

Table of contents

Volume 896

2021

◀ Previous issue Next issue ▶

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Accepted papers received: 13 October 2021

Published online: 12 November 2021

Open all abstracts

Preface

OPEN ACCESS 011001

Preface

+ Open abstract  View article  PDF

OPEN ACCESS 011002

Photographs

+ Open abstract  View article  PDF

OPEN ACCESS 011003

Peer Review Declaration

+ Open abstract  View article  PDF

Papers

OPEN ACCESS 012001

Stability performance of demolition waste composite as landfill liner



M A Budihardjo, M Hadiwidodo, I W Wardhana, E G Praptomo, B P Samadikun, A S Puspita and B S Ramadan

+ Open abstract  View article  PDF

OPEN ACCESS 012002

The effect of demolition waste composition on the landfill liner physical characteristic

M A Budihardjo, M Hadiwidodo, I W Wardhana, M R N A Tuasykal, B P Samadikun, I S Arumdani and B S Ramadan

+ Open abstract  View article  PDF

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-
- OPEN ACCESS** 012003
MSW handling of top 5 leading waste-producing countries in Southeast Asia
I S Arumdani, A S Puspita and M A Budihardjo
[+](#) Open abstract [View article](#) [PDF](#)
-
- OPEN ACCESS** 012004
Analysis of biodiversity in the Pamotan Mudal spring area, Rembang Regency
S Rachmawati, H H A Matin, S Suhardono, P Setyono, L Kusumaningrum, S Rinawati and D S Wijaya
[+](#) Open abstract [View article](#) [PDF](#)
-
- OPEN ACCESS** 012005
An inventory of the biodiversity of Kare Caves for the development of ecotourism karst district Pamotan Rembang
H H A Matin, S Rachmawati, S Suhardono, M F Wiratmaja, H A Zaky and R Helmi
[+](#) Open abstract [View article](#) [PDF](#)
-
- OPEN ACCESS** 012006
Biodiversity of Rambut Cave Sale Central Java
S Rachmawati, H H A Matin, S Suhardono, P Setyono, L Kusumaningrum, S Rinawati and M Sholiqin
[+](#) Open abstract [View article](#) [PDF](#)
-
- OPEN ACCESS** 012007
Technical and economic feasibility analysis of solar power plant design with off grid system for remote area MSME in Semarang City
J Windarta, S Handoko, T Sukmadi, K N Irfani, S M Masfuha and C H Itsnareno
[+](#) Open abstract [View article](#) [PDF](#)
-
- OPEN ACCESS** 012008
Holistic perspective to knowledge integration for performance of renewable and sustainable energy business
V Yadwad, S R Bharamnaikar and U Bhushi
[+](#) Open abstract [View article](#) [PDF](#)
-
- OPEN ACCESS** 012009
The development of waste to energy in Semarang, Indonesia
S P Hadi, B Prabawani and R S Hamdani
[+](#) Open abstract [View article](#) [PDF](#)
-
- OPEN ACCESS** 012010
Hydraulic analysis of Semarang River in supporting the drainage channel as water
This site uses cookies. By continuing to use this site you agree to our use of cookies. To find out more, see our [Privacy and Cookies policy](#)
A Sarminingsih, M Hadiwidodo, A Rezagama, K S Sausan and Nurullah



[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS 012011
Producing biogas from cow manure, chicken manure, and organic waste by batch system
M Taufiq, E Kusdiyantini and J Windarta

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS 012012
Environmental disclosure on agricultural and mining sector
Sukirman, U Yaisah, R Hidayah, D Suryandari and D Patrisia

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS 012013
Fast composting of food waste using thermal composter
B Zaman, N Hardyanti and P Purwono

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS 012014
Temporal variations in the water quality of beton spring, Gunungsewu karst area, Indonesia

A Cahyadi, I A Riyanto, T N Adji, E Haryono, M Widyastuti and A P K Aji

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS 012015
Adequacy measurement of public green open space (GOS) in absorbing carbon dioxide (CO₂) emissions from transportation activities in Tampan district, Pekanbaru

MS A P Permata, I Buchori and R Kurniati

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS 012016
A study of the clean water supply system in Pematang regency water supply company
I D Komalasari, B P Samadikun and A Sarminingsih


[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS 012017
Optimization of organic waste processing using Black Soldier Fly larvae Case study: Diponegoro university

I B Priyambada, S Sumiyati, A S Puspita and R A Wirawan

[+ Open abstract](#) [View article](#) [PDF](#)

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012018 

The effect of environmental management disclosure and green innovation on the Indonesian food and beverages industry's sales growth

A K Widiatami, B Solikhah, R Setiyani and A Yanitama

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012019

The use of banana peels as raw materials of bio-alcohol production

I Munfarida, M Munir and A Rezagama

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012020

Effectiveness of combined up-flow roughing filter and up-flow slow sand filter to reduce turbidity in Citarum water as a source of drinking water

G H Cahyana, A R Firdaus and T Mulyani

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012021

Effect of leachate recirculation and bulking agent on leachate quality

W Oktiawan, I B Priyambada and P Purwono

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012022

Distribution and soil carbon stocks of agroforestry vegetation on dry land in Aceh Besar regency

H A Umar, Endiyani, S Agustina, Irhami, C Anwar and E Rosa

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012023

Citric Acid and EDTA as chelating agents in phytoremediation of heavy metal in polluted soil: a review

Y C Shinta, B Zaman and S Sumiyati

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012024

Optimization of recycled polyethylene terephthalate plastic bottle fibers in grasscrete

A Etyangat, P Tiboti, M Kayondo and H Bakamwesiga

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012025

Effect of electrode configuration and voltage variations on electrocoagulation process in phosphate removal of laundry wastewater

B P Samadikun, W Oktiawan, Junaidi, A K Rais, T A Taqiyya, M R Amrullah and C Basyar

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OPEN ACCESS

012026

Application of local microorganisms from tuna fish and shrimp waste as bio activator for household organic waste composting by Takakura method

Y Dewilda, R Aziz and F Rahmayuni

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012027

The effect of time and velocity variation in sequencing batches reactor on TSS and nitrogen removal in tofu waste

S Sudarno, N Hardyanti, B Zaman, A Arihta and R Putri

[+ Open abstract](#) [View article](#) [PDF](#)

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012028

The effect of time and velocity variation in sequencing batches reactor on cod and bod, removal efficiency in tofu waste

N Hardyanti, S Sudarno, B Zaman, A Arihta and R Putri

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012029

A review on a machine learning approach of an intelligent irrigation monitoring system with edge computing and the internet of things

L R Loua, M A Budihardjo and S Sudarno

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012030

Potential of local plant *Eleocharis dulcis* for wastewater treatment in constructed wetlands system: review

L F Santosa, Sudarno and B Zaman

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012031

Comparative study between conventional and mechanical technology on fecal sludge treatment plants (FSTP) in Indonesia

A M Stevani and P Soewondo

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012032

Solid waste characterization and reducing potential at Faculty of Engineering, University of Surabaya

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012033

The effect of land subsidence on the selection of raw water sources in hotel and apartment buildings in Semarang city

B Syahputra, B F T Kiono and Sudarno

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012034

Utilization of yellow velvetleaf and water spinach to reduce copper ion in surface water of the estuary of babon river Semarang

B Syahputra and Nafiah

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012035

Risk analysis-based reliability assessment approach under epistemic uncertainty using a dynamic evidential network

M Bougofa, A Bouafia, A Baziz, S Aberkane, R Kharzi and A Bellaouar

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012036

Renewable energy policy and governance in West Sumatera Province: an overview

H Fajri, A D Akmal, B Saputra, Q P Ilham and N Wahyuni

[+ Open abstract](#) [View article](#) [PDF](#)

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012037

Integration of renewable energy policies between central and regional governments

H Fajri, A D Akmal, B Saputra, N Wahyuni, Q P Ilham and K D Maani

[+ Open abstract](#) [View article](#) [PDF](#)

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012038

Agree or disagree: local youth's perception of renewable energy development

B Saputra, H Fajri, A D Akmal, N Wahyuni and H S Halawa

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012039

Optimization of water treatment process performance of Duren Seribu Water Treatment Plant in Depok City: water quality and design parameters

R Hanifa, S Adityosulindro and N P S Wahyuningsih

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-
- OPEN ACCESS** 012040
Rainwater harvesting as an alternative of freshwater supply in Balikpapan city – a case study of Institut Teknologi Kalimantan
E T Mamangkey, R B Sukmara and Ariyaningsih
[+ Open abstract](#) [View article](#) [PDF](#)
-
- OPEN ACCESS** 012041
Biosurfactant and chemical surfactant effectiveness test for oil spills treatment in a saline environment
M Leslie, E Kardena and Q Helmy
[+ Open abstract](#) [View article](#) [PDF](#)
-
- OPEN ACCESS** 012042
Application of leachate recirculation on the concentration of landfill gases
I B Priyambada, B Widianarko, S B Sasongko and A S Puspita
[+ Open abstract](#) [View article](#) [PDF](#)
-
- OPEN ACCESS** 012043
COD removal, decolorization, and energy consumption of electrocoagulation as a wastewater treatment process
E Marlina, P Purwanto and S Sudarno
[+ Open abstract](#) [View article](#) [PDF](#)
-
- OPEN ACCESS** 012044
Comparison of wastewater treatment in oil and gas industry using conventional methods (chemical, physical and biological)
M Hamdy, Sudarno and H S Huboyo
[+ Open abstract](#) [View article](#) [PDF](#)
-
- OPEN ACCESS** 012045
The challenges of Malay Kampung infrastructure as an Old Semarang cultural heritage area
M Rahdriawan, H Wahyono, S F Arief, F Amadeo and A Oktavian
[+ Open abstract](#) [View article](#) [PDF](#)
-
- OPEN ACCESS** 012046
Environmental impact evaluation of crumb rubber industry production process by life cycle assessment (LCA) method (case study: PT FRP)
A Yerdianti and R Aziz
[+ Open abstract](#) [View article](#) [PDF](#)
-
- OPEN ACCESS** 012047
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Dry filtration technology application with activated carbon media to remove odor ammonia emissions from production process feed mill industry

N Harihastuti, S Djayanti and I R J Sari

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012048

Total mercury pathways from artisanal and small-scale gold mining in Sukabumi using system dynamics model

A Sunaryani and Y S Ridwan

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012049

Effect of electrode configuration and voltage variations on electrocoagulation process in surfactant removal from laundry wastewater

W Oktiawan, B P Samadikun, Junaidi, I G N Bramahesa, T A Taqiyya, M R Amrullah and C Basyar

[+ Open abstract](#) [View article](#) [PDF](#)

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012050

Environmental impact of tofu production in West Jakarta using a life cycle assessment approach

I P Sari, W Kuniawan and F L Sia

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012051

Assessing enablers to a circular economy in Indonesian furniture industry using Fuzzy-DEMATEL

P A Wicaksono, T R Naufal, S Saptadi and A Susanty

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012052

Nitrate concentration and accumulation on vegetables related to altitude and sunlight intensity

H Agusta, J G Kartika and K R Sari

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012053

Urban river water quality improvement in Bandung City, Indonesia

Y M Yustiani and T Alfiah

[+ Open abstract](#) [View article](#) [PDF](#)

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012054

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Estimation of greenhouse gas emission from household activities during the COVID-19 pandemic in Binjai City, North Sumatera

I Suryati, A Hijriani and I Indrawan

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012055

The potential and prospect of biomass as primary energy in Indonesia

A I D Lantasi, Syafrudin and Budiyono

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012056

The cellulose of *Boehmeria nivea* as natural flocculants: synthesis, modification, and flocculation analysis

D Fauzani, S Notodarmojo, M Handajani, Q Helmy and T Kardiansyah

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012057

Spatial distribution change of groundwater quality in deep aquifer of Semarang alluvial plains area in past five years

Susanto, Syafrudin and T T Putranto

[+ Open abstract](#) [View article](#) [PDF](#)

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012058

A selection method of municipal solid waste reduction in East Lombok, West Nusa Tenggara Province

S Septarini, H S Huboyo and Sudarno

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012059

Proposing a new strategy to minimize domestic wastewater under the influence of human factor in Antananarivo, Madagascar

F F F V F Rasolonjatovo, H S Huboyo and Sudarno

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012060

The influence of bootstrapping in testing a model of motivation and visit intention of generation Z to the attractive building architecture destinations

R Purwaningsih, D A Sekarini, A Susanty and S N W Pramono

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012061

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Research trend on sustainable architecture: a bibliometric analysis emphasizing on building, material, façade, and thermal keywords

P U Pramesti, M I Hasan and M Ramandhika

[+ Open abstract](#) [View article](#) [PDF](#)

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012062

Bioefficacy of microbial antagonists against *Zymoseptoria tritici* on wheat

I Barakat, N Chtaina, M E Guilli and B Ezzahiri

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012063

Analysis of waste composition as a source of refuse-derived fuel in Cilacap

D I Mustia, S Edy and A Nurul

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012064

Technical evaluation of ultrafiltration unit in Siwalanpaji's water treatment plant, PDAM Sidoarjo

F Rachmawati, B D Marsono, A Masduqi and A Purnomo

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012065

Environment carrying capacity of Pandawa Beach ecosystem and how to optimize it to support sustainable development

K Sumantra and I M W Wijaya

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012066

Eco-efficiency analysis of waste cooking oil recycling into liquid dish soap using life cycle assessment

S Hartini, Y Widharto, S R Indarto and G Murdikaningrum

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012067

Reduction of waste generation to extend the lifetime of landfill: review

R A Prasasti, M A Budihardjo and B P Samadikum

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012068

The Sendai Framework for disaster risk reduction: Insight from Covid-19 in Balikpapan City, Indonesia

Ariyanti, R B Sukmara and L Pradita

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012069

Performance evaluation of waste management in MRF-3R (case study Sukoharjo District)

L S Wangi, S Sumiyati and A Sarminingsih

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012070

Effect of seawater intrusion on groundwater in the Demak coastal area Indonesia: a review

A W Pramita, S Syafrudin and D N Sugianto

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012071

Dynamic model of municipal solid waste management from households in Sukuta Nema, The Gambia

B Jassey, B Zaman and Syafrudin

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012072

Evaluation of river water quality by using hierarchical clustering analysis

B Warsito, S Sumiyati, H Yasin and H Faridah

[+ Open abstract](#) [View article](#) [PDF](#)

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012073

Brackish water treatment for small community by using membrane technology

V R Auliya, B D Marsono, A Yuniarto and E Nurhayati

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012074

Comparative study on thermal comfort responses and sleep quality between Indonesian and Japanese students during summer in Japan

W Budiawan, K Tsuzuki and H Sakakibara

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012075

Removal of cyanide from alumina smelter wastewater using precipitation and filtration technique

M F Huda and Q Helmy

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012076

Organic, nitrogen, and phosphorus removal in hospital wastewater treatment using activated sludge and constructed wetlands

V Hanny, A M Rizal and Nasuka

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012077

Process improvement design at PT URW using failure mode and effect analysis

A Bakhtiar, I W Nurwidanto, S Hartini and P A Wicaksono

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012078

Treatment of textile industry wastewater by electrocoagulation technology

A Rezagama, D S Handayani, B A Rahardjo, S Ashifa and M Y Wafa

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012079

Characteristic differences between breeding places with and without *Culex sp.* larvae on lymphatic filariasis patient surroundings in an endemic area

A Siwiendrayanti, S Anggoro and Nurjazuli

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012080

The impacts of economic freedom on the environment: The case of carbon dioxide emissions in seven ASEAN countries

A Setyadharma, S I Nikensari, S Oktavilia and I F S Wahyuningrum

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012081

Public issues in waste affairs in the pandemic era as a challenge for agile bureaucracy

D Indiahono

[+ Open abstract](#) [View article](#) [PDF](#)

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012082

Study on waste bank capacity building plan and development strategies in Semarang City

M L A Sinaga, F R Madaningrum, R T Siagian, B P Samadikun and S Sumiyati

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Effect of leachate recirculation and bulking agent on leachate quality

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Abstract. The purpose of leachate processing is to reduce pollutants in leachate without using equipment that requires high investment and complicated maintenance. This research aims to determine the impact of leachate recirculation and bulking agents on leachate quality. Fresh solid waste recirculated using artificial leachate with a continuous flow of 1 L/h. The study is conducting for 14 days on a laboratory scale. On the 14th day, combination recirculation and bulking accelerate the increased pH value. Leachate recirculation increases the potential for contact between methanogenic bacteria and dissolved organic matter and contributes to buffering pH during the hydrolysis process. R3 produces a higher Electric Conductivity (EC) value than other reactors since the 7th day. This increase is probably due to the addition of dissolved salts from solid waste decomposition. The role of the bulking agent may not be too significant for changes in the EC value. On day 14, TDS at R1 was 11,748 mg/L, R2 was 12.144 mg/L, and R3 was 14.916 mg/L.

1. Introduction

The rapid population growth, economic growth, urbanization, and industrialization have led to an increase in waste generation, volume, type, and increasingly diverse waste characteristics [1]. The community can process about 5% of the total waste. The remaining 95% is taken to the Final Processing Site (TPA), while the land for the TPA is minimal [2]. In most countries, sanitary landfill is currently the most commonly used method for treating municipal solid waste (MSW) [3]. The substantial volume of waste and high rainfall produces large amounts of leachate as well. For example, Jatibarang landfill, a final waste treatment facility in Semarang City, manages 4,000 tons of waste every day with a composition of 61.95% organic waste from the total municipal waste (MSW) generated [4]. The existing treatment unit has not yet produced effluent quality following the quality standard. Visually, the watercolor in the inlet channel is not much different from the outlet [5]. Researches on leachate treatment are still less attentive nevertheless it contains highly polluted materials [6]. Leachate from the landfill needs to managing appropriately to not cause pollution to groundwater, surface water, and the environment.

WWTP Design for Banyuroto Landfill, Kulon Progo Regency consists of initial holding ponds, facultative ponds, and pond outlets with water hyacinth plants [7]. The Supit Urang IPAL pond, Malang, uses a stabilization pond, aeration pond, and a maturation pond [8]. The Bantar Gebang Integrated Waste



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Bioefficacy of microbial antagonists against *Zymoseptoria tritici* on wheat

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Abstract. From our previous research of bio-control agents of the wheat pathogen *Zymoseptoria tritici* as an alternative to chemical control, one strain of *Bacillus amyloliquefaciens* and one strain of *Trichoderma harzianum* showed high antagonistic potential *in vitro* and *in vivo* as a foliar treatment on potted plants under greenhouse. The present work aimed to evaluate the antagonistic potential of these two strains of microorganisms in seed treatment. The results obtained showed that the two antagonists can reduce the severity of the disease assessed at three growth stages of the two wheat cultivars. *B. amyloliquefaciens* I3 reduced the severity of septoria leaf blotch by 56% and 58% compared to the checks on Aguilal and Karim respectively at the flag leaf stage, while in the case of *T. harzianum* A, this rate was 54% on Aguilal and 55% on Karim. These results suggest that the antagonistic potential is due to a distant mechanism of action such as induced systemic resistance. The viability tests of the two antagonists on coated seeds stored at 4 °C showed that they were viable after twelve months of conservation and preserved their antagonistic potential against *Z. tritici*.

1. Introduction

Septoria leaf blotch, caused by *Zymoseptoria tritici* (teleomorph: *Mycosphaerella graminicola*), is one of the most important foliar diseases of wheat worldwide, frequently causing severe yield reductions. Fungicides, including the triazole and strobilurin groups, are commonly used to control this disease. The risk of developing resistant strains to these fungicides and the potential danger of pesticide use on the health and the environment encourages the research of alternatives, including biological control using antagonists. Among these agents, there are species of non-phytopathogenic rhizobacteria of the genus *Bacillus* spp. such as *B. amyloliquefaciens*, *B. licheniformis* and *B. subtilis*. These bacteria colonize the roots of plants and produce lipopeptide molecules such as lipopeptide molecules (surfactins, iturins, and fengycins) that induce resistance in plants and increase their defensive capacities against subsequent infections through the phenomenon of induced systemic resistance [1]. In addition, these rhizobacteria could have strong direct antibacterial and antifungal activity [2,3,4]. Also, several strains of the filamentous fungi of the *Trichoderma* spp. have been used to control some telluric and aerial plant pathogenic fungi [5]. The biocontrol activity of these *Trichoderma* spp. Strains have been attributed to several mechanisms of action that act synergistically: competition for nutrients and space, antibiosis,



Risk analysis-based reliability assessment approach under epistemic uncertainty using a dynamic evidential network

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Abstract. Probabilistic modeling is widely used in industrial practices, particularly for assessing complex systems' safety, risk analysis, and reliability. Conventional risk analysis methodologies generally have a limited ability to deal with dependence, failure behavior, and epistemic uncertainty such as parameter uncertainty. This work proposes a risk-based reliability assessment approach using a dynamic evidential network (DEN). The proposed model integrates Dempster-Shafer theory (DST) for describing parameter uncertainty with a dynamic Bayesian network (DBN) for dependency representation and multi-state system reliability. This approach treats uncertainty propagation across conditional belief mass tables (CBMT). According to the results acquired in an interval, it is possible to analyze the risk like interval theory, and ignoring this uncertainty may lead to prejudiced results. The epistemic uncertainty should be adequately defined before performing the risk analysis. A case study of a level control system is used to highlight the methodology's ability to capture dynamic changes in the process, uncertainty modeling, and sensitivity analysis that can serve decision making.

1. Introduction

In the last century, many industries have been complex and involved in the latest technological innovation. This technological development is accompanied by a continuous improvement of safety, which stays one of the main concerns in this field. Nowadays, the need for safety measures should be emphasized due to the possibility of catastrophic accidents resulting from this high innovation and development [1–2]. The safety engineer used many quantitative or qualitative methods for risk analysis such as failure mode and effects analysis (FMEA), what-if analysis, hazard and operability analysis (HAZOP), fault tree analysis (FTA), and Bayesian networks (B.N.) ... etc. Each method has its advantages and disadvantages. Most of these techniques are developed for treating aleatory and epistemic uncertainty using possibility theory, evidence theory, and fuzzy sets theory [3–4].

The B.N. has become more prevalent in reliability, availability, safety, and risk assessment for complex systems [5–7]. A review is presented in [8] that studied a recent brief statistical of B.N. applicability in the chemical and process industry. B.N. is applied as a dynamic safety analysis for a complex process. For example, Zarei et al. [9] applied a dynamic risk analysis approach for natural gas



Holistic perspective to knowledge integration for performance of renewable and sustainable energy business

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Abstract. Power generation and consumption globally has always been on the top agenda for any country since it contributes to the basic needs of human beings. In the race of bridging the supply and demand gap, human beings created side effects in the name of environmental pollution. The alternate source of energy is renewable energy, and many nations are committed to adopting these new forms of energy generation; these still contribute lesser than one-fourth of global energy consumption and power generation. This study aims to focus on knowledge integration for the performance of the renewable business segment. It creates a more practical alternative against other forms of energy generations like Thermal, natural gas-based. There are areas like a waste of energy as an example where it is still a lesser-known world. Many measurement techniques are still explored, which suggests Knowledge plays a vital role in the Business Performance of Renewable and Sustainable energy and in implementing Global Climate Control Strategies. The study results indicate the energy sector's transformation into the renewable energy sector, highlighting innovations, knowledge integration, effect on performance, and role of management & government.

1. Introduction

Energy has many usages like power generation for electricity purposes, heat exchange requirements in process industries, and other services. The most generated energy was coal (thermal), water (hydro), natural gas, nuclear, oil. As every nation needed energy for primary usage like electricity, they have invested a lot of money and decades on these forms of energy. As the gap between supply and demand, the investment expanded from the government to private in most countries. However, this also has invited climate issues like environmental pollution, which is the biggest survival challenge of the earth and a threat to the future generation.

Here comes the importance of the new form of energies or earlier lesser prioritized form of energy sources like solar, wind, biofuel, geothermal, hydro, wave, tidal. The volume of energy (MW or GW) generated by earlier forms like thermal was not easy or even sometimes impossible in the new form of energy like solar and wind. Depend on the geography and other resources each nation has. However, the technologies and investments in research have explored out-of-the-box thinking ideas, and many nations already started investing in renewable and sustainable energy. It has created opportunities for more considerable change on a global level, but due to a gap of resources, including knowledge, the target time to achieve the transformation committed by most nations is challenging. Hence knowledge



Optimization of recycled polyethylene terephthalate plastic bottle fibers in grasscrete

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Abstract. Cement and concrete production account for between 5% to 8% of global CO₂. Waste PET plastic and glass waste have also brought about rapid environmental degradation. Grasscrete was developed with glass powder of fewer than 75 microns (has pozzolanic properties) that performed 14% better than concrete at 90 days. So, to further this effort, this experimental research considered the glass create C20 (at 10% cement replacement) and added PET fibers (of aspect ratio 25) at different percentages of 1%, 2%, 3%, and 4% the weight of cement in a bid to optimize the grasscrete performance and its ability to absorb PET waste. Grasscrete being extremely brittle alone, failed by cracking at all percentage PET additions, thus improving its safety factor. A 1% PET fiber addition to grasscrete exhibited the highest strength properties compared to other percentage additions while having a durability of 1.5% better than concrete. It is thus recommended for structural uses as it outperforms concrete. Despite this, a 1% fiber addition decreased grasscrete's compressive strength by at least 3.5% at 28 days and 6% at 90 days but improved the flexural strength by 5.4% at 28 days and 0.8% at 90 days testing.

1. Introduction

Globally, fourteen million tons of waste glass and three hundred and eighty-one tons of waste plastic are disposed of annually [1]. 11 billion tonnes of concrete are consumed annually, making it the most used construction material in the world and contributes between 5% and 8% global CO₂ emissions [2]. To conserve the environment, engineers have constantly developed various ways to utilize recycled materials such as glass and plastics in various civil engineering applications. Studies have employed recycled polyethylene terephthalate bottles (PET) fibers in concrete and have recorded significant improvements in their mechanical properties [3]–[5].

This research will focus on finding improvements in the mechanical properties of grasscrete by the addition of recycled PET plastic fibers. So, engineers can better understand its performance in the field, especially in structural members. It will increase not only the recycling capacity of grasscrete but also its sustainability.

