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3	Thermal Analysis of a Clay Pot Utilized forCooling Water and Storing Vegetables/Fruits	Dr Aneesh Somwanshi	MSEIT (Mech.)	Energy Sources, Part A:	2023	1556-7230	https://www.tandfonline.com/doi/full/10.1080/15567036.2023.2202627	https://www.tandfonline.com/doi/full/10.1080/15567036.2023.2202627	SCI
4	Experimental investigation of locally available Torai (luffa cylindrica) as evaporative cooling pads	Dr Aneesh Somwanshi	MSEIT(Mech.)	Energy Sources, Part A:	2023	1556-7230	https://www.tandfonline.com/doi/abs/10.1080/15567036.2023.2188317	https://www.tandfonline.com/doi/abs/10.1080/15567036.2023.2188317	SCI
5	Analysis of various design parameters of a desert cooler	Dr Aneesh Somwanshi	MSEIT(Mech.)	Energy Sources, Part A:	2023	1556-7230	https://www.tandfonline.com/doi/abs/10.1080/15567036.2023.2206812	https://www.tandfonline.com/doi/abs/10.1080/15567036.2023.2206812	*SCI*
6	Performance of single slope solar still coupled to integrated collection/storage type of solar water heater for Raipur, Chhattisgarh, India	Dr Aneesh Somwanshi	MSEIT(Mech.)	Deslination and water treatment	2023	1944-3986	https://scholar.google.com/citations?view_op=view_citation&hl=en&user=SYaLfGEAAAAJ&citation_for_view=SYaLfGEAAAAJ:YOwf2qJgpHMC	https://scholar.google.com/citations?view_op=view_citation&hl=en&user=SYaLfGEAAAAJ&citation_for_view=SYaLfGEAAAAJ:YOwf2qJgpHMC	SCI
7	Performance of Various Wick Materials (Cotton, Jute, Wool, Polyester, Terri Cot) in Inclined Slope Solar Still	Dr Aneesh Somwanshi	MSEIT(Mech.)	Journal of propulsion technology	2023	1001-4055	https://propulsiontechjournal.com/index.php/journal/article/view/1145	https://propulsiontechjournal.com/index.php/journal/article/view/1145	Scopus
8	Thermal Analysis of Single Slope SolarStill w	Dr Aneesh Somwanshi	MSEIT(Mech.)	Journal of propulsion technology	2024	1001-4055	https://www.propulsiontechjournal.com/index.php/journal/article/view/1141/801	https://www.propulsiontechjournal.com/index.php/journal/article/view/1141/801	Scopus
9	Experimental Analysis for the Performance Assessment and Characteristics of Enhanced Magnesium Composites Reinforced with Nano-Sized Silicon Carbide Developed Using Powder Metallurgy	Dr Abhishek Ku Jain	MSEIT(Mech.)	ACS OMEGA	2024	2470-1343	https://pubs.acs.org/	doi.org/10.1021/acsomega.3c05089	Scopus

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Solar Energy

Volume 262, 15 September 2023, 111902

Thermal analysis of a closed loop inclined wick solar still (CLIWSS) with an additional heat storage water reservoir

Aneesh Somwanshi [a], Rupesh Shrivastava [b]

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https://doi.org/10.1016/j.solener.2023.111902

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Highlights

- A closed loop inclined wick solar still (CLIWSS) with a water reservoir for storing heated water has been suggested.
- The hot water exiting the wick is stored and pumped back in as the wick's inlet.
- The production of still improves when hot water is continuously provided to the wick.
- The daily distillate output for Jodhpur, India's summer (May) is 8.432L/m^2.
- The overall daily efficiency of the proposed still for summer is 64.1%.

Abstract

Desalination and Water Treatment 317 (2024) 100063

Contents lists available at ScienceDirect

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Enhancement in the performance of closed loop inclined wick solar still by attaching external bottom reflector

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ARTICLE INFO

Keywords:
Closed loop inclined wick solar still
Bottom reflector
Storage tank
Daily distillate output
Optimum tilt

ABSTRACT

A closed-loop inclined wick solar still containing an external bottom reflector (CLIWSSR) has been proposed in this work. The attached bottom reflector, when positioned at an optimum angle, increases the amount of solar radiation that strikes the wick. As a result, the overall amount of distillate which the solar still produces has increased. The mathematical model of CLIWSSR has been created and validated. The optimum average tilt angle (OATA) of the inclination of the reflector has been determined for various months in Raipur, Chhattisgarh, India (21.2514° N, 81.6296° E). The OATA of the bottom reflector for the summer months is about 48.5o, whereas for winter months it is about 26.1o. The daily distillate output produced by proposed system (CLIWSSR) in a typical winter day (21/02/2023) for Raipur is 6.106 kg/m^2 whereas the daily distillate output in same day of CLIWSS without reflector is 5.047 kg/m^2. The daily output produced from CLIWSSR is about 21% more than the CLIWSS without reflector. The proposed design is simple, giving higher performance and an effective way to address the need of pure water in remote and small towns.

1. Introduction

All life on earth depends on water. Fresh water scarcity is a constant problem for humanity. The need for freshwater is increasing due to rapid industrial development and an increase in global population, which affects both household demands and the ability of crops to provide enough food. This problem is made worse by the issue of industrial waste pollution of rivers and lakes as well as the enormous amounts of sewage discharged.

Human-caused contamination of natural water sources is one of the main causes of the world's freshwater deficit. The majority of the time, the groundwater is saline and unfit for various household works. The availability of pure water is highly scarce in dry regions, and how such water may be made available will have a significant impact on whether or not a human habitat can be established there. The one of the best methods for producing clean water from a water source is distillation. Fossil fuels are extremely hard to come by on earth, and their use in distillation causes air pollution. This can be done successfully with solar energy. Potable water is frequently created using solar stills. It is simple to maintain and reasonably inexpensive to build. Both brackish and dry areas can use it. A single basin solar still is extremely easy to operate [1]. The oldest known research in this field was done in 1551 [1]. The low production rates of solar stills have restricted their application. A significant goal in the development of this technology has been to increase the output rate per unit basin area. The output can be increased by enhancing the temperature differential between the basin water and glass cover; the difference in the temperature is the main driving force for getting output from solar still. The output can be increased by increasing the difference in temperature between basin water and glass cover. Either by increasing the temperature of basin water or by decreasing the temperature of glass cover. Temperature of basin water can be increased by different passive and active ways. In both cases, the energy from the sun raises the temperature and vapour pressure of the saltwater inside the still. Water begins to evaporate and leaves the leftovers in the basin once the vapour pressure at the interface surpasses that of the air. The mechanism subsequently condenses the pure water vapour, which is then gathered as distilled water. In a passive SS, the basin directly receives solar radiation; however, in an active solar still, the system is coupled with a solar thermal collector to raise the water temperature, considerably increasing the rate at which distilled water is produced. Active solar stills, however, have a complex design and frequently need power to operate. Passive type SS would therefore be a practical solution to tackle the water security dilemma among water-stressed people in rural or disaster-affected areas, given the lack of access to the electric power infrastructure and the maintenance expertise in many distant regions.

Till date many designs of passive SS have been introduced by various researchers. The basic design includes the simple basin type SS (single or double slope), Diffusion stills, Weir type SS, spherical SS, pyramid and rectangular shaped SS, tubular SS and wick type SS [2]. The design of wick type

Abbreviations: CLIWSSR, closed loop inclined wick solar still with reflector; CLIWSS, closed loop inclined wick solar still; IWSS, inclined wick solar still; SS, solar still; OATA, optimum average tilt angle; r, correlation coefficient; e, root mean of % deviation

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Energy Sources, Part A: Recovery, Utilization, and Environmental Effects ›
Volume 45, 2023 - Issue 2

Research Article

Thermal Analysis of a Clay Pot Utilized for Cooling Water and Storing Vegetables/ Fruits

Niladri Sarkar, Aneesh Somwanshi, Deepika Dhand & Ruchi Trivedi

Pages 4146-4159 | Received 31 Jan 2023, Accepted 07 Apr 2023, Published online: 17 Apr 2023

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ABSTRACT

In addition to supplying cooled water, clay pots can also be used to store fruits, vegetables, and even medicines that need to be kept at a moderate temperature. The authors recommended storing perishable things submerged inside the clay pot filled with water in locally accessible polythene bags. In the present paper, a mathematical model to determine the preservation temperature has been developed and validated for the climate of Raipur, Chhattisgarh, India. The convective coefficient between the pot and the surrounding air has been determined. Experiments were performed by loading a pot with apples/tomatoes. It is seen that with a load up to 10 W, the

Energy Sources, Part A: Recovery, Utilization, and Environmental Effects ›
Volume 45, 2023 - Issue 1

Research Article

Experimental investigation of locally available Torai (*luffa cylindrica*) as evaporative cooling pads

Prabhat Ranjan Mishra, **Aneesh Somwanshi** & Vivek Kumar Gaba

Pages 2523-2539 | Received 08 Nov 2022, Accepted 24 Feb 2023, Published online: 09 Mar 2023

Cite this article https://doi.org/10.1080/15567036.2023.2188317 Check for updates

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ABSTRACT

This work presents an experimental evaluation of the performance of a cooling pad made from the locally available material “Torai” (luffa cylindrica). Different performance parameters that define the cooling performance of the proposed pad, such as the exit air temperature, degree of cooling, saturation effectiveness, cooling potential, and coefficient of performance, have been experimentally investigated. Results show that the overall cooling performance (cooling potential, degree of cooling, effectiveness, and coefficient of performance) increases by increasing the pad thickness. For a given pad an increase in air velocity decreases the saturation

Energy Sources, Part A: Recovery, Utilization, and Environmental Effects ›
Volume 45, 2023 - Issue 2

Research Article

Analysis of various design parameters of a desert cooler

Prabhat Ranjan Mishra, **Aneesh Somwanshi** & Vivek Kumar Gaba

Pages 4898-4916 | Received 31 Jan 2023, Accepted 14 Apr 2023, Published online: 28 Apr 2023

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ABSTRACT

Aside from climatic parameters, the cooling potential of a desert cooler is influenced by fan flow rate, pad thickness, and pad packing factor, all of which are referred to as cooler parameters. In this study, a general equation for determining cooling potential in terms of cooler parameters is proposed and validated. An equation has been devised to determine the combination of fan flow rate (FFR) and pad area required to meet a given heating load. The equation aids in the sizing of coolers for a desired room temperature in various climates. The size of the cooler tank is determined by the rate of water evaporation. In this investigation, we evaluated the influence of different fan flow rates on the rate of water evaporation. It is seen that at a typical set

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Performance of single slope solar still coupled to integrated collection/storage type of solar water heater for Raipur, Chhattisgarh, India

Abhilash Dahayat, Aneesh Somwanshi, Brijesh Patel

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https://doi.org/10.5004/dwt.2023.30123

ABSTRACT

Solar stills provide better and economical options for getting clean water, especially in remote locations. In present work authors proposed an active solar still coupled to an integrated collection/storage type of solar water heater. Mathematical model of the proposed system has been developed to evaluate the thermal performance of the proposed system. Numerical computations have been performed considering the climate of Raipur, Chhattisgarh, India (21.2514°N, 81.6296°E). The effect of depth of water in solar still and the mass flow rate (MFR) of water flowing from heater into the solar still has been investigated. It is seen that the lower depth of water in basin gives more output in comparison to higher depth. At higher mass flow rate of water from solar water h into the still, the output produced is more in comparison to low MFR. When the m flow rate of water increased from 0.0020 to 0.012 kg/s the increased in the hourly output of still is about 51.4%. However, at higher MFR the pumping power required will be more. At 0.03 m water depth in basin the annual distillate output produced for Raipur is 2,288 kg/m^2 and when the depth of water is increased to 0.12 m the annual output produced is 705 kg/m^2 (MFR of water from pond is considered as 0.011 kg/s). when the depth of

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Performance of Various Wick Materials (Cotton, Jute, Wool, Polyester, Terri Cot) in Inclined Slope Solar Still

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Abstract: In this work the effect of different wick materials on the distillate output produced by inclined wick solar still has been experimentally investigated. The wick materials considered are cotton cloth, jute cloth, wool cloth, polyester and terrycloth. Wicking properties of materials such as porosity and capillary rise of water has been experimentally determined. Porosity is maximum 27.9% for cotton wick and minimum 18.9% for jute wick. The rise of water (capillary rise) for cotton wick is 120mm/h. The daily distillate output for solar still containing different wick materials have been experimentally determined in the climate of Raipur, Chattisgarh, India. The daily distillate output produced is maximum 4.321L/m^2 for cotton wick material and minimum 3.156L/m^2 for polyester wick material. The use of cotton wick in solar still is found economical and reliable.

1. Introduction

Both the continuation of human life and socioeconomic progress depend on water. Even yet, there are only a few places where you can get water that is up to par. Water quality can be enhanced by means of desalination. Traditional desalination methods include accessible; however, they demand a significant energy input, primarily from fossil fuels which contribute to the destruction of the environment. Consequently, utilising solar energy is one way to use sustainable energy sources. being one of the more viable options. Technology for desalination is gaining popularity as a reliable technology for fresh generation of water. Literature contains a history of desalination review. Desalination is the procedure used to remove water with a lot of salt, minerals and living things derived from water. Systems for desalinating water require energy to separate the salt from the water [1]. Systems that use solar radiation to separate water and salt are known as solar desalination systems.

Solar desalination is categorised differently based on the methods and energy source. The solar still is the most prevalent form of solar desalination system. Simple equipment called a solar still can be used to turn brackish, salty water into drinkable water. The two main categories of solar still are passive and active. The two main categories of passive stills are inclined and basin kinds. The productivity of these stills was greatly improved by extensive investigation. Water pours from the top to the bottom of the absorber surface in an inclined still. The employment of a wick, which draws water through the capillary action, helps to maintain the consistency of the water's thickness. According to reports, inclined absorber surface stills are much more productive than basin-style stills [2]. The performance of an inclined wick type solar still has been improved by a number of literary works. Ho-Ming Yeh et al. [3] investigation looked at the productivity of wick-type solar distillers in relation to environmental, design, and operational factors. In order to create a new type of still, Minasian et al. [4] joined a small conventional basin-type solar still with an opaque cover that was positioned in the shade. The performance of an inverted trickle solar still was researched by Badran et al. [5]. The effectiveness of stepped solar stills with thermal energy storage for latent heat was investigated by Radhwan et al. [6]. A weir-type inclined solar still's theoretical and experimental performance was investigated by Sadineni et al. [7]. In a study by Mahdi et al. [8], charcoal cloth was utilised as the absorber/evaporator material in a wick-type solar still. In a multiple-wick solar still with blackened jute cloth serving as the liquid surface, Sodha et al. [9] investigated how well the still

Thermal Analysis of Single Slope Solar Still with Sensible Storage Material (Sand)

PDF (https://propulsiontechjournal.com/index.php/journal/article/view/1141/801)

DOI: https://doi.org/10.52783/tjjpt.v44.i4.1141 (https://doi.org/10.52783/tjjpt.v44.i4.1141)

Keywords:
Single slope solar still, sensible storage, sand, daily distillate output, nocturnal production of pure water.

Abhilash Kumar Dahayat, Aneesh Somwanshi

Abstract

In this work authors utilized easily available and cheap sensible storage material (sand) in single basin solar still. The sensible storage material helps to enhance the distillate output from solar still during no sunshine hours. The mathematical model of the proposed solar still has been developed and experimentally validated. The numerical computation has been performed to analyse the effect of mass od sand placed beneath the basin plate. It is seen that with increase in mass of sand the overall daily distillate output decreases. When mass of sand increases from 15kg to 60 kg the daily distillate output decrease by 11.8%. The total daily distillate output produced by proposed still for a day in summer for Raipur is 5.32l/m^2 which is about 24.4% more than conventional single slope solar still. The total nocturnal production of pure water from the propped still for a day in summer in Raipur climate is 1.37l/m^2. The proposed solar still with sand storage is a good available cheap option to increase the overall productivity of conventional single slope solar still.

Issue

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Section

Articles

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Article

Experimental Analysis for the Performance Assessment and Characteristics of Enhanced Magnesium Composites Reinforced with Nano-Sized Silicon Carbide Developed Using Powder Metallurgy

Nadeem Faisal, Dheeraj Kumar, Amit Kumar, Alok Kumar Ansu,* Abhishek Sharma,* Abhishek Kumar Jain, Meshel Q. Alkahtani, T. M. Yunus Khan, and Naif Almakayeel

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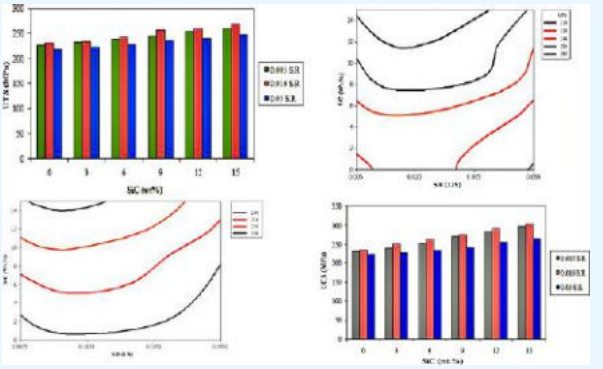
ABSTRACT: Magnesium, which is lightweight and abundant by nature, was widely used in the 19th century to make parts for automobiles and airplanes. Due to their superior strength-to-weight ratios, magnesium alloys were favored for engineering applications over unadulterated magnesium. These alloys result from the combination of magnesium with various metals, including aluminum (Al), titanium (Ti), zinc (Zn), manganese (Mn), calcium (Ca), lithium (Li), and zirconium (Zr). In this study, an alloy of magnesium was created using the powder metallurgy (PM) technique, and its optimal performance was determined through the Taguchi-Gray (TG) analysis method. To enhance the alloy's mechanical properties, diverse weight fractions of silicon carbide (SiC) were introduced. The study primarily focused on the Mg−Zn−Cu−Mn alloy, achieving the optimal composition of Mg−3Zn−1Cu−0.7Mn (ZC-31). Subsequently, composites of ZC-31/SiC were produced via PM and the hot extrusion (HE) process, followed by the assessment of the mechanical properties under various strain rates. The use of silicon carbide (SiC) resulted in enhanced composite densities as a consequence of the increased density exhibited by SiC particles. In addition, the high-energy postsintering approach resulted in a decrease in porosity levels. By integrating silicon carbide (SiC) to boost the microhardness, as well as the ultimate compressive and tensile strength of the composite material, we can observe significant improvements in these mechanical properties. The experimental findings also demonstrated that an augmentation in the weight fraction of SiC and the strain rate led to enhanced ductility and a shift toward a more transcrystalline fracture behavior inside the composite material.



1. INTRODUCTION

Magnesium is a lightweight metal that has a wide range of applications in various industries. Magnesium (Mg) is the eighth most abundant element in the earth's crust and can be easily extracted from various minerals. Magnesium is familiar for its lower density, higher strength, and excellent thermal conductivity. In engineering applications, magnesium alloy is mostly used for its superior strength-to-weight ratio.[1] Magnesium is a ductile material so it helps for easy forming and machining operations; higher corrosion resistance occurred in some of the magnesium alloys.[2] The automobile industry uses magnesium alloys for making vehicle parts like steering wheels, wheel rims, and seat frames in large quantities[3] and power train applications.[4] Magnesium alloys are used as implants in the human body because of their mechanical characteristics that are similar to human bone.[5] Aerospace structure systems are made of magnesium alloys to decrease the weight of the satellite.[6] Composite materials have superior properties than individual components made by various processing methods for different purposes. Fiber, metal, ceramic, etc., are used as reinforcement to increase the mechanical, thermal, and physical properties of composites. These materials are specially used for lightweight applications with improved properties of their own elements. Various reinforcements in magnesium matrix like aluminum oxide (Al_2O_3), silicon carbide (SiC), boron carbide (B_4C), carbon nanotubes (CNT), and titanium carbide (TiC)[7] provide

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ORIGINAL ARTICLE

Optimization and empirical studies of riser design in sand casting process using different mould properties

Rahul Kumar[1] · Susheel Kumar Maurya[2] · Mayank Choubey[3] · Shri Krishna Mishra[4] · Abhishek Kumar Jain[5] · Abhishek Sharma[6] · Rajan Kumar[7] · Indradeep Kumar[8] · Ashish Saxena[1] · Manoj Agrawal[9]

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Abstract
Sand casting is a crucial manufacturing step in creating a quality product that will meet the demands of the market. Four common metals aluminum, brass, gunmetal, and cast iron are evaluated to determine which makes the best riser. In this study, we use Taguchi L9 orthogonal array design of experiment (DOE) analysis to the melting and vent hole characteristics of sand and develop a mathematical model using Taguchi methods. It is necessary to concentrate the size and geometry of the riser. The riser design is optimized by process parameters of major diameter, minor height, and diameter of the riser. By balancing many factors, including riser design, melting, sand, and vent holes, we found the optimal configuration. The end objective is to improve the material's mechanical properties. As a result of its superior dimensional geometry, simplicity of pattern development, higher production rate, and decreased solidification time compared to another casting, investment casting has become increasingly popular. It is common to practice casting both ferrous and non-ferrous materials in the sand since doing so yields a high-quality, low-cost item. Most of the small-scale industries are making the cast material by sand casting process that observed the yield of casting ranges from 50 to 55% only. 50%on the raw material is spent for the riser, runner, and gating system. Out of 50%, the riser alone has 25% of the raw material. It is clear that, the riser having more volume of raw material.

Keywords Sand casting · Design of experiment · Taguchi techniques · Riser design · Mechanical properties

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1 Introduction

Casting is one of best manufacturing processes and it provides the furthermost liberty of design in terms of size, shape and product quantity where liquid metal is dispensed into a mold cavity [1–4]. The sand-casting process includes such as patterns, riser and runner, gating, design consideration, and casting allowance [5, 6]. The representation diagram of the casting process is depicted in Fig. 1.

The pattern is replica of the real part of mould cavity which made by wood and sometime other metals. The cavity is enclosed in a combined mould box namely Cope and Drag. The lower half of the box is known as Drag which is filled with sand and to make the mould cavity and gating system [7–10]. The upper half of the box is known as cope and is filled with sand and to make the sprue basin, sprue pin and riser. The parting line with dry sand is separating the cope and drag. The cope is removed from the drag and the pattern is removed without the damage of mould cavity [11–16]. The sprue basin and sprue pin are used to avoid the turbulent flow while pouring the molten metal to the mould cavity. The

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OPTIMIZE PRODUCTION DEFECTS IN THE HOT FORGING PROCESS WITH THE INITIAL ROLLING OPERATION.

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Abstract

This research work aims to optimize production defects in the hot forging process with the initial rolling operation. the research on rolling forging operations gives broad scopes of these defects in forging operations such as underfill, cracks formation, and scale pits. rolling operations are usually performed under hot forming conditions depending on the type of motion and shape set-up.

There are different types of rolling processes in which longitudinal rolling forging operation is mostly used in hot and cold rolling forging operations. Which are reduced material consumption in the forging process. That research helps control forging defects with regular correction and preventive analyses in rolling operations.

Keywords- Rolling Operation Edge Crack, Alligator Crack, Under Fill,

Introduction

Rolling is the one of basic processes in forming an operation in which metal flows between two rollers in different directions. The gap between two rollers is always smaller than the billet diameters to be formed. The time of metal piece is put into two rollers roll gets rotated by applying the force of friction and the compression billet gets compressed to thin and elongated than the original length.

Classification of the rolling process.

- According to process.

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THE PRESENT AND FUTURE PROSPECT OF ARTIFICIAL INTELLIGENCE IN THE MINING INDUSTRY

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Abstract:
The mining operation uses traditional and conventional techniques to extract minerals. Besides extracting minerals some other auxiliary operations are expedient to have safe and economical process. Presently some mechanical and electronics equipment have been used in this regard. Some softwarehas also been developed to serve the purpose. But these are not sufficient to meet the requirements of day by day changing scenario of introduction of newer and advanced technology. To keep up with the new technology modernization and the profit in shake of investors and stakeholders and importantly for the nation, and to ensure health and safety mining industry needs to approve new-age autonomous technologies and intelligent system in their field. Integration of Artificial Intelligence, Machine Learning, Internet of Things (IoT) and Automation are the keys to the 4th revolution in mining industry.In this way Artificial Intelligence can replace these technologies as the former is the simulation of human intelligence processes by machines, especially computer systems. The present paper focuses on the present and future of AI in mining industries.AI systems work by ingesting large amounts of labelled training data, analysing the data for correlations and patterns, and using these patterns to make predictions about future states. The present era is of AI which can have wider applicability in the various auxiliary operations associated with mining work. Owing to its performance better than human beings its future prospect will be of better importance.

Keywords:
Artificial Intelligence, Deep Learning, IoT in Mining, Machine Learning, Mining Automation, Mining Industry

1.Introduction:

Mining is considered as one of most required industries in 21st century as it is the supplier of raw materials to other industries. Mining operations involve extraction of ores and minerals of various kinds from the earth, which cannot be produced in laboratory or by cultivation. Although being one of the most profitable sector mining industries is one of the riskiest investments because of dangers associated with operations particularly at deeper underground mines. Mining industries are continuously facing issues related to capitals, infrastructure, health and safety and most importantly environmental and geological consequences. Mining provides employment opportunities and performs a lead role of a country's economic development with systemic governance. In general, there are four basicmethods of mining:
(i) Surface Mining for shallow depth ore bodies, (ii) Underground mining for deep or deposits, (iii) placer mining for extract valuable metals from sediments of beach or river beds, (iv) In-situ mining, the method of recovering minerals from earth without extracting the mix of rocks and ore to the surface for processing.
Artificial intelligence is the science of making machines that can think like humans. It can do things that are considered "smart." AI technology can process large amounts of data in ways, unlike humans. The goal for AI is to be able to do things such as recognize patterns, make decisions, and judge like humans. Artificial intelligence systems work by using any number of AI techniques.

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Experimental Study on Recycled HDPE and Waste Glass Powder Composite Material for Pipe Production

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ABSTRACT:

In Ethiopia, scraps of high-density polyethylene (HDPE) pipes and crushed glass bottles are largely considered waste and are not being recycled or reused. In this study, it is aimed at experimentally processing HDPE scrap and mixing it with waste glass powder to produce a composite material with the potential to become a matrix and reinforcement material for pipes. Six samples were produced with varying percentages of the reinforcement and matrix. Their mechanical and physical properties were measured according to composite standards. The compounding mechanism and chemical reactions were properly performed for each sample and crosslinking between all materials was characterized. The theoretical density of the samples was determined using the rule of mixture. After conducting all experiments, a composite sample with 27.645 MPa of tensile strength, 22.061 MPa of tear strength, an increase in hardness, an average actual density of 1.1195 g/cm^3 and an increase in abrasion resistance capability was selected. This study demonstrates the potential for recycling HDPE scraps and waste glass powder into a composite material with desirable mechanical and physical properties for use in the production of pipes. The experimental results indicate that the waste HDPE and glass powder can be effectively processed and utilized as a cost-effective and sustainable alternative to virgin materials for the production of composite materials. The use of waste materials in this manner can not only reduce the environmental impact of industrial waste but also create new opportunities for the recycling and repurposing of waste materials. Furthermore, the resulting composite material can offer improved mechanical properties such as tensile strength, tear strength and abrasion resistance, compared to traditional materials. This study provides valuable insights into the development of sustainable composite materials and offers a promising avenue for future research on the recycling and reuse of waste materials.

KEYWORDS:

Recycling; HDPE; Waste glass powder; Composite material; Sustainable; Mechanical properties; Pipe Production

CITATION:

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1. Introduction

Ethiopia has a growing problem of plastic and glass waste, including discarded high-density polyethylene (HDPE) and bottle glasses, which are commonly found dumped along roadsides and in garbage collection areas. The amount of such waste is increasing daily and there is little concern among the community and other stakeholders about the positive and negative impacts of this waste [1, 2]. Improper disposal of plastic and glass waste can lead to environmental pollution, but they can also be recycled and reused for other purposes. While several studies have explored the recycling of plastic waste in developed countries, there is a lack of research on the possibility of reinforcing waste HDPE with waste glass powder to produce new composite products. Plastic waste is a growing environmental concern around the world and the improper disposal of plastic waste can have serious negative impacts on the environment. In Ethiopia, the waste generated by pipe industries, specifically in the form of HDPE scraps, is often overlooked and considered waste material [3]. Similarly, the waste generated by glass industries in the form of cracked and crashed glass bottles is also not properly managed, leading to negative environmental impacts [4].

Composite materials are widely used in various applications due to their unique properties, such as high strength, stiffness and durability. The use of waste materials as reinforcements for composite materials has been extensively studied in recent years. Waste HDPE is a commonly generated plastic waste that can be used as a matrix material for producing composite materials. On the other hand, waste glass powder can be used as a

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Thermal Behaviour of Epoxy Composites Filled with Micro-sized LD Slag Particulates

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Abstract

This article reports an investigation of the thermal behaviour of the epoxy/LD-slag composites prepared by hand layup method at varied loading of filler from 0 wt. % to 40 wt. %. The main aim of the work is to establish hazardous industrial waste as a filler material for the development of polymer composites.The thermal conductivity of neat epoxy is 0.15 W/m-K and the same improves to 0.292 W/m-K with the addition of 40 wt. % LD-slag. The addition of LD slag appreciably improves the epoxy matrix's thermal stability by increasing its degradation temperature at different levels along with the enhancement in the char residue. The maximum glass transition temperature of 74.74 ºC is attained for a filler loading of 20 wt. %, whereas, a negligible reduction is observed at higher filler loading. Further, the material's specific heat capacity also progressed with the inclusion of LD slag and reached 1.115 kJ/kg-ºC showing an increment of 57.7 over the neat epoxy resin for a combination of epoxy/40 wt. % LD slag composite. The coefficient of thermal expansion gainfully declines with filler loading and decreases by 14.18 % for 40 wt.% of LD slag. The minimum coefficient of thermal expansion value registered is 59.3×10^{-6} /ºC.

Keywords: Epoxy, LD slag, Thermal conductivity, Thermogravimetric analysis, Differential scanning calorimetry, Thermal mechanical analys.

1. Introduction

With the rapid growth in the industrial sector all across the world, the amount of waste generated from the sector is also huge. This generated waste has a major problem associated with it, i.e., its disposal as it is very hazardous to the environment [1].Among the total waste generated, around 90 % belongs to the category of industrial waste. Steel-making is one of the largest businesses and the generation of waste through that process is also huge. Management of such waste materials has become very important for protecting the environment. One way to achieve this objective is to reuse/recycle the waste materials for the development of new materials [2]. Blast furnace slag, LD slag and LD sludge are the by-products generated in large quantities from the steel-making industries. Blast furnace slag is obtained during the production of iron in the blast furnace whereas, LD slag and LD sludge are obtained during the process of the LD converter. Increasing attention towards sustainable development and environmental awareness forces researchers to explore ways to either minimize it or reuse it [3]. Recently, these wastes have attracted the scientific community to utilize them as filler material in polymeric composites. Blas furnace slag is being utilized mostly as a filler material in the polymeric resin for the development of polymer composites [4-6]. LD slag and LD sludge are also explored as a single filler and in combination with other reinforcement for the development of a hybrid composite [7, 8]. Among the LD slag and LD sludge, the generation of LD slag is higher. Hence, in the present work, the main focus is on the utilization of the LD slag. In India, the estimated production of this by-product is nearly 160-170 kg per ton of crude steel depending upon the quality of the raw material [9]. Out of this, India utilized only around 25 % and the rest was discarded on neighbouring land of the site. This discarded slag is a prime source of soil, groundwater and air pollution near the dumped area [10]. The fine particles of the slag are easily carried away by the flowing air which may cause health problems to the humans and animals of the locality as it may be inhaled by them. Hence, judicial management of this huge quantity of waste is of prime importance.

Thus, considerable efforts for proper consumption of this waste have been put in as recycling and reuse is the only possible solution to this problem. LD slag has been used in the past in the infrastructural sector. It is gainfully used as raw material for the production of concrete and the construction of roads [9]. LD slag is also been used in railway ballast by combining it with stones. They are used in cement manufacturing as a replacement for clinker. Some works are also reported to utilize this slag for soil conditioners and fertilizers. Despite that, it is observed that the utilization is not up to the mark. Hence, a new avenue had been opened up for proper utilization of the LD slag. On that note, few works are

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Hybrid KNN-SVM machine learning approach for solar power forecasting

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https://doi.org/10.1016/j.envc.2024.100838 ↗

Abstract

Predictions about solar power will have a significant impact on large-scale renewable energy plants. Photovoltaic (PV) power generation forecasting is particularly sensitive to measuring the uncertainty in weather conditions. Although several conventional techniques like long short-term memory (LSTM), support vector machine (SVM), etc. are available, but due to some restrictions, their application is limited. To enhance the precision of forecasting solar power from solar farms, a hybrid machine learning model that includes blends of the K-Nearest Neighbor (KNN) machine learning technique with the SVM to increase reliability for power system operators is proposed in this investigation. The conventional LSTM technique is also implemented to compare the performance of the proposed hybrid technique. The suggested hybrid model is improved by the use of structural diversity and data diversity in KNN and SVM, respectively. For the solar power predictions, the suggested method was tested on the Jodhpur real-time series dataset obtained from the data centers of weather stations using Meteonorm. The data set includes metrics such as Hourly Average Temperature (HAT), Hourly Total Sunlight Duration (HTSD), Hourly Total Global Solar Radiation (HTGSR), and Hourly Total Photovoltaic Energy Generation (HTPEG). The collated data has been segmented into training data, validation data, and testing data. Furthermore, the proposed technique

Proactive failure warning for wind power forecast models based on volatility indicators analysis

2024, Energy

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>
> ...In addition, simple statistical methods are usually only suitable for short-term wind power forecasting, as the autocorrelation of wind power sequences decreases significantly with the increase of forecast intervals [Cui et al., 2024][15]. Artificial intelligence algorithms include support vector machines (SVM) [Saxena et al., 2024][16], decision trees [Ramos et al., 2022][17] and neural networks [Ramos et al., 2022][18]. Decision trees, SVM and neural networks all have the ability to handle nonlinear features of wind power....

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2024, Energies

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Optimization of cutting force during turning of custom 450 steel using TiAlSiN coated WC tool inserts

Original Article Published: 18 June 2024

(2024) Cite this article

International Journal on Interactive Design and Manufacturing (IJIDeM)

Aims and scope

Submit manuscript

Karthick Muniyappan, Ramakrishna Guttula, Siva Kumar M, Nishikant Kishor Dhapekar, Lenin N, Senthilkumar J., Ramanpreet Singh & Vimal Kumar Pathak

Abstract

Custom 450 steel exhibits superior machinability attributed to its optimized microstructure, promoting smoother material removal and decreased tool wear, alongside improved chip formation characteristics, thereby enhancing machining efficiency and minimizing downtime. Factors like machining parameters, tool strength, and composition of the

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In Press, Corrected Proof What's this?

SPT approach for assessing mechanical properties of materials

K. Karthik [a], K. Rajaram [b], P. Jagadeesh [c], R. Vijai [d], N. Shailendra Kumar Bohidar [e], P. Duraimurugan [f]

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https://doi.org/10.1016/j.matpr.2024.04.102

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Abstract

The Round Robin Test of the Small Punch Test (SPT) method represents a critical step in establishing its reliability and applicability for assessing the mechanical properties of materials used in power plants. The mechanical properties of materials, such as strength and deformation characteristics, are of paramount importance in ensuring the structural integrity and safety of power generation facilities. The SPT method, a widely adopted in-situ testing technique, holds promise as a cost-effective means of evaluating these properties. However, its precision and consistency in different geological and operational contexts remain subjects of investigation. This study presents the results and findings from a comprehensive Round Robin Test aimed at rigorously assessing the SPT method's performance and suitability for characterizing materials within power plants. Multiple testing campaigns were conducted across diverse sites and material conditions, encompassing varying geological formations, moisture content, and temperature ranges.

Automatic Door Closure System Based on Lighting Conditions

Publisher: IEEE

P. Gandhimathi ; S. Diwakaran ; Madhu. B ; N Rajesh Kumar ; Shailendra Kumar Bohidar ; K. Karthik **All Authors**

Abstract

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Chickens are social animals that prefer to be in the company of their flock during the day and seek shelter at night. Providing them with a safe and comfortable coop is e... **View more**

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Abstract:
Chickens are social animals that prefer to be in the company of their flock during the day and seek shelter at night. Providing them with a safe and comfortable coop is essential for their well-being, but managing the door can be a tedious task, especially during the changing seasons when the light conditions vary. Automating the door opening based on light conditions can simplify this task, save time and effort, and ensure that your chickens have access to fresh air and sunlight during the day and a comfortable nesting place at night. In this work, the opening of the door to the chicken coop based on the light conditions will be solved. The device will consist of a main microcontroller that will handle all the functionality. A light intensity sensor will be connected to it, based on which the door will be opened or closed. This function will be provided by a stepper motor. In addition to this basic function, the device will also take temperature and send the data via Wi-Fi to a website where the data can be viewed. The power supply here will be solved using a solar panel. The goal is therefore to achieve independence and therefore independence from the power line.

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Date of Conference: 04-06 January 2024 **DOI:** 10.1109/IDCIoT59759.2024.10467419

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Materials Today: Proceedings

Available online 11 May 2024

In Press, Corrected Proof What's this?

Corrosion-fatigue properties of 13%Cr4%Ni steel ForHydroturbine components

B. Vijaya Prakash [a], B. Murali [b], A. Muthu Kumaran [c], V. Pandiyarajan [d], Bohidar Shailendra Kumar [e], P. Duraimurugan [f]

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Abstract

This paper thoroughly investigates the corrosion-fatigue properties of 13% Cr-4% Ni stainless steel, specifically focusing on its application in hydro turbine components. The study aims to comprehensively analyze the material's resistance to corrosion and fatigue, elucidating the key factors influencing these properties and exploring the methodologies employed for testing and evaluation. By examining the practical implications of these properties for the design, operation, and maintenance of hydroelectric power plants, the research underscores the critical role of 13% Cr-4% Ni steel in facilitating sustainable and reliable hydropower generation. Through rigorous investigation and analysis, this paper contributes to advancing our understanding of material performance in hydropower applications, ultimately informing decision-making processes for the selection and utilization of materials in this vital energy sector.