

Living on the Slope: learning from Encosta do Bom-Jesus, Braga, Portugal

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ABSTRACT: Due to rapid urbanization and lack of available land, hillside settlements are growing along the greenery slopes of the Minho region in the north of Portugal. This paper presents a field study conducted in the hillside area of Encosta do Bom-Jesus, Lamações located in the city of Braga, Portugal. In this recent urban context and in today's awareness towards energy consumption and energy saving issues it was found imperative to learn a series of important aspects related to these households. These aspects relate personal and behaviour factors to energy use, but also include user's perception and satisfaction with their houses, their location, design, total energy consumption and costs and user's awareness towards the existence and application of solar technologies. The assessment was made through a questionnaire randomly applied to 100 households throughout the area of the Encosta do Bom-Jesus, Lamações. Results have shown a general household satisfaction with house location, thermal performance and energy consumption. Although aware of the advantages of the use of solar technologies in the total energy saving and in helping to safeguard the environment, only a few households have them implemented. Results have also shown the need for a more conscious, careful and wise use of energy as well as a correct control, by the users, of the house internal environment.

Keywords: user's behaviour and satisfaction; energy costs; thermal comfort

1. INTRODUCTION

Braga is the capital city of the Minho region, located in the North of Portugal. This region is highly populated with a density of 954 hab/km² and a total population of 175.063 inhabitants. The population in the city is dramatically increasing and undergoing a curious proliferation of new single detached houses along its surrounding hillside terrains on which was once rural land occupied by farmhouses. This is both a result of the autonomy given to the local municipalities and the characteristic settlement patterns of

the Northeast, which are in close relation with the topography of the region. One of the areas of the city, which has been growing more in the last decade, is the Freguesia de Lamações, where the current study is set.

In an era where so much is being said regarding energy saving in homes and how it benefits not only the household, but also all of us and the environment, it is the aim of this paper to investigate how energy conscious are the new households located on Encosta do Bom-Jesus, Lamações

ISEM Rising social consciousness in the field of renewable energy; Izmir Sustainable Energy Museum

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ABSTRACT: While the demand for energy continually increases, the importance and necessity to utilize Renewable Energy Sources (RES) also increases. Also works to increase efficient and rational use of energy are becoming more widespread around the globe. Unfortunately preferred energy production systems are still not renewable, and one of the most important reasons for this is; the society not having enough applicable information on RES. Thus the subject to be emphasized above all should be to increase social consciousness, and therefore create public opinion for the purpose of increasing buildings and systems that use RES. Within this framework, the study expressed here addresses the problem of rising public/social consciousness regarding RES by renewal of a historic building and putting it to public service as a Sustainable Energy Museum. The historic Electricity Plant, which is also identified as an industrial heritage in Izmir, will be renewed as "Izmir Sustainable Energy Museum", which would generate its own energy, and also support educational facilities. The museum building would be the first example to present RES like this to the public in Turkey. Consequently establishing a RES museum would cause easier comprehension of RES, introduction of the technologies to the society (especially children and youths), change the view towards RES and more conscious and common utilization of RES. Besides, since the presentation of RES would be in the form of a museum proposition, the long lasting effects on utilization of RES would be ensured by educational works, designed to introduce RES in earlier ages.

Keywords: Sustainable energy, energy museum, renewable energy sources

1. INTRODUCTION

The production and consumption of energy, which is used in many areas of life such as; heating, cooling and lighting of buildings, powering of appliances and transportation, is very important for both the individual and the society. Therefore,

nowadays, it is needed to reinterpret "energy", which has become an indispensable necessity.

While the demand for energy continually increases, the importance and necessity to utilize Renewable Energy Sources (RES) also continues to increase [1] [2]. Also works to increase efficient and rational use

Municipal Wastewater Selection for Microbial Biodiesel Production

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ABSTRACT: This research compared the effects of municipal wastewaters (i.e., primary and secondary treated) from the Christchurch Wastewater Treatment Plant (CWTP) in Christchurch, New Zealand (NZ) on microbial (microalgal-bacterial) biomass production, settleability, and quality as biodiesel feedstock. Inoculums consisted of native, mixed cultures from an oxidation pond and an activated sludge process. Growth of settleable biomass was encouraged by recycling settleable solids within laboratory-scale sequencing batch reactors (SBRs) operated using a 24-hr cycle, 8-day hydraulic residence time (HRT), and controlled climate conditions. Generally, biomass concentrations of reactors fed with primary wastewater (i.e., 200/400 mg/L final mean for Cold/Warm conditions) were at least double those of secondary wastewater reactors (i.e., 70/210 mg/L final mean for Cold/Warm conditions) due to greater nutrient loading and microbial growth. Furthermore, primary wastewater reactors demonstrated much greater settling (i.e., 76 vs. 22% on average) indicating more efficient biomass harvesting. Lipid contents and types were comparable for all microbial cultures. The benefits of high carbon and bacterial concentrations in primary wastewater appeared to outweigh any disadvantage of reduced light penetration to microalgae from shading.

Keywords: Microalgal-bacterial biomass, activated sludge, wastewater treatment, biodiesel

1. INTRODUCTION

Microalgal biomass grown on wastewater has potential for sustainable biofuel production [1, 2]. Although this field has been researched since the 1950s [e.g., 3, 4], this is the first known study to compare genuine municipal wastewaters as a substrate for native microbial (microalgal-bacterial) biomass production. The productivity, settleability, and quality of biomass grown on CWTP wastewaters were examined.

2. MATERIALS AND METHODS

2.1 Experimental Setup

Four SBRs were inoculated with a 21 L solution of indigenous microalgae and other microbes sourced from Oxidation Pond 6 (P6) wastewater collected from CWTP. One SBR (designated as AP) was also inoculated with 1.5 g (as total suspended solids [TSS]) of activated sludge as previous studies showed that it improved biomass settleability [5]. Four feed water conditions were examined for each climate regime: tap water control, secondary treated wastewater

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Feasibility Maintaining of the Efficiency of Maragheh Water Treatment Plant in the Case of Floating

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ABSTRACT: Maragheh (city in Iran) WTP was established based on nominal capacity 17290 m³/day in 1983. By the land extension, its capacity increased up to 29500 m³/day. The raw water is transmitted from the sited intake on the Alavian River from the sited intake by gravity channel toward the Water Treatment Plant. The different units of treatment plant include manually coarse bar screen, grit chamber, accelerators (5 units), gravity rapid sand filters (8 units), and pressure rapid sand filters (7 filters) and gas chlorination unit.

One of the major problems is the disturbance of system in floating conditions, because of extreme increase in river turbidity. In such cases, sludge production increases extraordinary and the influent of filter is a high turbid water that reduces the filter run time, so that the required water for backwash will be higher than total treated water production. It causes the plant shut down or reduction in plant reception. For solving this problem establishment a pre-treatment unit is necessary. For this achievement, the potential of plain sedimentation in turbidity reduction was evaluated.

Keywords: Detention time, Surface Load, Accelerator, Water treatment plant

1. INTRODUCTION

The city of Maragheh, is situated on the north west of Iran with 4.6 km² of area and altitude of 1332 meters. It is considered to have cold climate and has cold winters and moderate summers. Average of rainfall is at minimum 395mm and at maximum 500mm. [1]

Its population was 67605 in 1965 which has come to 195200 in 1996 and according to

the estimation is 328300 in 2007, therefore the water consumption has highly increased and the refinery has been extended within the 3 phases and during the last extension its capacity has come to 450 lit/s. [2]

The water providing sources of Maragheh include 16 wells in circuit and Alavian River. The details of hydraulic parameters of the river are as follows:

Average rate of flow=25.27m³/s

Peak rate of flow=3285m³/s

Circulating fluidized bed combustion of meat and bone meal

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ABSTRACT: Meat and bone meal (MBM) is phosphorus-rich material, which can be used as raw material of fertilizer. Prior to use, however, organic material in MBM must be removed completely by incineration. High NO_x emissions during incineration of MBM are anticipated since nitrogen content in MBM is very high. In the present work MBM was burned using a bench-scale circulating fluidized bed combustor at 1123 K. MBM ash was used as bed material. Experimental results showed that NO_x emissions decreased with increasing hold-up of MBM ash in the combustor. To investigate the mechanism of NO_x reduction, two series of model experiments were conducted: 1) combustion of alternative fuels (coal and soybean) using bone ash as bed material, and 2) MBM combustion in inert bed material (non-porous alumina). The former was carried out to evaluate catalytic effect of MBM ash on reduction of NO_x. The latter was conducted to evaluate the effect of fluidization condition on combustion behaviour of MBM. No reduction in NO_x emissions was observed during either experiment when the amount of bed material was increased. These results indicate that the combination of MBM as fuel and MBM bone ash as bed material has synergy effect on NO_x reduction during combustion.

Keywords: Fluidized bed combustion, nitric oxides, meat and bone meal

1. INTRODUCTION

Meat and bone meal (MBM) is phosphorus-rich material, which can be used as raw material of fertilizer. Prior to use, however, organic material in MBM must be destroyed completely by incineration. Combustion of MBM is also expected to produce thermal energy. On the other hand, a salient problem of MBM combustion is its high nitrogen content, which might engender high emissions of NO_x (NO+NO₂).

Fluidized bed combustors (FBCs), both bubbling type and circulating type, have been developed as a combustion technology

that can burn wide variety of fuels with low environmental impact. Especially, low-NO_x emission is a feature of FBCs. Indeed, FBCs have been employed for incineration of sewage sludge, which also contains high fuel-bound nitrogen. Thus fluidized bed combustion is expected to be an approach to burn MBM with low NO_x emissions.

Co-combustion of MBM with other fuels such as coal and peat in FBCs has been extensively investigated to recover thermal energy [1 - 6]. However, co-combustion of MBM with other fuels is not always a good approach if utilization of ash is taken into consideration; ash from co-fired fuels will

Increasing sustainability of rural community electricity schemes – case study of small hydropower in Tanzania

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ABSTRACT: Local small scale hydropower resources can play an important role in providing electricity to rural areas in Africa, in particular those areas remote from the national grid.

The large knowledge base on technical aspects of small hydropower indicates a proper understanding of the technology involved. However, at the same time the number of hydro projects implemented does not reflect the enormous potential that exists in Africa, suggesting other barriers than the technology itself are still persistent.

Studies on rural electrification conclude that technology issues are only part of the reason why energy access is still very low in certain areas. The way new (energy) technology is introduced in rural areas and the systems set up for operation and maintenance are equally important. Next to a conducive environment at national level with relevant regulatory, legislative and financial frameworks in place, emphasis needs to be put on the institutional design and practices incorporated.

To evaluate the role of institutional and management arrangements and practices adopted by developers on the sustainability of these systems, the research uses off-grid hydro schemes in the Southern Highlands of Tanzania as case studies. The article describes the contribution of financial, social and technical aspects to the sustainability of the isolated power schemes.

Based on the case studies conclusions are drawn towards methods that will increase the sustainability of hydro systems.

Keywords: small hydropower, mini grids, rural electrification, Africa, governance

1. INTRODUCTION

1.1. Energy access in Africa

Sustainable energy provision is regarded as a major challenge, especially in Africa

where large proportions of (rural) population do lack access to (basic) energy services. On the continent over 500 million people do not have access to electricity. This translates to two thirds of the population,

Anaerobic ammonia oxidation: A cost saving treatment process for wastewater with high ammonia to carbon ratio"

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Anaerobic ammonia oxidation: A cost saving treatment process for wastewater with high ammonia to carbon ratio

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SUMMARY: The leachate of landfill sites, partial flow from sludge treatment or effluents of anaerobic digestors and composting plants are characterized by unwanted high amounts of nitrogen and low carbon concentrations. The common elimination of nitrogen is mostly realized by nitrification and denitrification. To maintain the denitrification process most of the plants use acetic acid or methanol as the main carbon source. Due to the aeration during the nitrification process, the nitrogen removal becomes a highly energy consuming process. Additionally, the carbon source increases the surplus sludge and can cause temperature problems due to the waste heat of the process. The paper describes the plant optimization for the treatment of landfill leachate. By the stepwise reduction of added methanol and lowered aeration, high concentrations of Nitrite and Ammonia were detected in the activated sludge and the downstream activated carbon. During the changeover we measured the nitrogen species, COD and the hydraulic data of the plant. Additionally, the *Planctomyces* responsible for the anaerobic ammonium oxidation (ANAMMOX) were monitored by Fluorescence in situ Hybridisation (FISH). We verified the ANAMMOX related bacteria in the activated sludge and the downstream activated carbon. Last but not least, ANAMMOX reduces the costs for methanol, energy and surplus sludge as well as the CO₂ emissions of the plant.

Landfill, leachate, denitrification, anaerobic ammonium oxidation (ANAMMOX)

1 Introduction

The ANAMMOX process was discovered and patented by Mulder in 1992. The process takes place under anaerobic conditions. Ammonia becomes oxidized by nitrite and dinitrogen gas (N₂) can quit the process. The substrates of the process are ammonia and nitrite. Only 50 % of the ammonia has to be oxidized to nitrite. Compared to the conventional nitrification and denitrification process energy savings of about 50 % for the aeration and 100 % cost savings for the required carbon source can be reached. Mulder et al. published the basics of the process in 1995. Figure 1 shows a view of the N-cycle and the pathway of the anaerobic ammonia oxidation.

Assessment of the Technological Development and Economic Potential of Photobioreactors

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ABSTRACT: The idea behind photobioreactors (PBR) is to hold easy-to-handle phototrophic microorganisms, such as algae or cyanobacteria, in a translucent reactor. Phototrophic organisms can supply themselves with energy from sunlight by converting it into chemical energy. In recent years, PBR have been widely discussed and praised as an innovative energy technology that in the future could also be utilized for commercial energy supply.

In contrast to conventional biomass generation in the field, a PBR is essentially a closed system with well-defined interfaces towards the environment. This bears potentials to reduce the ecological impact on the environment and to increase the efficiency of energy conversion. Also, under the influence of solar radiation, some algae are even able to produce hydrogen from water. Moreover, phototrophic organisms, during photosynthetic activity, consume CO₂, enabling the establishment of a local carbon cycle by interconnecting coal-fired power plants with nearby PBR systems. The ability to absorb CO₂ and to produce biomass and hydrogen at the same time is unique and makes PBR an interesting new technology to be investigated further as a future option for low CO₂ power generation systems, despite its low conversion efficiency of at best around 6%.

In this paper, we investigate both the technological development and the economic potential of the PBR technology. The approach adopted is to consider the technology, its expected costs and revenues, and related risks from an investor perspective. To this end we develop an investment model that is used to calculate the economic feasibility of PBR for different scenarios, including a best-case scenario, with plenty of sunlight and water, inexpensive nutrients, high prices for hydrogen and biomass, and low other costs, that is compared to scenarios with less favorable boundary conditions.

Keywords: photosynthesis, economics, technology, analysis, algae, bioenergy, hydrogen, market forecasts, land use

Economics of Biomass Co-firing in New Hard Coal Plants in Germany

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ABSTRACT: Biomass co-firing in coal power plants (with shares of typically 5-20%_{wt}, depending on the type of biomass used) is an interesting option to mitigate CO₂ emissions, since the additional costs are relatively minor and a secondary benefit is provided by the increased fuel flexibility. Worldwide, about 150 co-firing plants are in operation. In Germany, the potential for biomass co-firing in coal plants is about 28 TWh_{el} per annum, assuming a 10% replacement of coal combustion by biomass. In this paper, we study the economic potential of biomass co-firing in hard coal power plants in Germany, with a particular focus on the power plants owned by the E.ON AG. To this end, we identify suitable biomass inputs fuels, investment and operating costs, and profitability of co-firing investments. In a sensitivity analysis we check for the robustness of the results gained, and in a Monte Carlo simulation uncertainties are explicitly taken into account. We find that both regional and international biomass supplies are relevant, and that the cost effectiveness of co-firing is strongly affected by prices for biomass, coal and CO₂ permits, while investment and operating costs have a modest influence only. According to our calculations, power generation costs attributable to biomass combustion for a plant put into operation in 2020 are between 70-75 €/MWh_{el}, while the average costs of biomass fuel from various sources and markets are calculated to be around 4.1 €/GJ.

Keywords: co-combustion, hard coal, CO₂ mitigation, fuel flexibility, Monte Carlo simulation

Diffusion of Agricultural Biogas CHP Technology in the Niederrhein Region: A Multi-Agent Simulation with a Focus of Heat Sinks and Innovative Heat Storage Systems

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ABSTRACT: In this paper we introduce a dynamic multi-agent simulation model for the diffusion of agricultural biogas technology that takes the heterogeneity in the locally available substrates potentials and heat sinks on the community level explicitly into account by means of GIS data. The model is applied for the Niederrhein region (North Rhine-Westphalia, Germany), where horticulture and animal breeding is widespread. The model-based analysis spans over the time period 2007-2019 and considers three different plant sizes (150, 500 and 1000 kW_e) and four different alternatives for dealing with the waste heat produced during electricity generation (no use, mobile storage, local district heating, ORC process). The results from the simulation show that (1) the existence of sufficient substrate potentials strongly affects the diffusion process while, the availability of heat sinks only plays a minor role; (2) especially larger plants benefit from additional heat revenues, whereas small- and medium-sized plants can be operated profitably already due to the high guaranteed feed-in tariffs; (3) the type of heat use technology is less relevant for the diffusion dynamics; and (4) the total installed biogas capacity in the model region is spatially widely dispersed and could reach some 40 MW by 2019.

Keywords: biogas, multi-agent simulation, technology diffusion, cogeneration, mobile heat storage