typical Process Plant's Probabilistic Risk is assessed.

Mr. Sai Satyananda Sahoo[1*], Mr. Shakti Prasad Jena,
[1*]Assisiant Professor, Department of Mechanical Engineering, NIT, Bhubaneswar, Odisha, India
[2]Assistant Professor, Department of Mechanical Engineering, NIT, Bhubaneswar, Odisha, India

*Corresponding author e-mail: saisatyananda@thenalanda.com

ABSTRACT
The risk management process for projects, notably those involving energy, oil & gas, and chemical final products, heavily relies on qualitative risk analysis. The issues raised throughout the research work are intended to explore the qualitative and quantitative risk analysis of a typical process plant, with a focus on the advantages and disadvantages of several approaches as well as the distinctions among them. Petrochemical plants and other electricity generating facilities are crucial infrastructure for the global use of petroleum products. A typical process plant is examined in the current study using a posited initiating event. The roles of the various system components, as well as the expected malfunctions and repercussions of those malfunctions, were discovered by the HAZOP study. To assess the likelihood that a designated system may malfunction, the study is supplemented by the fault tree technique. The findings shown that both the number of components in each set and the failure probability of each component within each set during the quantitative approach affect the percentage efficacy of each minimal cut set with relation to the risk of the system failing completely. Another finding indicated that the systems that are leading the event tree sequences and have a high percentage of failure probability along each sequence path are the most crucial systems in the event tree analysis..

KEYWORDS: Qualitative, Quantitative, HAZOP, FMEA, Minimum cut set, Effectiveness

INTRODUCTION

The major evidence-based accidents that have occurred in oil refineries and chemical plants globally over the past three decades have caused financial losses that have affected the economy, and because of their frequency and persistence, they have become catastrophes that have disrupted the operation of these factories. Production losses, property damage, environmental harm, injuries, and fatalities were the results of these accidents. Despite the fact that the analysis of major accidents was a topic that was covered in the majority of studies of these factories, there aren't any effective evaluations or prudent management practises in place to identify and evaluate those risks in order to prevent or mitigate them from becoming an accident.

Quantitative Risk Analysis addresses uncertainty within the QRA framework of the process system (QRA). To express the interdependencies of (or base events) events in ETA and FTA, a coefficient of dependence method is used. The strategy was clarified using a case study [1]. The analysis used in this paper employs a systematic methodology to evaluate the likelihood, implications, and hazards of hazardous events. Two essential presumptions are used in QRA based on Event Tree Analysis (ETA) and Fault Tree Analysis (FTA). The first supposition concerns the probabilities of the input events. The second one is about the interdependence of ETA base events or FTA base events.

A Heat Pump Water Heater Simulation Model's Development and Validation

Mr.Shakti Prasad Jena[1*], Mr. Abhijit Das,
[1*]Assisiant Professor, Department of Mechanical Engineering, NIT, Bhubaneswar, Odisha, India
[2]Assistant Professor, Department of Mechanical Engineering, GIET, Bhubaneswar, Odisha, India

*Corresponding author e-mail: shaktiprasad@thenalanda.com

ABSTRACT: In this study, a simulation model for heat pump water heaters was created and verified (HPWH). The HPWH's compressor, condenser, and evaporator were among the simulated components. This simulation model's main objective is to describe the volumetric and isentropic efficiency of the compressor using characteristic functions based on three sets of experimental data that correspond to three sets of operating conditions. These characteristic functions can be produced with a small amount of experimental data, saving time and money. A actual HPWH was used in experiments to verify the computer model. Up to 5% can be changed by the coefficient of performance (COP) between simulation and experimental outcomes. The results revealed that there was good agreement between the modelling and experimental outcomes. Investigations were also done into how the temperature of the inflow water and the surrounding air affected the COP of the HPWH.

KEYWORDS: simulation, heat pump, isentropic efficiency, volumetric efficiency, COP.

INTRODUCTION

The heating of water consumes a significant amount of energy. It may account for up to 40% of all energy used in homes [1][2]. This energy is the fourth most significant energy in commercial buildings, behind lighting, heating, and air conditioning. Other applications for hot water include swimming pools, laundry facilities, medical facilities, housing facilities, and food processing [3][4]. To maintain the fish's appropriate growth temperature, hot water is also used in a variety of other unusual circumstances, such as aquaponics systems [5][6]. The most popular modern technologies for heating water are resistors or fossil fuels. However, these methods have detrimental environmental implications due to their low energy efficiency and high emissions [3]. One of the useful techniques to conserve energy is to use HPWH. HPWH only utilises around 25% to 50% as much power as the resistance method [1][7]. HPWH is widely used over the world and is increasing by about 10% annually. HPWH uses a lot of electricity even though it consumes less than a resistor does. So, it's essential to design and operate an HPWH system that consumes less energy. One of the effective methods to address this issue is HPWH simulation [8–10].

There have been studies of HPWH's structure [8][11], numerical simulation [10 - 13], thermodynamics and working fluids [14 - 18], operation controlling [14][19][20], and other aspects. The study contributed to a broader application of HPWH in regular practise. In simulation studies, the pressure ratio is typically seen as a function of the compressor performance metrics of volumetric efficiency and isentropic efficiency. Indeed, both the condensation and evaporation pressures have an impact on them. To improve the accuracy of the simulation model, the performance functions in this study were created as functions of the two independent variables mentioned above. The simulation model has been validated using an actual HPWH. The accuracy of the HPWH simulation is demonstrated by the good agreement between simulation and experimental results. Using the HPWH simulation model under various operational scenarios, the COP of HPWH is examined [21].

Fatigue life prediction of gas tungsten arc welded AISI 304Lcruciform joints with different LOP sizes

Ms. Manaswini Patra[1*], Satyaban Sahoo[2]

[1*]Assistant Professor, Department of Mechanical Engineering, OEC, Bhubaneswar, Odisha, India

[2]Assistant Professor, Department of Mechanical Engineering, NIT, Bhubaneswar, Odisha, India

*Corresponding author e-mail: patimanaswini@gmail.com

ABSTRACT

Gas tungsten arc welded (GTAW) load-carrying cruciform joints of AISI 304L stainless steel with lack of penetration (LOP) have had their fatigue lives evaluated using the traditional S-N and crack initiation-propagation (I-P) techniques. The two main phases of the crack process are typically the crack initiation life (Ni) and the crack propagation life (Np). The crack initiation life of welded joints is predicted using the local stress-life approach, while the crack propagation life is predicted using a fracture mechanics approach. Using a 100 KN servo-hydraulic DARTEC universal testing machine with a 30 Hz frequency, constant amplitude fatigue tests with stress ratio, R = 0 were performed. The crack initiation and propagation data during the fatigue phase were discovered using an automatic crack monitoring system based on crack propagation gauges. The experimental values and expected lives were contrasted. In comparison to joints with other LOP sizes, it was discovered that joints with LOP of 2 mm for 6 mm thick plate had considerably longer fatigue lifetimes. The test findings were compared to the design curve from BS 5400: part 10 (formerly known as BS 7608).

Keywords: Stainless steel; Gas tungsten arc welding (GTAW); Cruciform joints; Lack of penetration (LOP); Fatigue life

INTRODUCTION

Stainless steels are widely used in the chemical pro- cesses and power generation industries. However, increasingly they are also being considered for structural applications, for example, in facading and transportation industries. Stainless steels offer the advantages over con- ventional structural steels where painting or other cor- rosion protection coatings would not be necessary. Many applications in the structural areas involve welded components, which have to be designed to avoid fatigue failure. Though considerable fatigue data exist for welded joints in structural carbon steels, there are very sparse design data for stainless steel welded joints. Further, the fatigue crack growth behaviour in stain- less steel weld ments appears to be least investigated. In the present work, an attempt has been made to fill up this lacunae through a detailed investigation on the fatigue performance of load carrying transverse fillet welded cruciform joints of AISI 304L stainless steel with different LOP sizes.

There are two types of fatigue cracking in fillet- welded joints: (a) root cracking and (b) toe cracking. In welded cruciform joints, the lack of penetration (LOP) occurs in the joint due to the lack of access to the root. The structures in which such joints used are often sub- jected to fatigue loading. This may result in the initiation of fatigue cracks at the LOP tip as well as from the toe region, which depends on the LOP size, fillet geometry and leg length. One of the formulae for stress intensity factors for the root of cruciform welded joints containing lack of penetration was presented by Frank and Fisher using a finite element method and then improved in BS 7910.

Characterization of Surface Oxide Layers on Black-Colored Titanium

Ms. Priyanka Balabantaray[*], Mr. Amiya Kumar Biswal[2],
[1*]Professor, Department of Mechanical Engineering, GIET, Bhubaneswar, Odisha, India
[2]Assistant Professor, Department of Mechanical Engineering, NIT, Bhubaneswar, Odisha, India

*Corresponding author e-mail: raypriyanka21@gmail.com

Abstract

Black-colored titanium was obtained by anodic oxidation of a commercially pure grade-1 titanium sheet in a 0.06 M NH_4NO_3 solution, followed by heat treatment at 773 K for 1 h in a vacuum furnace. The resulting oxide layer on the titanium substrate was examined by X-ray photoelectron spectroscopy, X-ray diffraction, glow discharge spectroscopy, and scanning electron micro-scopy. It was found that the oxide layer on the black-colored titanium sheet was several micrometers thick and mainly consisted of rutile TiO_2 exhibiting a sponge like nanoporous structure. It is considered that the black-colored appearance of the titanium sheet is due to the sponge like nanoporous struc-ture of the oxide layer absorbing the incident light. The photocatalytic activity of the black-colored titanium sheet was examined by observing the decompo-sition of a methylene blue (MB, $C_{16}H_{18}N_3SCl$) solution under ultraviolet ir- radiation due to the existence of rutile TiO_2. The sheet also exhibited photo-catalytic activity under visible light irradiation. It is believed that the photo-catalytic response upon irradiation with white light is due to carbon doping of the titanium oxide layer on the titanium substrate.

Keywords

Titanium, Titanium Oxide, Titanium Dioxide, Rutile, Photocatalyst, VisibleLight Response, Nanoporous Structure

Combined Effect of a Catalytic Reduction Device with Waste Frying Oil-Based Biodiesel on NO_x Emissions of Diesel Engines

Prakash Ch. Behera[*], Dr. Naga Sai Prasad[2],
[1*]Professor, Department of Mechanical Engineering, TITE, Bhubaneswar, Odisha, India
[2]Professor, Department of Mechanical Engineering, NIT, Bhubaneswar, Odisha, India

*Corresponding author e-mail: prakash_99@gmail.com

Abstract

Internal combustion engines with application in automobiles and other rele- vant industries constitute significant environmental pollution via the release of toxic exhaust gasses like carbon monoxide (CO), hydrocarbons (HC), particulate matter (PM), and nitrogen oxide (NO_x). Engine researchers and man- ufacturers are challenged to develop external and internal measures to ensure environmentally friendly solutions to accommodate and conform to the growing list of emission standards. Therefore, this work presents an experimental investigation of the NO_x emission profile of a diesel engine that is fuelled and fitted with waste frying oil-based biodiesel and catalytic converter. Using a single-cylinder, four-stroke air-cooled CI engine at a constant speed of 1900 rpm and different loadings of 25%, 50%, 75%, and 100%; fitted with a catalyt- ic converter at the exhaust outlet of the engine and linked to a dynamometer and a gas analyser, an experiment was conducted at biodiesel/diesel volume blends of B0 (0/10), B5 (5/95), B20 (20/80), B30 (30/70), B70 (70/30), B100
(100/0); and 30% concentration (v/v), 0.5 litre/hr flow rate of aqueous urea from the catalytic converter. The results show an increasing NO_x emission as the biodiesel component increased in the blend. The catalytic converter showeda downward NO_x reduction with a significant 68% reduction in efficiency athigh exhaust gas temperatures. It is concluded that the combined utilisation of waste frying oil-based biodiesel and the catalytic converter yields substan-tial NO_x emission reduction.

Keywords

Catalytic Converter, Waste Frying Oil, Biodiesel, NO_x Emission, DieselEngines

An Overview on 3D Printing Technology: Technological, Materials, and Applications

Rajesh Prakash Dash[*], Om Prakash Samal[2],

[1*]Asst. Professor, Department of Mechanical Engineering, OEC, Bhubaneswar, Odisha, India
[2]Assistant Professor, Department of Mechanical Engineering, NIT, Bhubaneswar, Odisha, India

*Corresponding author e-mail: omprakash@thenalanda.com

Abstract

By gradually adding materials, digital fabrication technology—also known as 3D printing or additive manufacturing—creates tangible items from a geometric representation. A rapidly developing technology is 3D printing. The use of 3D printing is very common these days. In the fields of agricultural, healthcare, the automotive, locomotive, and aviation sectors, 3D printing technology is increasingly employed for mass modification and fabrication of any kinds of open source designs. Layer by layer, material can be deposited to create an object using 3D printing technology and a computer-aided design (CAD) model. The overview of the various 3D printing technologies, applications of the technology, and materials utilised in the manufacturing business are all covered in this article.

Keywords: Additive manufacuting, 3D Printing, manufacturing industy

1. Introduction

By adding material in layers, 3D printing may turn geometric representations into actual physical objects [1]. Many 3D processes have seen amazing growth in recent years. Charles Hull launched the first 3D printing businesses in 1980 [2]. PGA rocket engine [6], steel bridge in Amsterdam [7], artificial heart pump [3], jewellery collections [4], 3D printed cornea [5], and other goods connected to the aviation and food industries are among the current applications of 3D printing.

Layer-by-layer production of three-dimensional (3D) structures starting with computer-aided design (CAD) drawings is the origin of 3D printing technology [8]. The development of 3D printing technology has been incredibly inventive and adaptable. For businesses trying to increase industrial efficiency, it offers up new possibilities and provides encouragement for many others. The materials that can currently be manufactured using 3D printing technology are conventional thermoplastics, ceramics, materials based on graphene, and metal [9]. The production line could shift and be revolutionised by 3D printing technology. The introduction of 3D printing technology will boost the production speed while cutting expenses. The consumer's demand will also have more of an impact on production at the same time.

Consumers have greater input in the final product and can request to have it produced to fit their specifications. At the meantime, the facilities of 3D printing technology will be located closer to the consumer, allowing for a more flexible and responsive manufacturing process, as well as greater quality control. Furthermore, when using 3D printing technology, the need for global transportation is significantly decreased. This is because, when manufacturing sites located nearer to the end destination, all distribution could be done with fleet tracking technology that saves energy and time. Lastly, the adoption of 3D printing technology can change the logistics of the company. The logistics of the companies can manage the entire process, offer more comprehensive and start-to-finish services [10].

Nowadays, 3D printing is widely used in the world. 3D printing technology increasingly used for the mass customization, production of any types of open source designs in the field of agriculture, in healthcare, automotive industry, and aerospace industries [11].

At the same time, there are several disadvantages the adoption of 3D printing technology in manufacturing industry. For instance, the effect of the use of 3D printing technology is will reduce the use of manufacturing labour so automatically will greatly affect the economy of countries that rely on a large number of low skill jobs. Furthermore, by using 3D printing technology, users can print many different types of objects such as knives, guns and dangerous items. Therefore, the use of 3D printing should be limited to only certain people to prevent terrorists and criminals bring guns without detected. At the same time, the people who get a hold of a blueprint will be able to counterfeit products easily. This is because, the use of 3D printing technology is simple, just sketching, and set the data in the machine-printed so 3D objects can generate [12].

To sum up, 3D printing technology has emerged during recent years as a flexible and powerful technique in