

2015 年度 試験研究助成 一覧

Rev. 2015/10/6

| No | 大学名   | 研究テーマ   | 研究者   |
|----|---|---|---|
| 1  | インドネシア大学<br>(UNIVERSITAS INDONESIA)<br>2015 | Study of Delaying Mixing of Cyclone Gas Burner for Utilize Producer Gas From Rice Husk Gasification<br><br>籾殻のガス化から発生炉ガスを利用するためのサイクロンガスバーナーの延期混合の研究   | Prof. Dr. Ir. Adi Surjosatyo, M.Eng   |
| 2  |   | Hydrogen Generation by Plasma Electrolysis Method in Methanol NaOH Electrolyte Solution<br><br>メタノール NaOH 電解質溶液におけるプラズマ電気分解方法による水素生成  | Dr. Ir. Nelson Saksono, MT  |
| 3  |   | Development of 10 KWe Organic Rankine Cycle Scroll Expander-Generator using Refrigerant 134a<br><br>冷媒 134A を使用する 10 KW 有機ランキンサイクル・スクロールエキスパンダー発電機の開発   | Prof. Dr. Ir. Muhammad Idrus Alhamid  |
| 1  | バンドン工科大学<br>(INSTITUT TEKNOLOGI BANDUNG )   | Identifying high permeability zones based on surface roughness criterion to expand an existing geothermal exploitation area using Polarimetric Synthetic Aperture Radar (POLSAR) techniques<br><br>多偏波合成開口レーダ (POLSAR) 技術を使って現存する地熱開発エリアを拡大するための、表面粗さの判定基準に基づく高浸透性ゾーンの特定制 | Asep Saepuloh, S.T.,M. Eng.,Ph  |
| 2  |   | Ecophysiological Responses of Cassava (Manihot esculenta L. Crantz) to Elevated Carbon dioxide Concentrations<br><br>高濃度の二酸化炭素に対するキャッサバ(和名:イモノキ)(学名 Manihot esculenta L. Crantz)の環境生理学的反応   | Dr. Taufikurahman   |
| 3  |   | Development of Green House Gas Emission Factor and Particulate Characterization from Peat Fire Emission in Indonesia<br><br>インドネシアでの泥炭火災の排出による温室効果ガス排出要因と煤塵(微粒子)の特性分析の新事実   | Ir.Puji Lestari, Ph.D   |
| 1  | ボゴール農業大学                                    | Waste Management Challenges In Bogor Agricultural University, Indonesia<br><br>Bogor 農業大学の廃棄物管理の挑戦  | M. Irfansyah Lubis, S.Hut., M.Dev.Prac. Prita Ayu Permatasari, SP. Annisa Nurdiana, SSi |
| 2  |   | Bio-methane Potential of Untapped Fresh Water Macroalgae from Campus Lake, In Bogor Agriculture University<br><br>ボゴール農業大学のキャンパス湖から採れる未利用淡水大型藻類のバイオメタンの可能性  | Mursalin<br>Dea Fauzia Lestari<br>Sri Muslimah<br>W. Arif Pambudi                       |

| No | 大学名                              | 研究テーマ   | 研究者  |
|----|----------------------------------|---|--|
| 3  | (INSTITUT<br>PERTANIAN<br>BOGOR) | <b>Design and Performance Test of Non-Odorourous and Low Maintenance (NOL) Composting Bin Prototype</b><br><br>臭気の無い低メンテナンス(NOL)堆肥作り容器の試作品の設計と性能試験  | Dr. Ir. Arief Sabdo<br>Yuwono, Msc<br>Yanuar Chandra<br>Wirasembada, ST, MSi<br>Indah Mutiara<br>Ningtyas Razaad, ST,<br>MSc       |
| 4  |                                  | <b>Aerophonic as Zero Waste Technology of Wastewater Management In Fisheries and Marine Science Faculty, Bogor Agricultural University (IPB), Indonesia</b><br><br>ボゴール農業大学の水産および海洋科学科における(微生物浄化による)排水管理の廃棄物ゼロ技術としての <b>Aerophonic</b> システム | Dr. Niken T.M. Pratiwi,<br>M.Si<br>Inna Puspa Ayu, S.Pi.,<br>M.Si<br>Aliati Iswantari,<br>S.Pi.,M.Si.<br>Tri Apriadi, S.Pi., M.Si. |

<マレーシア>2015 年度 試験研究助成テーマ一覧

| No | 大学名   | 研究テーマ  | 研究者   |
|----|---|--|---|
| 1  | サラワク大学<br>(UNIVERSITI<br>MALAYSIA<br>SARAWAK) | Environmentally Sustainable Residue Storage Facility (RSF) of Rare Earth Elements Processing Plant: Assessing Strength Suitability of Dihydrate Calcium Sulfate to be used for RSF<br><br>希土類元素処理工場の環境的に持続可能な残留貯蔵施設(RSF)<br>:RSFに使用するための二水和物硫酸カルシウムの評価強度適性 | Dr Alsidiq Hasan<br><br>Dr Fauzan b Sahdi   |
| 2  |   | Design and Implementation of Remote Monitoring and Controlling System Using Smartphone<br><br>スマートフォンを使用する遠隔監視・制御システムの設計と実施  | Puan Nazreen bt Junaidi<br>Dr Shahrol b Mohamaddan<br>Puan Nurul 'Izzati bt Hashim<br>Cik Nur Alia Athirah<br>Mohtadzar<br>Puan Shirley ak Rufus                  |
| 3  |   | Evaluation of factors affecting esterification process : conversion of waste cooking oil to biodiesel<br><br>エステル化プロセスに影響を与える要因の評価:廃食用油のバイオディーゼルへの変換   | Puan Norlisa bt Mili<br><br>Dr Rubiyah Hj Baina<br>Puan Nur Syuhada bt Ahmad Zauzi  |
| 4  |   | Development of A Real-time Remote Monitoring System using Wireless Body Network System<br><br>ワイヤレスボディネットワークシステムを使用したリアルタイムの遠隔監視システムの開発  | Cik Nur Alia Athirah<br>Mohtadzar<br><br>Dr Hushairi Zen<br>Dr Shahrol b Mohamaddan   |
| 5  |   | Mechanical Properties Of Clam Shell Powder-Filled Polymer Matrix Composites<br><br>クラムシェルパウダー充填ポリマー複合材料の機械的性質  | Puan Mahshuri Yusof<br>Encik Jethro Ak Henry Adam<br>Prof Madya Dr Siti Noor<br>Linda Taib<br>Puan Marini bt Sawawi   |
| 6  |   | Effect of thermal perturbation on a biodegradable polymer material tensile test's response<br><br>生分解性ポリマー材料の引張試験の応答に関する熱摂動の影響   | Encik Mohamad Syazwan<br>Zafwan b Mohamad Suffian<br>Prof Dr Amir Azam Khan<br>Dr Shahrol b Mohamaddan  |
| 7  |   | Utilization of a Low Cost Raspberry-Pi based Fast Charger for Lithium-Ion Mobile Phone Charging Station at Faculty of Engineering, UNIMAS<br><br>UNIMAS 工学部のリチウムイオン携帯電話用充電スタンド用として、低コスト Raspberry-Pi(ラズベリーパイ)コンピュータを組み込んだ急速充電器の利用                          | Encik Hazmi Hijazi b Abd Halim<br>Encik Mohd Syahmi b Jamaludin<br>Encik Abdul Hafiz Abdul Karim<br>Encik Abg Mohd Aizuddin b Abg Mohd Mohtar                     |
| 8  |   | Utilization Arduino in Laundry Robot for the Impaired and Disabled<br><br>障害者や身体障害者のためのランドリーロボットに Arduino(アルデュイーノ)マイコンの活用  | Encik Mohd Syahmi b Jamaludin<br>Dr Shahrol b Mohamaddan<br>Encik Hazmi Hijazi b Abd Halim<br>Encik Abdul Hafiz Abdul Karim<br>Encik Ahmad Adzlan Fadzli b Khairi |

| No | 大学名    | 研究テーマ  | 研究者   |
|----|--------|--|---|
| 9  | サラワク大学 | Ammoniacal Nitrogen Reduction In Industrial Effluent Discharge Using Phytoremediation Technology<br>ファイトレメディエーション(植物を利用した環境浄化法)技術を使った工業排水放出におけるアンモニア性窒素の削減 | Puan Noraziah bt Abdul Wahab<br>Co- Researcher<br>Dr Shanti Faridah Salleh<br>Dr Ivy Tan Ai Wei   |
| 10 |        | Investigation of the rise husk particleboard properties<br>もみ殻のパーティクルボード特性の調査  | Puan Marini bt Sawawi<br>Puan Mahshuri Yusof<br>Dr Magdalene ak Andrew Munot<br>Dr Siti Kudnie Sahari   |
| 11 |        | Low Power CMOS Power Amplifier for WiMax Application<br>WiMAXアプリケーションのための低消費電力CMOSパワーアンプ   | Dr Rohana bt Sapawi<br>Dr Siti Kudnie Sahari<br>Puan Sharifah Masniah Wan Masra<br>Puan Nazreen bt Junaidi<br>Puan Kuryati bt Kipli   |
| 12 |        | Development Of a Semi Autonomous Unmanned Aerial Vehicle (UAV) For Environmental Monitoring Applications<br>環境モニタリング用途の半自律型無人航空機(UAV)の開発                   | Encik Abg Mohd Aizuddin b Abg Mohd Mohtar<br>Dr Shahrol b Mohamaddan<br>Encik Mohd Syahmi b Jamaludin<br>Encik Hazmi Hijazi b Abd Halim<br>Encik Adrus bin Mohamad Tazuddin |
| 13 |        | Switch gear switching safety device<br>ギア・スイッチング安全装置スイッチ   | Dr Ir Prashobh Karunakaran  |



**FINAL REPORT**

**OSAKA GAS FOUNDATION  
OF INTERNATIONAL CULTURAL EXCHANGE**

**Year 2015/2016**

**TITLE**

**STUDY OF DELAYING MIXING OF CYCLONE GAS BURNER FOR UTILIZE  
PRODUCER GAS FROM RICE HUSK GASIFICATION**

**Principal Investigator:**

**Prof. Dr. Ir. Adi Surjosatyo, M.Eng.**

**Department of Mechanical Engineering**

**Faculty of Engineering**



**SCIENCE AND TECHNOLOGY RESEARCH CENTER**

**UNIVERSITY OF INDONESIA**

**DEPOK, 2016**

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## ABSTRACT

This research shows the phenomena of fluid flow between the air and gas mixture in the *cyclone synthetic gas burner*. The observations focused on the phenomenon of turbulence intensity, turbulent kinetic energy, and the flow velocity of air and gas mixing synthetic variation of the position due to *cyclone inlet gas burner* with modeling using ANSYS FLUENT. Observations mixing phenomena modeling is used to view the most optimum design for the *cyclone discharge gas burner* with a constant flow of air and synthesis gas respectively  $5.5 \times 10^{-4} \text{ m}^3 / \text{s}$  and  $4.7 \times 10^{-4} \text{ m}^3 / \text{s}$ . Synthesis gas is a product of rice husk biomass gasification-type *fixed bed downdraft gasifier* with a composition of 50%  $\text{N}_2$ , 3%  $\text{CH}_4$ , 18%  $\text{H}_2$ , 19%  $\text{CO}$  and 10%  $\text{CO}_2$ .

Keywords:

*Cyclone gas burner, turbulent kinetic energy, synthetic gas, fixed bed downdraft, rice husks.*





***Final Report***

***Osaka Gas Foundation of International Culture Exchange  
Year 2015/2016***

**Hydrogen Generation by  
Plasma Electrolysis Method in Methanol-NaOH  
Electrolyte Solution**



**Principal Investigator:**

**Nelson Saksono**

**Department of Chemical Engineering  
Faculty of Engineering University of Indonesia**

**2016**



## ABSTRACT

Hydrogen industry sector is one of the important industrial sectors. However, the hydrogen industry consume the most electrical energy due to the production using the process of electrolysis. Plasma electrolysis process is similar with electrolysis process, but it is done with high enough voltage until the electric spark is formed producing the plasma on the electrolyte solution. The plasma will produce reactive species such as radicals on large amount which are accelerated by the sharp potential gradient and have enough kinetic energy to induce unique chemical changes in aqueous solutions, so it is able to increase the formation of products in solution several more times than the Faraday electrolysis process. Plasma electrolysis is a method that can be applied in the production of hydrogen and can reduce energy consumption several times.

This research is aimed to observe the plasma electrolysis method to produce hydrogen gas and measure the electricity consumption needed in hydrogen production process. The research is conducted by using plasma electrolysis reactor completed by electrodes and cooling system. The result of this research shows the highest of hydrogen gas production is about 31.45 mmol/minute at 700 V and 0.01 M NaOH solution with methanol additive. Electricity consumption reaches 0.89 kJ/mmol of hydrogen gas which is 152 times less than electrolysis Faraday.

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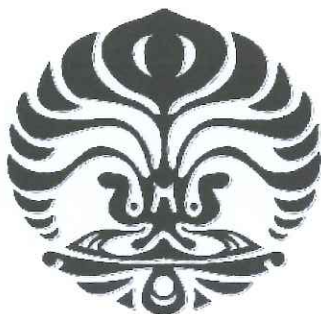
**FINAL REPORT**

**OSAKA GAS FOUNDATION  
OF INTERNATIONAL CULTURAL EXCHANGE  
YEAR 2015/2016**

**Development of 10 kWe Organic Rankine Cycle  
Scroll Expander-Generator using refrigerant 134**

**Principal Investigator :  
Prof. Dr. Ir. M. Idrus Alhamid**

**Department : MECHANICAL ENGINEERING  
Faculty : ENGINEERING**



**SCIENCE AND TECHNOLOGY RESEARCH CENTER  
UNIVERSITAS INDONESIA  
OKTOBER 2016**

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## ABSTRACT

*Compressor is one of mechanical equipment which is used to increase pressure in compressible fluids like air or gas. In its development, Compressor as one of mechanical equipment has experienced evolution and change in term of work process and system as a result of fast technology advance. The expander is scroll compressor supplied by Sanden having high efficiency and could be used in Organic Rankine Cycle. The patented scroll machine TRSA 90 is designed for power production by the expansion process with specifications of 85.7 cc/rev volumetric displacement. Plate heat exchanger Braze plate type were used for evaporator and condenser. A magnetic pump was used to circulate R-134a as the working fluid.*

### 1. Introduction

#### 1.1 Background

Indonesia has a rapid increase in the national daily consumption especially in the field of electrical energy and has been developing sources of renewable energy, including solar energy. Energy scarcity is a classic problem faced by each country in the world especially Indonesia. Indonesia government always try to organize energy policy each year. One of the examples is national energy policy which is appointed as the foundation to develop and increase the capability of energy in the future and also called energy mix. Energy mix policy consist of this following quota : coal 32.7 %, natural gas 30,6%, petroleum 26,2%, water 2,4%, geothermal 3,8%, and others 4,4%. [1]

Even, with that policy in order to keep the availability of energy source in the future, energy crisis still hamper Indonesian people. Indonesian people have high dependence to fossil fuel nowadays. The production of fossil fuel in Indonesia is declining each year due to run out sources.

Due to the consumption of fossil fuels and environment problems, the low-grade energy recovery technique has brought many interest. Scroll machine with the high efficiency, simple structure and small scale, is used as compressor in the refrigeration system and heat pump system. Scroll expander could be used as the energy recovery machine in the small energy recovery system and normally applied in the low-temperature waste heat recovery system. Most of the research on scroll expander is concentrated on the steady performances either simulation or experiment.



## Research Report

**Osaka Gas Foundation of International Cultural Exchange**

**(OGFICE)**



### *Research Title*

**Identifying High Permeability Zones Based on Surface Roughness Criterion to Expand an Existing Geothermal Exploitation Area Using Polarimetric Synthetic Aperture Radar (PolSAR) Techniques**

Principal Investigator:

Asep Saepuloh, Dr. Eng

Academic Unit

Research Division

: Geology

Faculty/School

: Faculty of Earth Sciences and Technology

**INSTITUT TEKNOLOGI BANDUNG**

October 2016



## I. IDENTITY PAGE

1. Title : Identifying high permeability zones based on surface roughness criterion to expand an existing geothermal exploitation area using Polarimetric Synthetic Aperture Radar (PolSAR) techniques
2. Topic : Technologies concerned with natural gas
3. Research Period : November 2015 – November 2016
- 4.1. Principal Investigator :
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| No | Name                | Departement and NIM         | Alocation of Time |        |
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5. Approved budget : US \$ 5,884.12 (Rp 58,841,200.00)

Approved by,  
The Dean of Faculty of Earth Sciences and Technology  
  
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Bandung, 28 August 2015

Principal Investigator



Asep Saepuloh, S.T., M.Eng, Dr. Eng

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## I. EXECUTIVE SUMMARY

1. **TITLE OF RESEARCH** : Identifying high permeability zones based on surface roughness criterion to expand an existing geothermal exploitation area using Polarimetric Synthetic Aperture Radar (PolSAR) techniques
2. **HEAD OF RESEARCH TEAM** : Asep Saepuloh, S.T., M.Eng, Dr. Eng
3. **TEAM MEMBERS** :
  - ✓ Arif Susanto
  - ✓ Diky Irawan
  - ✓ Dinul Akbari
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5. **EXTENDED ABSTRACT** :

Spatial mapping of geothermal-resource potential with an accurate detection of steam spot using remotely-sensed technology requires quantification of physical parameters of surface manifestation related to geothermal system. Synthetic Aperture Radar (SAR) remote sensing, the only useful observation and monitoring technology that can be undertaken in any weather condition, measures backscattering powers returned to a satellite sensor. The backscattering is mainly controlled by the surface roughness that is related to rock types. Resistance to the geological processes such as weathering, erosion, and alteration is different with rock type, which causes a dependence of the surface roughness upon rock type. The backscattering is also affected by dielectric permittivity and magnetic permeability of the ground surface. The purpose of this study is to develop methods for quantifying the surface roughness from the SAR data and detecting surface manifestations of geothermal based on the roughness. A surface roughness dataset by ground-truthing in a geothermal field using a profiler of 30 cm length was used to verify the estimated roughness. Detrending and interleaving techniques of the surface profile were applied to quantify accurately the surface roughness. Correlations of the measured surface roughness with the polarized backscattering intensity and the incidence angle were investigated, which was finally used to make a physical model by a curve fitting of 269 data points. The resultant model was applied to map a spatial distribution of the surface roughness over a 72 km<sup>2</sup> area in the Wayang Windu geothermal field, West Java, Indonesia using two scenes of Full Polarimetric mode of the Phased Array L-band Synthetic Aperture Radar (PALSAR) onboard Advanced Land Observing Satellite (ALOS). Both the ground-truthing and the SAR roughness data indicated that the roughness increased and decreased gradually towards the altered surface manifestations. The rock types and thermal intensities of hydrothermal fluid controlled the surface roughness in general. For lava and pyroclastic rocks, hydrothermal fluids have altered the rock matrices into clay minerals that are easily eroded. The rock fragments are more resistant than rock matrices at ground surfaces. Consequently, surface of the altered rocks becomes rough than the intact rocks in general. For tuff and lahar deposits, hydrothermal fluids have altered all the rock compositions into clay minerals and produced flat surfaces.



**Research Report**  
**Osaka Gas Foundation of International Cultural Exchange**  
**(OGFICE)**



**Ecophysiological Responses of Cassava**  
**(*Manihot esculenta* L. Crantz) to Elevated**  
**Carbon dioxide Concentrations**

Principal Investigator:

**Dr. Taufikurahman**

Academic Unit

Research Division : Science and plant Biotechnology  
Faculty/School : School of Life Science and Technology

**INSTITUT TEKNOLOGI BANDUNG**

October, 2016

## I. IDENTITY PAGE

1. Title : Ecophysiological Responses of Cassava  
(*Manihot esculenta* L. Crantz) to Elevated Carbon dioxide Concentrations
2. Relevance of Topic : Global Environmental Problems
3. Research Period : November 2015 – November 2016
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- 4.2 Members of the Team :

| No | Name and Academic Rank | Field of Experties              | Institution | Allocation of Time |        |
|----|------------------------|---------------------------------|-------------|--------------------|--------|
|    |                        |                                 |             | Hrs/week           | Months |
| 1. | Dr. Taufikurahman      | Science and plant Biotechnology | ITB         | 5                  | 10     |

- 4.3 Research Assistants/Students (mention names when available):

| No | Name                      | Departement and NIM     | Allocation of Time |        |
|----|---------------------------|-------------------------|--------------------|--------|
|    |                           |                         | Hrs/week           | Months |
| 1. | Maryam Al Lubbu, S.T      | Bioengineering/11210015 | 5                  | 10     |
| 2. | Azarine Rahmawati Gandina | Biology/10612039        | 5                  | 10     |
| 3. | Rizki Aprilany            | Biology/10612           | 5                  | 10     |

5. Approved budget : ¥ 80.000 (IDR 58,841,200)

Vice Dean of SITH ITB

Bandung, October 24<sup>th</sup> 2016  
Principal Investigator

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Dr. Taufikurahman  
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## II. EXECUTIVE SUMMARY

1. **TITLE OF RESEARCH** : Ecophysiological Responses of Cassava (*Manihot esculenta* L. Crantz) to Elevated Carbon dioxide Concentrations
2. **HEAD OF RESEARCH TEAM** : Dr. Taufikurahman
3. **TEAM MEMBERS** : Maryam Al Lubbu, S.T  
Azarine Rahmawati Gandina  
Rizki Aprilany
4. **OFFICIAL ADDRESS** : Labtek XI, Jl. Ganesha 10 Bandung
5. **EXTENDED ABSTRACT** :

Recently an issue of global warming as a result of increase in CO<sub>2</sub> released to the atmosphere rise an awareness to the possibility of the reduction in worldwide agricultural production. We investigated short term growth responses of cassava (*Manihot esculenta* L. Crantz) as an important agricultural commodity in Indonesia, to elevated CO<sub>2</sub> level. As a comparison we also examine the effect to sweet potato (*Ipomea batatas* L. (Lam)). The plants were exposed to CO<sub>2</sub> concentration of 612 ppm, 777 ppm and 959 ppm, beside a control of ambient CO<sub>2</sub> concentration of 298 ppm. After 7 days of exposure, plants growth in terms of leaves number, leaves area, number of branches, plant weight, shoot and root length, were mostly increased after being exposed to elevated CO<sub>2</sub> concentration. However elevated CO<sub>2</sub> reduced chlorophyll concentration in both plants. It seems that elevated CO<sub>2</sub> could have a positive impact to plant growth in short term, but in long term that may not necessarily the case as the chlorophyll content of the plant was reduced.

### 6. LIST OF RESEARCH OUTPUT :

We have submitted an abstract for oral presentation to International Conference on Food and Agriculture Technologies (ICFAT 2017) that will be held in January, 16-18, 2017 in Bali. We are also going to submit a full paper for publication later on (deadline in November 10<sup>th</sup> 2016).

## RESEARCH REPORT

OSAKA GAS FOUNDATION OF INTERNATIONAL CULTURAL EXCHANGE  
(OGFICE)



### Research Title

**Development of Green House Gas Emission Factor from Peat  
Fire Emission in Indonesia**

Principal Investigator:

Ir.Puji Lestari, Ph.D

Academic Unit

Research Division: Research group of Air and Waste Management  
Faculty/School: Faculty Civil and Environmental Engineering.

INSTITUT TEKNOLOGI BANDUNG

2016

## I. IDENTITY PAGE

1. Title : Development of Green House Gas Emission Factor and Particulate Characterization from Peat Fire Emission in Indonesia
2. Relevance of Topic : a. Technologies concerned with natural gas  
(select the appropriate topic) **b. Global environmental problems**
3. Research Period : November 2015 – November 2016
- 4.1 Principal Investigator :
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| 2. | Seny Damayanti, ST   | Env Engineering 25314716 | 10                | 6        |

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## **I. EXECUTIVE SUMMARY**

**1. TITLE OF RESEARCH:** Development of Green House Gas Emission Factor and Particulate Characterization from Peat Fire Emission in Indonesia

**2. HEAD OF RESEACH TEAM:** Prof. Puji Lestari, Ph.D

**3. TEAM MEMBERS:** -

**4. OFFICIAL ADRESS:** Jl. Ganesha No. 10 Bandung 40132

### **5. EXTENDED ABSTRACT:**

The aim of the research is to develop green house gases emission factors from peat fire emission in Indonesia as well as to develop source profiles and to enrich the database that is scientifically interests for Indonesia in particular and the region in general. Peat were sampled from five different locations and four different peat depths in West Kalimantan by using Eijelkamp peat sampler. Based on the ultimate analysis it was found that Pontianak peat had an average carbon content of  $57.09 \pm 2.20\%$  (dry) in the range of 52.85 to 59.43% (dry basis). Laboratory experiments were carried out by burning small amout of peats in a mini furnace and measuring their CO<sub>2</sub>, CO and CH<sub>4</sub> emission concentration during two different combustion phases i.e flaming and smoldering. Background concentrations were measured during precombustion. Field measurements of smoke concentrations were conducted during peat fire in Pulang Pisau, Central Kalimantan in 2015. Background concentration in field was carried out in Palangkaraya city, Central Kalimantan six months after peat fire ceased to ensure there was no influence of peat fire emission in the sampling area. The results of measurements in the laboratory showed the linear regression equation between the mass fraction of carbon and CO<sub>2</sub> emission factor during flaming conditions was:  $Y = 3630.4 X + 15.428$ ;  $R^2 = 0.9801$  ( $p = 0.000$ ) for  $0 \leq x \leq 1$ ; where Y was the CO<sub>2</sub> emission factor (g/kg) and X is the mass fraction of peat carbon. While the linear regression equation obtained during smoldering conditions was:  $Y = 2708 X + 284.66$ ;  $R^2 = 0.2059$  ( $p = 0.0673$ ) for  $0 \leq X \leq 1$ ; where Y was the CO<sub>2</sub> emission factor (g/kg) and X was the mass fraction of peat carbon. The higher the carbon content of peat then the greater CO<sub>2</sub> emission factor either during flaming or smoldering combustion stage. The results of measurements in the laboratory showed the linear regression equation between the MCE and CO<sub>2</sub> emission factor during smoldering conditions was:  $Y = 1928.8 X + 106.05$ ;  $R^2 = 0.6483$  ( $p = 0.000$ ) for  $0 \leq x \leq 1$ , where Y was the CO<sub>2</sub> emission factor (g/kg) and X was the MCE. The higher the value of MCE, the higher the combustion efficiency and resulting in greater CO<sub>2</sub> emissions. The results of measurements in the laboratory showed a simple linear regression equation between MCE and CO emission factors in flaming conditions was:  $Y = -1705.2 X + 1705.1$ ;  $R^2 = 0.9801$  ( $p = 0.000$ ) for  $0 \leq x \leq 1$ ; where Y was the CO emission factor (g/kg) and X was the MCE. While the linear regression equation obtained in smoldering conditions was:  $Y = -1302X + 1302.3$  ;  $R^2 = 0.6483$  ( $p = 0.000$ ) for  $0 \leq X \leq 1$ ; where Y was the CO emission factor (g/kg) and X is the MCE. The higher the MCE, the more complete combustion was, therefore the CO emission factors in both flaming and Smoldering conditions would be lower.

Results of laboratory measurements showed the significant influence of type of combustion stage with emission factors and MCE. The average CO<sub>2</sub> emission factor in smoldering condition was about 88% of its average flaming conditions. Average CO and CH<sub>4</sub> emission factors in the flaming condition was about 2.25% and 0.84% of its average in smoldering ones. The results of field measurements show a simple linear regression equation between CO<sub>2</sub> emission factors and MCE obtained in flaming condition was:  $Y = 2160.9 X - 100.57$ ;  $R^2 = 0.9695$  ( $p = 0.015$ ) for  $0 \leq x \leq 1$ , whereas for Smoldering conditions was:  $Y = 2103 X - 51.443$ ;  $R^2 = 0.9748$  ( $p = 0.000$ ) for  $0 \leq x \leq 1$ , where Y was the CO<sub>2</sub> emission factor (g/kg) and X was the MCE. From the graph it can be concluded that the higher the MCE, the higher the combustion efficiency will be and more complete combustion was achieved resulting in lower CO emissions. Results of field measurements showed a simple linear regression equation between CO emission factors and MCE obtained in smoldering condition was:  $Y = -1210 X + 1214.8$  ( $p = 0.000$ ), whereas for flaming condition was:  $Y = -1304.7 X + 1304.8$  ( $p = 0.000$ ), where Y was CO emission factor (g/kg) and X was the MCE. The higher the MCE, the higher combustion efficiency and more complete combustion achieved resulting in lower CO emissions. Based on the comparative analysis it can be concluded that the average emission factors of CO, CO<sub>2</sub> and CH<sub>4</sub> during smoldering stage in laboratory measurements were not the same as the results of field measurements. The average CO<sub>2</sub> emission factor during smoldering combustion stage in the laboratory measurements was about 15% higher compared to measurements in the field, while the average CO and CH<sub>4</sub> emission factors during smoldering stage in field measurement results were approximately 55% and 30.9% high, respectively compared to the results of measurements in the laboratory. This was because the average MCE during smoldering stage for measurements in the laboratory was higher at about 117% of the average measurements in the field. The relationship between CO<sub>2</sub> emission factor during smoldering combustion in the laboratory experimental results and in the field was expressed in the equation:  $Y = 0.9411 X - 144.2$ ;  $R^2 = 1$ , ( $p = 0.000$ ), where Y was the CO<sub>2</sub> emission factor during smoldering stage measured in the field measurements and X was the CO<sub>2</sub> emission factor during smoldering stage measured in the laboratory. The relationship between the CO emission factor during smoldering combustion in the the laboratory experimental results and in the field was expressed in the equation:  $Y = 0.8524 X + 1.1443$ ;  $R^2 = 1$ , ( $p = 0.000$ ), where Y was CO emission factors during smoldering stage measured in the field and X was a CO emission factor during smoldering stage measured in the laboratory.

**The Osaka Gas Foundation of International Cultural Exchange (OGFICE)**

**Research Grant FY 2015/2016**



**Final Report**

**Waste Management Challenges in Bogor Agricultural University, Indonesia**

**M. Irfansyah Lubis, S.Hut., M.Dev.Prac**

**Center for Environmental Research, Bogor Agricultural University**

**Prita Ayu Permatasari, SP.**

**Center for Environmental Research, Bogor Agricultural University**

**Annisa Nurdiana, SSi**

**Center for Environmental Research, Bogor Agricultural University**



**Submitted to:**

**Center for Environmental Research**

**Bogor Agricultural University**

**for**

**The Osaka Gas Foundation of International Cultural Exchange (OGFICE)**

**October 2016**

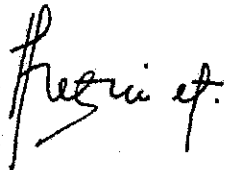
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Bogor, October 14, 2016  
Principal Investigator,



M. Irfansyah Lubis, M.Dev.Prac

## EXECUTIVE SUMMARY

Bogor Agricultural University (IPB) is one of the biggest universities in Indonesia. There are around 24,000 students and faculty members at this university every year. This has resulted into generation of a significant amount of solid waste (both organic and inorganic) in the University. An estimated 5,310 m<sup>3</sup> of solid waste was revealed to be generated by the University monthly. However, it is still a big challenge in the implementation of an effective management approach for the ever growing amount of solid waste. Inadequate labors and facilities especially insufficiency of garbage bins has resulted significant amount of papers, leftover foods, food packaging materials, plastic bags and other plastics are scattered around the Universities' compound. This made the University compound stinky and disgusting and it attracts a large number of flies (disease vectors), threatening the health of the people in University and it surroundings. This study is intended to estimate the number of garbage bins needed in each unit and its proper location to maximize its function.

The Osaka Gas Foundation of International Cultural Exchange (OGFICE)

Research Grant FY 2015/2016



## Final Report

# **Bio-methane Potential of *Salvinia* sp. from Campus Lake, in Bogor Agricultural University**

**Mursalin**

Center for Environmental Research, IPB

**Dea Fauzia Lestari**

Center for Environmental Research, IPB

**Sri Muslimah**

Center for Environmental Research, IPB

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Center for Environmental Research, IPB



Submitted to:

Center for Environmental Research

Bogor Agricultural University

for

The Osaka Gas Foundation of International Cultural Exchange (OGFICE)

October 2016



## General Information

Title : Bio-methane Potential of Untapped Fresh Water Macroalgae from Campus Lake, in Bogor Agricultural University

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Center for Environmental Research,  
Bogor Agricultural University,  
Director,



Dr. Ir. Hefni Effendi, M.Phil.

Bogor, October 14, 2016  
Principal Investigator,



Mursalin



## EXECUTIVE SUMMARY

Aquatic weeds is one of untapped renewable energy source and can be found easily in the nature especially in eutrophication lake. There is very high abundance of aquatic weeds causes negative effect for aquatic, that can cause disruption of the organisms and siltation of the lake. Situ Perikanan lakes around Bogor Agriculture University are covered by *Salvinia* sp. (kiambang). Sustainable management and utilization is need to minimize the impact. One of the solutions to minimize impact is use the *Salvinia* sp as a source of energy based on biomass. *Salvinia* sp material has advantages because its high abundance. The research aims are determine potential of *Salvinia* sp substrate, volume gas production, and gas composition of aquatic weed biogas. Substrate *Salvinia* sp are taken from Situ Perikanan lake, Bogor Agricultural University. Anaerobic digestion process is used for converting biomass into biogas especially methane by ruminant bacteria. Ratio of substrate is 1:1 (water and *Salvinia* sp) in batch system. Digester capacity is 30 liter and operated in lab scale with uncontrolled pH and temperature conditions. Gas volume and composition are measured by gas flow meter and chromatography method. Methane energy is produced to be one of the sustainable living alternative energy in Campus. If that is used on sustainable large scale it will be minimize impact eutrophication and blooming *Salvinia* sp while use as biogas. The results shows that *Salvinia* sp. has high lignin content thus it's hard to degrade. During the research, VFA accumulated and caused increased COD and insignificant decreasing of TS and TVDS. But the biogas volume productions and methane concentrations are quite high, thus *Salvinia* sp. suitable to be used as an alternative source of energy.



**The Osaka Gas Foundation of International Cultural Exchange (OGFICE)**

**Research Grant FY 2015/2016**

## **Final Report**

# **Design and Performance Test of Non-Odororous and Low Maintenance (NOL) Composting Bin Prototype**

**1. Dr. Ir. Arief Sabdo Yuwono, MSc**

**Bogor Agricultural University**

**2. Yanuar Chandra W, ST, MSi**

**Bogor Agricultural University**

**3. Joana Febrita, ST, MT**

**Bogor Agricultural University**



**Submitted to:**

**Center for Environmental Research**

**Bogor Agricultural University**

**for**

**The Osaka Gas Foundation of International Cultural Exchange (OGFICE)**

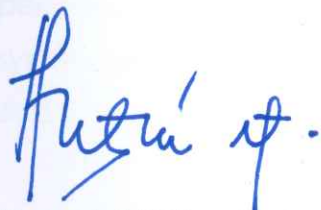
**October 2016**

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Bogor, 11 October 2016

Center for Environmental Research,  
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Director,



Dr. Ir. Hefni Effendi, M.Phil

Principal Investigator,



Dr. Ir. Arief Sabdo Yuwono, M.Sc

## EXECUTIVE SUMMARY

### **Design and Performance Test of Non Odorous and Low Maintenance (NOL) Composting Bin Prototype**

*Arief Sabdo Yuwono, Yanuar Chandra Wirasembada, Joana Febrita*

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Solid waste management usually generate new problems, not only environmental concerns, but social concerns as well. Until the present time, IPB (Bogor Agricultural University) as one of the biggest academic institutions in Indonesia, are against these problems, especially in odorous impacts which are generated from open dumping. Solid waste management practices in IPB are still limited to merely collection (without any separation for its composition), transport and disposal (open dumping). The objectives of this research are to design and develop a non-odorous and low maintenance (NOL) composting bin prototype based on the generated waste, to carry out performance test of the composting bin and to test the compliance of the resulted compost (using national standard: SNI 19-7030-2004). Based on the research, the average of waste generation in IPB Dramaga was 0.04 kg/capita/day, where the average of waste density was 106.3 kg/m<sup>3</sup>. The main fraction of waste composition are plastic (32%), paper (28%), and food scrap (23%). The design of the composting bin prototypes were built into three different types. They were CB1 (covered by roof), CB2 (same with CB1 but without roof) and CB3 (without roof and using natural static pile composting system). Based on temperature test, odour emission test and compost performance test in three models of composting bins, CB3 was the most suitable composting bin to be implemented due to its great performance test. Composting bin was designed using natural static pile composting system, where the volume of composting bin was 7.5 m<sup>3</sup> per batch with minimum area of 64.5 m<sup>2</sup>.



**The Osaka Gas Foundation of International Cultural Exchange (OGFICE)**

**Research Grant FY 2015/2016**



**Final Report**

**Aerophonic as Zero Waste Technology of  
Wastewater Management in Fisheries and Marine Science  
Faculty, IPB, Indonesia**

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**Submitted to:**

**Center for Environmental Research**

**Bogor Agricultural University**

**for**

**The Osaka Gas Foundation of International Cultural Exchange (OGFICE)**

**October 2016**

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Center for Environmental Research,  
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Bogor, 13 October 2016  
Principal Investigator,



Dr. Ir. Niken Tunjung Murti Pratiwi, M.Si.

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**RINGKASAN LAPORAN AKHIR**  
**GERAN PENYELIDIKAN OSAKA GAS**  
*END OF OSAKA GAS*  
*GRANT REPORT SUMMARY*

|   |  |
|---|--|
| <b>A. Tajuk Projek</b><br><i>Project Title</i>  | : Environmentally Sustainable Residue Storage Facility (RSF) of Rare Earth Elements Processing Plant: Assessing Strength Suitability of Dihydrate Calcium Sulfate to be used for RSF |
| <b>Ketua Penyelidik</b><br><i>Project Leader</i>  | : Dr Alsidqi Hasan   |
| <b>Fakulti/Institut</b><br><i>Faculty/Institute</i>   | : Faculty of Engineering   |
| <b>Ahli Kumpulan Penyelidik</b><br><i>Research Team Members</i>   | : Dr Fauzan Sahdi  |
| <b>B. Tarikh Geran Diluluskan</b><br><i>Grant Approval Date</i>   | : 16 November 2016   |
| <b>Tempoh Projek</b><br><i>Project Duration</i>   | : 1 year   |
| <b>Peruntukan Yg. Diluluskan</b><br><i>Budget Approved</i>  | : RM 3000  |
| <b>Perbelanjaan Terkini</b><br><i>Expenditure To-Date</i>   | : RM 2860  |
| <b>C. Pencapaian Keseluruhan</b><br><b><i>Overall Achievement</i></b><br>Huraikan pencapaian berbanding objektif, hipotesis serta permasalahan asal yang diselidiki..<br><i>Describe the achievements in relation to the original objectives, hypothesis and research problems.</i><br><br><u>The objectives of the research are as follows:</u><br><br>1.To determine/characterize physical properties (index properties) of the Dihydrate calcium sulfates (gypsum) and classifies them according to the Unified Soil Classification System (ASTM, 2011).<br>2.To determine the total and effective strength parameters of the calcium sulfate. The strength parameters will be explored at their peak and critical (residual) strength states. The investigation will generate the parameters used for the stability analysis of the residue storage facility (RSF) and future troubleshooting purposes. |  |

The research experiments carried out:

Series of experimental testing have been conducted for gypsum powder. Commercial gypsum powders is used as to simulate solid waste produced from Flue Gas Desulphurisation (FGD) and Neutralisation Underflow (NUF) industrial process as used in Rare Earth Elements Processing Plant. The commercial gypsum powder is sourced from Siam Gypsum Plaster. XRF test indicates that the commercial powder indeed contains 99.7% gypsum. The following experimental testing have been conducted:

1. To achieve objective no 1:

- a. Index tests: Specific gravity, particle size distribution, Liquid limit to classify the gypsum powder according to Unified Soil Classification System (USCS)
- b. X-ray Fluorescence analysis (done at Universiti Putra Malaysia)
- c. Scanning Electron Microscopy (SEM)

2. To achieve objective no 2:

Series of Triaxial Consolidated Undrained (CU) tests have been performed.

#### **D. Pencapaian Utama**

##### ***Key Findings***

The research reveals strength behaviour of gypsum powder that is quite different compared to silicate mineral soils (e.g. sand, silt, clay). It hydrates and produce strong bonds when mixed in paste consistency. However in saturated consistency such as investigated in this research, it creates a low density (porous) structure with weaker bonds. The Triaxial CU tests show that that the material appear to behave some peak strength, i.e. dilative behaviour rather than contractive behaviour. This perhaps attributed due to the bonds produced during the hydration.

From the observation, the strength behaviour of gypsum can be categorized into two regimes: structured and destructured. The structured regime is much affected by the strength resulted from the crystallization or cementation of the gypsum. The structured regime terminates at a certain confining pressure and then the behaviour of gypsum change into destructured regime. At this regime, the strength of the gypsum is mainly affected by the internal friction.

#### **E, Hasil Penyelidikan**

##### ***Deliverables***

Sila tandakan item yang berkaitan pada senarai berikut:

*Please tick the relevant items below:*

|  | Item  | Bilangan/Number |
|--|---|-----------------|
|  | Kertas teknikal/bersiri dalaman<br><i>Internal technical/serial papers</i>      | -               |
|  | Tesis/disertasi pelajar sarjana<br><i>Student's Masters thesis/dissertation</i> | 1               |
|  | Tesis pelajar PhD<br><i>Student's PhD thesis</i>                                | -               |
|  | Kertas persidangan tempatan<br><i>Local conference papers</i>                   | -               |
|  | Kertas persidangan antarabangsa<br><i>International conference papers</i>       | -               |
|  | Makalah dalam jurnal tempatan<br><i>Local journal papers</i>                    | -               |
|  | Makalah dalam jurnal antarabangsa<br><i>International journal papers</i>        | 1               |



M-2

**RINGKASAN LAPORAN AKHIR**  
**GERAN PENYELIDIKAN OSAKA GAS**  
*END OF OSAKA GAS*  
*GRANT REPORT SUMMARY*

|  |  |
|--|--|
| <b>A. Tajuk Projek</b><br><i>Project Title</i>   | : <b>Design and Implementation of Remote Monitoring and Controlling System Using Smartphone</b>  |
| <b>Ketua Penyelidik</b><br><i>Project Leader</i>   | : Nazreen bt Junaidi   |
| <b>Fakulti/Institut</b><br><i>Faculty/Institute</i>  | : Fakulti Kejuruteraan   |
| <b>Ahli Kumpulan Penyelidik</b><br><i>Research Team Members</i>  | : <ol style="list-style-type: none"> <li>1. Dr. Shahrol b. Mohammadan</li> <li>2. Nurul 'Izzati bt Hashim</li> <li>3. Nur Alia Athirah bt Hj. Mohtadzar</li> <li>4. Shirley Rufus</li> </ol> |
| <b>B. Tarikh Geran Diluluskan</b><br><i>Grant Approval Date</i>  | :  |
| <b>Tempoh Projek</b><br><i>Project Duration</i>  | : 1 January 2016 – 31 December 2016  |
| <b>Peruntukan Yg. Diluluskan</b><br><i>Budget Approved</i>   | : RM 4500  |
| <b>Perbelanjaan Terkini</b><br><i>Expenditure To-Date</i>  | : RM 4500  |
| <b>C. Pencapaian Keseluruhan</b><br><i>Overall Achievement</i><br>Huraikan pencapaian berbanding objektif, hipotesis serta permasalahan asal yang diselidiki..<br><i>Describe the achievements in relation to the original objectives, hypothesis and research problems.</i> |  |

As a conclusion, a temperature remote controlling of a clean room system is successfully created. A simple wireless networking used to control the temperature is successfully created and it is successfully communicated with SIM900A GSM module and Arduino UNO microprocessor that used to monitor and load the temperature reading from LM35 temperature sensor is successfully configured.

In this project, the Arduino UNO microprocessor is programmed to load all the content from LM35 temperature sensor, Zigbee and SIM900A GSM module. This microcontroller would retrieve the value of the LM35 temperature sensor and if the value of the temperature is exceed the threshold that has been set up the microprocessor will send the data to SIM900A to notify the user by sending the SMS.

#### D. Pencapaian Utama

##### *Key Findings*

In this research, a remote monitoring and controlling system using a smartphone is successfully developed. A wireless networking used to control the temperature is successfully developed and a successful communication is established between SIM900A GSM module and Arduino UNO microprocessor that is used to monitor and load the temperature reading from the LM35. The Arduino UNO microprocessor is also successfully programmed to load all the content from the LM35 temperature sensor, Zigbee, and SIM900A GSM module. A user-friendly controlling system based mobile phone control and are designed and implemented.

#### E, Hasil Penyelidikan

##### *Deliverables*

Sila tandakan item yang berkaitan pada senarai berikut:

*Please tick the relevant items below:*

|   | Item  | Bilangan/Number |
|---|---|-----------------|
|   | Kertas teknikal/bersiri dalaman<br><i>Internal technical/serial papers</i>      |                 |
|   | Tesis/disertasi pelajar sarjana<br><i>Student's Masters thesis/dissertation</i> |                 |
|   | Tesis pelajar PhD<br><i>Student's PhD thesis</i>                                |                 |
| / | Kertas persidangan tempatan<br><i>Local conference papers</i>                   | 1               |
|   | Kertas persidangan antarabangsa<br><i>International conference papers</i>       |                 |
|   | Makalah dalam jurnal tempatan<br><i>Local journal papers</i>                    |                 |
|   | Makalah dalam jurnal antarabangsa<br><i>International journal papers</i>        |                 |
|   | Monograf atau buku<br><i>Book/monograph</i>                                     |                 |

Lain-lain/others (sila nyatakan/please specify)



**RINGKASAN LAPORAN AKHIR**  
**GERAN PENYELIDIKAN OSAKA GAS**  
*END OF OSAKA GAS*  
*GRANT REPORT SUMMARY*

|   |  |
|---|--|
| <b>A. Tajuk Projek</b><br><i>Project Title</i>                  | : Evaluation of factors affecting esterification process: conversion of waste cooking oil to biodiesel   |
| <b>Ketua Penyelidik</b><br><i>Project Leader</i>                | : Norlisa Mili   |
| <b>Fakulti/Institut</b><br><i>Faculty/Institute</i>             | : Engineering Faculty  |
| <b>Ahli Kumpulan Penyelidik</b><br><i>Research Team Members</i> | : DR RUBIYAH BINTI BAINI<br>NUR SYUHADA BT AHMAD ZAUZI   |
| <b>B. Tarikh Geran Diluluskan</b><br><i>Grant Approval Date</i> | : 16 November 2015   |
| <b>Tempoh Projek</b><br><i>Project Duration</i>                 | : January 1, 2016- December 31,2016  |
| <b>Peruntukan Yg. Diluluskan</b><br><i>Budget Approved</i>      | : RM 4500  |
| <b>Perbelanjaan Terkini</b><br><i>Expenditure To-Date</i>       | : RM0  |
| <b>C.</b>   | <p>Final thesis project was produced entitled: 'AMBAL SHELL CATALYST FOR SUSTAINABLE BIODIESEL PRODUCTION VIA ESTERIFICATION AND TRANSESTERIFICATION REACTION'.</p> <p>Biodiesel has emerged as a prominent source to replace petroleum diesel. Conventionally, transesterification reaction utilized homogenous catalyst as it yields biodiesel satisfactorily and require low reaction time. However, it possesses main hindered element in the downstream process that required additional purification process to excrete glycerol, catalyst, and alcohol. Thus, it leads to high-energy</p> |

requirement, a lot of water wash utilization and necessity of wastewater treatment. In this study, conventional catalyst which is homogenous is substitute with heterogeneous catalyst. The aim of this study was to analyze the catalytic performance of ambal shell waste derived catalyst to obtain mineral diesel. Ambal shell was prepared by calcination process for conversion of calcium carbonate to calcium oxide at 900°C. Then, catalyst was analysed using Scanning Electron Microscope(SEM), Fourier transform infrared spectroscopy (FTIR) and Brunauer, Emmett, and Teller (BET) respectively. Utilization of waste cooking oil as biodiesel feedstock is widely studied to lower down the production cost of biodiesel. Biodiesel was synthesized through esterification followed by transesterification reaction. The optimum yield of biodiesel obtained was 94% at temperature (65°C), amount of catalyst, (2.5%), methanol to oil molar ratio ( 12:1), speed,250 rpm and reaction time 3.5 hours.

### Evaluation of biodiesel;

A gas emission analysis on diesel and biodiesel blending (B5 and B20) had been conducted to compare the harmful exhaust emission potential produced during combustion. During the experiment, four types of gaseous are detected from the smoke emission fuels. They are carbon monoxide (CO), nitrogen oxide (NO), and nitrogen dioxide (NO<sub>2</sub>).Table 4.9 shows the result of the gas emission composition in the smoke after combustion of each type of fuels.

The result from Table 4.9 shows that the CO produced from diesel is higher than biodiesel blending which is 1200ppm. CO emission in the blends of the biodiesel is lower than that of the diesel due to the less carbon content in the biodiesel blend compared to diesel(Sharma et al, 2014). The outcome also can be observed from a higher concentration of CO in B5 compared to B20.

Table 4.9: Gas Emission Composition in the Smoke after Combustion of Fuels

| Fuel   | Gas emitted (ppm) |    |                 |  |
|--------|-------------------|----|-----------------|--|
|        | CO                | NO | NO <sub>2</sub> | NO <sub>x</sub> (NO <sub>2</sub> + NO) |
| Diesel | 1200              | 17 | 0.4             | 20                                     |
| B5     | 1014              | 20 | 0.9             | 20.9                                   |
| B20    | 841               | 24 | 2.1             | 26.1                                   |

NO<sub>x</sub> emitted from biodiesel blending (B5 and B20) combustion are higher than diesel fuel. As reported by Tan *et al* (2015b), the high oxygen content in biodiesel has risen up the problem of higher NO<sub>x</sub> emission. Whilst, the increased of NO<sub>x</sub> level may be due to high temperatures in the combustion chamber to burn the biodiesel up to its flash point (Giakoumis et al., 2012).

## D. Pencapaian Utama Key Findings

Razor shell a biomass product was found as a catalyst for production of biodiesel.

**E, Hasil Penyelidikan  
Deliverables**

Sila tandakan item yang berkaitan pada senarai berikut:

*Please tick the relevant items below:*

|   | Item  | Bilangan/Number   |
|---|---|---|
|   | Kertas teknikal/bersiri dalaman<br><i>Internal technical/serial papers</i>      |   |
|   | Tesis/disertasi pelajar sarjana<br><i>Student's Masters thesis/dissertation</i> |   |
|   | Tesis pelajar PhD<br><i>Student's PhD thesis</i>                                |   |
|   | Kertas persidangan tempatan<br><i>Local conference papers</i>                   |   |
|   | Kertas persidangan antarabangsa<br><i>International conference papers</i>       |   |
|   | Makalah dalam jurnal tempatan<br><i>Local journal papers</i>                    |   |
| ✓ | Makalah dalam jurnal antarabangsa<br><i>International journal papers</i>        | 1 (Manuscript) submitted to Chinese Journal of Catalysis (Q3)<br>Under review |
|   | Monograf atau buku<br><i>Book/monograph</i>                                     |   |

Lain-lain/others (sila nyatakan/*please specify*)

Sila senaraikan maklumat (pengarang, tahun, tajuk, jurnal/penerbit, jilid, halaman) bagi penerbitan/tesis yang dihasilkan (jika ada).

*Please specify the publications (authors, year, title, journal/publisher, volume, page nos.) (if any)*

Mili Norlisa<sup>a</sup>, Aziz Fazliana<sup>a</sup>, Mahsahirun M. Mahadir<sup>a</sup>, Baini Rubiyah<sup>a</sup>, Amin M. M. Afizal<sup>a</sup>, Said K.A.M. and Nor Hasmaliana Abdul Manas<sup>a</sup>



RINGKASAN LAPORAN AKHIR  
GERAN PENYELIDIKAN OSAKA GAS  
END OF OSAKA GAS  
GRANT REPORT SUMMARY

|  |  |
|--|--|
| <b>A. Tajuk Projek</b><br><i>Project Title</i>   | : Development of A Real-Time Remote Monitoring System using Wireless Body Network System |
| <b>Ketua Penyelidik</b><br><i>Project Leader</i>   | : Nur Alia Athirah Binti Hj Mohtadzar  |
| <b>Fakulti/Institut</b><br><i>Faculty/Institute</i>  | : Faculty of Engineering, UNIMAS   |
| <b>Ahli Kumpulan Penyelidik</b><br><i>Research Team Members</i>  | : Assoc. Prof. Dr Hushairi Zen<br>Dr Shahrol Mohamaddan                                  |
| <b>B. Tarikh Geran Diluluskan</b><br><i>Grant Approval Date</i>  | : 1 January 2016   |
| <b>Tempoh Projek</b><br><i>Project Duration</i>  | : 1.5 Years  |
| <b>Peruntukan Yg. Diluluskan</b><br><i>Budget Approved</i>   | : RM4000   |
| <b>Perbelanjaan Terkini</b><br><i>Expenditure To-Date</i>  | : RM3000   |
| <b>C. Pencapaian Keseluruhan</b><br><i>Overall Achievement</i><br>Huraikan pencapaian berbanding objektif, hipotesis serta permasalahan asal yang diselidiki..<br><i>Describe the achievements in relation to the original objectives, hypothesis and research problems.</i><br><br>In consonance with the objective of the project to produce an effective monitoring system; an easy to use, wearable, measureable to high frequency asynchronously, two modules have been developed; waist module and shoulder module of health monitoring system. They are used to measure human body parameter, monitor human health and provides cloud system to send data through remote places.<br><br>The research has been done by two undergraduate students of Year 2015/2016 as their Final Year Project. The research is divided into two sections; the software and hardware. The microcontroller used in this project is Microchip PIC32. Each student has completed their thesis with title:<br>1. Wearable Devices in BAN System for Health Monitoring Purpose |  |



2. Operating System in Early Cardiac Monitoring System using BAN System  
The outcome product has been awarded with a silver medal in UNIMAS Innovation Technology Expo 2016 on 23-24th May 2016 and a bronze medal in Malaysia Technology Expo on 16-18<sup>th</sup> February 2017 in Kuala Lumpur.

Continually another two undergraduate students of Year 2016/2017 have developed two monitoring system by using Arduino UNO. They have completed their thesis with title:

1. Real-time Remote Monitoring System Using Arduino for Cardiac Disease Patient
2. Wearable Body Posture Monitoring System

The outcome product has been presented in UNIMAS Innovation Technology Expo 2017 on 17-18th May 2017 and has been awarded with a silver and a bronze medal.

#### **D. Pencapaian Utama** **Key Findings**

1. Development of three health monitoring systems:

- a) Early Cardiac Monitoring System using microcontroller PIC32.
- b) Cardiac Remote Monitoring System Using Arduino
- c) Wearable Body Posture Monitoring System

2. Two journal publications:

- a) Journal of Applied Mechanics and Materials, ISSN: 1662-7482, Vol. 833, pp 185-189/ doi:10.4028, 2016.  
Wrist Module as an Applied Health Monitoring System in Wireless Body Area Network System
- b) Journal of Applied Mechanics and Materials, ISSN: 1662-7482, Vol. 833, pp 179-184/ doi:10.4028, 2016.  
Revelation of Body Behavior Based on Arm Motion Measurement in Wireless Body Area Network System

#### **E, Hasil Penyelidikan** **Deliverables**

Sila tandakan item yang berkaitan pada senarai berikut:

*Please tick the relevant items below:*

|   | Item  | Bilangan/Number |
|---|---|-----------------|
|   | Kertas teknikal/bersiri dalaman<br><i>Internal technical/serial papers</i>      |                 |
|   | Tesis/disertasi pelajar sarjana<br><i>Student's Masters thesis/dissertation</i> |                 |
|   | Tesis pelajar PhD<br><i>Student's PhD thesis</i>                                |                 |
| √ | Kertas persidangan tempatan<br><i>Local conference papers</i>                   | 2               |
|   | Kertas persidangan antarabangsa<br><i>International conference papers</i>       |                 |
| √ | Makalah dalam jurnal tempatan<br><i>Local journal papers</i>                    | 2               |



**RINGKASAN LAPORAN AKHIR**  
**GERAN PENYELIDIKAN OSAKA GAS**  
*END OF OSAKA GAS*  
*GRANT REPORT SUMMARY*

|   |  |
|---|--|
| <b>A. Tajuk Projek</b><br><i>Project Title</i>  | : MECHANICAL PROPERTIES OF CLAM SHELL POWDER-FILLED POLYMER MATRIX COMPOSITES        |
| <b>Ketua Penyelidik</b><br><i>Project Leader</i>  | : MAHSHURI BINTI YUSOF   |
| <b>Fakulti/Institut</b><br><i>Faculty/Institute</i>   | : KEJURUTERAAN   |
| <b>Ahli Kumpulan Penyelidik</b><br><i>Research Team Members</i>   | : JETHRO HENRY ADAM<br>ASSOC PROF DR HJH SITI NOOR LINDA TAIB<br>DR MARINI BT SAWAWI |
| <b>B. Tarikh Geran Diluluskan</b><br><i>Grant Approval Date</i>   | : 1 JANUARI 2016   |
| <b>Tempoh Projek</b><br><i>Project Duration</i>   | : 1 TAHUN  |
| <b>Peruntukan Yg. Diluluskan</b><br><i>Budget Approved</i>  | : RM3000.00  |
| <b>Perbelanjaan Terkini</b><br><i>Expenditure To-Date</i>   | : Tidak dibelanjakan   |
| <b>C. Pencapaian Keseluruhan</b><br><b><i>Overall Achievement</i></b><br>Huraikan pencapaian berbanding objektif, hipotesis serta permasalahan asal yang diselidiki..<br><i>Describe the achievements in relation to the original objectives, hypothesis and research problems.</i><br><br>Adding fine micron sized lokan powder into unsaturated polyester resin may increase mechanical properties of the composites. The results indicate that including aragonite $\text{CaCO}_3$ derived from lokan shell powder in all micron sizes (29.84 -- 636.87 $\mu\text{m}$ ) greatly improved the stiffness of the composites. The stiffness or elastic modulus of aragonite $\text{CaCO}_3/\text{UPE}$ |  |

composites appeared to increase with tensile, compressive and flexural loadings more than unfilled or neat UPE resin. The stiffness increased as the filler size decreased and the filler content increased. Adding aragonite  $\text{CaCO}_3$  particles into the UPE matrix also improved the composites' tensile strength and compressive strength, but not flexural strength. The strength enhanced as the filler size decreased and filler content increased.

#### **D. Pencapaian Utama**

##### ***Key Findings***

The findings from this research motivate us to explore potential application of *lokan* shell powder.

##### **Finding 1. The lokan shell powder is in the form of aragonite**

Aragonite is a useful biomedical material because it is denser than calcite (commercial  $\text{CaCO}_3$ ) and can be integrated into, and mend and replace bones (Stupp & Braun, 1997). This valuable polymorph of natural  $\text{CaCO}_3$  is used to produce scaffolds to repair bone (Awang-Hazmi et al., 2007).

##### **Finding 2. Biomedical applications**

Hanna et al. (2011) studied the characterization of different types of ceramic filler infused into UPE resin. According to their study,  $\text{CaCO}_3$  powder with less than 53  $\mu\text{m}$  size and in the range of 3-15 wt% exhibited the best mechanical properties for biomaterial application compared with other fillers, such as  $\text{CaO}$ ,  $\text{MgCO}_3$  and  $\text{MgO}$ . However, our results reveal that adding 8 wt% of lokan powder into unsaturated polyester gives compatible result with 15 wt% commercial  $\text{CaCO}_3$  as Hanna et al did. It is expected that by adding lokan powder filler content up to 15 wt% as Hanna et al. (2011) did, both tensile strength and tensile modulus may be quite similar or better.

##### **References:**

- Awang-Hazmi, A., Zuki, A., Noordin, M., Jalila, A., & Norimah, Y. (2007). Mineral composition of the cockle (*Anadara Granosa*) shells of west coast of peninsular malaysia and it's potential as biomaterial for use in bone repair. *Journal of Animal and Veterinary Advances*, 6(5), 591-594.
- Hanna, W. A., Gharib, F. E., & Marhoon, I. I. (2011). Characterization of ceramic filled polymer matrix composite used for biomedical applications. *Journal of Minerals and Materials Characterization and Engineering*, 10(12), 1167.
- Stupp, S. I., & Braun, P. V. (1997). Molecular manipulation of microstructures: biomaterials, ceramics, and semiconductors. *Science*, 277(5330), 1242-1248.

**E, Hasil Penyelidikan**  
***Deliverables***

Sila tandakan item yang berkaitan pada senarai berikut:

*Please tick the relevant items below:*

|   | Item  | Bilangan/Number |
|---|---|-----------------|
|   | Kertas teknikal/bersiri dalaman<br><i>Internal technical/serial papers</i>      |                 |
|   | Tesis/disertasi pelajar sarjana<br><i>Student's Masters thesis/dissertation</i> |                 |
|   | Tesis pelajar PhD<br><i>Student's PhD thesis</i>                                |                 |
|   | Kertas persidangan tempatan<br><i>Local conference papers</i>                   |                 |
|   | Kertas persidangan antarabangsa<br><i>International conference papers</i>       |                 |
|   | Makalah dalam jurnal tempatan<br><i>Local journal papers</i>                    |                 |
| √ | Makalah dalam jurnal antarabangsa<br><i>International journal papers</i>        |                 |
|   | Monograf atau buku<br><i>Book/monograph</i>                                     |                 |

Lain-lain/others (sila nyatakan/*please specify*)

The paper is submitted to Encon2017 and waiting for the reviewer. The accepted paper will be published in journal indexed by Scopus.

Sila senaraikan maklumat (pengarang, tahun, tajuk, jurnal/penerbit, jilid, halaman) bagi penerbitan/tesis yang dihasilkan (jika ada).

*Please specify the publications (authors, year, title, journal/publisher, volume, page nos.) (if any)*



RINGKASAN LAPORAN AKHIR  
GERAN PENYELIDIKAN OSAKA GAS  
*END OF OSAKA GAS*  
*GRANT REPORT SUMMARY*

|           |   |   |   |
|-----------|---|---|---|
| <b>A.</b> | <b>Tajuk Projek</b><br><i>Project Title</i>   | : | The Effect of Thermal Perturbation on a Polymer Material's Tensile Test                 |
|           | <b>Ketua Penyelidik</b><br><i>Project Leader</i>  | : | Mohd Syazwan Zafwan bin Mohd Suffian  |
|           | <b>Fakulti/Institut</b><br><i>Faculty/Institute</i>   | : | FK  |
|           | <b>Ahli Kumpulan Penyelidik</b><br><i>Research Team Members</i>   | : | 1. AP Dr Abdullah Yassin<br>2. Prof. Dr. Ir. Amir Azam Khan<br>3. Dr Shahrol Mohamaddan |
| <b>B.</b> | <b>Tarikh Geran Diluluskan</b><br><i>Grant Approval Date</i>  | : | 1 Januari 2016  |
|           | <b>Tempoh Projek</b><br><i>Project Duration</i>   | : | Satu tahun  |
|           | <b>Peruntukan Yg. Diluluskan</b><br><i>Budget Approved</i>  | : | RM 4500   |
|           | <b>Perbelanjaan Terkini</b><br><i>Expenditure To-Date</i>   | : | RM 4349.71  |
| <b>C.</b> | <b>Pencapaian Keseluruhan</b><br><i>Overall Achievement</i><br>Huraikan pencapaian berbanding objektif, hipotesis serta permasalahan asal yang diselidiki..<br><i>Describe the achievements in relation to the original objectives, hypothesis and research problems.</i> |   |   |

|   | <ol style="list-style-type: none"> <li>1. Result shows that the experimental test gives smaller stress and strain compared to the simulation test.</li> <li>2. There was a small difference in terms of heat distribution for both experimental and simulation test during the tensile test.</li> <li>3. The surrounding environment such as temperature, may affect thermocouple reading.</li> <li>4. The quality of the specimen must be checked first to make sure that the properties of the specimen was in good condition.</li> <li>5. As a result of this experiment, it is proven that thermal perturbation affects a polymer material's tensile test.</li> </ol>   |                 |      |                 |  |  |  |  |   |  |  |  |  |   |   |   |  |   |  |   |  |   |  |  |  |   |   |                |
|---|---|-----------------|------|-----------------|--|--|--|--|---|--|--|--|--|---|---|---|--|---|--|---|--|---|--|--|--|---|---|----------------|
| <b>D. Pencapaian Utama</b><br><i>Key Findings</i>   | <ol style="list-style-type: none"> <li>1. Thermal perturbation affects the mechanical strength of polymer material by tensile test.</li> <li>2. Heat release from the experimental specimen will affect the mechanical properties of the specimen.</li> </ol>   |                 |      |                 |  |  |  |  |   |  |  |  |  |   |   |   |  |   |  |   |  |   |  |  |  |   |   |                |
| <b>E, Hasil Penyelidikan</b><br><i>Deliverables</i> | <p>Sila tandakan item yang berkaitan pada senarai berikut:<br/>Please tick the relevant items below:</p> <table border="1"> <thead> <tr> <th></th> <th>Item</th> <th>Bilangan/Number</th> </tr> </thead> <tbody> <tr> <td></td> <td>Kertas teknikal/bersiri dalaman<br/><i>Internal technical/serial papers</i></td> <td></td> </tr> <tr> <td></td> <td>Tesis/disertasi pelajar sarjana<br/><i>Student's Masters thesis/dissertation</i></td> <td></td> </tr> <tr> <td></td> <td>Tesis pelajar PhD<br/><i>Student's PhD thesis</i></td> <td></td> </tr> <tr> <td>✓</td> <td>Kertas persidangan tempatan<br/><i>Local conference papers</i></td> <td>1</td> </tr> <tr> <td></td> <td>Kertas persidangan antarabangsa<br/><i>International conference papers</i></td> <td></td> </tr> <tr> <td>✓</td> <td>Makalah dalam jurnal tempatan<br/><i>Local journal papers</i></td> <td>1</td> </tr> <tr> <td></td> <td>Makalah dalam jurnal antarabangsa<br/><i>International journal papers</i></td> <td></td> </tr> <tr> <td>✓</td> <td>Monograf atau buku<br/><i>Book/monograph</i></td> <td>1 (Report FYP)</td> </tr> </tbody> </table> <p>Lain-lain/others (sila nyatakan/please specify)</p> <ol style="list-style-type: none"> <li>1. 1 Research poster for research exhibition purposes.</li> </ol> |                 | Item | Bilangan/Number |  | Kertas teknikal/bersiri dalaman<br><i>Internal technical/serial papers</i> |  |  | Tesis/disertasi pelajar sarjana<br><i>Student's Masters thesis/dissertation</i> |  |  | Tesis pelajar PhD<br><i>Student's PhD thesis</i> |  | ✓ | Kertas persidangan tempatan<br><i>Local conference papers</i> | 1 |  | Kertas persidangan antarabangsa<br><i>International conference papers</i> |  | ✓ | Makalah dalam jurnal tempatan<br><i>Local journal papers</i> | 1 |  | Makalah dalam jurnal antarabangsa<br><i>International journal papers</i> |  | ✓ | Monograf atau buku<br><i>Book/monograph</i> | 1 (Report FYP) |
|   | Item  | Bilangan/Number |      |                 |  |  |  |  |   |  |  |  |  |   |   |   |  |   |  |   |  |   |  |  |  |   |   |                |
|   | Kertas teknikal/bersiri dalaman<br><i>Internal technical/serial papers</i>  |                 |      |                 |  |  |  |  |   |  |  |  |  |   |   |   |  |   |  |   |  |   |  |  |  |   |   |                |
|   | Tesis/disertasi pelajar sarjana<br><i>Student's Masters thesis/dissertation</i>   |                 |      |                 |  |  |  |  |   |  |  |  |  |   |   |   |  |   |  |   |  |   |  |  |  |   |   |                |
|   | Tesis pelajar PhD<br><i>Student's PhD thesis</i>  |                 |      |                 |  |  |  |  |   |  |  |  |  |   |   |   |  |   |  |   |  |   |  |  |  |   |   |                |
| ✓   | Kertas persidangan tempatan<br><i>Local conference papers</i>   | 1               |      |                 |  |  |  |  |   |  |  |  |  |   |   |   |  |   |  |   |  |   |  |  |  |   |   |                |
|   | Kertas persidangan antarabangsa<br><i>International conference papers</i>   |                 |      |                 |  |  |  |  |   |  |  |  |  |   |   |   |  |   |  |   |  |   |  |  |  |   |   |                |
| ✓   | Makalah dalam jurnal tempatan<br><i>Local journal papers</i>  | 1               |      |                 |  |  |  |  |   |  |  |  |  |   |   |   |  |   |  |   |  |   |  |  |  |   |   |                |
|   | Makalah dalam jurnal antarabangsa<br><i>International journal papers</i>  |                 |      |                 |  |  |  |  |   |  |  |  |  |   |   |   |  |   |  |   |  |   |  |  |  |   |   |                |
| ✓   | Monograf atau buku<br><i>Book/monograph</i>   | 1 (Report FYP)  |      |                 |  |  |  |  |   |  |  |  |  |   |   |   |  |   |  |   |  |   |  |  |  |   |   |                |



**RINGKASAN LAPORAN AKHIR**  
**GERAN PENYELIDIKAN OSAKA GAS**  
*END OF OSAKA GAS*  
*GRANT REPORT SUMMARY*

|   |   |   |
|---|---|---|
| <b>A. Tajuk Projek</b><br><i>Project Title</i>                  | : | Utilization of a Low Cost Raspberry-Pi based Fast Charger for Lithium-Ion Mobile Phone Charging Station at Faculty of Engineering, UNIMAS   |
| <b>Ketua Penyelidik</b><br><i>Project Leader</i>                | : | Hazmi Hijazi bin Abdul Halim  |
| <b>Fakulti/Institut</b><br><i>Faculty/Institute</i>             | : | Engineering   |
| <b>Ahli Kumpulan Penyelidik</b><br><i>Research Team Members</i> | : | Dr Ir Prashobh Karunakaran<br>Encik Abdul Hafiz Abdul Karim<br>Encik Abang Mohamad Aizuddin b Abang Mohamad Mohtar<br>Encik Mohd Syahmi bin Jamaludin   |
| <b>B. Tarikh Geran Diluluskan</b><br><i>Grant Approval Date</i> | : | 1 January 2016  |
| <b>Tempoh Projek</b><br><i>Project Duration</i>                 | : | 31 December 2016  |
| <b>Peruntukan Yg. Diluluskan</b><br><i>Budget Approved</i>      | : | RM4500  |
| <b>Perbelanjaan Terkini</b><br><i>Expenditure To-Date</i>       | : | 500   |
| <b>C. Pencapaian Keseluruhan</b><br><i>Overall Achievement</i>  |   | <p>Huraikan pencapaian berbanding objektif, hipotesis serta permasalahan asal yang diselidiki..<br/> <i>Describe the achievements in relation to the original objectives, hypothesis and research problems.</i></p> <p>Commonly, mobiles devices charged over night by the end users. In these situations, it is acceptable to the users for the phone to take several hours to charge. But, it is very crucial</p> |

nowadays, as mobile phone is using a lot of data usage which make the battery discharge very fast especially during a busy day or during a long period travel. Traditional constant current constant voltage (CC-CV) charging methods require long charging time up to 4.5 hrs – 4 hrs.

In this project, a low cost, fast and time saving mobile phone charging station prototype is proposed with the implementation of a low cost Raspberry Pi computer. In previous study, the charging time using DSP-based charger is within 40 mins in experiments, change in charging temperature is within 1.1°C and the charging efficiency is up to 87.51%.

In term of costing, the DSP controller itself is more expensive compared to Raspberry Pi controller. In term of local community, this project is expected to serve free fast charging service among faculty community and the prototype station will be placed in the faculty of engineering, UNIMAS.

#### **D. Pencapaian Utama** *Key Findings*

The main objective of the project is to develop a charging system with controlled by microcomputer. Once the li-ion battery gets fully charged, the supply will automatically cut off. The main components for the system are Raspberry Pi and charging circuit. To have complete fast charging system, some program will be used for controlling the voltage and also the current for the output of the circuit.

This chapter will discuss the results of the system from the hardware development and also software development. All the configuration on some application used and how the charging system works also will be discuss in details in this chapter.

##### **Software End Result**

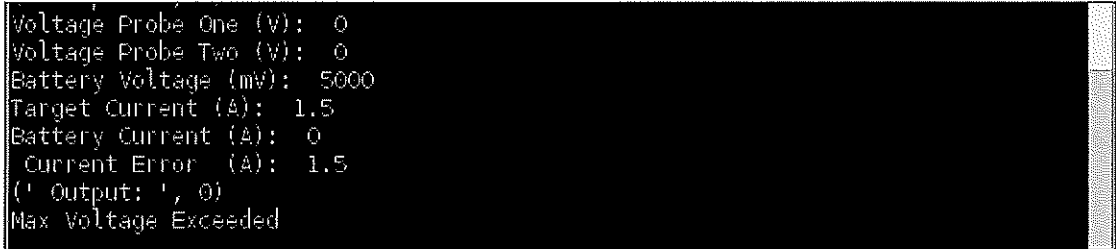
For software part, there is a main program that used to control the charging system which is python script that used to control current and voltage for the charging circuit.

##### **Charging Program**

The program code for this project is reasonably straight forward. There are variables at the top of the code that allow user to customize the charger by inputting the values of the battery capacity rating, the exact resistance of the power resistor. There are also variables for the safety threshold of the charger. The maximum allowable voltage of the battery is set to 5 volts and the current is set to 1.5 ampere. If any of this safety threshold is exceeded, the charger is automatically turned off.

In the body code, the system constantly measures the voltages of the terminal of the power resistor. This is used to calculate both the terminal voltage of the battery and the current flowing into the battery. This current compared to the target current which is set to 1.5 ampere. If the current is different from the target current by more than 1.5 ampere, the system automatically adjusts the output to correct it.

To monitor the performance of the charger, the Raspberry Pi was connected with monitor of computer or laptop. Figure 4.1 show the display of the result while the phone was charging. From what we can see in the figure, the voltage that supply to the battery is 5V and the current is 1.5A.



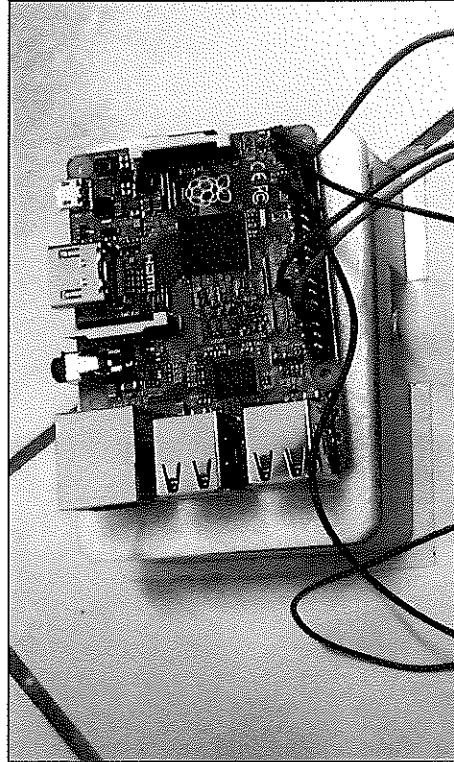
```
Voltage Probe One (V): 0
Voltage Probe Two (V): 0
Battery Voltage (mV): 5000
Target Current (A): 1.5
Battery Current (A): 0
Current Error (A): 1.5
(' Output: ', 0)
Max Voltage Exceeded
```

**Figure 1: Display of the result of the coding**

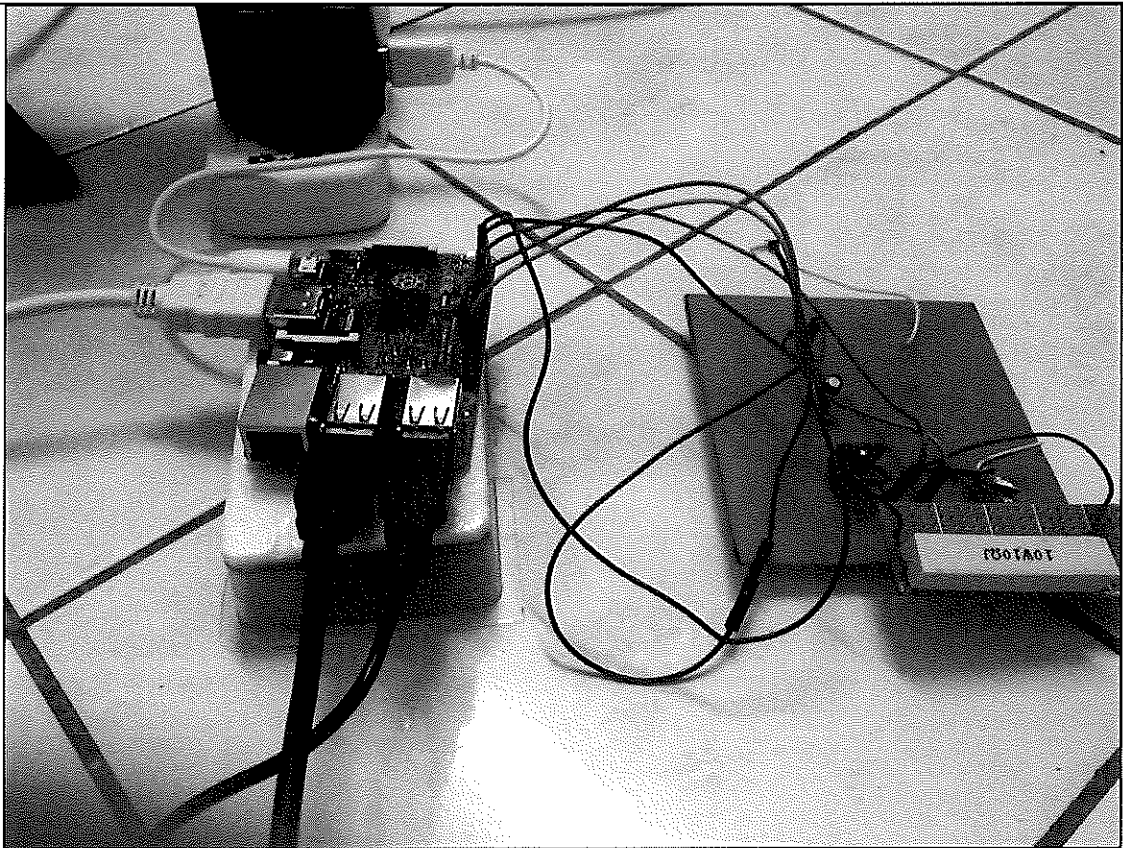
##### **Hardware End Result**



In this project, there are two main hardware that been used together which are Raspberry Pi 2 model B and charger circuit. Figure 4.2 shows the Raspberry Pi with SD card attach on it. The connection of complete system which contains Raspberry Pi, charger circuit and power supply can be seen in Figure 4.3.



**Figure 2: Raspberry Pi 2 Model B with SD card**



**Figure 3 : Complete Charger System Hardware**

In the SD card, there are Raspbian operating system had been installed and it can be used directly once the Raspberry Pi is connected to power supply. There are some of configuration need to be set up on Raspberry Pi such as enable to use the whole memory of SD card, time and date.

#### **Charging System End Result**

At the end of this project, there was result obtained and the comparison between the charging with raspberry pi controller, DSP controller and without controller has been made.

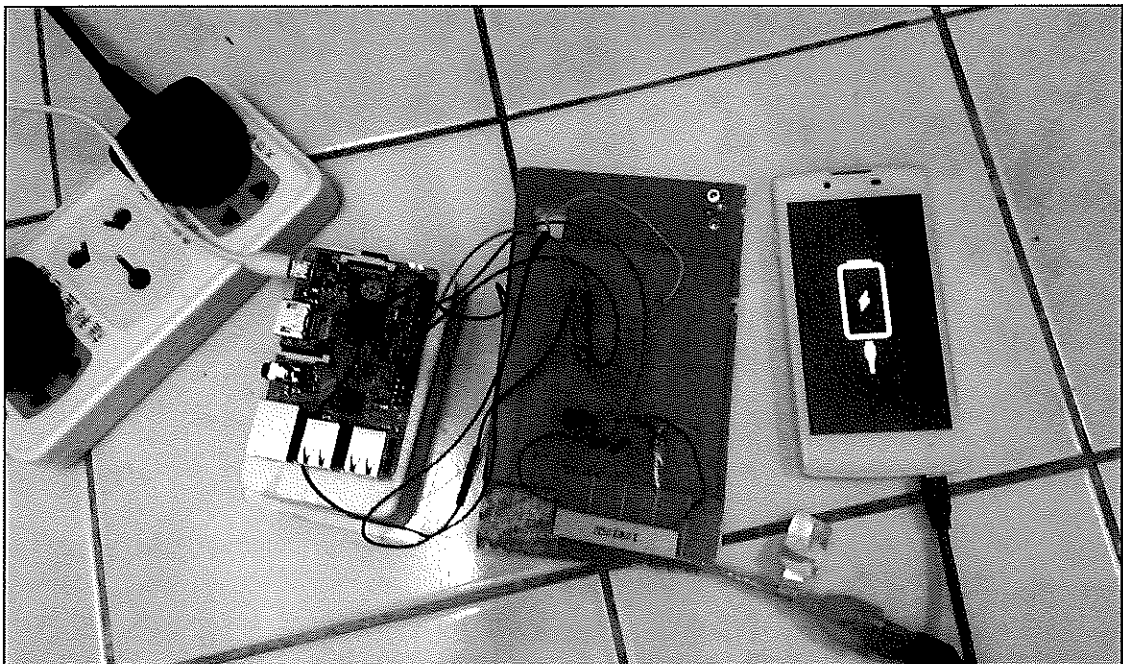
**Table 1: Charging Result and the Comparison**

| Charging Station | Raspberry Pi (My Project) | DSP Controller    | Without controller |
|------------------|---------------------------|-------------------|--------------------|
| Time Charging    | Within 1 hours            | Within 40 minutes | 3-4 hours          |
| Cost             | RM 204.90                 | RM 2000 and above | -                  |

Figure 4.4 show the battery of the mobile phone that has been charged with my project was full and figure 4.5 show the complete set up while the mobile was charging with this project.



**Figure 4: The Mobile Battery that was Completely Full**



**Figure 5 : The Raspberry Pi Controlled the Charger Circuit Charging the Mobile Phone**

In this project, charging system had been successfully demonstrated by using Raspberry Pi and able to control the current that flow into the battery and cut off the charger supply when battery is full. This project had been developed using simple programming that control the whole process of the charging system. First objective is to design and build charging system for mobile phone with low cost Raspberry Pi. Raspberry Pi can be powered up using 5V micro USB and its current usage is depending on peripheral used. Second objective is to design local made charging station for community had been achieve after completing this project. This charging station is completely using the simple programming that had been installed into Raspberry Pi which is charging program. Apart from controlling the current for the circuit, this program also works as a cut off supply which it will do when the battery was full. To

achieve the objectives of this project which is to create a simple system with good feature but in lower cost, system using Raspberry Pi is used. The total cost for this project is lower than RM500 but it can compete with the advanced charging system that already invented in the market nowadays. All the material needs is very simple and can be easily bought at any shopping store nowadays. Upon completing this project there are a few problem occur such as the program that had been installed is not working properly. Besides that, since the Raspberry Pi is very new innovation, it does not really support several of peripheral and the system is still in upgrading process from time to time. To overcome these problems, there are some adjustment needs to be done to the program to make sure it will work perfectly to produce desired output. Last but not least, the Raspberry Pi also needs to be updated from time to time to allow more featured to be used.

### Recommendations

Although the Charging System controlled by Raspberry Pi was able to work successfully, there are also some parts that can be improved for the better performances. This section will discuss on recommendation that can be taken for the future used.

The first limitation occurs on this project is the maximum current. In this project, 1.5 ampere current was used. In the future, it is recommended to use a higher current for more faster charging quality such as 2.1 ampere. At this moment, the charging system only can handle until 1.5 ampere.

In this system, it only uses one port to charge the mobile phone. However, the number of port used can be added in the future that available for all the users that want to use it at the same time.

The end result of this system is not really showed every detail of charging state of the battery. The suggestion is to get LCD to monitor the voltage and current status during charge.

### E, Hasil Penyelidikan Deliverables

Sila tandakan item yang berkaitan pada senarai berikut:

*Please tick the relevant items below:*

|  | Item  | Bilangan/Number |
|--|---|-----------------|
|  | Kertas teknikal/bersiri dalaman<br><i>Internal technical/serial papers</i>      |                 |
|  | Tesis/disertasi pelajar sarjana<br><i>Student's Masters thesis/dissertation</i> |                 |
|  | Tesis pelajar PhD<br><i>Student's PhD thesis</i>                                |                 |
|  | Kertas persidangan tempatan<br><i>Local conference papers</i>                   |                 |
|  | Kertas persidangan antarabangsa<br><i>International conference papers</i>       |                 |
|  | Makalah dalam jurnal tempatan<br><i>Local journal papers</i>                    |                 |
|  | Makalah dalam jurnal antarabangsa<br><i>International journal papers</i>        |                 |
|  | Monograf atau buku<br><i>Book/monograph</i>                                     |                 |

Lain-lain/others (sila nyatakan/*please specify*)

Innovation Technology Expo (INTEX2016), UNIMAS

Sila senaraikan maklumat (pengarang, tahun, tajuk, jurnal/penerbit, jilid, halaman) bagi



RINGKASAN LAPORAN AKHIR  
GERAN PENYELIDIKAN OSAKA GAS  
END OF OSAKA GAS  
GRANT REPORT SUMMARY

|   |   |   |
|---|---|---|
| <b>A. Tajuk Projek</b><br><i>Project Title</i>  | : | Utilization Arduino in Laundry Robot for the Impaired and Disable   |
| <b>Ketua Penyelidik</b><br><i>Project Leader</i>  | : | Mohd Syahmi bin Jamaludin   |
| <b>Fakulti/Institut</b><br><i>Faculty/Institute</i>   | : | Fakulti Kejuruteraan  |
| <b>Ahli Kumpulan Penyelidik</b><br><i>Research Team Members</i>   | : | i. Dr. Shahrol b Mohamaddan<br>ii. Encik Hazmi Hijazi b Abd Halim<br>iii. Encik Abdul Hafiz Abdul Karim<br>iv. Encik Ahmad Adzlan Fadzli b Khairi |
| <b>B. Tarikh Geran Diluluskan</b><br><i>Grant Approval Date</i>   | : | 1 January 2016  |
| <b>Tempoh Projek</b><br><i>Project Duration</i>   | : | 1 tahun   |
| <b>Peruntukan Yg. Diluluskan</b><br><i>Budget Approved</i>  | : | RM 4500   |
| <b>Perbelanjaan Terkini</b><br><i>Expenditure To-Date</i>   | : | RM 3297   |
| <b>C. Pencapaian Keseluruhan</b><br><i>Overall Achievement</i><br>Huraikan pencapaian berbanding objektif, hipotesis serta permasalahan asal yang diselidiki..<br><i>Describe the achievements in relation to the original objectives, hypothesis and research problems.</i><br><br>Robotics technology can be applied in rehabilitation area to help incapable people performing their daily tasks with minimal or no assistance from a nurse or caretaker. By using assistive |   |   |

robot that can sense, process the situation and perform the actions that will ease and help incapable people in their daily life. In this project, the laundry robot will help the incapable person by doing their laundry by taking the specific basket to go to the laundry for them. It will be more helpful to the incapable person because doing laundry can be a large burden to some people who are incapable to do it by themselves.

In this research, we have found several ways to assist incapable people doing their laundry basket carrier. By using infrared sensor, the robot can detect a track that lead to washing machine and where the patient located. By using line detector, the robot will move according to the track that has been designed. The project also managed to create an algorithm for the movement of the robot so that the robot can move while carrying the laundry basket and lead to washing machine. After arriving at the washing machine, the laundry basket will be dropped and the robot will move along the track to next check point where there is empty laundry basket to be carry away to the patient location.

#### **D. Pencapaian Utama** *Key Findings*

With this project, we can assure the usage of robotic technology can be implemented in assisting the impaired patient for daily live with minimum cost required. Even though the project has been scaled down to laboratory test scale, the method of assisting the impaired patient has been achieved.

#### **E, Hasil Penyelidikan** *Deliverables*

Sila tandakan item yang berkaitan pada senarai berikut:

*Please tick the relevant items below:*

|                          | Item  | Bilangan/Number |
|--------------------------|---|-----------------|
| <input type="checkbox"/> | Kertas teknikal/bersiri dalaman<br><i>Internal technical/serial papers</i>      |                 |
| <input type="checkbox"/> | Tesis/disertasi pelajar sarjana<br><i>Student's Masters thesis/dissertation</i> |                 |
| <input type="checkbox"/> | Tesis pelajar PhD<br><i>Student's PhD thesis</i>                                |                 |
| <input type="checkbox"/> | Kertas persidangan tempatan<br><i>Local conference papers</i>                   |                 |
| <input type="checkbox"/> | Kertas persidangan antarabangsa<br><i>International conference papers</i>       |                 |
| <input type="checkbox"/> | Makalah dalam jurnal tempatan<br><i>Local journal papers</i>                    |                 |
| <input type="checkbox"/> | Makalah dalam jurnal antarabangsa<br><i>International journal papers</i>        |                 |
| <input type="checkbox"/> | Monograf atau buku<br><i>Book/monograph</i>                                     |                 |

Lain-lain/others (sila nyatakan/please specify)





**RINGKASAN LAPORAN AKHIR**  
**GERAN PENYELIDIKAN OSAKA GAS**  
*END OF OSAKA GAS*  
*GRANT REPORT SUMMARY*

|   |   |  |
|---|---|--|
| <b>A. Tajuk Projek</b><br><i>Project Title</i>  | : | Ammoniacal Nitrogen Reduction in Industrial Effluent Discharge using Phytoremediation Technology |
| <b>Ketua Penyelidik</b><br><i>Project Leader</i>  | : | NORAZIAH ABDUL WAHAB   |
| <b>Fakulti/Institut</b><br><i>Faculty/Institute</i>   | : | Engineering  |
| <b>Ahli Kumpulan Penyelidik</b><br><i>Research Team Members</i>   | : | 1. DR SHANTI FARIDAH SALLEH<br>2. DR IVY TAN AI WEI  |
| <b>B. Tarikh Geran Diluluskan</b><br><i>Grant Approval Date</i>   | : | 1 January 2016   |
| <b>Tempoh Projek</b><br><i>Project Duration</i>   | : | 1 year   |
| <b>Peruntukan Yg. Diluluskan</b><br><i>Budget Approved</i>  | : | RM5, 000.00  |
| <b>Perbelanjaan Terkini</b><br><i>Expenditure To-Date</i>   | : | RM 5, 000.00 (In progress of reimbursing department the purchasing of perspex)                   |
| <b>C. Pencapaian Keseluruhan</b><br><b><i>Overall Achievement</i></b><br>Huraikan pencapaian berbanding objektif, hipotesis serta permasalahan asal yang diselidiki..<br><i>Describe the achievements in relation to the original objectives, hypothesis and research problems.</i><br><br>Please refer to attached Summary Report. |   |  |

**D. Pencapaian Utama**  
**Key Findings**

The ammoniacal nitrogen uptake rate differed among *Eichornia Crassipes* and *Pistia Stratiotes*. The highest percentage of ammoniacal nitrogen removal for the *Eichornia Crassipes* and *Pistia Stratiotes* was 52% by 15th day and 28% by the 6th day. The ammonia nitrogen concentration for the semiconductor effluent was initially 27.9 mg/L. The wastewater treated with *Eichornia Crassipes* had the highest percentage of reduction by the 15th day which was 52% as compared with *Pistia Stratiotes* which was only 20%.

When the wastewater was treated using *Spirulina Platensis*, there was a sharp decrease in AN concentration from 27.9 mg/L to 6.21 mg/L in duration of 5 days in which removal achieved was 77.75%. Upon reaching this level, then, the industrial effluent can be safely discharged into the river due to the TAN that already comply with the Environmental Quality (Industrial Effluent) Regulation 2009. Samajaya Industrial Zone, Sarawak following standard B in which TAN level must be 20 mg/L or less before discharge. Thus, from the result, it could be concluded that the ideal retention time for phycoremediation of industrial effluent is 5 days. It indicated that *Spirulina platensis* had a good ability of assimilating AN from industrial effluent. Hence, in this studies, the potential remediation macrophyte is the *Eichornia Cassipes* and the *Spirulina Platensis* as the potential microalgae. The optimum working condition is at pH 8~ 10 and the retention time is 5 ~ 15 days.

**E, Hasil Penyelidikan**  
**Deliverables**

Sila tandakan item yang berkaitan pada senarai berikut:

*Please tick the relevant items below:*

|  | Item  | Bilangan/Number |
|--|---|-----------------|
|  | Kertas teknikal/bersiri dalaman<br><i>Internal technical/serial papers</i>      |                 |
|  | Tesis/disertasi pelajar sarjana<br><i>Student's Masters thesis/dissertation</i> |                 |
|  | Tesis pelajar PhD<br><i>Student's PhD thesis</i>                                |                 |
|  | Kertas persidangan tempatan<br><i>Local conference papers</i>                   |                 |
|  | Kertas persidangan antarabangsa<br><i>International conference papers</i>       |                 |
|  | Makalah dalam jurnal tempatan<br><i>Local journal papers</i>                    |                 |
|  | Makalah dalam jurnal antarabangsa<br><i>International journal papers</i>        |                 |
|  | Monograf atau buku<br><i>Book/monograph</i>                                     |                 |

Lain-lain/others (sila nyatakan/*please specify*):

Four (4) Final Year Project Reports

MSO/V.1.2010



**RINGKASAN LAPORAN AKHIR**  
**GERAN PENYELIDIKAN OSAKA GAS**  
*END OF OSAKA GAS*  
*GRANT REPORT SUMMARY*

|   |  |
|---|--|
| <b>A. Tajuk Projek</b><br><i>Project Title</i>  | : Investigation of the rice husk particleboard properties                    |
| <b>Ketua Penyelidik</b><br><i>Project Leader</i>  | : Dr Marini Sawawi   |
| <b>Fakulti/Institut</b><br><i>Faculty/Institute</i>   | : FK   |
| <b>Ahli Kumpulan Penyelidik</b><br><i>Research Team Members</i>   | : Pn. Mahshuri Yusof<br>Dr. Magdalene Andrew Munot<br>Dr. Siti Kudnie Sahari |
| <b>B. Tarikh Geran Diluluskan</b><br><i>Grant Approval Date</i>   | : October 2015   |
| <b>Tempoh Projek</b><br><i>Project Duration</i>   | : 1 year   |
| <b>Peruntukan Yg. Diluluskan</b><br><i>Budget Approved</i>  | : RM3000   |
| <b>Perbelanjaan Terkini</b><br><i>Expenditure To-Date</i>   | : RM1600   |
| <b>C. Pencapaian Keseluruhan</b><br><i>Overall Achievement</i><br>Huraikan pencapaian berbanding objektif, hipotesis serta permasalahan asal yang diselidiki..<br><i>Describe the achievements in relation to the original objectives, hypothesis and research problems.</i><br><br>This research describes the fabrication of particleboard by using rice husks and urea |  |

formaldehyde vs phenol formaldehyde as a binder. The rice husk was initially treated using sodium hydroxide (NaOH) with 2%, 5% and 8% concentration prior to resin addition.

In comparison between the NaOH treatment, the 5% concentration of NaOH shows a better flexural properties compared to untreated, 2% and 8% concentration for both phenol and urea formaldehyde. The NaOH treatment provides a higher degree of surface roughness of the rice husk which contribute to better adhesion between binder and rice husk.

Rice husk particleboard using phenol formaldehyde as a binder shows a better flexural properties compared with urea formaldehyde with the significant strength improvement of 36% for 5% NaOH treatment. The moisture absorption for phenol formaldehyde is less compared to urea formaldehyde which indicate the suitability of the particleboard using phenol formaldehyde for outdoor application.

#### **D. Pencapaian Utama**

##### ***Key Findings***

It was found that the rice husk particleboard properties can be improved by using NaOH treatment at 5% concentration. Thus, the particleboard has a potential to be used in commercial particleboard production as an alternative to conventional wood particleboard that normally used in furniture industry.

#### **E, Hasil Penyelidikan**

##### ***Deliverables***

Sila tandakan item yang berkaitan pada senarai berikut:

*Please tick the relevant items below:*

|                          | Item  | Bilangan/Number |
|--------------------------|---|-----------------|
| <input type="checkbox"/> | Kertas teknikal/bersiri dalam<br><i>Internal technical/serial papers</i>        |                 |
| <input type="checkbox"/> | Tesis/disertasi pelajar sarjana<br><i>Student's Masters thesis/dissertation</i> |                 |
| <input type="checkbox"/> | Tesis pelajar PhD<br><i>Student's PhD thesis</i>                                |                 |
| <input type="checkbox"/> | Kertas persidangan tempatan<br><i>Local conference papers</i>                   |                 |
| <input type="checkbox"/> | Kertas persidangan antarabangsa<br><i>International conference papers</i>       |                 |
| <input type="checkbox"/> | Makalah dalam jurnal tempatan<br><i>Local journal papers</i>                    |                 |
| <input type="checkbox"/> | Makalah dalam jurnal antarabangsa<br><i>International journal papers</i>        |                 |
| <input type="checkbox"/> | Monograf atau buku  |                 |



**RINGKASAN LAPORAN AKHIR**  
**GERAN PENYELIDIKAN OSAKA GAS**  
*END OF OSAKA GAS*  
*GRANT REPORT SUMMARY*

|  |  |
|--|--|
| <b>A. Tajuk Projek</b><br><i>Project Title</i>   | : Low Power CMOS Power Amplifier for WiMax Application   |
| <b>Ketua Penyelidik</b><br><i>Project Leader</i>   | : Dr. Rohana Sapawi  |
| <b>Fakulti/Institut</b><br><i>Faculty/Institute</i>  | : Faculty of Engineering   |
| <b>Ahli Kumpulan Penyelidik</b><br><i>Research Team Members</i>  | : Dr Siti Kudnie Sahari<br>Puan Sharifah Masniah Wan Masra<br>Puan Nazreen Junaidi<br>Puan Kuryati Kipli |
| <b>B. Tarikh Geran Diluluskan</b><br><i>Grant Approval Date</i>  | : 1 Januari 2016   |
| <b>Tempoh Projek</b><br><i>Project Duration</i>  | : 1 tahun  |
| <b>Peruntukan Yg. Diluluskan</b><br><i>Budget Approved</i>   | : RM 5000.00   |
| <b>Perbelanjaan Terkini</b><br><i>Expenditure To-Date</i>  | : RM4400.00  |
| <b>C. Pencapaian Keseluruhan</b><br><b><i>Overall Achievement</i></b><br>Huraikan pencapaian berbanding objektif, hipotesis serta permasalahan asal yang diselidiki..<br><i>Describe the achievements in relation to the original objectives, hypothesis and research problems.</i><br><br>Wimax CMOS power amplifier is the last stage of transmitter end that is capable of transmitting high speed data and strong immunity to multi-path fading and narrow-band interference. The challenge of this line of study is power amplifier used in WIMAX system must be highly efficient to conserve battery power. However, the linearity specifications are often achieved by backing off the output power which causes a large reduction in efficiency. It becomes critical |  |

issue to design power amplifier (PA) with high efficiency to achieved low power consumption because of the power amplifier is the most power hungry blocks of RF front-end circuits. Therefore, CMOS proposed power amplifier is designed to achieve low power consumption while maintaining other parameters such as linearity that suitable for WIMAX application. With low power consumption of power amplifier it will conserve battery power.

#### **D. Pencapaian Utama**

##### ***Key Findings***

1. Low power consumption CMOS power amplifier is designed to solve the problem of high power consumption and linearity simultaneously.
2. The tunable PA achieves high power gain, good input and output matching, low power consumption and good power added efficiency (PAE) over all frequency range of interest. It can be concluded that the proposed PA is quite promising for future mobile terminals.
3. Analyzing the drawback of RF circuit design with existing studies.

#### **E, Hasil Penyelidikan**

##### ***Deliverables***

Sila tandakan item yang berkaitan pada senarai berikut:

*Please tick the relevant items below:*

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|--|---|-----------------|
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|  | Tesis/disertasi pelajar sarjana<br><i>Student's Masters thesis/dissertation</i> |                 |
|  | Tesis pelajar PhD<br><i>Student's PhD thesis</i>                                |                 |
|  | Kertas persidangan tempatan<br><i>Local conference papers</i>                   |                 |
|  | Kertas persidangan antarabangsa<br><i>International conference papers</i>       |                 |
|  | Makalah dalam jurnal tempatan<br><i>Local journal papers</i>                    |                 |
|  | Makalah dalam jurnal antarabangsa<br><i>International journal papers</i>        |                 |
|  | Monograf atau buku<br><i>Book/monograph</i>                                     |                 |

Lain-lain/others (sila nyatakan/*please specify*)

Student's FYP thesis



**RINGKASAN LAPORAN AKHIR**  
**GERAN PENYELIDIKAN OSAKA GAS**  
*END OF OSAKA GAS*  
*GRANT REPORT SUMMARY*

|   |   |
|---|---|
| <b>A. Tajuk Projek</b><br><i>Project Title</i>                  | : Development of a Semi-Autonomous Unmanned Aerial Vehicle (UAV) for Environmental Monitoring Applications  |
| <b>Ketua Penyelidik</b><br><i>Project Leader</i>                | : Abang Mohamad Aizuddin bin Abang Mohamad Mohtar   |
| <b>Fakulti/Institut</b><br><i>Faculty/Institute</i>             | : Faculty of Engineering  |
| <b>Ahli Kumpulan Penyelidik</b><br><i>Research Team Members</i> | : Dr. Shahrol b Mohamaddan<br>Mohd Syahmi b Jamaludin<br>Hazmi Hijazi b Abd Halim<br>Adrus b Mohamad Tazuddin<br>Prof. Madya Dr. Abdullah bin Haji Yassin   |
| <b>B. Tarikh Geran Diluluskan</b><br><i>Grant Approval Date</i> | : 16 November 2015  |
| <b>Tempoh Projek</b><br><i>Project Duration</i>                 | : 12 months (initial approval) 1 January 2016 to 31 December 2016<br><br>18 months (after extension) 1 January 2016 to 30 June 2017   |
| <b>Peruntukan Yg. Diluluskan</b><br><i>Budget Approved</i>      | : RM4,500   |
| <b>Perbelanjaan Terkini</b><br><i>Expenditure To-Date</i>       | : RM3,900   |
| <b>C. Pencapaian Keseluruhan</b><br><i>Overall Achievement</i>  | Huraikan pencapaian berbanding objektif, hipotesis serta permasalahan asal yang diselidiki.<br><i>Describe the achievements in relation to the original objectives, hypothesis and research problems.</i> |



The general problem statement for this research project revolved around the possibility of developing a multi rotor UAV for environmental monitoring and visual inspection applications. It was hypothesized that the development of such system will be beneficial especially for remote areas which are inaccessible from the ground. The initial objectives were then set to building a UAV system with sensors suitable for environmental monitoring applications, developing a graphical user interface (GUI) to acquire live feed from the sensors and measure the reliability and efficiency of the overall UAV system. It was hypothesized that the added sensors module will improve the environmental monitoring and visual inspection process.

The achievement relative to the initial proposal is slightly below expectations. This can be justified by lack of resources, hardware and skilled personal in the area of UAV and also Arduino programming. There were only two FYP students which started from nothing and the procurement process took a little bit longer than expected. As the project progressed, the idea of building a custom UAV was abandoned and instead, a ready-made UAV from DJI was purchased. The reasoning for the purchase was that a lot of time is needed to learn to customize a UAV drone whereas commercial drones are becoming relatively cheaper with the added user-friendly features. The UAV drone has become semi-autonomous with checkpoint capabilities, follower feature and flying performance is stable. There are disadvantages compared to full custom drones for instance, lack of modularity in terms of hardware (frame, rotors, cameras etc.) and the suitability of commercial drones for professional engineering applications. Yet, the advancement of technology will surely diminish these advantages. Nevertheless, a prototype sensor measurement module (SMM) has been developed and is ready to be used together with the drone. Future works can be planned and therefore this system can be used as a case study (learning) and exhibition purposes. In conclusion, the achievements met the the objectives but more experimental data is required for performance testing and also improve the compactness and aerodynamics of the SMM payload.

#### **D. Pencapaian Utama** ***Key Findings***

The final product design was achieved after the implementation of the Pugh evaluation method. Various factors of the casing were considered in terms of materials, fabrication methods and attachment design. A sensor measurement module (SMM) was developed for the DJI Phantom 3 UAV drone. Arduino was used as the backbone of the prototype. The wireless communication is possible via the XBee communication modules. The corresponding graphical user interface (GUI) was also developed to obtain streamed data from the SMM. The components were assembled in a specially designed casing and 3D-printed before attached to the drone as shown in Figure 1.

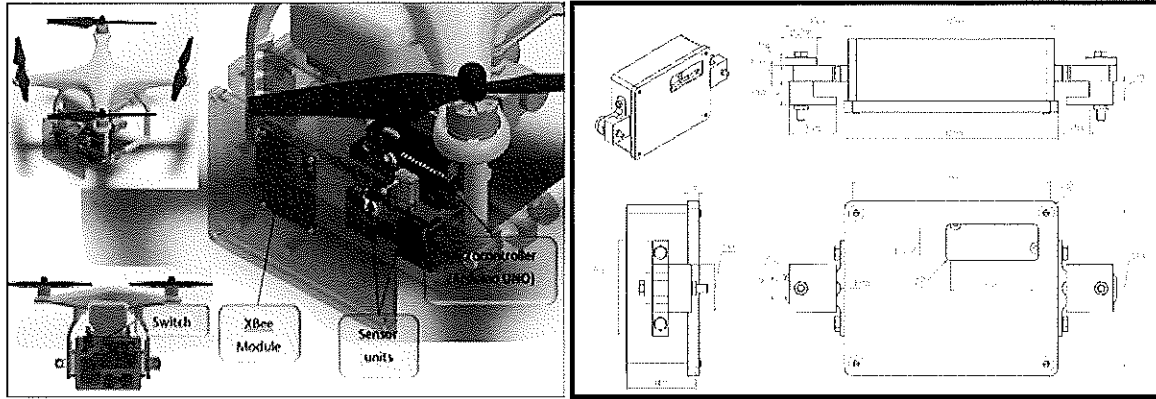


Figure 1: The final prototype and drawing dimensions.

The performance of the sensors (temperature, humidity, and gas) were done, however the gas sensor tests were doubtful and need more testing. Overall, the temperature and humidity results is in accordance with other instrumentation devices and varies within their tolerances. This is shown in Figure 2 and Table 1.

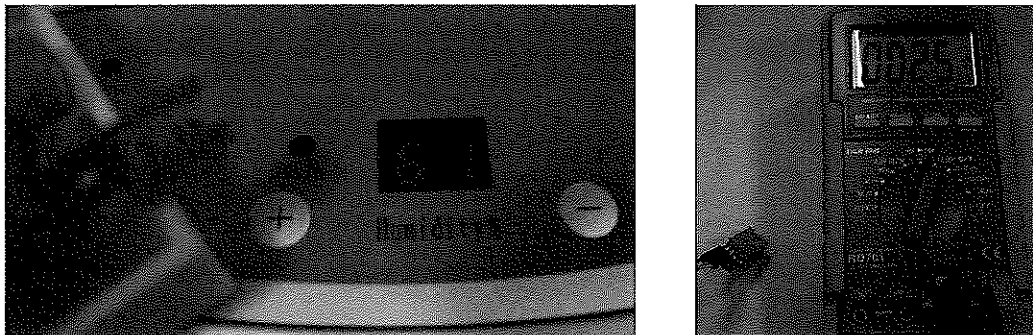


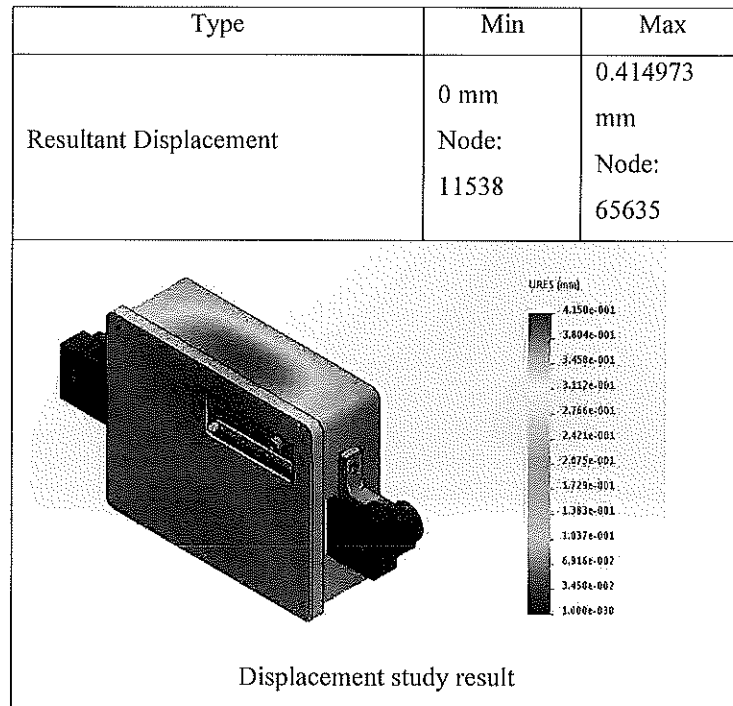
Figure 2: Experimental measurements comparison with other sensors.

Table 1: Experimental data measurements obtain from sensors of the SMM.

| Data Entry | Temperature | Humidity | Rs/Ro |
|------------|-------------|----------|-------|
| 1          | 24          | 63       | 9.9   |
| 2          | 24          | 63       | 9.9   |
| 3          | 24          | 63       | 9.9   |
| 4          | 24          | 63       | 9.9   |
| 5          | 24          | 63       | 9.9   |

A static study (stress, strain and displacement plots) was conducted on the casing to determine the practicality of the SMM when attached to the drone. It was found that there were no major hotspots that can contribute to failure in the design. The highest displacements are expectedly at the less supported parts of the SMM which behaves like plates as shown in Table 2.

**Table 2: Displacement results for the static study of the SMM under external load.**



A flow simulation was run to consider the aerodynamic effects of the SMM on the drone as shown in Figure 3. It was found that there are substantial areas of high pressure in front of the SMM against the travel direction. It can be hypothesized that the SMM is not sufficiently aerodynamic and this is experimentally proven via visual observation while under real-time testing. In actual flying test, the drone suffers a bit but is noticeable in its flying performance in terms of travelling against high speed wind conditions compared to without any payload. Figure 4 shows the actual flying test and the data feed into the GUI. The performance of the drone had also been investigated with relations to its range, features, flying speed and stability while carrying the SMM payload. The flying range of the drone was found to around 400 m horizontal distance and 30 m vertical distance while the XBee module stopped streaming data at 120 m horizontal distance and 30 m vertical distance. The integration of the GUI and the hardware had been evaluated. It works fine but there are some minor glitches that needs to be addressed to in future works.

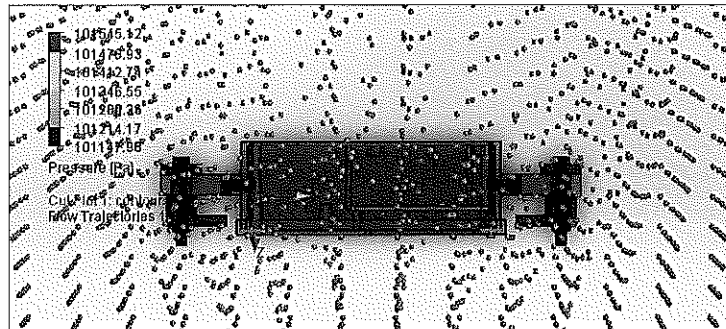


Figure 3: Flow simulation of the SMM.

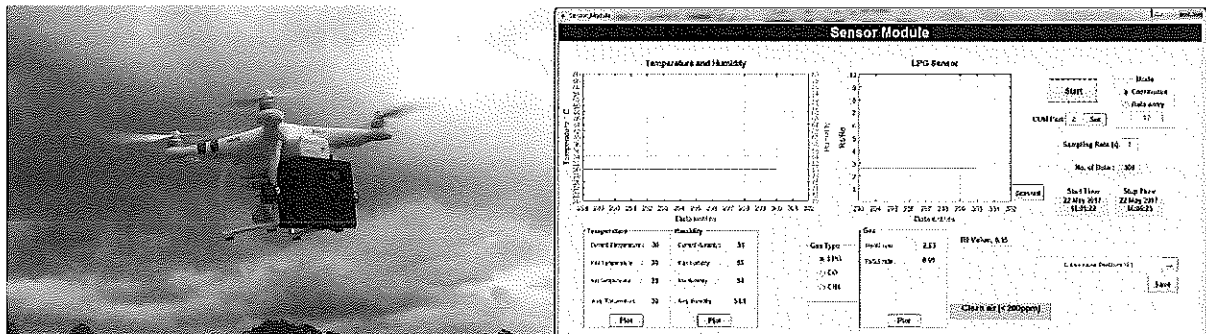


Figure 4: Actual real-time testing of the drone with payload and the live feed data from the GUI.

## E, Hasil Penyelidikan Deliverables

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|  | Tesis/disertasi pelajar sarjana<br><i>Student's Masters thesis/dissertation</i> |                 |
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|  | Kertas persidangan tempatan<br><i>Local conference papers</i>                   |                 |
|  | Kertas persidangan antarabangsa<br><i>International conference papers</i>       |                 |
|  | Makalah dalam jurnal tempatan   |                 |



**RINGKASAN LAPORAN AKHIR**  
**GERAN PENYELIDIKAN OSAKA GAS**  
*END OF OSAKA GAS*  
*GRANT REPORT SUMMARY*

|   |   |
|---|---|
| <b>A. Tajuk Projek</b><br><i>Project Title</i>  | : Switch gear switching safely device   |
| <b>Ketua Penyelidik</b><br><i>Project Leader</i>  | : Dr Ir Prashobh Kumar Karunakaran  |
| <b>Fakulti/Institut</b><br><i>Faculty/Institute</i>   | : Faculty of Engineering  |
| <b>Ahli Kumpulan Penyelidik</b><br><i>Research Team Members</i>   | : Mohd Hafiez Izzwan b Saad<br>Dr Lakshmanan al Gurusamy<br>Hazmi Hijazi b Abdul Halim<br>Shirley ak Rufus<br>Azfar Safari b Abdullah |
| <b>B. Tarikh Geran Diluluskan</b><br><i>Grant Approval Date</i>   | : 16 November 2015  |
| <b>Tempoh Projek</b><br><i>Project Duration</i>   | : 12 months (initial approval) 1 January 2016 to 31 December 2016   |
| <b>Peruntukan Yg. Diluluskan</b><br><i>Budget Approved</i>  | : RM3,000   |
| <b>Perbelanjaan Terkini</b><br><i>Expenditure To-Date</i>   | :   |
| <b>C. Pencapaian Keseluruhan</b><br><i>Overall Achievement</i><br>Huraikan pencapaian berbanding objektif, hipotesis serta permasalahan asal yang diselidiki.<br><i>Describe the achievements in relation to the original objectives, hypothesis and research problems.</i> |   |

The aim of the project is to create a portable safety switching system which can be easily carried by electrical technicians to break or close high voltage circuit breaker. By focusing on safety as the precedence, breaking high voltage switchgear could be very hazardous to humans when contacts occur. Since back year there are so many cases of accident and evidence on switchgear failed on the operated. In Malaysia, the unwanted accident happened on February 2015 where three Tenaga Nasional Berhad (TNB) technicians who were critically injured in an electrical substation explosion. Thus, the portable safety switching system breaker comes in the first place to solve the failed switchgear in an electrical substation. The objectives of this project are to design and create a control system to improve safety in the switching of high voltage circuit breaker and test the safety switching system on actual high voltage circuit breaker.

The improvement on the safety of the switch gear was a success in this project. A control system had been design and fabricated where this system will open and close the switch gear safely. The system is using an electro-pneumatic system where it is a process that transfer the power supply from the input to the output pneumatic cylinder. The supply power of a 240V AC circuit is converted to 24V DC circuit to trigger the “push and pull” contactor. The contactor is an electrically controlled switch used for switching an electric power circuit. It usually an easily “ON and OFF” system contactor. The contactor required only 24V DC to be triggered, that why AC – DC power converter are needed for the converting electric power part. When contactor is switch ON, the control valve will direct and regulate the flow of air pressure from air compressor. Then, the pneumatic cylinder will pull the lever and break the switch gear. The outcome of this project as expected.

#### **D. Pencapaian Utama** *Key Findings*

The Experiment test was carried out at the electrical testing laboratory Sarawak Energy Berhad Store Complex at Bintawa, Kuching. The Figure 1 shows the testing location of the fabricated a safety switching system. The experiment was supervised by four Sarawak Energy technical staff to ensure our safety and the testing going well even the equipment not in service.

All the equipment is set in ten meters away if using the real switch gear. However, for experimental test is only 1 meter away from switch gear. The fabricated remote switch is need to be attached to the switchgear body. Then, the woodblock that holds the pneumatic cylinder is tied to the switchgear body by using a ratchet strap to make sure the cylinder in the right-angle position. At the end of the cylinder, a wire is tied to the switchgear lever with perfection loops wire tied. After that, the air compressor is switched on for two minutes for fully ready to use. The Figure 1 shows how the safety switching system is attached and ready to the actual test.

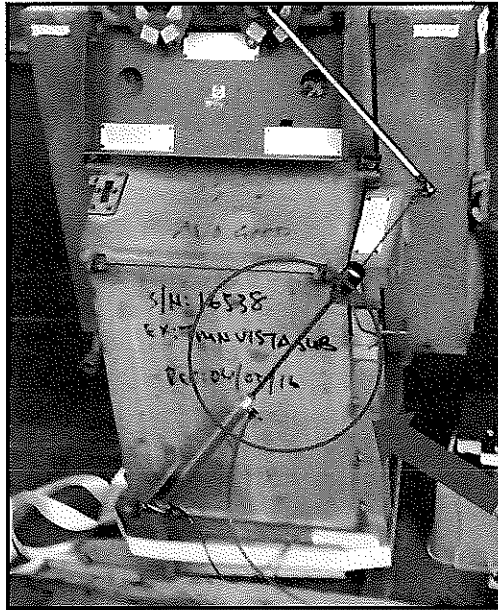


**Figure 1:** The attachment of a safety switching system to the switchgear.

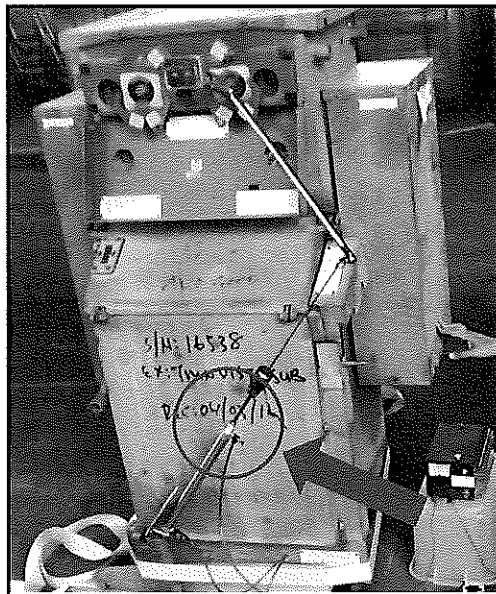
Then, the switchgear switching circuit is ready for experimental test. When the power supply is switched 'ON' and safety setting approved by the technical staff, the remotely wired 'ON' push button or the green button are pressed. The pneumatic cylinder creates a pulling force to pull the switchgear lever and switched off the switchgear.

During the first attempt, the cylinder cannot pull the lever due to lose tied wire. Thus, it needs some adjustment and perfection loops tied method was applied to the lever. The second attempt also unsuccessful since the ratchet strap failed to hold and grip the woodblock firmly. So, the best position for the wood block holder need to be initiate and the test continuous. For the third attempt, the pneumatic cylinder holder successfully pulls the lever and break the switchgear.

After succeed to switch off the switchgear, the process was carried on to switch 'ON' back the switchgear. The procedure was as same procedure to break the switchgear. For this time, the 'OFF' push button or the red button are pressed to create a pushing force to push back the switchgear lever to the original position and results the switchgear are working back. The Figure 2 and Figure 3 demonstrations the condition before and after the breaking switchgear process.



**Figure 2:** the condition before pulling process

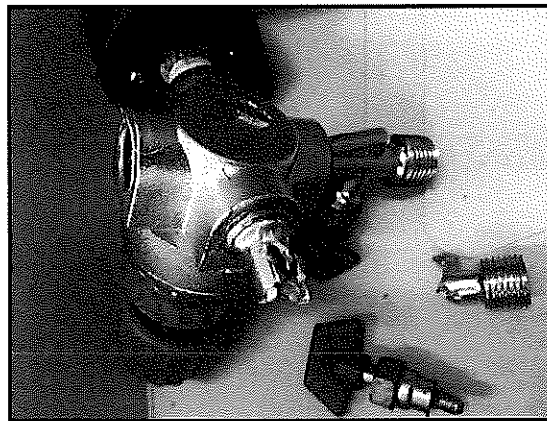


**Figure 3:** After successfully pulling the lever



From Figure 2, in the red circle part with arrow direction shows the initial position of the safety switching system in the body of the switchgear and it ready to pull the lever. Figure 3 are the result after successfully pull the lever. The electro-pneumatic cylinder pulling the lever and become short compared to Figure 2.

The other finding from this experiment, the air compressor pressure need to be set up from 3 – 5 psi. If more than 5 psi, the valve pipe will damage. This has been shown in Figure 5.



**Figure 5:** Wrecked valve pipe air compressor

**E, Hasil Penyelidikan**  
***Deliverables***

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*Please tick the relevant items below:*

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|--------------------------|---|-------------------------|
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