Centre for Advanced Research on Energy

CARe Newsletter

PUBLISHED SEMI-YEARLY | ISSN: 2289-9871

CENTRE FOR ADVANCED RESEARCH ON ENERGY
Universiti Teknikal Malaysia Melaka

Issue 8, June 2021

HIGHLIGHTS

UTeM and UNIVERSITAS SEBELAS MARET (UNS) JOINT INTERNATIONAL CONFERENCE

Faculty of Mechanical Engineering,Universiti Teknikal Malaysia Melaka will be organizing the "7th International Conference And Exhibition On Sustainable Energy And Advanced Material 2021 (ICE-SEAM 2021)" on 23rd November 2021. The theme of this conference is "Energy Efficient and Advanced Material for Sustainable Development" which has been in place since 2013.

The biennial conference, which was first launched in 2009, is jointly organized by Universitas Sebelas Maret (UNS), Indonesia. The focus of this international conference is on the advancement of sustainable energy technologies which is supported by advanced materials technology. These joint conferences had been successfully organized for 5 times, namely 3 times in Solo, Indonesia (2011, 2015, and 2019) and 2 times in Melaka, Malaysia (2013 and 2017).

For the very first time, this conference will be held virtually**.** However, we will continue to strive to fulfil the aim of this conference, which is to provide a platform for the dissemination of knowledge and the latest scientific discoveries in cutting-edge technology. Furthermore, the conference will also strengthen the networking between academicians, scientists, engineers, and technologists at regional and international levels. Thus contributing to our role of becoming pioneers in the world of engineering and technology as technology scholars.

At the university level, it is in cohort with the Seven Strategic Goal that is "Visible and Globally Prominent Promotion" of UTeM at the highest level. With a registration fee as low as RM 450 and RM 650 for local and international participants respectively, it is amongst one of the lowest registration fees for an international conference, aiming to attract participants from all over the world. We sincerely hope that this event gives the utmost benefit to all participants.

Highlights

- 10 participants with the best presentation will be awarded the "ICE-SEAM 2021 Best Presentation Award"
- The accepted extended abstracts will be submitted for indexing in the Web of Science Conference Proceeding Citation Index and Google Scholar.
- Accepted full papers (optional) will be published in our supporting journals, indexed in Scopus/WoS

Sponsorship Opportunity

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Feel free to visit: iceseam2021.utem.edu.my. Come and join us, block the date, and see you soon!

Report by: Mohd Afzanizam Mohd Rosli

CARe Research Group

Advanced Materials **(A-MAT)**

Green And Efficient Energy Technology **(GrEET)**

Green Tribology And Engine Performance **(G-TriboE)**

Innovation and Sustainability In Machine Technologies **(i-SMAT)**

Intelligent Vehicle Systems **(InVeS)**

INFO CARe Lab Facilities

Advanced Materials Lab

Air Conditioning Lab

CAD Studio

Condition Based Maintenance Lab

Control and Electronic Systems Vehicle Lab

Engine Performance Lab

High Performance Structure Lab

Innovation Laboratory

NDT Laboratory

Rapid Prototyping Lab

Structural Health Monitoring Lab

Tribology Lab

Turbo Machinery Lab

Vibration and Acoustics Laboratory

From The Editor

The masks and social distance became the "new normal"; the COVID-19 pandemic had a huge impact on the world, and research institutions were no exception. To keep connected, we have learned to speak with one another in new ways, using video-conferencing applications. Nonetheless, while the coronavirus has posed numerous challenges to academic research, it has also created opportunities for future research to improve. And now, a year later, I can feel that our world is beginning to heal for the most part, and I can see the light at the end of the tunnel.

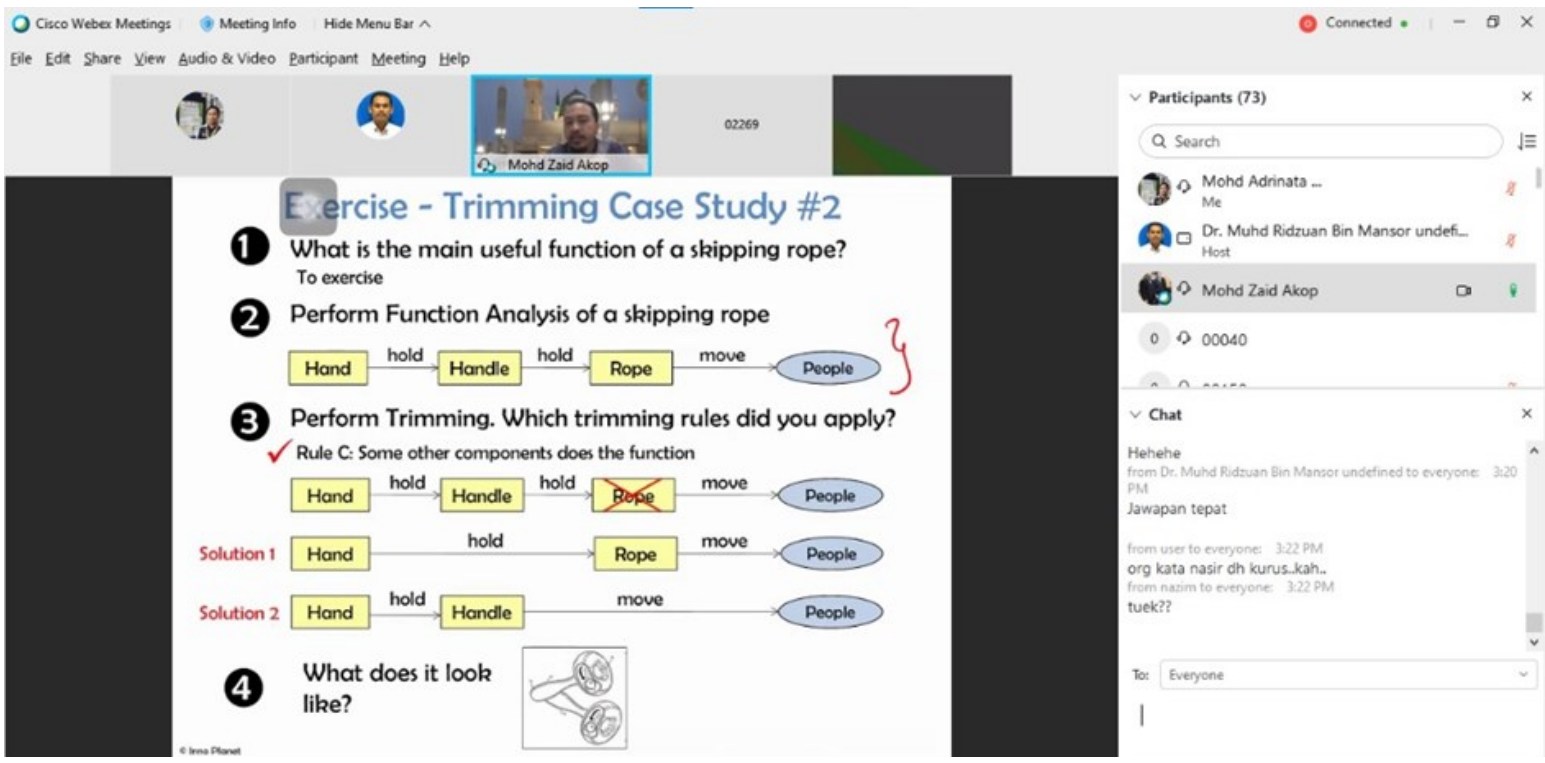
Greetings from the newsletter team.

Sivakumar Dhar Malingam

Spurring Innovative Thinking in Solving Workplace Problems Through TRIZ

A short course on Theory of Inventive Problem Solving Method (TRIZ) to FKM and UTeM staff was held on 24th March 2021 through Webex online platform. The free course was jointly organized by the Faculty of Mechanical Engineering and MyTRIZ-UTeM practitioner group and has successfully attracted more than 70 participants from all disciplines (academic, technical, and administrative staffs) as well as students. The objective of the course is to introduce about TRIZ method to help spur innovative thinking in solving workplace-related problems so that higher work productivity and efficiency could be gained.

This simple yet powerful problem-solving methodology was delivered by three FKM/CARe researchers, which are Ir. Ts. Dr. Mohd Zaip Akop, Dr. Mohd Adrinata Shaharuzaman and Dr. Muhd Ridzuan Mansor. The focus of the course was to showcase to participants how the root cause of the problem could be correctly identified through TRIZ Function Analysis and Function Modelling method, and later innovative solutions to solve the problem could be generated by using the TRIZ Trimming and 40 Inventive Principles method. Case studies on how to solve selected problems were also demonstrated to participants, to provide them knowledge on the systematic way of applying the TRIZ method based on the information that they have learned. It is hoped that the knowledge shared through this short course will be beneficial to all UTeM staffs in solving the problem faced in their workplace through innovative thinking method.



Example of problem solving case study using TRIZ Trimming method

Report by: Muhd Ridzuan Mansor, Mohd Adrinata Shaharuzaman & Mohd Zaid Akop

Co-funded by the Erasmus+ Programme of the European Union

LAUNCHING OF UTEM FUTURE FUEL DESIGN TRAINING CENTRE

A historical achievement under the UTeM UNITED Erasmus+ International Research Grant Project led by FKM researcher, Prof. Ts. Dr. Noreffendy Tamaldin was successfully gained on 4th May 2021, with the official launching of the UTeM Future Fuel Design Training Centre. The event was launched by UTeM Honorable Vice-Chancellor, Datuk Wira Prof. Dr. Raha Abdul Rahim, witness by UTeM Deputy Vice Chancellor (Research and Innovation), Prof. Dr. Ghazali Omar, Dean of FKM, Dr. Ruztamreen Jenal, and Deputy Director, Advanced Manufacturing Centre, Prof. Ir. Dr. Hambali Arep as well as UTeM UNITED researchers.

The establishment of the UTeM Future Fuel Design Training Centre was part of the milestone in the ongoing UNITED Erasmus+ International Research Grant Project which is to establish the Engineering Knowledge Transfer Unit (EKTU) within each project partner university and is fully funded by the European Union (EU). The new UTeM Future Fuel Design Training Centre (EKTU is equipped with the latest fuel management system training equipment, focusing on diesel injection technology. The new center will offer many exciting training programs to both industrial and academic participants, covering on fundamentals and principles of the fuel delivery and management system of the modern automotive system. It comprises of Common-rail Fuel Management System, Fuel Solenoid Injector and Piezo Injectors unit, High Pressure and Low-Pressure Pump, Fuel storage and high precision flow sensor.

Official launching ceremony of UTeM Future Fuel Design Training Centre

The center will start to offer two training programs, which are basic training and advanced training to participants. Furthermore, the new equipment received could also be integrated with the existing equipment available at the university. For example, a fuel analyzer, thermal imaging, and vibration analyzer could be integrated with the EKTU equipment to provide the additional measurement of fuel injection behavior inside the cylinder. The new UTeM Future Fuel Design Training Centre and its training programs offered will strengthen the existing world-class infrastructure available, especially in FKM UTeM, towards supporting many of the University's seven strategic goals such as producing competent human capital ranging from students, academic staff, and those from the industries.

Training Program offered by UTeM Future Fuel Design Training Centre	
Basic Training Program	Advanced Training Program
i. Fundamental of fuel delivery system. ii. Basic component in fuel delivery system/fuel injection. iii. Working principle of a fuel injection system iv. Demonstration of a fuel injection system	i. Function of Diesel Fuel Injection System ii. Injection Timing Control iii. Atomization, Bulk Mixing & Air Utilization iv. Injection Quality Control.

New Fuel Management System training equipment in the UTeM Future Fuel Design Training Centre

Disclaimer:
This project has been funded with support from the European Commission. This publication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.
Project number : 598710-EPP-1+2018-1-AT-EPPKA2-CBHE-JP

Report by: Muhd Ridzuan Mansor, Noreffendy Tamaldin, Ghazali Omar & Ahmad Kamal Mat Yamin

MoA WITH AEROSPACE MALAYSIA INNOVATION CENTRE

UTeM has signed MoA with Aerospace Malaysia Innovation Centre (AMIC) on the development of thermoplastic material for the aerospace industry. This is a milestone in the thermoplastic research in UTeM to significantly contribute to the aerospace industry in Malaysia. The research is spearheaded by Dr. Nadlene Razali and focuses on the material characterization of Polyphenylene sulphide (PPS) plastic for aerospace applications.

Engineering material plays a massive role in improving the aerospace industry. The material influences the final weight of the flying aircraft; thus it is crucial to select the most suitable material with lightweight characteristics during the design stage while not compromising other essential mechanical properties.

Aircraft were created using wood frames with fabric surfaces in the early century. The early designs were later replaced by aircraft made from metal. Currently, modern aircraft are manufactured from a wide range of materials, including various plastics. Engineers anticipate that greater aircraft performance can be yield using engineering plastics. More research in the development of innovative polymers is required to turn this possibility into reality.

Fifty years ago, aluminum dominated the aerospace industry. It was lightweight, cheap, and possesses other desirable mechanical characteristics. 70% of an aircraft was once made from aluminum. Other new materials such as composites and alloys were also used, including titanium, graphite, and fiberglass, but only in a very small ratio compared to aluminum. Readily available, aluminum was used everywhere from the fuselage to main engine components.

As years go by, a typical jet built today is as little as 20% pure aluminum. Most of the non-critical structural materials – paneling and aesthetic interiors – now consist of even lighter-weight carbon fiber reinforced polymers (CFRPs) and honeycomb materials. Meanwhile, for engine parts and critical components, there is a simultaneous push for lower weight and higher temperature resistance for better fuel efficiency, bringing new requirements into the aerospace material.

On 29th October 2020, Boeing has announced that they approved Stratasys Ltd.'s usage of Antero 800NA as 3D printing. Antero 800NA is a PEKK-based polymer developed specifically for production-grade Stratasys FDM 3D printers. Boeing has released specification BMS8-444 and added the 800NA material to the Qualified Products List (QPL) after an extensive evaluation of the material's performance. It is the first material from Stratasys qualified by Boeing for use in applications with elevated chemical resistance or fatigue requirements. Stratasys Aerospace Vice President Scott Sevcik said "Boeing has recognized the tremendous utility of Antero to meet applications that could not have been 3D-printed before. Additive manufacturing has tremendous benefits for simplifying aerospace supply chains both in original equipment and MRO, but robust materials for meeting challenging flight requirements have been needed." The qualification means the high-temperature material can now be used on flight parts for Boeing planes. The future for high-performance thermoplastic in aerospace is promising. This is proven by the recent growth in the number of applications in both structural and non-structural assemblies.

Report by: Muhammad Zaid Harith Ramlan, Nadlene Razali & Mohd Hanafee Zin

INTELLIGENT ENGINEERING TECHNOLOGY SERVICES SDN. BHD.

1st Spin-Off Company
Universiti Teknikal Malaysia Melaka

Intelligent Engineering Technology Services Sdn. Bhd. (IETS) registered on January 2021, as the 1st UTeM spin-off company to develop a platform for new local technology towards fulfilling industrial needs and demands.

The advantage of being part of UTeM members, IETS Sdn. Bhd. can accommodate the global industry's latest technology and create the future local technology of industry in Malaysia, with the competitive edge to be offered locally and internationally.

Based on the direction of "Making the Future Technology", IETS Sdn. Bhd. has an extensive competency to develop new local technology that can be strategically offered to local and international demands. In IETS Sdn. Bhd., we believe our future technology is your today's needs.

VISION

"To provide ultimate business experience through future technology by research, strategic consulting services and development of new products and solutions"

MISSION

To establish a global presence and set the industry benchmark for future technology by:

- Accepting best method, process, quality, and ethical standards.
- Practicing our experience and expertise to enhance the value of stakeholders' needs.
- Implementing continuous improvement in work standards and practice to provide optimum customer satisfaction.
- Establishing technological proficiencies.

OUR TEAM:

Managing Director : Mohd Azli bin Salim
Chief Operation Officer : Nor Azmmi bin Masripan
Chief Technology and Innovation Officer : Adzni bin Md. Saad
Head of Research Department : Syaidah binti Md. Saleh

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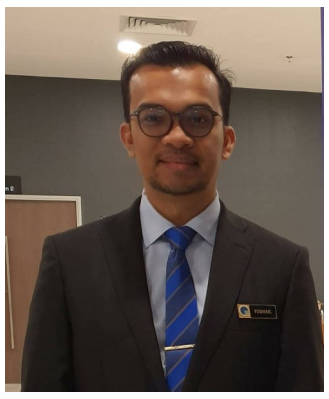
Report by: Mohd Azli Salim

Opportunity for Income Generation in the Era of Pandemic Covid-19

By:



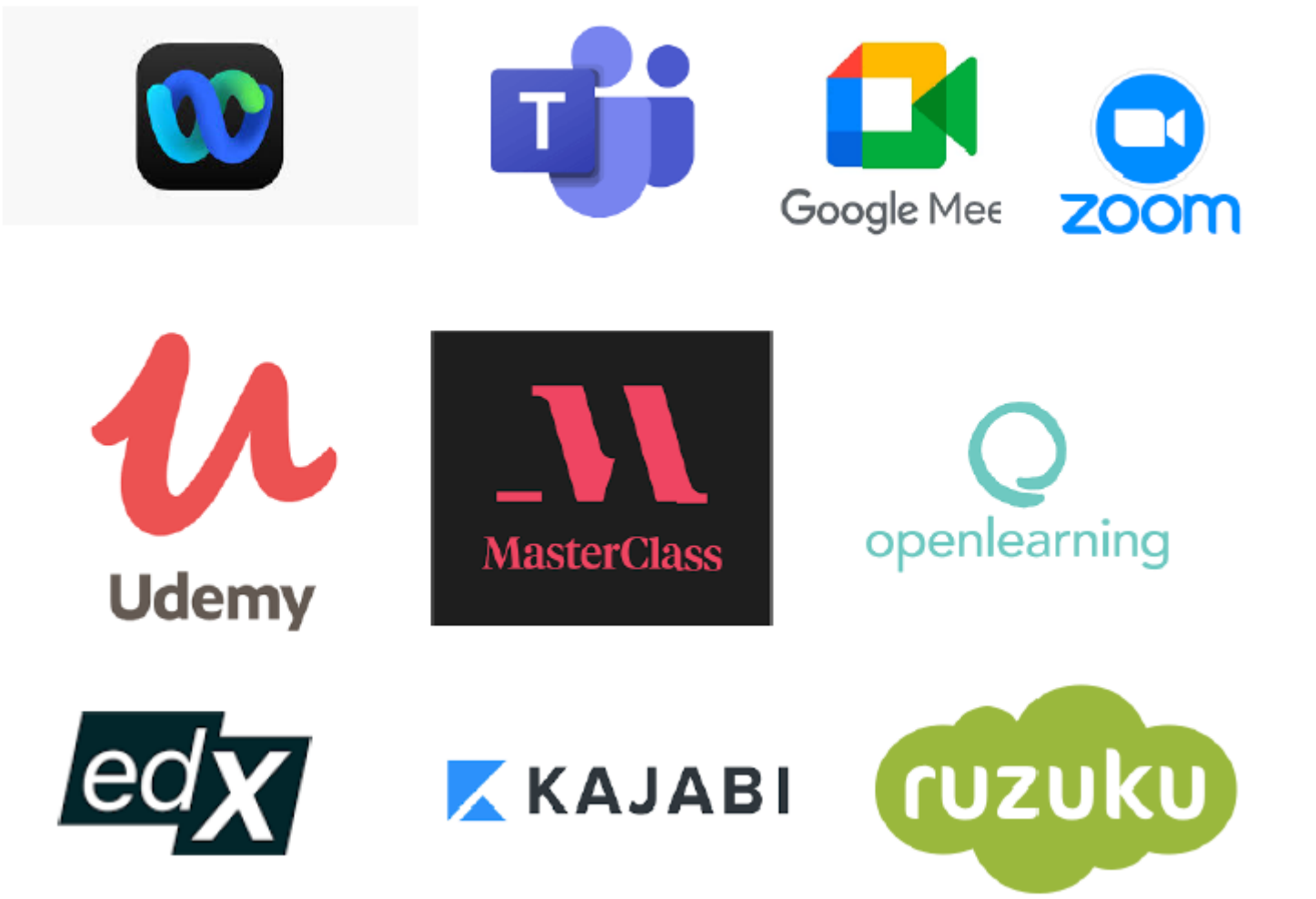
Fudhail Abdul Munir

It is a well-known fact that pandemic Covid-19 has significantly affected the economic activities throughout the nation. Various economic sectors including higher education are also in distress. While the Public Higher Institutions (IPTA) could sustain the devastating effect of the economic turmoil, private universities and colleges might not be that fortunate. There has been a major reduction of up to 50% in terms of the number of student enrolment into private higher education institutions (IPTS) starting from 2020 [1].

Since most IPTS depend on student enrolment as their main source of income, the huge reduction of enrolment can result in the closing down of these IPTS. Although student enrolment in IPTA has steadily maintained over the year, the alternative income activities such as rental, consultancy, and short courses have significantly been reduced owing to the Movement Control Order (MCO). As such, many IPTAs are forced to utilize their cash reserve to cover the operating expenditure (OPEX).

As such, a fast mitigation plan is needed for higher institutions to withstand the catastrophic effect of pandemic Covid-19 on their revenues. One of the methods is to establish an online training platform by utilizing technological advancement. The concept of having face-to-face classes is now proven to be replaceable with online video-conferencing applications such as Webex, MS Team, Google Meet, Zoom, etc. People are seen to be adapting to this kind of technology. Therefore, IPTAs and IPTS should grab this opportunity to establish an online training platform focusing on short courses with certification and also micro-credential courses (credit hour transferable). One of the world's biggest platforms for short courses training namely Udemy is generating revenue of approximately RM 2 billion annually. Believe it or not, the top 10 Udemy instructors have reached RM 70 million in earnings by offering courses on Udemy.com [2]. Apart from Udemy.com, there are also alternative online training platforms such as Masterclass, Openlearning.com, EdX.org, Kajabi.com, Ruzuku.com, and many others.

It is the right time for the universities in Malaysia to venture into this new type of learning. After all, it is our bread and butter to provide soft and hard skills to all Malaysians.



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G-Triboe Researchers received Industrial Grant from Mytribos

MYTRIBOS was founded in 2007 with the primary goal of promoting proper practises in research and development related to the field of tribology in Malaysia, as well as facilitating collaborations between academia and industry in all possible endeavours. MYTRIBOS has been active in organising various activities such as conferences, seminars, workshops, training, publications, and community services to promote a better industry-community-academia network on a local and international level.

MYTRIBOS Industrial Grant (MIG) is one of MYTRIBOS's efforts to assist researchers from institutions of higher learning and industry in obtaining research funds to solve industry-based problems. CARe proposal, led by Hilmi Amiruddin, was announced as one of the successful recipients of the MIG 2021 industrial grant in April 2021, after enduring extensive and meticulous proposal review and defence processes by the panels. Other successful recipients are from IIUM, UniMAP, UiTM and USM.

The recipient obtained an overall grant worth RM 12,000.00, and the project will run for 18 months, beginning 1 May 2021 and ending 31 October 2022. The primary goal of this study is to create an environmentally friendly material-based grease with good lubrication behaviour and mechanical stability for high-speed railway axle box bearing applications.

Report by: Hilmi Amiruddin

IN-CAR AIR CLEANING BY USING GREEN TEA

By:

Norain Idris
(GrEET)

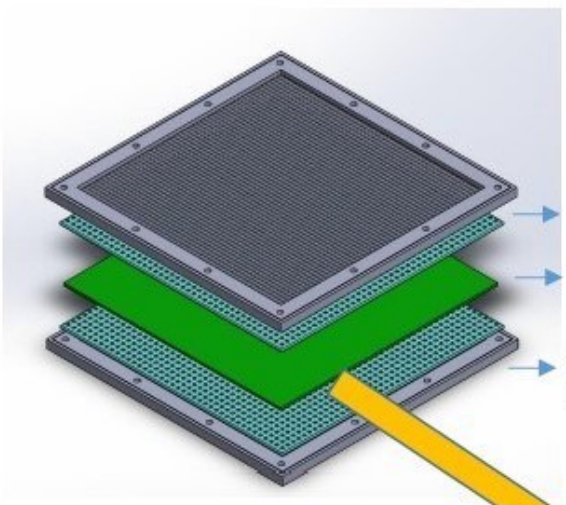
An automotive air-conditioner system normally filters out air particulate matter and dust from the intake air. However, bacteria and viruses on in-car surfaces are hardly removed, especially the in-car air is often recirculated, despite taking fresh air from the outside, to reduce air-conditioner load. Therefore, the bacteria summation is not diluted by fresh air.

The bacteria are transferred from the outside source via hand touch especially on car controllers and radio buttons, reusable grocery bags, which are left in the car boots. Bacteria growth is also caused by in-car spilled beverages and food. These bacteria multiple, especially in warm spots in the car or on any surface, which is not reached by sunlight (Gołofit-Szymczak et al., 2019). In addition, cold and flu viruses will remain alive at least for 24 hours on certain hard surfaces. In a car, the dashboard area is the most exposed area to bacteria due to the air-conditioner air outlet located on the dashboard (Kumar et al., 2018).

There are several methods, which can be used to kill or deactivate the bacteria such as iron-oxide nanowire, UV light, silver ion filter, and catechin filter. However, iron-nanowire and UV light need to be powered by electrical energy, whereas silver ion filter is expensive. Therefore, in this project, a catechin filter is selected since it is a standalone filter and can be sandwiched in the existing car air-conditioner filter at a low cost.

Catechin, which is a high-concentrated phytochemical compound and presents in plant-based foods and beverages like green tea, is also known as flavanols (Carr & Descheemaeker, 2008). Green tea, which has been long used in ancient traditional medicine, is said to have the ability to kill bacteria infection agents and have anti-microbial and antivirus properties (Steinmann et al., 2013).

By benchmarking on a commercial split unit, Daikin Smarto AC, an in-car air-conditioner filter by using green tea is developed to make full use of green tea potential as a bacteria reduction agent. According to our swap test on in-car handles, dashboard, and passenger seat by using test method of AS 1766.1.3,1991, reduction of Aerobic Plate Count, which is a parameter to indicate common bacteria on car interior surface, is shown between 12 and 20%. This swap test was conducted before and after 1-hour car air conditioner running.



Green tea air filter will be placed side by side with the existing cabin car air filter, filtering the outside air, just before the air enters the car cabin.

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Prospective Research on Waste Cooking Oil

By:

Mohd Hafidzal Mohd Hanafi
(GrEET)

Nurul Hanim Razak
(GrEET)

Asriana Ibrahim
(i-SMAT)

Numerous researches have been conducted about waste cooking oil (WCO). This work is inspired by the initiative of protecting the environment, especially on sewerage, river, and sea. Improper disposal of waste cooking oil has contributed to environmental issues such as water pollution and the greenhouse effect which later became a threat to marine life. There are many prospective research areas relating to WCO research that can be explored. Some of the potential works include WCO treatment, composition in WCO, chemical reaction, and intermolecular bond structure. As the preliminary step, the focus of our team is to produce products from WCO like Organic Intelligent Candle (OIC) and Organic Plastic Alternatives (OPA) through designated experimental procedures. Figure 1 illustrates the benefits of OIC and OPA.

Both of these products have many potentials and benefits. Compared to conventional products, OIC/OPA is produced from organic material, is safe for consumption. The other benefit of this product is biodegradable which contributes to pollution reduction. These products can potentially be commercialized as the production process is easy and does not require complex apparatus or machines.

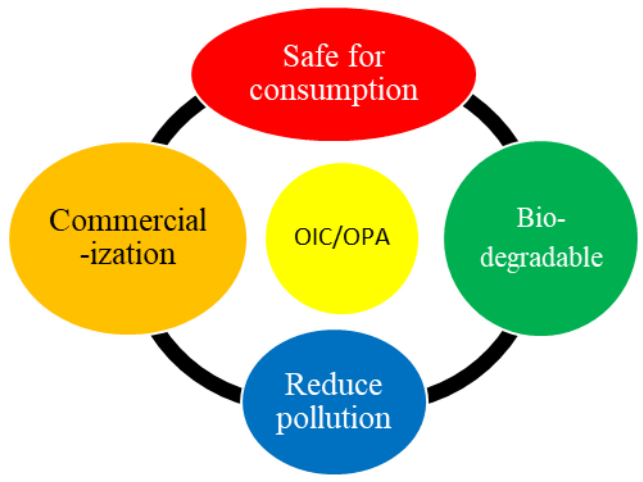

Figure 1. Benefits of OIC/OPA

The product concept has received recognition at International Invention, Innovation & Technology Exhibition (ITEX 2020) with a silver medal for OPA and a gold medal in Apprentice Innovation & Research Exhibition (AIREX 2020) for OIC and OPA (as shown in Figure 2). In addition to innovation awards, the works have also been awarded 2 research grants; UTeM Short Term Research Project Grant worth RM46,000 and the Fundamental Research Grant Scheme (FRGS) from the Ministry of Higher Education worth RM81,910.

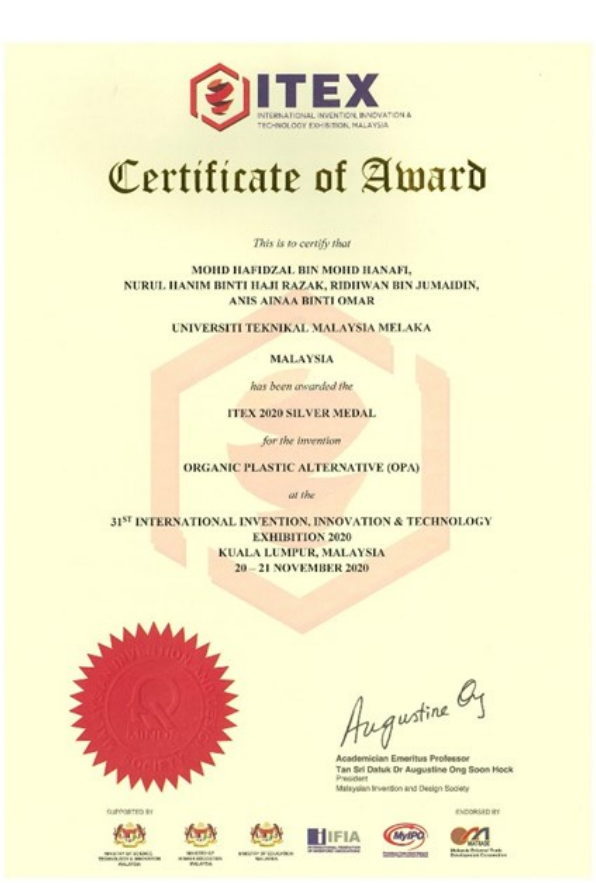

Figure 2. Achievement at ITEX 2020 and AIREX 2020

APPLICATION OF ULTRASONIC WAVES IN OIL-CONTAMINATED PARTICLE TREATMENT

By:

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Mohd Hafidzal Mohd Hanafi
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Ultrasonic technology uses the ability of sound waves with a higher frequency and inaudible range that can be propagated in various materials. The ultrasonic is considered to be a green emerging technology that can be used in many industrial applications. Ultrasonic has been widely used in the downstream and upstream of the oil and gas industry due to its high efficiency at low cost [1]. Petroleum crude oil-contaminated sand from oil wells is categorized as hazardous waste and should not be disposed of without treatment as it can contaminate the sea and land. A lot of cleaning methods were reported for oil-contaminated sand, such as microwave [2], chemical [3], and biology [4], which presented various approaches to solve the problems. However, each of these methods has its limitation.

Ultrasonic energy is considered one of the promising methods to treat oil-contaminated sand effectively. The working principle of ultrasonic is when a transducer produces sound vibration and travels throughout the oil-contaminated mixture. The sound waves will create compression and rarefaction, which leads to micro and macro mixing of the immiscible liquids. Microbubbles will form when the low pressure produced by rarefaction exceeds the threshold force between the oil molecules. The microbubbles will expand under negative pressure and collapse under positive pressure from acoustic energy. These microbubbles are also known as cavitation bubbles. In the meantime, micro streaming, derived from the nonlinear oscillations of bubbles, will cause violent turbulence called shockwave accompanied by micro jetting that will produce shear forces, which strong enough to break the bond between oil and the contaminated particles. The phenomenon is called a cavitation mechanism, illustrated as shown in Figure 1.

Today, abundant studies have been carried out to fully understand the potential of using ultrasonic in oily wastewater treatment [5], oily sludge treatment [6] as well as vegetable oil treatment [7]. Future development in this field includes further investigation on the detailed separation mechanism and interaction between ultrasonic technological parameters and contaminated characteristics. Opportunities also arise in the areas of the application of ultrasonic cavitation effect on impurities removal from waste cooking oil.

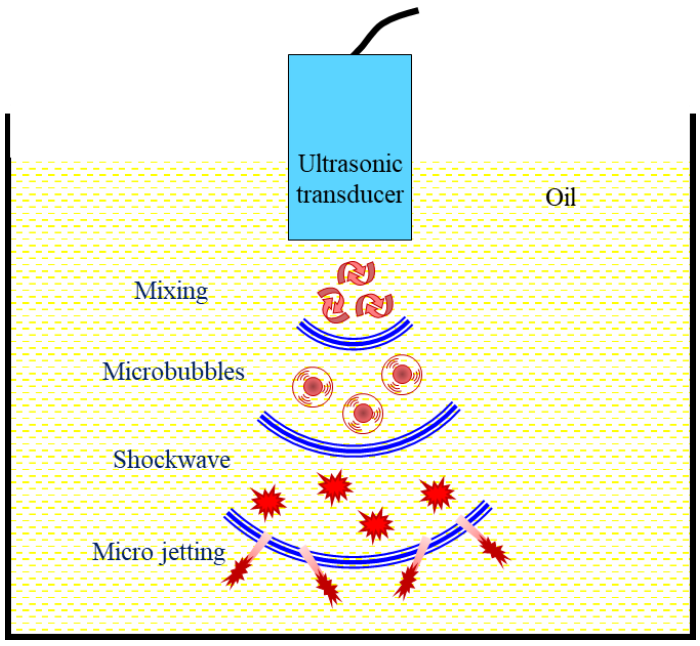

Figure 1: Cavitation mechanism in an oily liquid.

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Application of Butanol as Future Bio-Fuel

By:

Mohd Hafidzal Mohd Hanafi
(GrEET)

Nurul Hanim Razak
(GrEET)

Asriana Ibrahim
(i-SMAT)

Growing concern on soot emission of fossil fuels has motivated researchers to study alternative fuels. Soot is reported as the second largest emission that causes global warming after carbon dioxide (CO2) [1]. Soot is black carbon that formed during the incomplete combustion of fuel. Soot emission is also known to be a harmful component to humans since it can cause diseases such as asthma, chronic bronchitis, and collapsed lungs [2]. Soot is not only harmful to health, but it is it also cause problem to the engines. Soot formed in the engine will contaminate and increase the viscosity of lubricant oil. Subsequently, lubricant oil life becomes shorten and increases its service frequency [3].

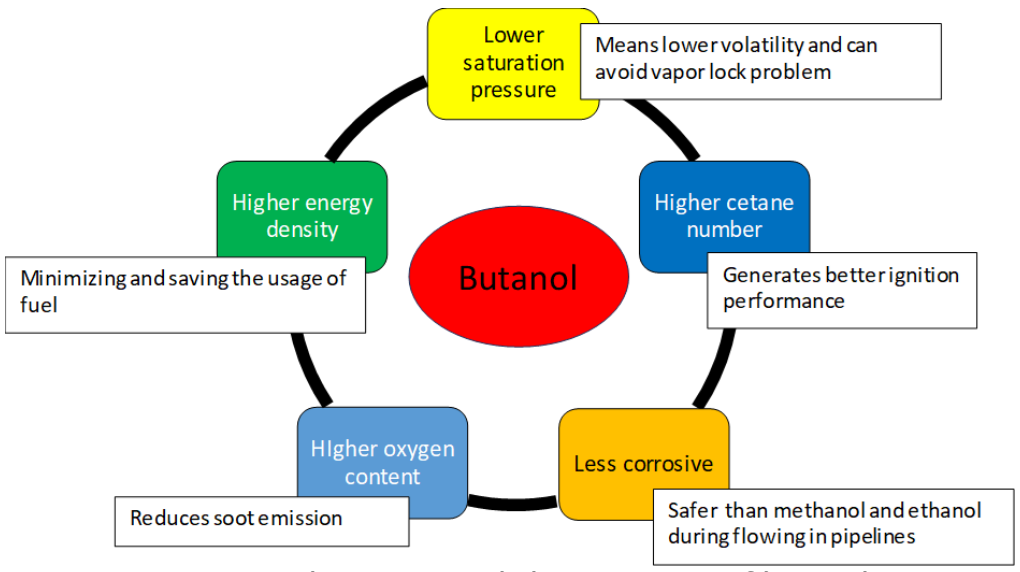

Figure 1: Advantages and characteristics of butanol

Butanol is one of the approaches to solve the soot emission issue. Butanol is well known as oxygenated fuel and as a second-generation biofuel. Butanol also is called an alternative fuel that can replace fossil fuel sources in the future. Other advantages and characteristic of butanol are illustrated in Figure 1 and properties for gasoline, diesel, methanol, ethanol, and butanol is shown in Table 1. The cetane number of butanol is higher than methanol and ethanol, which helping in contributes to good ignition performance. Research Octane Number (RON) number for butanol almost similar to gasoline. Therefore, it can mix well with gasoline at lower or higher concentrations. The saturation pressure of n-butanol is low, which means that butanol has lower volatility and can avoid the vapor lock problem. Besides that, carbon atoms of butanol (C4H9OH) are longer, thus the volumetric energy density of butanol exceeds that of methanol and ethanol, which results in minimizing and saving the usage of fuel. Butanol is also safer for consumption since it is less corrosive when transported in pipelines. Butanol as oxygenated fuel has higher oxygen content relative to biodiesel, which reduces soot emission.

Table 1 Properties of gasoline, diesel, methanol, ethanol, and butanol [4].

Fuel	Research octane number, RON	Cetane number	Saturation pressure at 38 ˚C [kPa]	Volumetric energy density [MJ/L]	Lower heating value [MJ/Kg]
Gasoline	92-98	0-10	31.01	32	42.7
Diesel	20-30	40-55	1.86	32-40	42.5
Methanol	136	3	31.69	16	19.9
Ethanol	129	8	13.8	20	28.9
Butanol	96	25	2.27	29	33.1

The potential of butanol application as biofuel encourages many researchers to conduct studies on butanol by a different method. Some researchers using shock tubes [5], rapid compression machine (RPM) [6], micro flow reactor with a controlled temperature profile [7], jet stirred reactor [8], and Chemical kinetic mechanisms modeling [9].

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CARe Achievements for the 1st Half of 2021

Despite the COVID 19 pandemic that has started since the end of 2019, CARe researchers still manage to carry out their research activities even though too many challenges to face during this pandemic.

No	Product	Leader (K)	Medal	Event
1	Kenaf/PLA Biodegradable Filament	Dr. Nadlene Razali (K), Aida Haryati Binti Jamadi (PG), Mastura Binti Mohammad Taha, Dr. Ridhwan Bin Jumaidin, Nuzaimah Binti Mustafa, Dr. Syahibudil Ikhwan BinAbdul Kudus	Gold	EREKA, UniMAP
2	Automotive Electronic Packaging Safety using Graphene Stretchable Conductive Ink	Ameeruz Kamal Ab Wahid (PG),Norhisham Ismail (PG), Adzni Md. Saad, Ts.Dr. Mohd Azli Salim	Silver	EREKA, UniMAP
3	Satay Xpress (Satay Skewing Machine)	Dr. Nurfaizey Bin Abdul Hamid (K), AhmadAl-Nabil Bin Shamsudin, Ahmad Hakimi Husaini Bin Khairuddin, Nuramira Binti Azman, Roshakimi Bin Abdullah, Siti Norazren Binti Mohamad Sapandi	Silver	EREKA, UniMAP
4	C2L	Ts.Dr. Mohd Azli Salim (K),Sr. Dr. Norbazlan Mohd Yusof, Ir. Ts. Dr. Mohd Zaid Akop, Prof. Madya. Dr. Nor Azmmi Masripan, Adzni Md. Saad, Faizil Wasbari, Dr. Nurfaizey Abdul Hamid,Prof. Dr. Ghazali Omar, Ts. Aminurrashid Noordin	Gold	MTE 2021
5	Visitor Screening and Sanitizing Station	Dr Nurul Hilwa Binti Mohd Zini (K),Dr. Fadhilah Shikh Anuar, Syed Hafiz Hakimi bin Syed Najmuddin (P), Muhamad Fakhrul Akmar bin Fazli (P), Muhammad Shukri Azizi bin Razak (P),Muhammad Hafiz bin Mohd Fadzil (P), Zam Firdaus Bin Che Zamri (P)	Silver	MTE 2021
6	Water Based Photovoltaic Thermal (PVT) with Dual Oscilating Absorber	Dr Suhaimi Bin Misha (K), Dr. Mohd Afzanizam Mohd Rosli,Prof. Ts. Dr. Noreffendy Tamaldin, Muhammad Safwan Asyraf Ramli (PG)	Bronze	MTE 2021

Among the achievements for the first half of 2021 is participation in competitions and exhibitions organized by Ekspo Rekacipta & Pameran Penyelidikan (EREKA), UniMAP 2021, and Malaysia Technology Expo (MTE2021). CARe researchers won 1 Gold and 2 Silver from EREKA and 1 Gold, 1 Silver and 1 Bronze from MTE2021.

No	Title	Reseacher	Amount (RM)	Type
1	THE ADOPTION OF ENABLING TECHNOLOGIES FOR PROCESS EFFICIENCY AND DATA SHARING IN ELV REMANUFACTURING AND RECYCLING	**MOHD RIZAL BIN ALKAHARI** - ANUAR BIN MOHAMED KASSIM - BURHANUDDIN BIN MOHD ABOOBAIDER	157,600	National
2	DEVELOPMENT OF EXTENDBLE BUNDLE PULLER FOR REFINERY PLANT	**MOHD SHUKRI BIN YOB** - AL AMIN BIN MOHAMED SULTAN - KHAIRULL ASWAD BIN JAAFAR (HRSB) - FUDHAIL BIN ABDUL MUNIR - HAIRUL BIN BAKRI - MOHD ADRINATA BIN SHAHARUZAMAN - MOHD JUZAILA BIN ABD. LATIF - MOHD SHAHIR BIN KASIM	400,000	Matching Grant
3	DEVELOPMENT OF NEW MULTIPURPOSE CRUTCH FOR PHYSIOTHERAPY REHABILITATION PROGRAM	**MOHD JUZAILA BIN ABD. LATIF** - MASJURI BIN MUSA @ OTHMAN - MOHD NAZIM BIN ABDUL RAHMAN - MOHD SHUKRI BIN YOB - RUZY HARYATI BINTI HAMBALI	40,000	Matching Grant
4	DEVELOPMENT OF LOW COST ONLINE MONITORING SYSTEM FOR MACHINE VIBRATION USING MEMS SENSOR	**FUDHAIL BIN ABDUL MUNIR**	40,000	Matching Grant
5	DEVELOPMENT OF NON-EDIBLE VEGITABLE OIL-BASED GREASE WITH BEESWAX THICKENER AND HEXAGONAL BORON NITRIDE NANOADDITIVE FOR HIGH-SPEED RAILWAY AXLEBOX BEARING	**HILMI BIN AMIRUDDIN** -MOHD FADZLI BIN ABDOLLAH	12,000	Industrial Grant
		TOTAL	**649,600**	

Until mid-year 2021, CARe has managed to receive grants from the national and industry totaling to RM649,600.

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In terms of book publishing, 4 books have been successfully published with UTeM and Elsevier.

No	Title	Author			Publisher
1	Advanced Approach for Future Technology	TS. Dr. Mohd Azli Bin Salim	Ir. Ts. Dr Mohd Zaid Bin Akop	Adzni Bin Md Saad	Penerbit UTeM Press
2	Engineering as a Tool for Technology Solution	TS. Dr. Mohd Azli Bin Salim	Adzni Bin Md Saad	Ir. Ts. Dr Mohd Zaid Bin Akop	Penerbit UTeM Press
3	Design and Sustainability	Dr. Muhd Ridzuan Bin Mansor	Prof. Sapuan Bin Salit		Elsevier
4	Introduction to Malaysian Natural Rubber Compound	TS. Dr. Mohd Azli Bin Salim	Intan Raihan Asni Rosszainily		Penerbit UTeM Press

Apart from that, the involvement of postgraduate students under CARe researcher supervision also helps a lot to improve research achievements at FKM. Among the activities participated by FKM postgraduate students are product competition organized by EREKA UniMAP 2021, Malaysia Technology Expo (MTE2021), Material Lecture Competition, Three Minutes Thesis competition (3MT) organized by Centre for Graduate Studies (PPS) UTeM, and also online student mobility program with Tokushima University, Japan. In competition 1 Gold and 1 Silver

ACTIVITY AND ACHIEVEMENT FKM'S POSTGRADUATE STUDENT 2021 (Updated 8 July 2021)

Product Competiton

No	Product	Leader (K) / member	Medal	Organizer	Date
1	Kenaf/PLA Biodegradable Filament	Dr. Nadlene Razali (SV), **Aida Haryati Binti Jamadi (M041920002)**, Mastura Binti Mohammad Taha, Dr. Ridhwan Bin Jumaidin, NuzaimahBinti Mustafa, Dr. Syahibudil Ikhwan BinAbdul Kudus	Gold	EREKA, UniMAP	18 Jan -18 Feb 2021
2	Automotive Electronic Packaging Safety using Graphene Stretchable Conductive Ink	**Ameeruz Kamal Ab Wahid (P041910004), Norhisham Ismail (P041810002)**, **Adzni Md. Saad (P041810011)**, Ts.Dr. Mohd Azli Salim (SV)	Silver		
3	Water Based Photovoltaic Thermal (PVT) with Dual Oscilating Absorber	Dr Suhaimi Bin Misha (SV), Dr. Mohd Afzanizam Mohd Rosli,Prof. Ts. Dr. Noreffendy Tamaldin, **Muhammad Safwan Asyraf Ramli (M042010040)**	Bronze	MTE 2021	22 - 26 March 2021

Competition

No	Competition	Participant	Result	Organizer	Date
1	Material Lecture Competition	**Daniel Azlan Bin Mohd Azli (M042020039)** SV: Dr. Mizah Binti Ramli	Champion	FKP, UTeM	28-Apr-21
2	Three Minutes Thesis (3MT)	**Muhammad Zaid Bin Nawam (M041820014)** SV: Mohd Afzanizam Bin Mohd Rosli	Champion	PPS, UTeM	6-May-21

Student Mobility

No	Program	Perticipant		Date
1	Spring School 2021 Tokoshima University	**Nur Aqila Syamimi Amir Hamzah (M042020022)** SV: Dr. Mohd Rody Bin Mohamad Zin		8 - 16 March 2021
2		**Azmil Arif Mohamad Wazir (M042010032)** SV: Dr. Nurfaizey Bin Abdul Hamid		
3		**Nor Ana Binti Rosli (P041820001)** SV: PM Ir. Ts. Dr. Mohd Rizal Bin Alkahari		
4		**Muhammad Nur Akmal Kazim (M042020014)** SV: PM.Dr. Mohd Fadzli Bin Abdollah		
5		**Mohamad Nordin Mohamad Norani (P041820002)** SV: PM.Dr. Mohd Fadzli Bin Abdollah		
6		**Daniel Azlan Bin Mohd Azli (M042020039)** SV: Dr. Mizah Binti Ramli		
7		**Favian Jikol (M042020001)** SV: Ir.Ts. Dr. Mohd Zaid Bin Akop		

from EREKA, UniMAP, and 1 Bronze from MTE 2021. For MLC and 3MT, we have entitled a champion. Meanwhile 7 postgraduate students had joined the student mobility program.

Hopefully, all these achievements would inspire CARe researchers and FKM students to be more successful.

Drive to greener future

Report by: Mohd Rody Mohamad Zin

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ISSN 2289-9871