Centre for Advanced Research on Energy

CARe Newsletter

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CENTRE FOR ADVANCED RESEARCH ON ENERGY
Universiti Teknikal Malaysia Melaka

Issue 7, December 2020

HIGHLIGHTS

CARe LAB VISIT BY UTeM VICE-CHANCELLOR

On 24th November 2020, the Center for Advanced Research on Energy (CARe) was very fortunate to receive a visit from the Vice-Chancellor of Universiti Teknikal Malaysia Melaka (UTeM). Among the labs visited are Advanced Materials and Characterization Laboratory (AMCHAL), Innovation Lab and Advanced Academia-Industry Collaboration Lab (AiCL).

These labs are research labs that are very active in producing innovative products. AMCHAL is very active in conducting research in advanced materials with collaboration from industries such as Nano Malaysia, MPOB, PLUS Malaysia and many more.

Innovation lab is one of the research labs under the research group of Innovative Machine and Mechanism (i-SMAT) under CARe. This lab focus on research related to 3d printing technology. AiCL has close cooperation with Plus Malaysia and Nano Malaysia. This close network has benefit the community with its product innovation.

During this visit, CARe also presented the results of the research group's achievements. Among CARe's most significant achievements is, being the largest recipient of FRGS grants amounting to RM1.56 million. It is hoped that this achievement can be improved in the future.

Report by: Mohd Rody Mohamad Zin

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

Welcome to the seventh issue of CARe Newsletter. 2020 has been a year that nobody will forget. The Covid-19 pandemic has cast a long shadow over every aspect of our lives-and we are not yet free from its far-reaching ramifications. Despite the difficulties and challenges, CARe researchers have worked hard to deliver projects and secure new research funding. Looking forward to the New Year and a new beginning, I wish you all peace and happiness shared with family and friends however you are able to connect.

Greetings from the newsletter team.

Sivakumar Dhar Malingam

TRIZ TRAINING TO MELAKA TEACHERS

The first training on Introduction to the Theory of Inventive Problem Solving (TRIZ) by TRIZ Trainer from Universiti Teknikal Malaysia Melaka (UTeM) was conducted on the 15th of September 2020. The introductory training involves 15 teachers from Melaka in collaboration with Unit Pembangunan Bakat Murid, Jabatan Pendidikan Negeri (JPN) Melaka and Office of Assistant Vice Chancellor – Industry and Community (PPNC-JIM), UTeM. The one-day corporate social responsibility (CSR) introduction to TRIZ L1 was held at Galaxy Room, Samsung IoT, Technology Campus, UTeM. Topics covered were Function Analysis, Cause and Effect Chain Analysis (CECA), Trimming, Engineering Contradiction, Contradiction Matrix and 40 Inventive Principles.

This program provides opportunities to the secondary school teachers to develop their potential in producing a creative / innovation project through TRIZ method. The training can develop the culture of inventing a new product from various sources and understand the latest innovation developments using TRIZ tools. Therefore, this program was implemented to transfer knowledge from UTeM TRIZ trainers to the teachers in Melaka to create a strong team of teachers with the foundation in TRIZ knowledge. With this knowledge transfer, it can directly encourage the involvement of students in activities involving Science, Technology, Engineering and Mathematics (STEM). Knowledge in STEM among teachers is essential to help students to choose their career in the future that is related to STEM.

Thanks to myTRIZ-UTeM trainers Ts Dr Mohd Zaid bin Akop, Ts Dr Mai Mariam binti Mohamed Aminuddin, Mrs Izadora binti Mustaffa and Dr Muhd Ridzuan bin Mansor, as well as PM Ts Dr Effendi bin Mohamad from PPNC-JIM UTeM for making the event a success.

Report by: Mohd Adrinata Shaharuzaman & Muhd Ridzuan Mansor

RESEARCHERS FROM INVES SECURED ANCHOR III 2020 INTERNATIONAL GRANTS

The New Car Assessment Program for Southeast Asia, or known as ASEAN NCAP, is an automobile safety rating program jointly established by the Malaysian Institute of Road Safety Research (MIROS) and Global New Car Assessment Program (Global NCAP) upon a collaborative MoU signed by both parties during the FIA (Fédération Internationale de l'Automobile) Foundation Annual General Assembly in New Delhi, India on 7 December 2011. In April 2020, ASEAN NCAP and participating OEMs had released its third instalment the ASEAN NCAP Collaborative Holistic Research (ANCHOR III) international research project, in the pursuit to strengthen research works towards its 2021-2030 ASEAN Road Safety Roadmap.

In the same spirit to support the noble road safety initiatives, five (5) CARe group of researchers with collaboration from several automotive, industrial playmakers and international university members as joint researchers have submitted research proposals to bid for the prestigious international grants. After enduring extensive and meticulous three (3) stages of proposal review and defence processes by the panels, in July 2020, all five CARe proposals submitted were announced as the successful recipients of the ANCHOR III international grants. The delightful accomplishment has enabled CARe to secure total grants worth of RM 78,254.00 from all five projects. The project shall commence starting from 1 August 2020 until 31 July 2021, for 12 months.

This major success in the ANCHOR III research grant proved the high competency and technical capabilities of CARe researchers to lead and execute an international project, primarily focusing on automotive safety. The outcome gained at the end of each research projects is expected to spur further and strongly support ASEAN NCAP 2021-2030 Roadmap objectives towards improving road safety performance especially in ASEAN countries.

Report by: Muhd Ridzuan Mansor, Amrik Singh Phuman Singh, Juffrizal Karjanto, Nidzamudin Md Yusof & Khairul Amri Tofrowaih

RM 741,160 worth of research grants Secured by InVeS in 2020

INTELLIGENT VEHICLE SYSTEMS RESEARCH GROUP

Intelligent Vehicle Systems (InVeS) research group was established on January 1st, 2020 and focuses on the research on sustainable energy and automotive specialized in autonomous driving. The research areas of this group include but are not limited to autonomous vehicle systems, electric vehicles, human-vehicle interaction, and vehicle dynamics and control.

In the year 2020, the research group members received various research grants from local and international organisations. Table 1 shows the ASEAN NCAP Collaborative Holistic Research - Phase III (ANCHOR III) grants awarded to the members of the InVeS research group. The total amount received for this international research grants is RM 42,000. The list of grants received under the Fundamental Research Grant Scheme (FRGS) is given in Table 2. The research group members successfully secured five FRGS grants with a total amount of RM 492,160.

A team led by Dr. Fauzi Ahmad from the InVeS research group was awarded three short term research grants under Intelligent Braking Control for Autonomous Vehicle Safety System program. The details on these grants are provided in Table 3. The total amount received under this program is RM 47,000. Other research grants secured by the InVeS research group, as shown in Table 4, are the Malaysian Technical University Network (MTUN) matching grant, UTeM-Industry Research Matching Grant (IRMG), and short term research (prototype) grant. The total amount received for these grants is RM 160,000. In the year 2020, the InVeS research group received RM 741,160 worth of research grants.

Table 1: ASEAN NCAP Collaborative Holistic Research - Phase III (ANCHOR III)

Title	Principal Investigator	Amount (RM)
Naturalistic and Observational Study on Communication in Mixed Traffic Scenarios: Autonomous Vehicle vs. Motorcyclist	Dr. Juffrizal Karjanto	16,700
Correlation of Darkness Level of the Road with Driver Behaviour	Dr. Nidzamuddin Md. Yusof	13,800
Analysis of Autonomous Collision Avoidance in Emergency Lane Change Considering Vehicle in the Neighbouring Lane	Dr. Amrik Singh Phuman Singh	11,500

Table 2: Fundamental research grant schemes

Title	Principal Investigator	Amount (RM)
Characterization of Brake Force and Wedge Properties of IBS	Dr. Fauzi Ahmad	20,000
Adaptive PID Control of Antilock Braking System (ABS) in IBS for Autonomous Vehicle	Associate Professor Ir. Dr. Mohd Azman Abdullah	20,000
Malaysia Acceptance on Autonomous Vehicle Safety System in Relation to Purchase Intention: A Structural Equation Modelling Approach	Dr. Nur Hazwani Mokhtar	7,000

Table 3: Short term research grants

Title	Principal Investigator	Amount (RM)
Wireless HEV Engine Diagnostics Using State of the Art Machine Learning-Based Signal Analysis Z-Freq	Ts. Nor Azazi Ngatiman	126,400
Formulations of Autonomous Vehicle Driving's Taxonomy In Triaxial Accelerations using Real-Road Experimental Studies	Dr. Juffrizal Karjanto	116,500
Correlation Between Early Autonomous Vehicle Manoeuvres Information and Motion Sickness Symptoms on Future Users while Performing Non-Driving Related Tasks	Dr. Nidzamuddin Md. Yusof	104,800
Wideband Dynamic Vibration Absorber using Combined Hardening and Softening Nonlinearities For Effective Vibration Suppression	Associate Professor Dr. Roszaidi Ramlan	74,640
Autonomous Collision Avoidance with Oncoming Vehicle in Overtaking Maneuver using Optimal Control Theory	Dr. Amrik Singh Phuman Singh	69,820

Table 4: Other research grants

Title [Research Grant]	Principal Investigator	Amount (RM)
Development of Trash Collector and Water Quality Management Systems for Sungai Melaka [Malaysian Technical University Network (MTUN) Matching Grant]	Ts. Dr. Nur Rashid Mat Nuri @ Md Din	100,000
Development of Low Cost Online Monitoring System for Machine Vibration using MEMS Sensor [UTeM-Industry Research Matching Grant]	Ir. Dr. Fudhail Abdul Munir	40,000
Rollover Warning Device for Heavy Vehicle [Short Term Research (Prototype)]	Ir. Ts. Mohamad Hafiz Harun	20,000

Report by: Amrik Singh Phuman Singh, Juffrizal Karjanto & Nidzamuddin Md. Yusof

BUCKLING OF SHELL STRUCTURES

By:

Olawale Ifayefunmi
(A-MAT)

Shell structures are primary structural components in various industrial applications, including aeronautical, rail, onshore, offshore, aircraft, etc. However, the use of such shell structures is strongly characterised by the thinness ratio of the shell. As an example, thin shell structures with large thinness ratio finds application in the aeronautical industries as parts of launcher-vehicles systems, rail and automobile industries as an energy absorber. Whereas, relatively thick shells structures are used in onshore and offshore industries as pressure vessels, offshore platforms legs and connectors between two cylinders with different diameters. The most commonly used shell structures in the offshore and oil industries are truncated cones, circular cylinders, torispheres as shown in Figure 1.

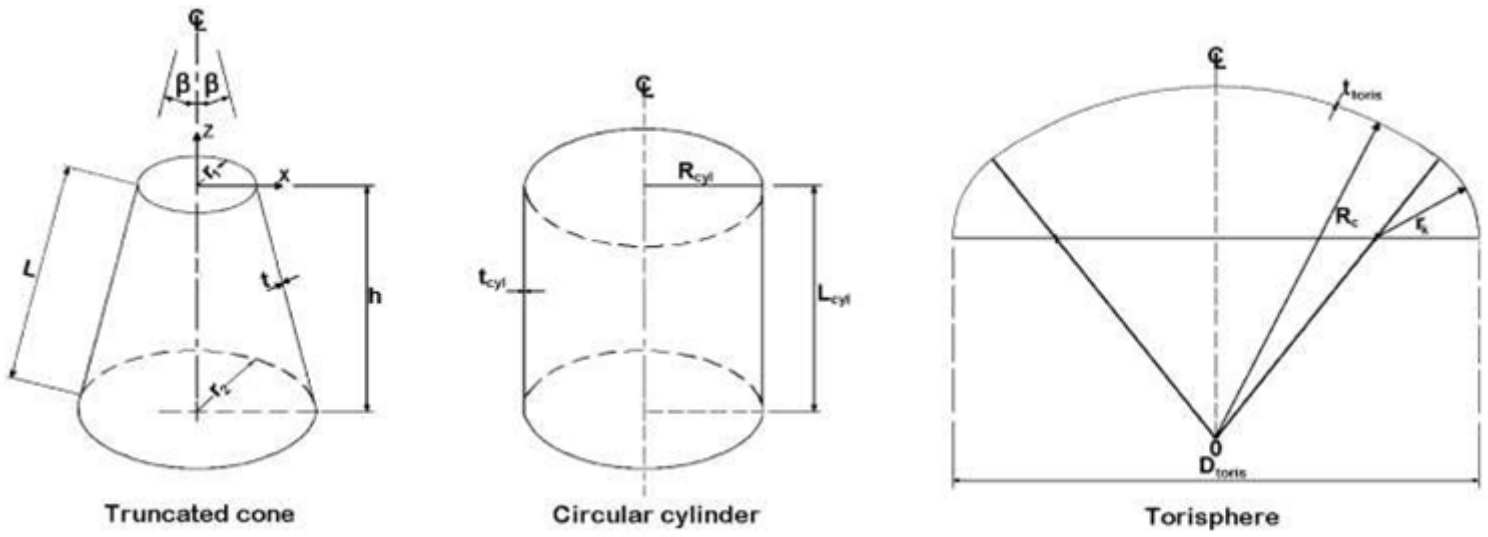

Figure 1 Geometry of standard shells structures used in offshore applications.

During useful application, these shell structures are subjected to various loading conditions ranging from axial compression, bending, external pressure, internal pressure, torsion or combination of any of these loading conditions. Although, one of the significant factors that limit the extent to which these structures can be loaded is static stability such as buckling. The effects of buckling on major offshore structures are shown in Figure 2. This can be catastrophic and costly, thereby resulting in some of the following:

i) loss of life
ii) loss of properties and belongings
iii) costly financial implication
iv) loss of time, and v) pollution

Figure 2: Typical effects of buckling of offshore/onshore structures

The above-mentioned consequences highlight the importance of the study of the buckling behaviour of such structures. To successfully carry out buckling analysis on these shell components, it is vital to study and understand the behaviour of such shell structures. This technical challenge has spawned significant interest in the author for many years to engage in internationally recognised research in the mechanical behaviour and the mode of failure (buckling) of this shell structures subjected to various loading conditions.

By:

Muhammad Zulfattah Zakaria

(GrEET)

From leftover to fertiliser: Smokeless rice field via Inoculant

The sun was shining, and the wind was blowing gracefully. It was a lovely day in Pendang, Kedah. Nina, a 6-year-old cute little girl, was sitting at the window of her beautiful small wooden house. Her mother was cooking a fried kangkong belacan while steaming fragrant rice for lunch. A very wonderful day indeed. Suddenly, thick smoke was blown into the house. Nina panicked. She can barely breathe. Her mother ran towards her and brought her outside the house. Nina's face turned bluish, a sign of low oxygen level in blood. Her mother provided her with Ventolin spray. A puff, then second puff, and finally the third puff eventually enabled Nina to breathe normally. This is a nightmare, asthmatic patient like Nina must deal with periodically. Her house was situated near the paddy field. She had to experience such a traumatic situation three times a year. When farmer burnt the field to rid the straw and stubble for the next planting, the smoke will invade her house and her health.

It is a common practice for a rice farmer to burn the straw and stubble. This leftover is hard to decompose. Burning it will clean the field and provide the soil with carbon black which many farmers believe will fertiliser the soil. However, burning the field will also destroy the beneficial bacteria, worms, and fungus which leads to reduced fertility of the soil. It was measured that every acre paddy field will provide around four tonnes of straw and stubble (Fores, Menendez, & Comin, 1988). This rest can be turned into high-value compost via worm, fungi, bacteria, and mechanised system (Nghi et al., 2020). As the mechanised system will acquire lots of effort, facility and cost it is not a preferred choice for the farmer. Vermin compost on the other hands is time-consuming and cannot be used for in-situ straw decomposing. The easiest way of eliminating the leftover is via a fungi-bacterial application capable of degrading the silica-coated straw and decomposing the cellulose and hemicellulose into compost (Ibrahim, Robin, Rezk, & El-Saka, 2013).

Fungi family-like Trichoderma is well known for its antagonistic behaviour. It does not harm the plant where it resides but kills other fungi within its reach. It was also reported that Trichoderma is capable of accelerating the decomposing of plant leftover (Zhang, He, Wang, Cai, & Xu, 2009). Combining Trichoderma with a bacterial strain like bacillus subtilis or pseudomonas spp under certain pH and temperature was proven to decompose wheat straw at an accelerated pace (Wiedow, Baum, & Leinweber, 2007). Utilising the same procedure, paddy straw and stubble was collected and treated with the same inoculant. Results show that there is no change in pH for both treated and untreated samples, but the inoculant-treated sample degraded the straw mulch in less than one month as compared to the non-treated sample (Figure 1).

Figure 1: Decomposing of paddy straw and stubble with a decomposing inoculant after one month shows decomposed leaves (left sample) and a non-treated sample with intact leaves structure (right)

Field testing was conducted right after the successful lab test. The participants are private rice field operator in Bukit Rambai, Melaka with a total land size of 60 acres and the second test site is situated in Lanjut Manis with a total field size of 40 acres belonged to Lembaga Pertubuhan Peladang Negeri Melaka, a federal government entity. Both sites were chosen due to their different soil type (sandy soil in Lanjut Manis and clay soil in Bukit Rambai). The inoculant application was materialised in November 2020 in Bukit Rambai, witnessed by the head of the village, Tok Sidang Haji Rosli (Figure 2). He also operated the tested rice field. This act shows his strong support towards a cleaner environment as well as his leadership by example principle.

The success of this project will change the rice plantation program not only locally, but also internationally. Burning the leftover solves only a single problem but created many other problems. Inoculant with straw decomposing capability solves the leftover yet minus the smoke and comes with additional fertiliser as a bonus. And yes, less chemical fertiliser will be required, and no more smoke will harm the asthmatic patient like Nina.

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DRONE REVOLUTION IN AGRICULTURE

By:

Shamsul Anuar Shamsudin
(i-SMAT)

For the past decade, a revolution has taken place in agriculture. The use of drone is becoming popular. The farms owned by corporations are usually large and would require many workforces to manage. However, most of the workers in plantations are foreign workers. Some of these negative impacts are discussed by Abdul-Rahman et al. in [1] albeit for the nation's construction sector.

Nevertheless, the human population is growing fast that authorities are predicting a 70% increase in food needed by 2050 [2]. Radoglou-Grammatikis et al. [3] highlighted the options in using the Internet of Things (IoT) as well as the Unmanned Aerial Vehicles (UAV) or drones in achieving higher yield in agriculture. Mogili and Deepak in [4] pointed out that the agricultural fields could benefit from a more precise and safe delivery of pesticide and fertiliser using drones. This activity when done manually by human workers, may lead to adverse effects from the poisonous concoction [5]. Hence, the use of drones in this respect would alleviate harmful repercussion.

Another use of drone in farming in Europe is health-monitoring of crop growth [6]. Sensors can be attached to the drones and they can detect the condition of the crops from about 100 meters up in the air. Locations in the fields that need weeding could also be identified using drones. The cost of building an agricultural drone could be less than USD 3000 as suggested by Price and Richardson in [7]. Currently, there is even off-the-shelf solution that is about USD 1000 that could fertilise by liquid spraying and granule spreading. However, in durian or other local fruit smart farming, the capability of obstacle avoidance is crucial. Fortunately, studies like obstacle avoidance are aplenty.

A lucrative durian orchard usually has many trees. The trees would reach 20 meters tall after 20 years. When in season, the durians will drop to the ground usually at night. In many orchards in Malaysia, there are huts or small building for the owners to rest and watch after the orchard. The trees would need to be treated with fertilisers and watered regularly to ensure good quality fruits. Hence, drone technology can find a role in various farms here in Malaysia because it is doable. In the end, its use would likely increase productivity and save on workforce cost.

Naji in [8] almost single-handedly built a drone for visual surveillance at a farm in Texas as part of a graduate study. Therefore, similar applications can be made in Malaysian agriculture because there is locally available expertise. Many UTeM researchers may not already have a previous research grant for such a smart-farming or advanced agricultural project. However, many faculty members and student researchers have participated in remote control or autonomous underwater vehicle (AUV) and drone flying competitions and have published work on their involvement. This is evident from [9-11]. In the recent Singapore Autonomous Underwater Vehicle Competition (SAUVC) in Singapore, the Universiti Teknikal Malaysia Melaka (UTeM) team from the Faculty of Mechanical Engineering was able to share fourth-place finishes in the international meeting, which included autonomous features in the completion of three tasks in water. In addition, there was also a timed event where the AUV needed to complete a straight path. More recently, a PhD candidate is working on a UAV drone application for an agricultural project planned to take place at the UiTM, Jasin Campus. Hence, this work has a bright future ahead that can be built on various drone experience of many at UTeM.

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By:

Siti Nurhaida Khalil

(i-SMAT)

Merlimau Water Treatment Plant (WTP) Expansion Project Phase 1

The Merlimau WTP expansion plan was held based on these justifications:

- To increase the treated water supply from Merlimau WTP with an additional 55 MLD capacity.
- To ensure the treated water supply satisfies the needs of the approved developing area in the state of Melaka by the state Government.
- The treated water supply for this project is focussed on Melaka Tengah region, thus reducing water capacity load from Bukit Sebukor WTP and Bertam Plant.
- This project is proposed based on SAMB treated water supply forecast, which was presented in SAMB Business Plan.
- The status of water production at Merlimau WTP and the distribution area is shown in Table 1-1.

Table 1-1: Average Treated Water Production in Merlimau WTP and Distribution Area Water Demand

	Average production (MLD)	Distribution Area
2008	34.35	All over Merlimau, Sg Rambai Dan Sebahagian Jasin
2009	36.32	All over Merlimau, Sg Rambai Dan Sebahagian Jasin
2010	33.67	All over Merlimau, Sg Rambai Dan Sebahagian Jasin
2011	35.50	All over Merlimau, Sg Rambai, Sebahagian Jasin Dan Sebahagian Kecil Melaka Tengah.
2012	38.50	All over Merlimau, Sg Rambai, Sebahagian Jasin Dan Sebahagian Kecil Melaka Tengah.
2013	43.00	All over Merlimau, Sg Rambai, Sebahagian Jasin Dan Sebahagian Kecil Melaka Tengah.

Forecast for treated water demand and distribution for new Merlimau WTP Bukit Perah 2 project is as shown in Table 1-2. The forecast was made for usage in the year 2016 up to 2020. Table 1-2 is as shown. From this table, it is observed that the water demand in Melaka, especially Bandar Melaka, has increased tremendously.

Table 1-2 Forecast capacity for water distribution Merlimau WTP Phase 1 and 2

DISTRIBUTION AREA	ESTIMATED FORECAST CAPACITY (MLD)		
	2016	2018	2020
Kolam Bukit Perah Lama (Loji Merlimau Fasa I)*Sungai Rambai, Spg Bugis, Merlimau, Pulai and Umbai*	10	14	16
Kolam Bukit Bahudin (Loji Merlimau Fasa I) *Sebahagian Jasin termasuk Bandar Jasin, Kawasan lot-lot MAIM, UiTM Semujok, Penjara Industri dan Chin-Chin.*	10	15	23
Kolam Serkam Baru (Loji Merlimau Fasa I) *Kawasan Perindustrian Serkam , Kampung Tersusun Lipat Kajang dan Projek Rimbunan Kasih.*	10	14	16
Kolam Bukit Lintang Baru (Loji Merlimau Fasa II)*Kawasan Industri Telok Mas, Semabok, Pulau Besar dan Crystal Bay.*	30	31	32
Kolam Bukit Lintang Baru – Kolam Bukit Senjuang – Kolam Pulau Melaka (Loji Merlimau Fasa II)*Melaka Coastal Area, Banda Hilir, Melaka Raya and Pulau Melaka*	20	22	23
Total	80	96	110

This justifies the needs for upgrading the water supply network via Merlimau WTP to Bandar Melaka intake i.e. to support the demand from various users. Next Figure 1-1 will show the water projection for the state of Melaka, an analysis held by SAMB, Syarikat Air Melaka Berhad.

With the implementation of this project, it is expected that the need for a clean water supply for Melaka from 2016 to 2020 will be fulfilled. This is very important to accommodate the needs of the people and the development of the state, especially from the demand of the industrial sector expected to grow in the Jasin area.

Conclusion

Water supply from the proposed expansion of the Merlimau Phase II plant is more towards the Central Melaka district especially on the coastal areas of Ketapang Beach, Pulau Besar, Crystal Bay, Semabok, Melaka Raya commercial area, Banda Hilir tourism area and development in Melaka Island. From the studied water usage model conducted, after the completion of the new plant, it shows that the water supply reaches up to 50 MLD capacity. Thus additional 55MLD is essential to support future demand in these areas. This will help reduce the production load from the Bukit Sebukor plant which has already reached its maximum production capacity where this plant can no longer meet the current and future development of Melaka Raya and Malacca's commercial areas.

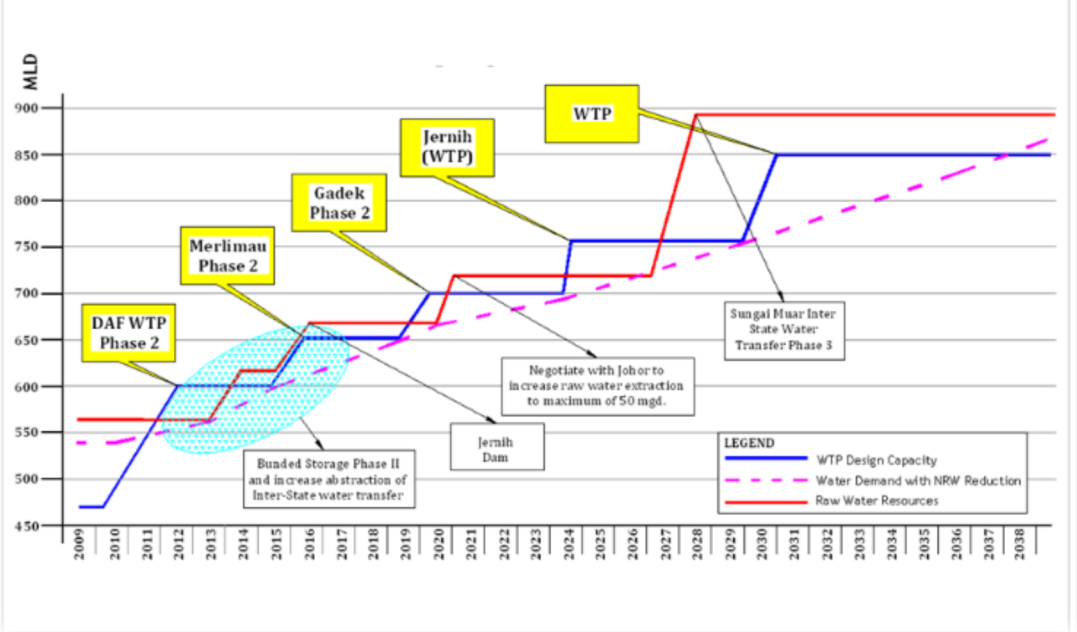

Figure 1-1: Projection or clear water demand in Melaka (2009-2038)

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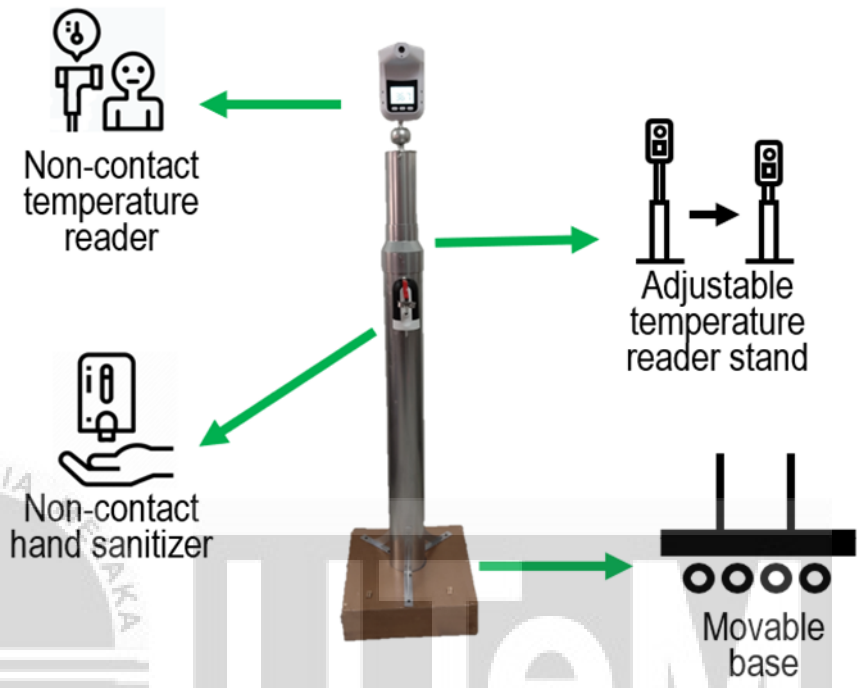
V3S: Visitor Screening and Sanitizing Station

By:

Nurul Hilwa Mohd Zini
(G-TriboE)

The world is currently fighting with Covid-19 pandemic, with some countries are discussing to authorise the use of Pfizer and BioNTech's coronavirus vaccine to their citizens. However, according to Malaysia Deputy Minister of Science, Technology and Innovation, Ahmad Amzah Hashim, about 30% will not be vaccinated. They will be children aged below 18 years old and those with immune system problems. Thus, a good practice like washing hands with soap and water recommended by the World Health Organization (WHO), must be complied as the preventive measure to stop the spreading of Covid-19 virus among the community. Otherwise, 60% alcohol-based hand sanitiser can be used as the alternative. Malaysia government has developed the Standard Operating Procedures (SOPs) for business premises which require visitors to be screened before entering the premises. This screening process includes MySejahtera QR code scanning, temperature scanning, and hand sanitising.

However, the concern with the current screening process in the business premises is the non-hygienic method of body temperature scanning and hand sanitising. Since the visitors can be from different age groups; small children to adults, handheld temperature readers are typically used to suit all visitors with different body heights. However, this method may increase the possibility of spreading the virus as everyone would touch the temperature readers. Most of the time, there is no person in-charged to hold the temperature readers at the entrance of the premises. After the temperature scanning process, the visitors will also need to sanitise their hand and again, most of the premises provide only manual hand sanitisers. The visitors need to touch the top cap of the sanitiser bottles, raising the risk of spreading the virus.



Visitor Screening and Sanitizing Station

A prototype called Visitor Screening and Sanitising Station (V3S) has been developed by a group of researchers from CARe, UTeM to replace the manual processes of temperature scanning and hand sanitising. The idea of this prototype is to include all of the touchless screening equipment in a single station. The device consists of an automatic temperature reader with a height-adjustable feature, which allows the visitors to effortless scan their body temperature by just stepping on a button located at the base of the station, and reaching out their hands to a contactless, self-pumped hand sanitiser. They just have to put their hand close to the sanitiser sensor to dispense the sanitiser liquid.

The visitors can also scan the MySejahtera QR code on the same station within an easy-hand reach. The whole new procedure through this prototype does not require the visitors to make any contact to the temperature reader and sanitiser with their bare hands and introducing more hygiene method.

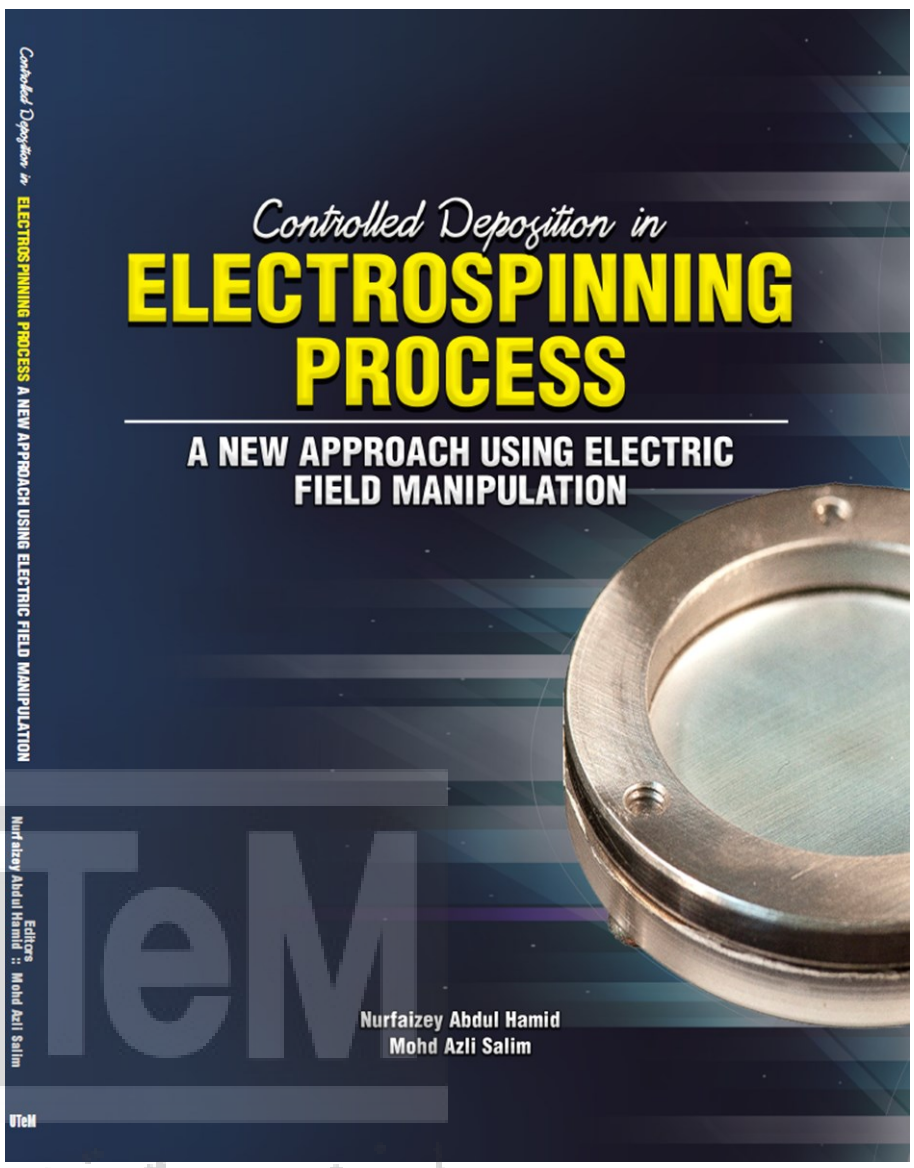
This innovation aims to minimise or eliminate contact during the visitor screening and sanitising process at business premises. The researchers involved in this project are Dr. Nurul Hilwa Binti Mohd Zini, Dr. Fadhilah Binti Shikh Anuar, Muhammad Hafiz Bin Mohd Fadzil, Muhammad Shukri Azizi Bin Razak, Muhamad Fakhrul Akmar Bin Fazli, Syed Hafiz Hakimi Bin Syed Najmuddin, Zam Firdaus Bin Che Zamri.

INSIGHT INTO ELECTROSPINNING

By:

Nurfaizey Abdul Hamid
(A-MAT)

Electrospinning is a simple, versatile, and scalable method of producing polymeric nanofibres from a solution or melt using electric charge. Since the 1990s, electrospinning gained much interest due to global interest in nanotechnology. The process was introduced in the mid-'90s as a method of producing nanoscale fibres. For the first time, the word "electrospinning" was used by Doshi & Reneker in a journal article in 1995. The work is often cited as having started the next wave of interest in the field as evidenced by the rapid increase of publications in the following years. However, the use of electric charge to produce fibres from fluids was first described in a patent by John F. Cooley (1900) followed by a patent by William J. Morton (1902). Three decades later, from 1934 to 1944, several patents were granted to Anton Formhals (1934) on the process and apparatus of producing artificial threads.



Due to their nanoscale diameters, electrospun fibres have been the subject of many attempts for applications that require a high surface-area-to-volume ratio. A wide variety of applications such as filtration, tissue engineering, wound dressing, drug delivery, composite reinforcement, and electronics, have been proposed. Among others, the most notable application of electrospun fibres is in filtrations. A nanofibre is as thin as 1/100,000 of a human hair (Figure 1) many a filter made of nanofibers would have high porosity with many attempts area-to-volume ratio. The earliest recorded attempt in industrialising electrospun nanofibres took place in the Soviet Union. In 1938, a group of scientist from L. YaKarpov Institute in the USSR developed electrospun fibres gas masks known as Petryanov Filters®. Nowadays, filtration products made of electrospun nanofibres have been successfully marketed such as the Ultra-Web® by Donaldson Company Incorporation, Hybrid Membrane Technology (HMT) by DuPont™, and Nanosan® by NanoStruck Technologies.

A basic electrospinning machine consists of two electrodes; a source electrode which is connected to a high voltage power supply (positive or negative polarity); and a grounded conductive electrode or collector which is placed opposite to the source electrode (Figure 2). At the source electrode, a polymer solution is forced to flow through an orifice either using the constant flow system of a syringe pump or constant pressure system using gravity. The component with the orifice is often called the "spinning tip" or "spinneret". At an appropriate feed rate, a pendant polymer droplet will form at the end of the spinneret. When the droplet is charged, the electrostatic forces between the like-charged molecules cause the semi-spherical shape of the droplet to deform; however, the surface tension of the droplet prevents it from breaking up. At this moment, the droplet's shape takes on a conical shape known as the Taylor cone. When the applied voltage reaches a critical value, the electrostatic forces are higher than the surface tension of the droplet, the surface ruptures and a straight jet of polymer is ejected from the vertex of the Taylor cone accelerating towards the collector. Due to intermolecular bonding, the charged jet does not break up due to the Plateau-Rayleigh instability and thus fibres are formed at the collector electrode.

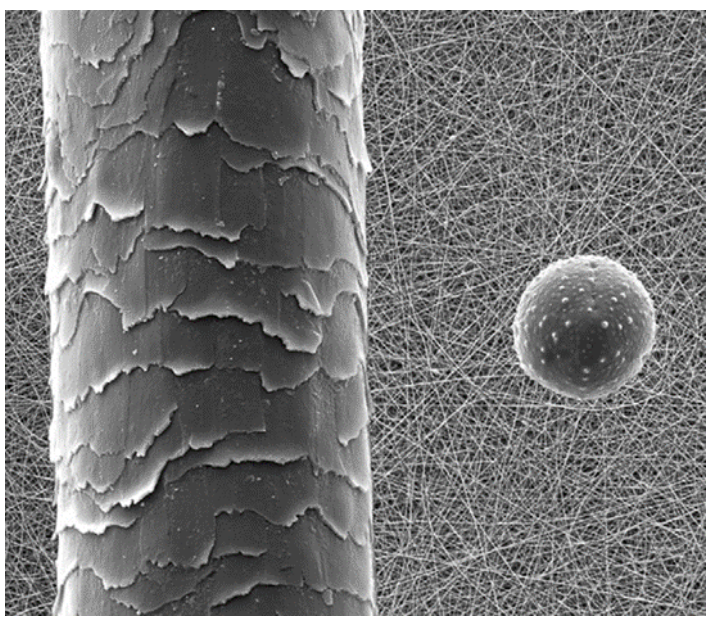


Figure 1. Scanning electron micrograph illustrating size difference between human hair (left), a pollen grain (right), and electrospun nanofibers in the background. Image from Elmarco s.r.o.

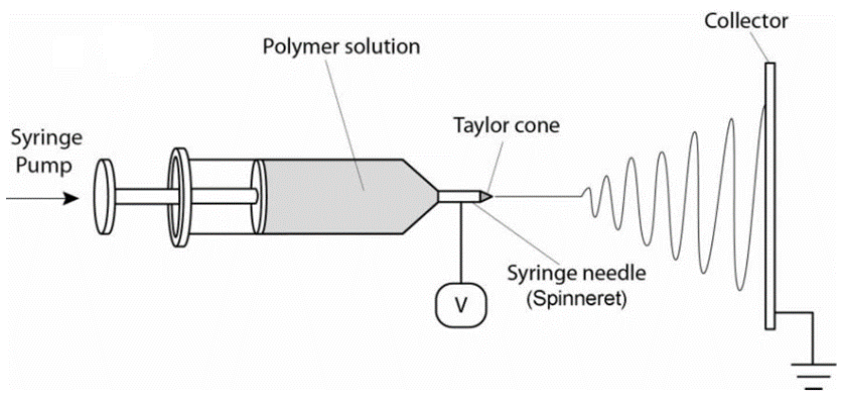


Figure 2. A schematic of the electrospinning process.

Book publication by AP Ir. Ts. Dr. Talib

By:

Abdul Talib Din
(i-SMAT)

Associate Professor Ir. Ts. Dr. Abdul Talib Din (AP Ir. Ts. Dr. Talib) from Faculty of Mechanical Engineering UTeM has recently produced several books which are very useful for engineers and the students of engineering. The books' titles are Etika Profesional Jurutera Malaysia which translated as Professional Ethics for Malaysian Engineers, Tatacara dan Kaedah Perundingan Kejuruteraan di Malaysia, and Integrated Design Project – An Exemplary Guideline for Course Implementation.

Professional Ethics for Malaysian Engineers is a very crucial knowledge that conveyed by the book titled Etika Profesional Jurutera Malaysia. This book is handy for engineers who want to know deeply about engineering professional ethics and also very easy to understand as it gives many examples relevant to real engineering cases. The book can be used as a basic reference for the engineers in dealing with their daily works or activities with respectable professional conducts and integrity.

While book titled "Tatacara dan Kaedah Perundingan Kejuruteraan di Malaysia" is authored by several Professional Engineers cum Academicians from UTeM including and edited by AP Ir. Ts. Dr. Talib. It is useful for the Professional Engineers who want to know the procedures and the regulations how to register a consultancy company with the BEM (Board of Engineers, Malaysia), the Ministry of Finance and the government agencies. It includes how to operate consultancy companies in order to meet the requirements of the government, local authorities and clients with concern on the safety and health of the public and end-users.

Finally, the book titled Integrated Design Project – An Exemplary Guideline For Course Implementation is a book specially authored by several FKM lecturers including and edited by AP Ir. Ts. Dr. Abdul Talib Din. It is a very detailed and structured guideline by example for the student to learn the subject on Integrated Design Project. This subject was made compulsory to be incorporated in the curriculum by EAC (Engineering Accreditation Council) to enable the Higher Learning Institutions to gain accreditation from BEM.

One Year Establishment of Advanced Academia-Industry Collaboration Lab

AiCL is the new lab being established in FKM. The main distinguishing characteristic of this laboratory is that it becomes the establishment of fostering collaboration between academia and industry. All the research projects are conducted based on the real problems faced by the industry. The research activities in this laboratory are conducted by researchers at the doctor of philosophy, masters, and bachelor degree levels. Ts Dr. Mohd Azli bin Salim led this laboratory and assisted by researchers; Mr. Adzni bin Md Saad, Associate Professor Dr. Nor Azmmi bin Masripan, Ts. Dr. Mohd Zaid bin Akop, Dr. Nurfaizey bin Abdul Hamid, Mr. Faizil bin Wasbari and Ts. Aminurrashid bin Noordin. It has three(3) doctor of philosophy students, six(6) master of science students and 12 bachelor degree students who are completing their final year project.

A team of researchers from this laboratory has been selected by Radio Television Malaysia (RTM) to film the research documentary of this laboratory. The selection criteria are based on the successful outcomes of the conducted research activities, where the industry has successfully accepted the research products. A total of two research projects that have been chosen for the filming are "Nanoparticles Conductive Ink for Electronics Packaging Industry" and "Semi-automatic Machine of Safety Cone Laying and Picking". Both of these research projects are led by Ts. Dr. Mohd Azli bin Salim, and assisted by all the team members including Prof. Dr. Ghazali bin Omar.

Report by: Adzni Md. Saad, Nor Azmmi Masripan & Mohd Azli Salim

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Contact us

Centre for Advanced Research on Energy
Faculty of Mechanical Engineering
Universiti Teknikal Malaysia Melaka
Hang Tuah Jaya, 76100 Durian Tunggal, Melaka, Malaysia

Phone : +606 234 6891
Fax : +606 234 6884
E-mail : care@utem.edu.my

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