LEMBAR
HASIL PENILAIAN SEJAWAT SEBIDANG ATAU *PEER REVIEW*
KARYA ILMIAH : PROSIDING

Judul Karya Ilmiah	:	Experimental Study of Wind Booster Addition for Savonius Vertical Wind Turbine of Two Blades Variations Using Low Wind Speed
Jumlah Penulis	:	5 Orang (**Eflita Yohana**, MSK. Tony Suryo U, Binawan Luhung, Mohamad Julian Reza and M Badruz Zaman)
Status Pengusul	:	Penulis ke-1
Identitas Prosiding	:	a. Judul Prosiding : The 4th International Conference on Energy, Environment, Epidemiology and Information System (ICENIS 2019)
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Reviewer 2

Prof.Dr.rer.nat. Ir. A. P. Bayuseno, M.Sc.
NIP. 196205201989021001
Unit Kerja : Departemen T. Mesin FT UNDIP

Reviewer 1

Prof. Dr. Jamari, S.T., M.T.
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   Artikel terbit pada proseding yang dihasilkan dari konferensi internasional yang bereputasi.

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   Metodologi disusun sudah cukup baik. Variabel-variabel yang diukur cukup untuk mengkaji efektifitas wind booster. Data yang disajikan secara informatif. Terdapat kebaharuan data yang dapat digunakan untuk disain wind booster.
4. **Kelengkapan unsur dan kualitas terbitan:**
   Artikel terbit di proseding yang termasuk bereputasi internasional terindek sehingga telah mengalami proses review yang ketat.

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Experimental Study of Wind Booster Addition for Savonius Vertical Wind Turbine of Two Blades Variations Using Low Wind Speed

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Abstract

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Abstract

The Wind turbine is a tool used in Wind Energy Conversion System (WECS). The wind turbine produces electricity by converting wind energy into kinetic energy and spinning to produce electricity. Vertical Axis Wind Turbine (VAWT) is designed to produce electricity from winds at low speeds. Vertical wind

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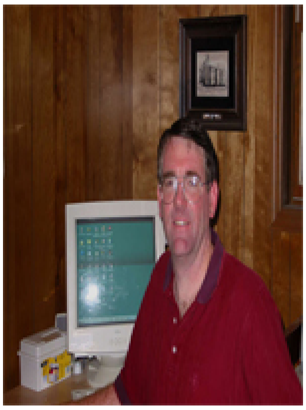

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Experimental Study of Wind Booster Addition for Savonius Vertical Wind Turbine of Two Blades Variations Using Low Wind Speed

Eflita Yohana[1,*], *MSK. Tony* Suryo U [1], *Binawan* Luhung[2], *Mohamad Julian* Reza[2], and *M Badruz* Zaman[1]

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Abstract. The Wind turbine is a tool used in Wind Energy Conversion System (WECS). The wind turbine produces electricity by converting wind energy into kinetic energy and spinning to produce electricity. Vertical Axis Wind Turbine (VAWT) is designed to produce electricity from winds at low speeds. Vertical wind turbines have 2 types, they are wind turbine Savonius and Darrieus. This research is to know the effect of addition wind booster to Savonius vertical wind turbine with the variation 2 blades and 3 blades. Calculation the power generated by wind turbine using energy analysis method using the concept of the first law of thermodynamics. The result obtained is the highest value of blade power in Savonius wind turbine without wind booster (16.5 ± 1.9) W at wind speed 7 m/s with a tip speed ratio of 1.00 ± 0.01. While wind turbine Savonius with wind booster has the highest power (26.3 ± 1.6) W when the wind speed of 7 m/s with a tip speed ratio of 1.26 ± 0.01. The average value of vertical wind turbine power increases Savonius after wind booster use of 56%.

Keywords: **Savonius; Wind Booster; Power; Tip Speed Ratio.**

1 Introduction

The more advanced a nation, the greater the electricity needs of the people. Power plants supply this electricity demand, where the majority of energy sources of power plants still use fossil energy. While the availability of fossil energy is getting limited and the negative impact on the environment is quite much. The use of fossil fuels produces greenhouse gases [1]. These gases absorb heat energy that the earth will emit into space, causing a warming of the troposphere.

Efforts to reduce global warming continue to be carried out. Various countries have made innovations, ranging from making regulations to limit the use of energy that has an impact on global warming to the use of renewable energy to reduce global warming. Renewable energy is an energy that can be renewed and can be used continuously. Its sources are obtained from the sun, wind, gas, and others. It provides many advantages such as can be found anywhere and basically has a small effect on the environment. One of them is wind energy, it is clean energy and in the production process, it does not pollute the environment [2].

The use of renewable energy is still limited, this is due to a lack of research. While the use of it can be an investment in the future. Wind power has been used for 3000 years. Until the 20th century. At the beginning of modern industrial world, the use of wind energy sources is replaced by fossil fuel engines or electricity networks [3].

Wind turbines are a tool used in the Wind Energy Conversion System (SKEA). Wind turbines can produce electricity by converting wind energy into kinetic energy through a blade contained in the turbine and rotating the shaft on the generator to produce electricity [4]. The turbine is divided into two types, Horizontal Axis Wind Turbines (HAWT) and Vertical Axis Wind Turbines (VAWT). Horizontal Axis Wind Turbine (HAWT) is designed to produce electricity from wind at high speed. Vertical Axis Wind Turbine (VAWT) is designed to produce electricity from wind at low speeds. [5].

One of the turbines classified as VAWT is the Savonius wind turbine. This wind turbine has a simple construction that operates independently of the wind direction and starts at low wind speeds that were developed and patented by Sigurd J. Savonius in the 1920s. The best rotor has an efficiency of 31% while the efficiency of the prototype is 37% [6].

Based on data from BMKG, in Indonesia, especially in the city of Semarang, the average wind speed is around 2.5 m / s [7]. Even though wind speeds are low, Indonesia has wind potential that is available almost throughout the year. This makes it possible to develop a small-scale wind power plant system.

The purpose of this study was to analyze the value of the power obtained based on the speed of the incoming wind that pushed the turbine blade and the value of wind

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Methods and Advances in the Forensic Analysis of Contaminated Rivers

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Abstract. Trace metals and metalloids are a common and persistent form of riverine (river) contamination and are derived from a wide variety of sources, including mining and milling operations, industrial activities, urban runoff, agricultural chemicals, and atmospheric pollution, among a host of others. Documentation of trace metal sources and dispersal pathways in riverine ecosystems is essential to mitigate their potentially harmful effects to human and ecosystem health and is often required from a legal (environmental forensic) perspective to assess liability for the costs of remediation. Unfortunately, documenting the sources and source contributions of trace metals in rivers has proven difficult, time-intensive, and costly. Herein, a four-component, interdisciplinary framework is proposed to efficiently identify the sources and source contributions of trace metals in alluvial sediments where multiple natural and/or anthropogenic sources exist. The components include (1) the analysis of the river's alluvial stratigraphic architecture and geomorphic history, (2) the temporal correlation of geochemically characterized alluvial deposits to potential anthropogenic trace metal sources, (3) the analysis of the spatial variations in selected geochemical parameters, and (4) the use of geochemical and/or isotopic tracers to quantitatively estimate the contributions of trace metals from the defined natural and anthropogenic sources. The four components are *not* intended to be exhaustive; the framework may require modification following multiple lines of evidence approach, in which additional methods and data are added to the investigation until there is confidence that all trace metal sources and their contributions have been effectively defined.

Keywords: **Environmental Forensics; Trace Metals; Contaminated Rivers.**

1 Introduction

Trace metals and metalloids (herein referred to collectively as trace metals) are one of the most common and persistent contaminants in riverine ecosystems[1–6]. In rivers characterized by "normal" Eh and pH conditions, trace metals are primarily sorbed onto sediments, particularly fine-grained, chemically reactive sediments, composed of clay minerals, iron (Fe) and manganese (Mn) oxides and hydroxides, and organic matter. As a result, 90% or more of the total trace metal load is typically transported with particulates by physical processes [7,8], and incorporated into channel bed, floodplain, and other types of alluvial (river) deposits [9,10]. These alluvial deposits, then, contain a record of the spatial and temporal variations in the quantity of trace metal inputs into, and transported through, the river system, and their analysis can provide insights into the degree to which anthropogenic activities including mining, agriculture, urbanization, and industry, among others, have contaminated the aquatic environment. Moreover, the river (riverine) sediments can be used to determine the source of trace metals within the river.

The determination of trace metal sources has become one of the most important components of river cleanup for two primary reasons. First, the success of a remediation program depends on identifying where the contaminants are coming from, and then reducing or eliminating their input into the aquatic environment. In fact, the improvements in water quality in many countries since the 1970s have primarily been related to the implementation of environmental regulations that restrict the input of contaminants to water bodies from identified sources, particularly those related to industrial or mining activities. Second, the determination of trace metal sources is often driven by the polluter-pays-principal in which the polluter is required by law to pay for the cleanup of the river such that it is returned a close approximation of its previous condition.

In the U.S., for example, the Comprehensive Environmental Compensation, Response and Liability Act (CERCLA), frequently referred to as the Superfund Program, was enacted in 1980 at the federal level to address the most contaminated sites across the country. State governments have also enacted hazardous waste site remediation programs largely patterned after CERCLA. The developed legislation at both the federal and state levels allows for the allocation of liability to potentially responsible parties (PRPs). These PRPs may include single or multiple person(s) and entity(ies) such as current and past site owners or operators, generators of chemical wastes, and those involved in or responsible for the transport of wastes between sites [11].

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Biorefineries for Sustainable Food-Fuel-Fibre Production: Towards a Circular Economy

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Abstract. Agriculture and related industries form the backbone of many Asian economies. Not only do they provide food, but they are increasingly proving to be a reliable local source of energy and materials. Biofuels from palm oil and sugarcane are prominent examples where the palm and sugar mills serve as biorefineries – providing food, fuels as well as materials. Nevertheless, there are also associated environmental impacts which need to be considered along with economic considerations. A life cycle approach is useful for both environmental as well as economic assessment. In particular eco-efficiency, a tool combining both environmental and economic aspects is very useful to analyze biorefinery configurations and look at the trade-offs between the environmental and economic aspects. The increase of value-added products from the biorefineries may lead to increased economic benefits but also increased environmental emissions. Indicators such as eco-efficiency show the relative advantages of the enhanced biorefinery system as compared to conventional food or biofuel production systems. Thus, they provide important information to decision-makers both for industry and policy.

Keywords: **Biorefinery; Eco-efficiency; Life cycle approach; Oil palm; Sugarcane.**

1 Introduction

Agriculture is a key economic sector for many countries in Asia. Not only does it provide food for domestic consumption, but agro-industries also support the economy through export of food products. Rice, palm oil, sugar, and cassava are some prominent examples. More recently, however, in addition to food products, the agro-industries are increasingly adapting to the production of liquid transportation fuels or so-called biofuels as well as biochemicals. Many countries in Southeast Asia, particularly, Indonesia, Malaysia, Philippines, Thailand, and Vietnam have been leading in the production of biofuels – biodiesel from palm oil and coconut oil to replace diesel and ethanol from sugarcane, molasses and corn to replace gasoline. These countries have promoted the use of biofuels through blending mandates and economic instruments supporting the introduction of biofuels into the market. Biofuels have been promoted for a number of reasons including *inter alia* the use of local materials to reduce imports, the use of renewable materials instead of fossil resources, reduction of greenhouse gas emissions by replacing fossil fuels with bio-based fuels as well as stabilizing farmer incomes. All the intended goals are commendable and seem achievable, but are not automatic. Hence, it is necessary to evaluate them using rigorous scientific techniques and identify the conditions and constraints under which they can be successfully achieved. In such evaluations, it is important to look at the entire supply chain in order to avoid transferring problems from one part of the life cycle to another. This is consistent with the idea of a circular economy that is being promoted worldwide. This paper looks at some of the environmental and economic aspects of palm oil and sugarcane biorefineries in Thailand [1-3]. Eco-efficiency is used as a composite indicator including both environmental and economic aspects.

2 Methods

The eco-efficiency indicator was first introduced by the World Business Council on Sustainable Development to promote sustainable development in industry. It is by now widely recognized and used internationally and has also been incorporated as an international standard (ISO14045:2012). It is generically defined as the ratio of product or service value to environmental impact. The definitions of both these terms constituting the ratio are, however, flexible depending on the context and goal. In this study, eco-efficiency is defined as shown in Eq.1:

$$\text{Eco-eff}_{\text{bioref}} = \text{GVA (US\$) / LC-GHG (kgCO}_2\text{eq)} \quad (1)$$

where $\text{Eco-eff}_{\text{bioref}}$ is the eco-efficiency of the biorefinery; GVA is the gross value added and LC-GHG is the total (life cycle) greenhouse gas emissions.

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Alternatives to groundwater abstraction as a measure to stop land subsidence: a case study of Semarang, Indonesia

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Abstract. The Water as Leverage project aims to lay a blueprint for urban coastal areas around the world that are facing a variety of water-related issues. The blueprint is based upon three real case studies in Bangladesh, India and Indonesia. The case of Indonesia focuses on Semarang, a city that faces issues like flooding, increased water demand, and a lack of wastewater treatment. In this report I summarise the different techniques available to tackling these issues. Along with this I provide a cost-benefit analysis to support decision makers. For a short term it is recommended to produce industrial water from (polluted) surface water as a means to offer an alternative to groundwater abstraction. On a long term it is recommended to install additional wastewater and drinking water treatment services to facilitate better hygiene and a higher quality of life.

Keywords: **Land subsidence; polluted water; flooding.**

1 Introduction

In order to prepare urban areas for a resilient future, the Netherlands Special Envoy for International Water Affairs initiated a programme called “Water as leverage” (WaL). This programme aims to provide the necessary initial investments to incentivise the further implementation of real urban water resilience projects. WaL started pilots in three Asian cities with the prospect of laying a blueprint for other cities and regions around the world facing similar water challenges. One of these pilots is located in Semarang, Indonesia. Semarang deals with a combination of disasters, including floods, droughts, pollution and water conflicts [1]. In this report I look at the problems that Semarang is facing. Then, I review the general technical solutions to solve these issues. Finally, I compare these generic technical solutions to arrive at a recommendation.

Flooding is a big issue at the coast of Semarang causing a lot of damage to buildings and vehicles. In Semarang two types of flooding can be distinguished: pluvial floods and coastal floods. Different causes can be pointed out for the increasing threats of floods: a decrease in infiltration capacity in the highlands, more extreme rainfall patterns, and land subsidence below the sea. Land subsidence is the biggest contributor to the increasing flood risks in coastal areas of Semarang [2]. To counter these problems dams are constructed in the highlands to retain water for usage during the dry season. Closer to the coast land is protected using dikes and the polder system. However, the root cause for the increasing flood threats - land subsidence- has been neglected [3]. This problem is expected to worsen and cause high costs in the future. Therefore, immediate action to stop land subsidence is required.

The water demand in Semarang has grown from 0.5 million m^3/year in 1910 to 53 million m^3/year in 2000 due to the increase in population and industry [4]. The local water company (PDAM) has not been able to grow accordingly with the water demand of Semarang. Therefore, groundwater has increasingly become a resource for domestic users and industry in Semarang [5]. However, the abstraction of groundwater depletes aquifers below the ground. This in turn is a cause for land subsidence with subsidence rates in Semarang reaching up to 10 cm/year [6]. Land subsidence increases the risks to floods and landslides [7].

Only 1% of all wastewater in Indonesia is treated [8]. Despite attempts to manage waste effectively, central domestic waste water treatment and sewer systems are still lacking and should be improved [9]. Industrial waste water treatment is governed through the PROPER mechanism. However, in reality monitoring occurs only once every five years and is mostly a formality. Hence, there still lies a big challenge ahead to (liquid) waste management in Indonesia. The pollution in rivers and other water bodies make it challenging to use surface water as a water resource. Moreover, especially when highly polluted rivers cannot flow freely they may pose a threat to human health [10].

All of the three aforementioned problems require intervention both in technical and governmental means.

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