STIRLING ENGINES: OPERATIONAL THEORY, DEVELOPMENT HISTORY, DESIGN CONFIGURATIONS AND APPLICATIONS



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Abstract. The attractive performance of Stirling engine attains great interests and meets the demands of the efficient use of abundant energy and environmental security. The development and investigation of Stirling engine have come to the attention of scientists and engineers due to its simplicity, reliability and environmental-friendly. The first Stirling engine was invented by Robert Stirling in 1816. The Stirling engine operates on a closed thermodynamic regenerative cycle. The Stirling engines have indicated its multi-fuel capability to operate with variety of possible solid-, liquid- and gaseous fuel with wide range of operating temperature. The importance feature of the engine is that it can utilize abundant heat source from solar irradiation, waste-heat from industry, heat produced from agricultural waste and other low- and moderate-temperature sources. The efforts in development and investigation made by scientists and engineers since from the invention indicate useful base line information for future engine systems design. It is observed that successful engine operation depending on the careful selection of driving mechanism and engine configuration.

I. INTRODUCTION

Currently, energy demand has significantly increasing in a continuous manner worldwide, as well as the progressive population growth, rising living standards and v arious buildings sectors. The world has to face daunting pressures on the energy market. Past decades expressing a significant increase in electricity demand along with a considerable rise of its consumption, as well as its retail prices and fuel costs (Bravo et al., 2012). Several countries facing the suffer from these increasing demands with constant or even decreasing power supply, which leads to a progressive growth in the energy shortage gap (Al Moussawi, Fardoun, & Louahlia-Gualous, 2016). The limitations and constraints on existing electricity supply and delivery, concerns on worsening environmental conditions and climate change, grid infrastructure, population health and financial consequences describing another affecting situation that induced increasing pressure on the energy situation (Shafie, Mahlia, Masjuki, & Ahmad-Yazid, 2012).

Apparently, the interest and exploitation of renewable and alternative energy sources significantly increase for better energy production, efficiency and consumptions, thus minimizing the worsening energy-related issues (Hachem, Gheith, Aloui, & Ben Nasrallah, 2018). A large amount of low and moderate temperature heat is released from various industrial processes. It was reported that about one third of energy consumption in the world based on industrial activities, and about 20-50% of the waste heat exposed to the atmosphere. Low and moderate temperature heat resources from renewable sources (solar, biomass, geothermal, etc.) already available over the world, as well as the waste heat. Therefore, exploiting these low-grade waste heat and renewable sources provides significant advantages and opportunities for addressing the energy-related problems (Wang, Sanders, Dubey, Choo, & Duan, 2016).

Stirling cycle engines have attracted increasing attention in recent decades due to the great capability of utilizing low-grade heat sources with potentially high thermal efficiency (Ahmadi, Ahmadi, & Pourfayaz, 2017). The Stirling engines operate with a closed regenerative thermodynamic cycle that equivalent to the theoretical thermal efficiency of the Carnot cycle.

The usage of compressible working fluid such as air, helium, hydrogen, and nitrogen based on periodical expansion and compression at different temperature levels allows the conversion of thermal energy into mechanical energy. The ability of Stirling engines to use various fuel as heat source with high thermal efficiency, low noise operation, and ease of construction and maintenance meet the demand of the effective use of energy sources (Thombare & Verma, 2008). The Stirling engines operate at low and moderate temperature heat sources have a wide application prospect for recovering small-scale distributed low-grade thermal energy (Wang et al., 2016).

II. TECHNICAL DEVELOPMENT HISTORY OF STIRLING ENGINES

The first regenerative cycle heat engine was invented by Robert Stirling, a Scottish minister in 1816 with patent no. 4081 (Refer to Figure 1). The first Stirling engine was coal-burning, low-pressure air engine developed to compete with saturated steam engines for providing auxiliary power for manufacturing and mining (Stine, 1999). Numerous Stirling engine based on his invention were built in many forms and sizes because of the engine was simple construction and safe to operate, low noise operation for any combustible fuel, clean and efficient compared to steam engines. However, the first era of the Stirling engines were severely hampered due to rapid development of internal combustion engines and electric motor (Kongtragool & Wongwises, 2003).

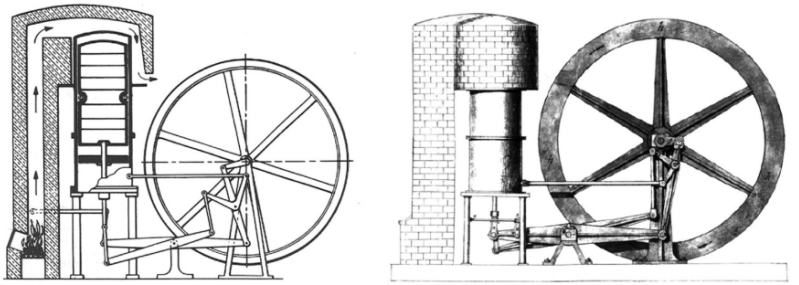


Figure 1: An illustration of first Stirling engine invented by Robert Stirling.
Source: (Erol, Yaman, & Doğan, 2017).

Although the earlier Stirling engine was huge and less efficient, the efforts in developing new engines were continued to improve the deficiencies. A number of modern Stirling engine are being developed and more efficient than the early engines, and could be operated at any sufficient heat source temperatures. Some of significant development of Stirling engine is summarised in **Table 1**. Over the last 50 years, various engines size of power has been built mainly for power generation.

Table 1. Technical development of Stirling engines for power generation.

Year	Researchers	Achievements
1816	Robert Stirling	Invented and patented a regenerative cycle heat engine
1853	John Ericsson	Built a large marine SE producing a brake power of 220 kW.
1872	John Ericsson	Developed a solar thermal dish/Stirling for irrigation, refrigeration, and locomotion.
1937	Philips	Developed a small thermal-power electric generator for auxiliary equipment such as radios in remote areas.
1954	Philips	Developed a SE using hydrogen as working fluid and produced 30 kW of power.
1973	Philips/Ford	Performed an experimental study on automotive SE and accomplished an individual power of over 300 times than early SE.
1978	Gupta et. al.	Developed a 1 and 1.9 kW solar-powered SE for rural applications.
1990	Ahmed et. al.	Reported briefly the operation of 50 kW SE for electricity production.
1992	Dixit et. al.	Designed a compact power generating system capable of using the combination of variety solid fuels as a local power source.
1993	Clucas et. al.	Developed a SE for battery charging system.

1999	Podesser	Developed a 3.2 kW SE powered by flue gas of the biomass furnace for electric power generation in rural villages.
2002	Davernport et. al.	Described the operation of the second-generation of Dish/Stirling system and improved the engine performance based on power produced from below 20 kW to 23 kW.
2006	Reinalter	Developed and analysis of 10 kW Dish/Stirling system that produced 11 kW of electric power.
2009	Gopal et. al.	Developed a SE for micro combined heat and power (microCHP) system for domestic scale application.
2012	Nayak et. al.	Developed a SE for energy conversion using thermal energy in sea water for electricity generation.
2012	Ming, G. L.	Developed a parabolic Dish/Stirling concentrating solar thermal-electric energy conversion system.
2015	Zainudin, M. F.	Developed a small capacity single-cylinder rhombic drive beta-configuration Stirling engine prototype

Instead of generating electric power, many researchers were developed a Stirling engine for automobiles by companies such as General Motor and Ford in 1970 and 1980's. During the conducted test, it was found that the Stirling engine tends to run at constant power tuning, which is not proper for automobiles. However, this limitation provides a perfect characteristic for certain applications such as water pumping and combined heat and power (Kerdchang et al., 2005). Currently, studies about high-temperature differential SE has been reported, having a heater and cooler temperature about 923 K and 338 K, respectively. Besides, the thermal limit for engine operation of high-temperature Stirling engine depends on the material used for the engine construction itself. The engine efficiency also varies from about 30 to 40 %, based on the operating temperature range of 923 to 1073 K, and average running speed ranging from 2000 to 4000 rpm (Tavakolpour, Zomorodian, & Golneshan, 2008).

III. OPERATIONAL THEORY

A Stirling engine is a heat mechanical device which operates on a closed regenerative thermodynamic cycle. The cycle consists of cyclic compression and expansion of compressible working fluid at different temperature level such that a net conversion of heat energy into useful mechanical work is produced. Since the Stirling engine is external-heated, the heat is transferred from the heat source to the working fluid through the engine wall. As the working fluid is in a closed system, there are no problems with contamination and working fluid losses.

In the ideal Stirling cycle, it has three theoretical advantages. Firstly, as the ideal cycle consists of the ideal regeneration, the thermal efficiency of the cycle is equal to Carnot cycle. The regenerator, typically known as temporary heat storage, rapidly absorbs or releases the heat from or to the working fluid which is passing through. Secondly, as the Stirling cycle consists of two isentropic processes with two constant-volume processes, this resulting in increasing the amount of work without the necessity to use higher pressure limits and large swept volumes. Compared with other reciprocating heat engines that operate within the same operating conditions, the ideal Stirling engine is subjected having highest mechanical efficiency (Kongtragool & Wongwises, 2003).

For an ideal Stirling cycle operation, it consists of four thermodynamic processes acting on the closed volume of working fluid. The processes are commonly called as isothermal compression and expansion, and constant-volume heat addition and rejection. Considering a cylinder containing two-opposed piston with a regenerator located between the pistons as shown in Figure 2, the ideal Stirling cycle starts with the assumption that the piston at the compression space is at the outer dead point (bottom dead centre) and the piston at the expansion space is at the inner dead point (top dead centre), close to the regenerator. As the working fluid is in the cold compression space, the compression volume is at maximum while the pressure and temperature are at their minimum values represented by point 1 on P-V and T-S diagram (Figure 3a and 3b).

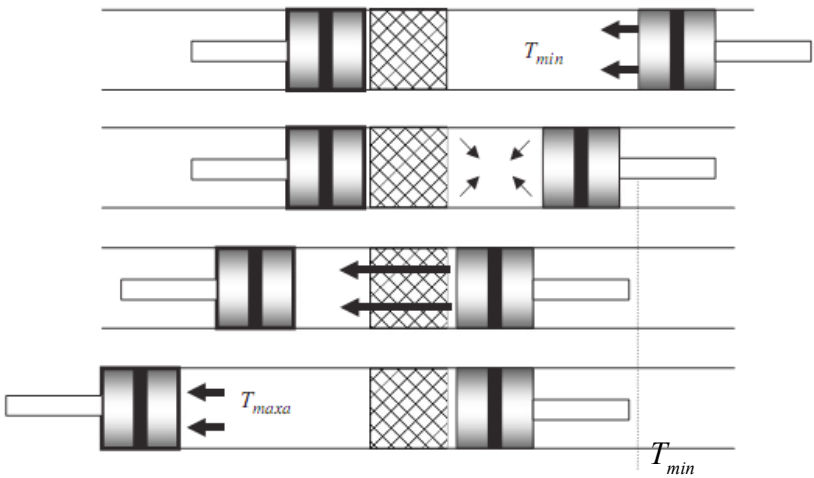
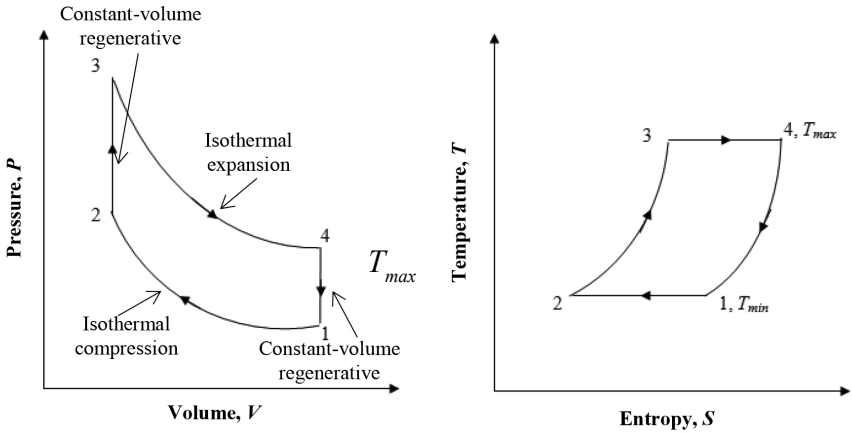


Figure 2. Engine arrangement for ideal cycle.
Source: (Thombare & Verma, 2008).



a. P-V diagram.

b. T-S diagram.

Figure 3. The ideal Stirling cycle.
Source: (Thombare & Verma, 2008).

Process 1-2, isothermal compression process: During this compression process, the compression piston moves toward regenerator while the expansion piston remains stationary. The working fluid is compressed in the cold space, and the pressure rises from P_1 to P_2. The temperature is maintained constant due to the heat flow from the cold space to surrounding. Meanwhile, work is done on the working fluid equal in magnitude to the heat rejected from the cycle. There is no change in internal energy, and there is a decrease in entropy. Within the isothermal compression process, the heat transfer involves from the working fluid to the cold sink at T_{min}:

$$P_2 = P_1 (V_1/V_2) = P_1 r_v \tag{2.1}$$

where $T_1 = T_2 = T_{min}$

Heat transfer, Q_{12} = Work done, W_C:

$$Q_{12} = W_C = P_1 V_1 \, ln \, (1/r_v) = mRT_1 \, ln \, (1/r_v) \tag{2.2}$$

Change in entropy:

$$s_2 - s_1 = R \, ln \, (1/r_v) \tag{2.3}$$

Process 2-3, constant-volume regenerative transfer process: In this process, both pistons move simultaneously. The compression piston moves toward regenerator and expansion piston moves away from the regenerator, so that the volume between pistons remains constant. The working fluid is transferred from the compression space to expansion space through porous media regenerator. The temperature of working fluid increases from T_{min} to T_{max} by heat transfer from the regenerator matrix to working fluid. The gradual increase in temperature of working fluid in this process causes an increase in pressure. However, no work is done, and there is an increase in the entropy and internal energy of the working fluid. The heat transfers from the regenerator matrix to the working fluid at constant-volume:

$$P_3 = P_2 (T_3/T_2) = P_2/\tau \tag{2.4}$$

where $V_3 = V_2$, and $\tau = T_2 / T_3$. Heat transfer from the regenerator matrix to the working fluid:

$$Q_{23} = C_v (T_3 - T_2) \tag{2.5}$$

Change in entropy:

$$s_3 - s_2 = C_v \, ln \, (1/\tau) \tag{2.6}$$

Process 3-4, isothermal expansion process: In the expansion process, the expansion piston continues to move away from the regenerator towards outer dead piston while the compression piston remains stationary at inner dead point adjacent to regenerator. As the expansion piston proceeds, the pressure decreases as volume increases. The temperature remains constant by adding heat to the system from an external source at T_{max}. Work is done by the working fluid on the piston equal in the magnitude to the heat supplied. There is no change in internal energy, but an increase in the entropy of the working fluid.

$$P_4 = P_2 (V_3/V_4) = P_3 (1/r_v) \tag{2.7}$$

where $T_4 = T_3 = T_{max}$

Heat transfer, Q_{34} = Work done, W_E:

$$Q_{34} = W_E = P_3 V_3 \, ln \, (1/r_v) = mRT_3 \, ln \, (1/r_v) \tag{2.8}$$

Change in entropy:

$$s_3 - s_4 = R \, ln \, r_v \tag{2.9}$$

Process 4-1, constant-volume regenerative process: In this process, both pistons move simultaneously to transfer working fluid from the expansion space to the compression space through regenerator at constant volume. During the flow of working fluid through regenerator, the heat is transferred from the working fluid to the regenerator matrix reducing the temperature of working fluid to T_{min}. In this process, no work is done, but there is a decrease in the internal energy and the entropy of the working fluid.

$$P_1 = P_4 (T_4/T_1) = P_1\tau \tag{2.10}$$

where $V_1 = V_4$, and $\tau = T_2/T_3$. Heat rejection from the working fluid to the regenerator matrix:

$$Q_{41} = C_v (T_1 - T_4) \tag{2.11}$$

Change in entropy:

$$s_1 - s_4 = C_v \ln \tau \tag{2.12}$$

and if

$$r_v = V_4/V_3 = V_1/V_2 \tag{2.13}$$

The total heat supplied, $Q_{in} = RT_3 \ln r_v$, and the total heat rejected, $Q_{out} = RT_1 \ln r_v$. Then the thermal efficiency can be written as:

$$\eta_t = (mRT_3 \ln r_v - mRT_1 \ln r_v) / (mRT_3 \ln r_v) \tag{2.14}$$

$$\eta_t = 1 - (T_1/T_3) = 1 - (T_{min}/T_{max}) = 1 - \tau \tag{2.15}$$

The Stirling cycle is highly idealized thermodynamic cycle, which consists of two isothermal and two constant-volume processes that are thermodynamically reversible. The first assumption of isothermal working fluid and heat exchange imply that the heat exchangers are required to be perfectly efficient, and infinite heat transfer rate is required between the cylinder wall and working fluid. Next assumption requires zero rates of heat transfer between the cylinder wall and working fluid. However, both assumptions remain invalid in practical engine operation (Thombare & Verma, 2008).

IV. DESIGN CONFIGURATIONS

Stirling engine can be broadly classified into three types of engine configurations according to the Kirkley-Walker classification system (Ming, 2012). The term describes the forms of cylinder coupling of a Stirling engine, in which the displacer piston and power piston are connected. These configurations, namely alpha-, beta- and gamma-configuration are commonly used where these configurations have the same thermodynamic cycle but different mechanical design characteristics (Kongtragool & Wongwises, 2003)

Alpha-configuration uses two sealed pistons, called expansion and compression piston in separate cylinders, which are connected in series on either side of the heater, regenerator, and cooler, as shown in Figure 4. These pistons move uniformly in the same direction to provide constant-volume heating and cooling process of the working fluid. The alpha engine is conceptually the simplest Stirling engine configuration. It can also be compounded into a compact multiple cylinder arrangements, enabling extremely high specific power output. The pistons are typically driven by a swash plate mechanism, resulting in a sinusoidal reciprocating motion having a 90-degree phase angle difference between the adjacent piston (Thombare & Verma, 2008).

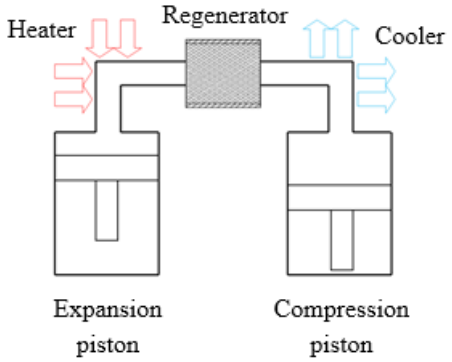


Figure 4. Alpha-configuration Stirling engine.

For the beta-configuration engine, it uses displacer and power piston that incorporated in the same cylinder. The compression space in this configuration consists of the space swept by the bottom side of the displacer and the top side of the power piston (refer to Figure 5). The piston and displacer are connected to crankshaft by separate linkage to maintain required phase angle. Beta-configuration offers advantages in terms of compactness, lower dead space and overlapping volume (Shendage, Kedare, & Bapat, 2011).

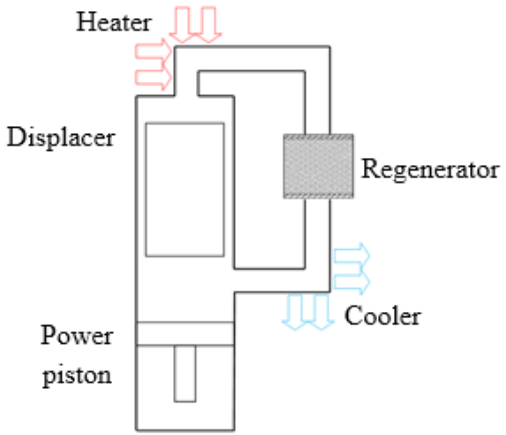


Figure 5. Beta-configuration Stirling engine.

Similar to beta-configuration, a gamma-configuration also used displacer and power piston. However, both pistons are located at separate cylinders as shown in Figure 6. In this configuration, the compression space is located between two cylinders with an interconnecting transfer port. This configuration provides the advantage of simple crank mechanism to drive both pistons. The gamma-configuration with double-acting piston arrangement has theoretically the highest possible mechanical efficiency. Besides, this configuration shows good self-pressurization. However, the cylinder orientation should be designed vertically rather than horizontally in order to reduce bushing friction (Kongtragool & Wongwises, 2003).

In the Stirling engine constructions, piston coupling mechanism is essential to create continuous motion to achieve volumetric changes that result in a net power output. The driving mechanism has to be able to provide the reciprocating motion to both piston and displacer, and simultaneously ensure the desired phase angle difference between their motions. Since the Stirling engine includes two volumes at different temperatures connected to each other through a heat exchanger, these volumes are required to change periodically to fulfil working fluid dynamic, thermodynamics and heat transfer requirements of the engine. The volumetric change is performed by driving mechanism with various mechanical arrangements.

Slider-crank

The slider-crank mechanism has been used in internal combustion engine because it is extremely reliable with a wealth of operating experience. This type of driving mechanism is used in double-acting engine either with or without a crosshead (refers to Figure 7). The advantage of using this type of driving mechanism is about the reliability and easy to be constructed. However, the disadvantage of using this mechanism is almost impossible to be balanced dynamically. Typically, this mechanism is extensively used in twin-cylinder arrangement (Erol et al., 2017).

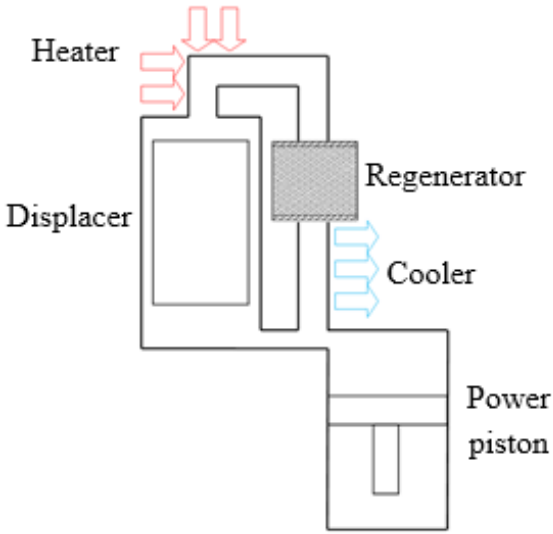


Figure 6. Gamma-configuration Stirling engine.

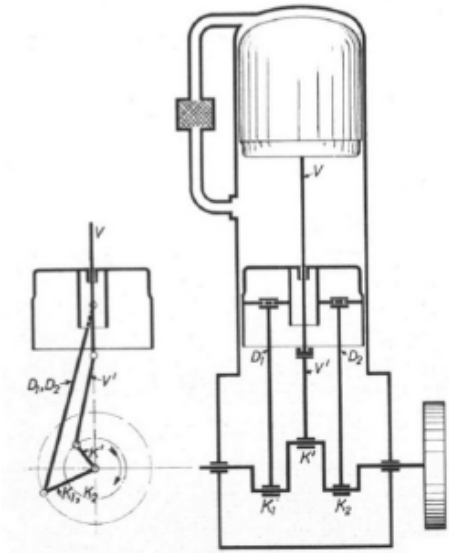


Figure 7. Slider-crank mechanism.
Source: (Erol et al., 2017).

Crank rocker drive

The crank rocker drive is the first drive mechanism used in Stirling engine. The crank rocker mechanism consists of power piston, crankshaft and swing arm, as shown in Figure 8. It is suitable for small single-cylinder engines. For an engine using this mechanism, the pressure in the crankcase must be minimum, close to the atmospheric pressure. The high level of charge pressure decreases the engine power. However, it is not preferable to be used in large engine due to its weight. The high friction acting on the power piston decreases the engine power (Erol et al., 2017).

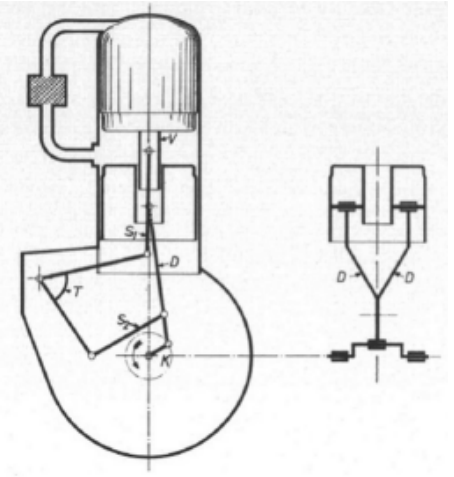


Figure 8. Crank rocker drive mechanism.
Source: (Erol et al., 2017).

Rhombic-drive

Figure 9 shows the schematic of Stirling engine with rhombic drive mechanism in beta-configuration engine. Rhombic drive mechanism was originally developed in 1953 by the Phillips Company for the twin-cylinder Lanchester car engine where it allowed perfect balancing of the inertial forces on both pistons (Shendage et al., 2011). Rhombic drive Stirling engine perhaps the most well-known and most developed single-cylinder Stirling engine. Compared to slider-crank drive, the rhombic drive provides

reduction in engine size, minimum side thrust, ensures silent working of the engine and gives maximum power output and higher thermal efficiency (Erol et al., 2017). However, the main disadvantages are the complexity of the unit. It has a large number of moving parts, bearing surfaces and need of a matched pair of gear wheels for each assembly (Thombare & Verma, 2008).

Wobble plate drive mechanism

The wobble plate drive mechanism was built by William Siemens in 1860. The schematic of wobble plate drive is shown in Figure 10. Based on these mechanism, it offers biggest advantage of specific output capability since no charge pressure is necessary. The wobble plate drive mechanism is generally used in double acting Stirling engines (García-Canseco, Alvarez-Aguirre, & Scherpen, 2015). Technically, the wobble plate drive is also used in pumps, compressors and internal combustion engines. Besides, the wobble plate drive mechanism is used to generates electricity by converting the linear motion of the pistons into rotary motion in the magnetic rotor. However, due to lubrication challenge, the friction loss and components wear is significantly high (Erol et al., 2017).

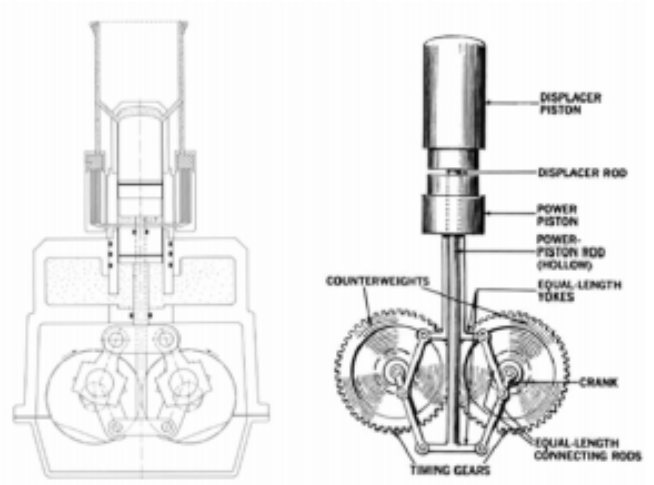


Figure 9. Rhombic-drive mechanism.
Source: (Erol et al., 2017).

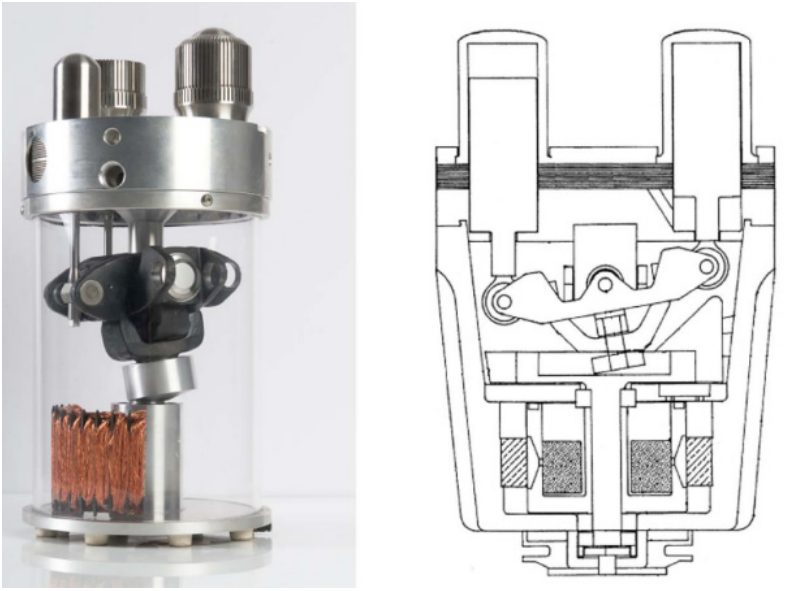


Figure 10. Wobble plate mechanism.
Source: (Erol et al., 2017).

Ross-yoke

The Ross-yoke drive mechanism developed by Andy Ross for Stirling engine is shown in Figure 11. The drive mechanism is used to reduce the weight and the size of single acting Stirling engine with two parallel cylinders without reducing the mechanical efficiency. The parallel cylinder configuration offers better connection to the heat exchangers. This mechanism does not create sinusoidal volumetric changes and the piston's motion functions are quite complex. In this mechanism, the two pistons are connected to the crankshaft with a triangular mechanism. The advantage of using this mechanism is that minimal lateral force acts on the pistons. This reduces the friction between the piston and the cylinder, thereby extending the working life of the parts. Besides, lubrication problems, vibrations and noise are minimal for the Stirling engines that used Ross-yoke drive (Erol et al., 2017).

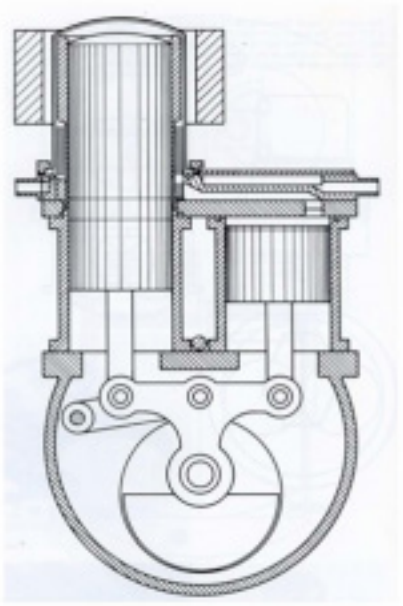


Figure 11. Ross-yoke drive mechanism.
Source: (Erol et al., 2017).

Scotch-yoke

The Scotch-yoke mechanism is shown in Figure 12. This mechanism was designed by Charles Algernon Parsons, and improvised to ensure perfect balancing by using the simple harmonic motions of the mechanism. In these mechanism, compact radial bearings may be used, and the dimensioning of these bearings requires the calculation of the forces acting on every single part. The Scotch-yoke drive mechanism is usually used in valve mechanisms of high-pressure petroleum and gas pipelines (Erol et al., 2017).

Swash plate

The swash plate drive mechanism is shown in Figure 13. This mechanism is mounted on a shaft supported by the piston and piston arms. Most

of the engines with swash plate drive mechanism are smaller than single or double acting Stirling engines with different drive mechanisms with the same power and number of cylinders. The engine size can be reduced up to 50%, compared to the in-line or boxer type rhombic drive engines with four cylinders in particular. The swash plate mechanism can be dynamically balanced with a constant angle (α). The balance problem decreases as the number of cylinders' increase. Besides, the engines equipped with this drive mechanism have fewer lubrication and noise problems. It is important to control the swash plate angle for controlling the power during engine operation. Sealing issues in high speed engines also must be considered. Because of its compact structure compared to other drive mechanisms, its manufacturing process is complex and uneconomical (Erol et al., 2017).

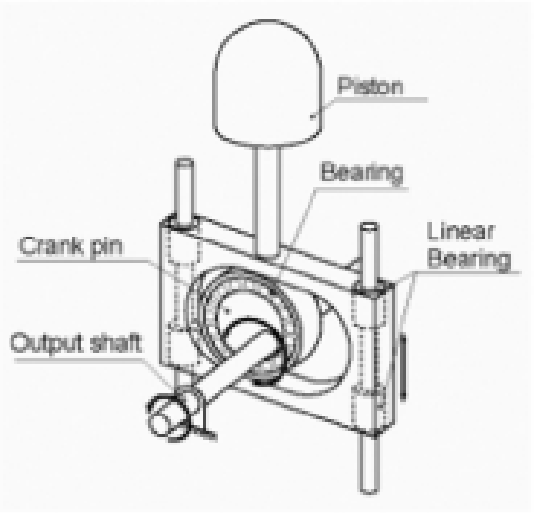


Figure 12. Scotch-yoke drive mechanism.
Source: (Erol et al., 2017).

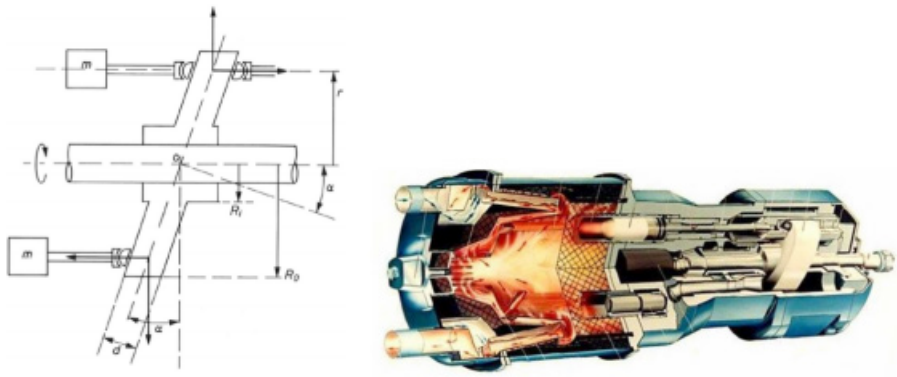


Figure 13. Swash-plate drive mechanism.
Source: (Erol et al., 2017).

Lever-drive

Figure 14 shows the mechanical arrangement of the manufactured Stirling engine equipped with lever drive mechanism. In this mechanism, the crankshaft has only one pin for the connection of piston rod and lever arm. The motion of the displacer is governed by a lever. The lever consists of two arms with 70° conjunction angle. One of them holds a slot bearing as the other holds a circular bearing. At the corner of lever, a third bearing exists. The lever is mounted to the body of engine through the bearing at the corner by means of a pin. The slot bearing at one arm of the lever is connected to the crank pin. The circular bearing at the other arm of lever is connected to the displacer rod. While the crank pin turns around the crank centre, it drives the lever back and forth around the pin connecting the lever to the body. The other arm connected to the displacer rod movers the displacer up and down. This mechanism presents better performance by means of minimizing the hot volume and maximizing the cold volume without changing the total volume (Halit Karabulut, Aksoy, & Oztürk, 2009).

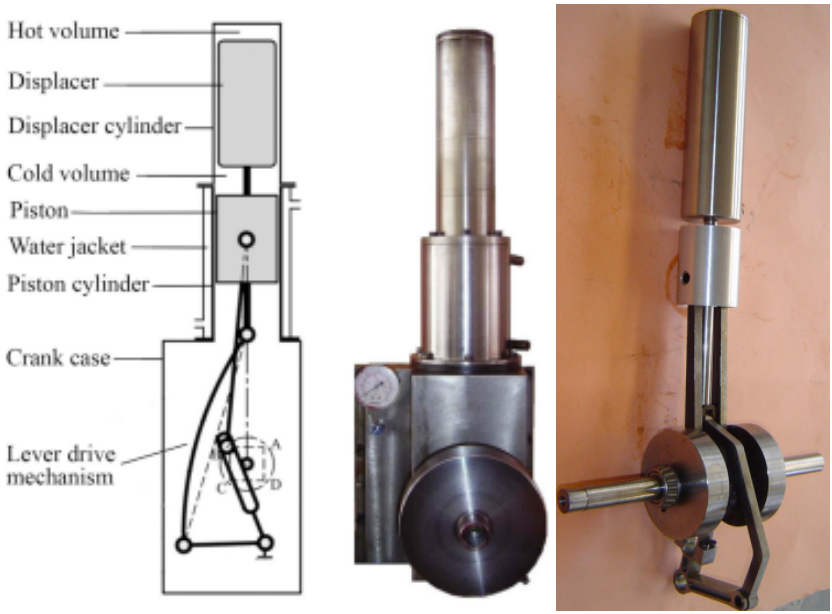


Figure 14. Lever-drive mechanism.
Source: (Halit Karabulut, Yücesu, et al., 2009).

Gas coupling

From the previous section, all engines were described have used driving mechanisms in which the piston is connected to the connecting rod by mechanical linkage, which is attached to a power output shaft. However, Stirling engine can operate without the piston being coupled mechanically. In other words, the power or displacer pistons are described as being free. The concept was first practically invented by William Beale, which the term Beale free piston engines are often used to describe free piston Stirling engines.

The piston is not being coupled mechanically, but it is coupled with gas dynamically. The configuration is identical to the piston-displacer form, except that there is no mechanical crank mechanism and the cylinder is properly sealed at both ends, since there is no piston rod passing out of the system. The displacer-piston rod is hollow and open at one end so that the

working fluid inside the displacer is in continuous communication with the fluid in the bounce which remains at the constant pressure. This working chamber constitutes a fluid-spring effect. Technically, the free piston Stirling engines are suitable for pumping water reciprocating pumps and linear alternator. However, the technical difficulties incurred with these type of engines are the about the sealing and durability of reciprocating components due to wear and tear (Thombare & Verma, 2008).

V. APPLICATIONS

The exploitation of low- and moderate-temperature heat source, and renewable energies provide significant opportunities resolve the energy related problems. Stirling cycle engines have attracted increasing attention in recent decades due to the great capability of recovering low-grade heat with potentially high efficiencies. The great flexibility to be powered by any kind of heat sources at any temperature levels with simple constructions and minimal costs make the Stirling engines have a wide application prospect for recovering small-scale distributed low-grade thermal energy (Wang et al., 2016).

External combustion engines may use variation of fuels as the heat source. Different Stirling engines use different heat sources such as solar, geothermal, natural gas, biomass, waste heat, etc. were designed and manufactured. Due to continuous combustion in atmospheric pressure, the Stirling engines that operate on fossil fuels produced lower emission level than the diesel and gasoline engines that use the same fuel (Erol et al., 2017). Various application of Stirling engines was developed, in electricity generation, solar power applications, water pumps, sea vehicles, nuclear power plants, etc. The electricity generation of Stirling engines with various fuels is shown in Figure 15.

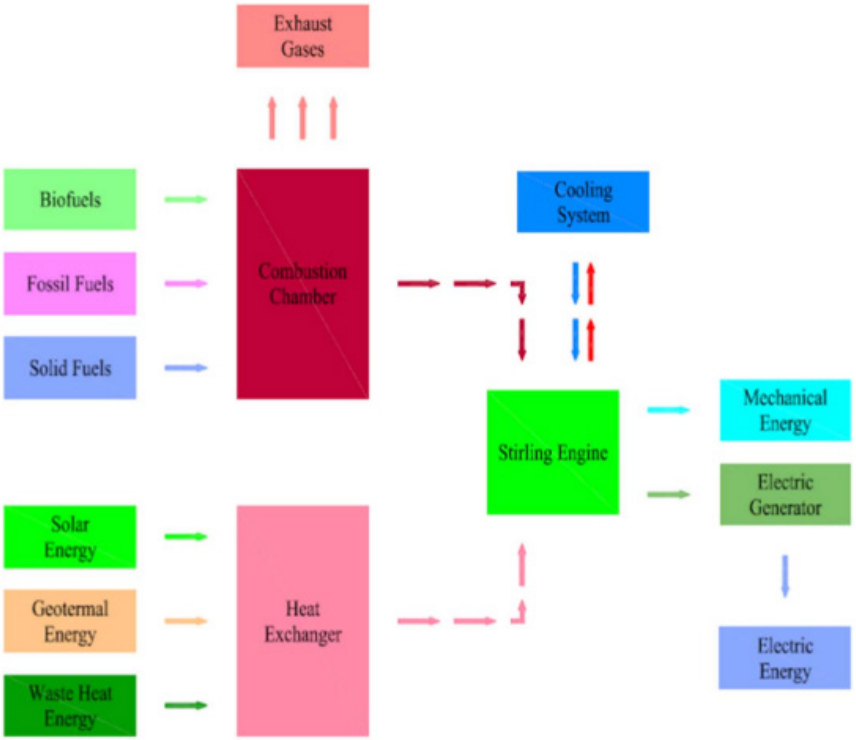


Figure 15. Energy generation from different fuels in Stirling engines.
Source: (Erol et al., 2017).

Solar thermal energy conversion is widely used to generate heat and produce electricity. The conversion from thermal to electric energy is getting remarkable popularity in industrial sector. Solar thermal energy is an alternative to generate electricity, process chemicals or even for space heating (Ming, 2012). Parabolic Dish-Stirling system is classified as one of the developed CST technologies. Based on Figure 16 and 17, the para-

bolic Dish-Stirling system design has a stand-alone parabolic reflector that concentrates sunlight on the focal point. The Stirling engine heat receiver located at the focal point region absorbs the concentrated thermal energy to produce mechanical work and then convert to electricity through an alternator/ electric generator. The parabolic Dish-Stirling system is applicable to off-grid power generation, such as remote area or island situations.

In other similar technology, a micro-cogeneration system in Figure 18 generates electricity as well as the heat energy simultaneously, which the electrical output is below than 5 kW (Alanne, Söderholm, Sirén, & Beausoleil-Morrison, 2010). The usage of Stirling engine for this system is self-sufficient to fulfil both heat and power output demand (Balcombe, Rigby, & Azapagic, 2015). These developed system contributes in optimizing the use of energy sources, improving the energy efficiency and reducing carbon emissions. This system widely developed in residential sector (Ferreira, Nunes, Martins, & Teixeira, 2012). However, recent research and development on solar-powered Stirling engines found enormous potential in cogeneration sector in order to increase the efficiency (Singh & Kumar, 2018).

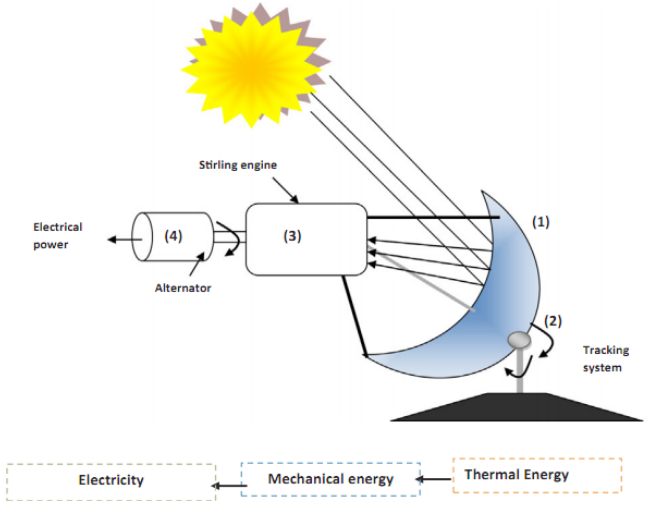


Figure 16. Parabolic Dish-Stirling system components and concept.
Source: (Hachem et al., 2018).

Besides, Stirling engines are well replicated in the field of cryogenics at very low temperatures. These cryo-coolers can liquefy nitrogen, hydrogen and helium. Several industries have manufactured Stirling cryo-coolers. Industries are aim to reduce the size of coolers. However, the cooling capacity decreases sharply with the size. Several research works are still performed to study the size limit of the Stirling cycle chillers and conducting micrometric investigations on chiller. Stirling engines also had been applied as direct propulsion for vehicles. First Stirling engine prototype was developed by Ford; however, the prototype has an issue of varying the mechanical power. Furthermore, some satellites also get electrical power through Stirling engines. The Stirling engine in space used the radioactive isotopes as the heat source (Hachem et al., 2018).



Figure 17. Parabolic Dish-Stirling system.
Source: (Ming, 2012).

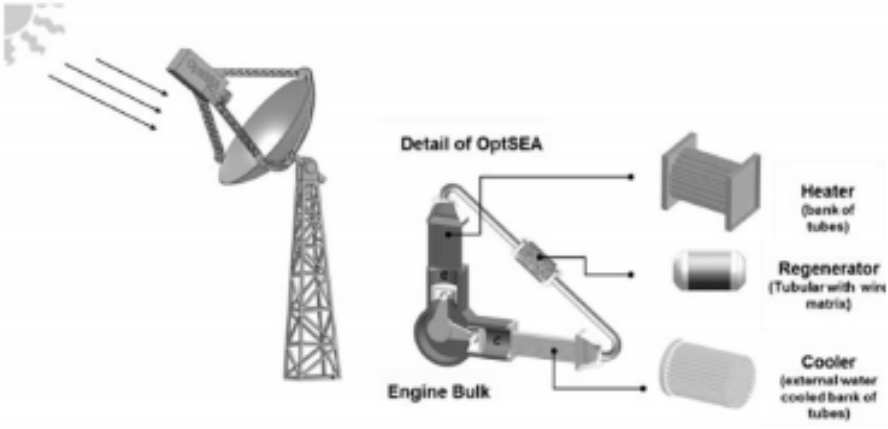


Figure 18. Layout of a solar-powered Stirling engine for micro-cogeneration. **Source:** (Singh & Kumar, 2018).

VI. CONCLUSION

The Stirling engines have indicated its multi-fuel capability to operate with variety of possible solid-, liquid- and gaseous fuel with wide range of operating temperature. The importance feature of the engine is that it can utilize abundant heat source from solar irradiation, waste-heat from industry, heat produced from agricultural waste and other low- and moderate-temperature sources. The efforts in development and investigation made by scientists and engineers since from the invention indicate useful base line information for future engine systems design. It is observed that successful engine operation depending on the careful selection of driving mechanism and engine configuration. The reliable and efficient operation of an engine is depending upon the dynamic behaviour of engine mechanism and performance of heat exchangers. An additional development information is needed to develop practical engine based on the selection of suitable engine configuration, adoption of working fluid and better sealing element design for alternative power generation.

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Zainudin, M. F. (2015). Development of small capacity rhombic drive beta-configuration Stirling engine. *Master Thesis.* Universiti Malaysia Pahang, Malaysia.

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5. Technical visit to MZ Engineering GmbH in Zhoupau, Germany, in conjunction with the joint collaborative project with MZ Motorrad Sdn. Bhd., 19th. To 20th. August 2003.
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8. Attended discussion on the Quality at Awana Kijal, Terengganu, Malaysia, 11th to 15th April, 2004
9. Attended discussion on the e-IRPA at KUITTHO, Batu Pahat, Johor 24th April 2004.
10. Technical visit to the Denmark for Automotive NVH Solution B&K, 24th to 28th September,2004
11. Technical visit to the Denmark for Combustion analyzer using laser, Dentac, 28th to 31th September, 2004
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iii. International Advisory Board of The 4th International Conference on Numerical Analysis in Engineering (NAE 2004)
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   iv. Bachelor of Technology (Hons) in Applied Automotive, Kuala Lumpur Infrastructure University College (KLIUC) (2007)
   v. Higher National Diploma In Automotive Engineering, Kolej WIT (WIT) (2007)

20. Malaysia Qualification Agency (MQA) 2007~2009
   a) Evaluator for Malaysia Qualification Agency (MQA) (Kejuruteraan dan Teknologi), 2007~2009
      i. Sarjana Muda Teknologi Kejuruteraan (Kepujian) Mekanikal (Automotif),Universiti Kuala Lumpur Malaysia Spanish Institute, (UniKL), (2007)
      ii. Diploma of Mechanical Engineering in Technical Japanese, Universiti Industri Selangor (UNISEL) (2007)
      iii. Doctor of Philosophy Mechanical Engineering, Universiti Teknologi Petronas (UTP) (2007)
      iv. Diploma Kejuruteraan Mekanikal, Kolej Nilai Antarabangsa Negeri Sembilan (2007)

v. B. Eng. Mechanical Engineering, Kolej SEGI Subang Jaya (2007)
vi. Diploma Kejuruteraan Automotif, WIT, Selangor (2007)
vii. Higher National Diploma in Automotive Engineering, WIT, Selangor (2007)
viii. Diploma in Mechanical Engineering, Kolej Nilai Antarabangsa Inti, Negeri Sembilan (2007)
ix. Diploma in Modern Automotive Technology, Kolej Otomotif TOC Selangor (2007)
x. Btec Higher National Diploma in Mechanical Engineering, Kolej Linton Negeri Sembilan (2008)
xi. UK Degree Transfer Programme - Mechanical Engineering, Kolej Nilai Antarabangsa Inti, Negeri Sembilan (2008)
xii. Diploma of Engineering Technology in Automotive Maintenance Technology, Kolej Antarabangsa Teknologi Inovasi Mutiara (2008)
xiii. B Eng (Hons) in Mechanical Engineering, Kolej TAFE Seremban, Negeri Sembilan (2008)
xiv. B Eng (Hons) in Automotive Engineering, Kolej TAFE Seremban, Negeri Sembilan (2008)
xv. Bachelor of Manufacturing Engineering Technology, Kolej Universiti Tati, Terengganu, (2008)

21. Ahli Jawatankuasa Meayuarat Pementauan Pembangunan Kampus Tetap Universiti Malaysia Pahang, 2007~2010
22. Ahli Jawatankuasa kecil Di Bawah Jawatankuasa Kerja (Akademik dan Antarabangsa) Rangkaian Universiti Teknikal Malaysia (MTUN), Program Kejuruteraan Teknologi, 2007~2009
23. Pengerusi Panel Penyiasat Kemalangan & Kerosakan kenderaan Rasmi Universiti Malaysia Pahang, 2007~2009
24. Ahli Jawatankuasa Penggubal Dokumen Plan Strategik Universiti Malaysia Pahang (UMP) 2008.

25. Ahli Jawatankuasa Tetap Senat Kurikulum, Pengajaran dan Pembelajaran, Universiti Malaysia Pahang, 2008 2008~2011.
26. Ahli Jawatankuasa Tetap Senat Penyelidikan dan Pengembangan Ilmu, Universiti Malaysia Pahang, 2008~2015.
27. Ahli Mesyuarat Jawatankuasa Pengurusan dan Kewangan dan Akaun Universiti (JKPA) UMP, 2005~2011.
28. Ahli Jawatankuasa Tetap Senat Kemasukan, Peperiksaan dan Pengijazahan, Universiti Malaysia Pahang, 2008~2015.
29. Advisor to the SAE Student Chapter UMP, 2008 - present
30. Ahli Jawatankuasa Tetap Senat Pengajian Siswazah, Universiti Malaysia Pahang, 2008~2015.
31. Ahli Jawatankuasa Induk Pemilihan Majlis Pewakilan Pelajar (JIMPP) UMP, 2009
32. Regimen Wataniah 505, Major Kehormat, 2009 – present
33. Malaysia Qualification Agency (MQA) 2009~2011.
    a) Panel Penilai MQA (Kejuruteraan dan Teknologi), 2009~2011
        i. Diploma in Mechanical Engineering Kolej Antarabangsa Teknologi Lanjutan Serawak, (2009)
        ii. B Eng (Hons) in Automotive Engineering (A6248), Kolej TAFE Seremban, Negeri Sembilan (2009)
        iii. Diploma in Mechanical Engineering, Kolej Universiti Teknologi Antarabangsa Twintech, Kuala Lumpur (2009)
        iv. Diploma Kejuruteraan Mekanikal, KOLEJ WIT, Selangor Darul Ehsan. (2009)
        v. Diploma Tinggi Kejuruteraan Mekanikal, KOLEJ WIT, Selangor Darul Ehsan. (2009)
        vi. Sarjana Muda Teknologi Kejuruteraan (Kepujian) Penyelenggaraan dan Pengurusan Automotif, Universiti Kuala Lumpur – Malaysia France Institute, Selangor Darul Ehsan (2009)
        vii. Master of Mechanical Engineering, Universiti Tenaga Nasional (UNITEN), Selangor, (2009)

viii. Diploma in Mechanical Engineering, Kolej Antarabangsa Teknologi Lanjutan Serawak,Serawak, (2010)
ix. Advanced Diploma in Automotive Design and Manufacturing Engineering, Politeknik Sultan Azlan Shah (PSAS), Perak (2010)
x. Diploma Kejuruteraan Automotif, Kolej WIT (Pelabuhan Klang), (2010)
xi. Diploma in Mechanical Engineering, Kolej Universiti Teknologi Antarabangsa Twintech, Damansara, (2010).
xii. Advance Diploma Politeknik Sultan Azlan Shah, Perak, (2010).
xiii. Sarjana Muda Teknologi Kejuruteraan Mekanikal (Automotif) Dengan Kepujian, Universiti Tun Hussien Onn Malaysia, Batu Pahat, Johor, (2011)
xiv. Diploma Teknologi Kejuruteraan Mekanikal, Universiti Tun Hussien Onn Malaysia, Batu Pahat, Johor, (2011)
xv. Sarjana Kejuruteraan Mekanikal (Automotif) Secara Mod Campuran, Universiti Teknikal Malaysia Melaka, (2011)
xvi. Sarjana Kejuruteraan Mekanikal (Automotif) Secara kerja Kursus, Universiti Teknikal Malaysia Melaka, (2011)
xvii. Advanced Diploma in Automotive Design and Manufacturing Engineering, Politeknik Sultan Azlan Shah (PSAS), Perak (2011)
xviii. Advanced Diploma in Mechanical Engineering, Politeknik Ungku Omar, Perak, (2011)
xix. Advanced Diploma in Mechatronic Engineering, Politeknik Johor Bahru, Johor, (2011).

34. Panel Pengurusan Kerja bagi Kursus Penilaian Tahap Kecekapan (TK 3/TK 5) Gred 45 dan 52. UMP, 2010
35. Penceramah bagi kursus kaedah Penyelidikan, UMP, 2010.
36. Penasihat Badan Pelajar Universiti Malaysia Pahang Kelab Wataniah, UMP, 2010.

37. Penasihat Badan Pelajar Universiti Malaysia Pahang Kelab SAE-UMP Chapter, UMP, 2010~present.
38. Ahli Jawatankuasa Induk Pemilihan Majlis Pewakilan Pelajar (JIMPP) UMP, 2010
39. Ahli Jawatankuasa Induk Bencana Banjir UMP, 2010~2013
40. Ahli Jawatankuasa Bertindak Kajian Hala Tuju Bidang Automotif, Jabatan Pengajian Tinggi, KPT,2010~peresent
41. Ahli Jawatankuasa Daya Usaha dan Inovasi, Jabatan Pengajian Tinggi, KPT, 2010~peresent
42. Ahli Jawatankuasa Induk Pemilihan Majlis Pewakilan Pelajar (JIMPP) UMP, 2011
43. Panel Penasihat Industri (IAP) UMS, 2011~present
44. Ahli Jawatankuasa Penasihat Kurikulum Program Dipolma Kolej Kemahiran Tinggi MARA Kuantan, Pahang, 2011
45. Ahli Jawatankuasa Akademik Fakulti kejuruteraan Mekanikal, UMP, 2011~present
46. Malaysia Qualification Agency (MQA) 2011~2014.
    b) Panel Penilai MQA (Kejuruteraan dan Teknologi), 20011~2014
        i. Sarjana Muda Teknologi Kejuruteraan Mekanikal (Automotif) Dengan Kepujian, MFI, 2012.
        ii. Bachelor of Technology in Mechanical Engineering, Lincoln University College, Selangor, 2013.
47. Penal Pelantikan Sebaga Ahli JawatanKuasa Penasihat Politeknik Sultan Mizan Zainal Abidin, KPT 2013
48. Pelantikan Pemeriksa Luar bagi Penilian Kendiri Program Kolej Komuniti Pasir Salak, Perak, KPT, 2013
49. Pelantikan Pemeriksa Luar bagi Penilian Kendiri Program Kolej Komuniti Sungai Siput, Perak, KPT, 2013
50. Pelantikan Pemeriksa Luar bagi Penilian Kendiri Program Kolej Komuniti Kuala Ternggan, Ternggan, KPT, 2013
51. Penasihat, Sekretariat Mahasiswa Negeri Sembilan, 2014~present
52. Pelantikan Pemeriksa Luar bagi Penilian Kendiri Program Kolej Komuniti Arau, Perlis, KPT, 2013

53. Felo Pembangunan Modal Insan Mekanik Kenderaan Hibrid dan Elektrik, Kolej Komuniti, Kementerian Pendidikan Malaysia, 2014.
54. Pakar Rujuk Program Pembangunan Modal Insan Mekanik Kenderaan Hibrid dan Elektrik, Kolej Komuniti, Kementerian Pendidikan Malaysia.,2014
55. Malaysia Qualification Agency (MQA) 2011~2014.
    a) Panel Penilai MQA (Kejuruteraan dan Teknologi), 20011~2014
56. Pakar Rujuk Untuk Nilai Taraf Agensi Kelayakan Malaysia (MQA), 2014~2017.
57. Ahli Jawatankuasa Penasihat Kurikulum Program Dipolma Kolej Kemahiran Mara Kuantan, 2014
58. Panel Penilai luar bagi system Pentaksiran Pengajian Politeknik, KPM, 2014
59. Fellow Automotive Engineering Center, Universiti Malaysia Pahang, 2014
60. Fellow Centre of Excellence for Advanced Research in Fluid Flow, Universiti Malaysia Pahang, 2014
61. Ahli JawatanKuasa Penasihat Politeknik Sultan Mizan Zainal Abidin, KPT, 2014
62. Pakar Rujukan dan Jawatankuasa Membantu Fakulti-Fakulti untuk mendapat Jurnal Tahap Scopus, ISI dan Elsevier,2014.
63. Ahli Lembaga Jurutera Malaysia, 2014~2017
64. Ahli Persatuan Pendidikan Kejuruteraan Malaysia 2014~2017.
65. Ahli Jawatankuasa Penasihat Kurikulum Program Dipolma Kolej Kemahiran Mara Kuantan, 2015.
66. Ahli JawatanKuasa Penasihat Politeknik Sultan Mizan Zainal Abidin, KPT,2015.
67. Panel Pemeriksa Dalaman bagi Penilian Kendiri Politeknik Sultan Azlan Shah (PSAS), Perak, KPT, 2015
68. Ahli Jawatankuasa Penilai Penarafan Bintang MyRa, KPT, 2015~2017.
69. Penilai MQA –. Ijazah Sarjana Muda Teknologi Kejuruteraan Mekanikal (Teknologi Automotif) Dengan Kepujian, UTeM, 2016

70. Panel Pemeriksa Luar bagi Penilian Kendiri Politeknik Banting, Selangor, KPT, 2016
71. Ahli Jawatankuasa Penilai Penarafan SETARA, KPT,2017.
72. Penilai MQA –. Ijazah Sarjana Muda Teknologi Kejuruteraan Automotif Dengan Kepujian, SEGI, 2017

Other Responsibilities

i. Evaluator for Promotion Professor

1. Institute of Technology Brunei (ITB), Brunei - Associate Professor Dr. Md. Mustafizur Rahman (2013)

ii. Evaluator for Promotion Associate Professor

1. UTM – Dr. Kahar bin Osman (2008)
2. UTEN - Dr. Mohd Hariffin Boosroh (2009)
3. UTHM - Dr. Badrul bin Omar (2010)
4. UTHM - Dr. Mohd Amri bin Lajis (2010)
5. UTM – Dr. Mohd Zarhamdy bin Md. Zain (2010)
6. UTM – Dr. Nor Azwadi bin Che Sidik (2010)
7. UTM - Dr. Intan Zaurah Mat Darus (2010)
8. UTM – Dr. Mohamed Ruslan bin Abdullah (2010)
9. UTM – Dr. Syahrullail bin Samion (2010)
10. UNIMAS – Dr. Abu Salleh Ahmad (2011)
11. UTHM – Dr Mustafa bin Ibrahim (2011)
12. UTHM – Dr. Ahmad Jais Bin Alimin (2012)
13. UTeM- Dr. Muhamad Zahir Hassan (2014)
14. UTHM-Dr. Norasikin Binte Mat Isa (2016)
15. UTHM-Dr. Henry Nasution (2017)
16. UTHM - Dr. Mohammad Kamil (2017)
17. UTHM - Dr. Mohd Zamani

iii. Visting Profesor

1. Kolej Universiti Kejuruteraan dan Teknologi Malaysia, (KUKTEM), 2003~2004
2. Universiti Tenikal Malaysia Melaka, (UTEM), 2011~2013.

6. WORK EXPERIENCE

Administration

i. Universiti Teknologi Malaysia (1992¬2004)

1. Head of Thermodynamics Laboratory UTM,1992~1994
2. Committee (Member) "National Conference on Energy and Environment Toward 2020", UTM, 1993.
3. Head of Combustion Laboratory UTM,1994~1995
4. Academic Adviser UTM, 1993~1995
5. Planning committee member for the Four stroke engine handling and maintenance course, Jabatan Pendidikan Pahang, 1994
6. Industry Research and Development Scheme (IGS) project technical evaluation board 1999~2000
7. Chairman of Outdated Malaysia Standards (SIRIM) Review for Working Group on Vehicle Lighting and Marking, 2000~2003
8. Industry Research and Development Scheme (IGS) project technical evaluation board 2003~present
9. Head of Thermodynamics Panel UTM, 1998~2000
10. Committee (Secretary) "The 6th Small Engines, Their Fuels and the Environment", UTM,1999.
11. Fasilitator Kursus Kaedah Penyelidikan (SLAB) UTM,1999
12. Deputy Director Automotive Development Centre UTM, 1999~2004
13. Head of Automotive Expert Group UTM, 1999~2004
    i. Menyediakan kertas kerja ke Jawatankuasa Tetap Senat untuk menjalankan kursus Sarjana Muda Kejuruteraan (Mekanikal Automotif)
    ii. Menyediakan kertas kerja ke Jawatankuasa Tetap Senat untuk pengambilan pelajar Sarjana Muda Kejuruteraan Mekanikal ke Sarjana Muda Kejuruteraan (Mekanikal Automotif)
14. Curriculum committee member, Faculty of Mechanical Engineering, UTM, 1999~2004

15. Committee member for PSM project FKM UTM, 1999~2002
16. Academic Adviser UTM, 1999~2004
17. Advisor to the Faculty of Mechanical Engineering Automotive Club (AUTEC), UTM, 2000~2004
18. Committee member for the evaluation of IRPA RMK 7 proposals, under the category of EAR, at the level of focus group & JKPP, UTM,2000.
19. Editor Jurnal Teknologi (A) UTM, 2000~2002
20. Editor Jurnal Mekanikal UTM, 2000~2002
21. Technical Tender committee member for the Automotive laboratory, UTM, 2000.
22. Faculty Academic Publication committee member UTM, 2001~2004
23. Assistant head of Automotive, Aeronautic and Marine Focus Group (IRPA) UTM, 2002~2004
24. Committee (Secretary) "The 6th Asia-Pacific International Symposium on Combustion and Energy Utilization (6th APISCEU)", UTM, 2002.
25. IRPA RMK 8 proposal evaluation committee member, under the category of EAR, at the level of focus group & JKPP, 2002~2004.
26. Research methodology course (SLAB) evaluator UTM, 2002
27. Editor for Jurnal Teknologi (A) UTM, 2002~2004
28. Editor for Jurnal Mekanikal UTM, 2002~2004
29. Advisor to the SAE Student Chapter UTM, SAE UTM, 2003~2004

ii. Lembaga Akreditasi Negara (LAN) (1999~2004)

1. Evaluator for Lembaga Akreditasi Negara (LAN) (Kejuruteraan dan Teknologi),1999-2000
    i. Diploma Kejuruteraan Automotive, Kolej TAFE, Seremban

2. Evaluator for Lembaga Akreditasi Negara (LAN) (Kejuruteraan dan Teknologi), 2000-2002
    i. Diploma Kejuruteraan Automotive, Kolej WIT, Perak
    ii. Master In Engineering Management, Universiti Tenaga Nasional
    iii. Diploma Tinggi Nasional (HND) Kejuruteraan Automotif, Kolej WIT, Port Kelang.
3. Evaluator for Lembaga Akreditasi Negara (LAN) (Kejuruteraan dan Teknologi),2002-2004
    i. Sijil Autobody, Kolej Yayasan Sabah, Kota Kinabalu. (2002)
    ii. Diploma Kejuruteraan Automotif, Kolej TAFE, Seremban (2002)
    iii. Bachelor of Engineering in Mechatronic, University of Nottingham In Malaysia (UNiM) (2003)
    iv. Master of Engineering in Mechatronic, University of Nottingham In Malaysia (UNiM) (2003)
    v. Diploma in Mechantronic Engineering, Institut Teknologi Butterworth, Pulau Pinang (March, 2003)
    vi. Master Engineering in in Mechanical Engineering, University of Nottingham In Malaysia (UNiM) (2003)
    vii. Master Engineering in Mechanical Engineering, University of Nottingham In Malaysia (UNiM) (2003)
    viii. Diploma Kejuruteraan Automotif, Kolej WIT, Pelabuhan Kelang, Selangor (2003)
    ix. Diploma Tinggi Nasional (HND) Kejuruteraan Automotif, Kolej WIT, Pelabuhan Kelang, Selangor (2003)
    x. Diploma Kejuruteraan Automobile, Kolej WIT, Ipoh, Perak (2003)
    xi. Diploma in Mechantronic Engineering, Institut Teknologi Butterworth, Pulau Pinang (November, 2003)
    xii. Btec HND in Automotive Engineering, Kolej TAFE Seremban Negeri Sembilan (2004)

7. ACADEMIC EXPERIENCE

1. Number of Years of Experience in the Academic and taught Subjects.

Experience in the Academic : 24 Years (Diploma, Degree, Master and Ph. D level)

Engineering Subject taught,

1. Thermodynamics
2. Fluid Mechanics
3. Static and Dynamics
4. Numerical Analysis
5. Finite Elements Analysis
6. Internal Combustion Engine
7. Automotive Technology
8. Combustion Technology
9. Heat Transfer Technology
10. Automotive Electrical and Electronic Systems
11. Power Plant Technology
12. Boiler Technology
13. Energy Managements
14. Refrigeration and Air Conditioning

2. Supervision

i. Ph. D. : 18 student

1. ”Development of Advanced Intake System For CNG Fuelled SI Engine”, Mardani Ali Sera, UTM, 2003. (Indonesia)
2. “Development of New Injector For Compressed Natural Gas Engine and The Effect on Performance”, Semin Sanuri, UMP, 2011. (Indonesia)
3. “Investigation of CNG fuel used Diesel Engine “, Abdul Rahim Ismail, UMP, 2011,

4. "Design and Development of Single Cylinder Two Stroke Linear Engine Spring Mechanism", Aguk Zuhdi Muhammad Fathallah, UMP, 2011.(Indonesia)
5. "Modeling and Optimization Hydrogen Fueled Engine", Mohammed Kamil Mohammed, UMP, 2011. (Iraq)
6. "Design and Development of Control System for Four Stroke Premixed Charge Spark ignition Free Piston Generator Engine", Indra Ranu Kusuma, UMP, 2012, (Indonesia)
7. "Development of Dish Stirling Concentrating Solar Thermal Electric Energy Conversion", Gan Leong Ming, UMP, 2012.
8. "Design and Development of Intelligent Integrated of Environmental Control Systems for Household Comfort with minimum Energy Consumption", Norfadzilah Jusoh, UMP, 2014.
9. "Combined Forced and Natural Convective Heat Transfer From Cylinder Embedded in Saturated Porous Media", Adanan Mohammed Hussien, UMP, 2014, (Iraq). "Investigate Infuence Added Fin In intake Manifold to Performance in Engine using Ethanol Fuel", Beny Cahyono, UMP, 2014,(Indonesia).
10. "Mixture Formation and Combustion Characteristics of Diesel-Hydrogen Dual Fuel Engine", Widodo Budi Santoso, UMP, 2014(be completed), (Indonesia)
11. "Enhancement of in Cylinder Airflow Burning Rate for a Four Stroke Spark Ignition Engine Running on Compressed Natural Gas Fuel", Devarajan a/l Ramasamy, USM, 2014
12. "Design and Development of Intelligent Integrated of Environmental Control Systems for Household Comfort with minimum Energy Consumption", Norfadzilah Jusoh, UMP, 2014.

13. "Computational Fluid Dynamics (CFD) Study for Flow Patterns and Heat Transfer in Air Conditioning Systems", Muhammad Ehtesham Ul Haque, UMP, 2014, (Pakistan)
14. "Multi Fatigue Characteristic of Automotive Component Under Variable Amplitude Loading", Thamir Khalil Ibrahim, UMP, 2014.(Bangadesh)
15. "Combined Forced and Natural Convective Heat Transfer From Cylinder Embedded in Saturated Porous Media", Adanan Mohammed Hussien, UMP, 2014, (Iraq).
16. "Effect of Nanofluids as Coolant in The Cooling System", Hizanorhuda Zurgiba, 2014.
17. "Development of Air-Compressed Hybrid Six Stroke Engine by Combined Compressed Exhaust Recovery and Internal Combustion Engine", Faizail Wasberi, UMP, 2014.
18. "Computational Fluid Dynamics Study For Flow Patterns and Heat Transfer in Air Conditioning Systems', Muhammad Ehtesham Ul Haque, UMP, 2015, (Pakistan).

ii. Master : 26 student

1. "Simulation and Experimental Investigation of Turbocharged Investigation of Turbocharged Diesel Engine", Roslee Yahya, UTM,1995.
2. "Characteristic Improvement of a Carburetor for a Petrol Internal Combustion Engine", Wong Hong Mun, UTM, 2002.
3. "Development of Intake System For Compressed Natural Gas (CNG) – Fuelled SI Engine", Sin Kwan Leong,UTM, 2003.
4. "The Development of Two-Stroke Engine with an Electronic Engine Management System", Chong Chin Lee,UTM, 2004

5. "The Effect of Engine parameter on Two Stroke Engine Performance", Chin Kok Leong, UTM, 2004
6. "Analysis Engine Performance for New Two Stroke Engine Design ", Chiew Chen Wee, UTM, 2004,
7. "Analysis of Two Stroke Engine Using The Computer Simulation", Mohd Farid bin Muhamad Said, UTM, 2004,
8. "Analysis Engine Performance for New Generation of Two Stroke Engine", Gan Leong Ming, UTM, 2005,
9. "Design And Development of a New Two Stroke Engine Using Gas As Fuel", Devarajan a/l Ramasamy, UTM, 2006
10. "Analysis the performance of Fuel Injection ", Talha Faroz, KUKTEM, 2007, (India)
11. "Numerical Analysis of Scavenging Process for New Two Stroke Diesel Engine. ", Nik Mohd Izual Nik Ibrahim, UMP, 2007
12. "Develipment of Vehicle Fuel Tank Using Kevlar Honeycomb Material", Mohamad Fatasya Othman, UMP, 2007
13. "Design And Development of a New Two Stroke Engine with air and Fuel Injection ", Mohd Fadzil Abdul Rahim, UMP, 2009.
14. "Design And Development of a New Two Stroke Engine for Agricultures used", Awang Idris,UMP, 2009.
15. "Development of Regenerative Piezoelectric Linear Generator for Alternative Power Generation", Siti Nur Sakinah Jamaludin,UMP, 2012.
16. "Development of Gamma Type Stirling Engine For Moderate Operating Temperature", Mohd Farid Zainudin, UMP, 2014.
17. "Development of Hybrid Solar Thermal Energy Storing System For Modular Concentrating Solar Thermal", Tanti Zanariah Shamsir Ali, UMP, 2014.

18. "Performance Enhancement of Evacuated Solar Tube Collector using Water Based Nanofluids ", Mahendran a/l Moorthy, UMP, 2014.
19. "Development of Plug in Hybrid Air Motocycle Based On Single Cylinder Small Volumetric Displacement Four Stroke Engine Compressor", Teoh Sun Jie, UMP, 2015
20. "Feasibility Analysis on Small Scale Dish-Type Concentraing Solar Thermal Steam Turbine Prototype", Zarina Amat Jafar, UMP, 2015.
21. "Development of Concentrating Solar Collector System For Renewable Energy Generation", Billy Anak Sup, UMP, 2015
22. "Development of Fine Particles Biomass steam Gasification Process for Syngas Generation", Tan Liang Yit, UMP, 2015.
23. "Analysis of Pre Chamber in Compressed Natural Gas Engine", Muhammad Syahir Ali, UTeM, 2016
24. "Study on the Air Flow Inside the Single Cylinder Engine", Abdul Muhaimin Mohd Shafie", UTeM, 2016.
25. "Development of Solid Briquette Biomass Downdraft Gravity Gasification for Syngas Generation", Tan Kee Voon, UMP, 2016.
26. "Evaluation on the Influence of Driving Behavior Mapping On Human Factor Related Road Accident Prevention", Teo Sir Hiang, UMP, 2016.

iii. First Degree Dissertations: 102 Student

1993

1. "A Simulation to Study Engine Performance in a Turbocharged Diesel Engine", Normah Haji Ismail, 1993.
2. "Computer Program for Calculation of Properties of Equilibrium Products with Some application to I. C. Engines", Ng Tiong Hoo, 1993.

3. "The Effect of Cyclic Variation on Combustion Pressure and Heat Release in D. I. Engine", Hapida Ghazali, 1993.

1994

4. "A Simulation Study on the Diesel Engine Fuel Injection System", Norizam Haji Mohd Ishak, 1994.
5. "A Study on The Prediction of Combustion Performance in a Diesel Engine", Shamsul Daud, 1994.
6. "Experimental Investigation of Emission in Diesel Engine", Abdul Kadir Abd. Rahman, 1994.
7. "Film Cooling Effectiveness on the Suction Side of a Turbine Blade in a Two Dimension Laminar Flow", Azwan Teh bin Azman Teh, 1994.
8. "Petrol Engine Emission Study", Mohd. Noor Azli Isa, 1994.

1999

9. "Effect of Water With Emulsion on Engine Vibration", Saravanan a/l Narayanan, 1999.
10. "Kajian Potensi Alam Sekitar Bagi Penggunaan Gas Asli Termampat (CNG) Sebagai Bahanapi Enjin Pencucuhan Bunga Api", Afzanizar Ahmad, 1999.
11. "Kajian Prestasi Dan Analisis Enjin Diesel Yang Di Turbocas", Siva Kumar a/l Shanmugam, 1999.
12. "Kesan-Kesan Suntikan Bahanapi Ke Atas Prestasi Pembakaran Dalam Enjin Diesel", Azhani Asari/Ashaari, 1999.
13. "Kesan Suhu Air Penyejuk Ke Atas Prestasi Sebuah Enjin", Adli Bahari, 1999.
14. "Simulation Study on PCU", Chew Huat Chiang, 1999.
15. "The Effect of Adiabatic Temperature on the Control Combustion Product", Yeoh Sim Teik, 1999.
16. "The Influence of Compress Natural Gas (CNG) on the Engine Performance by Simulation", Chin Wei Yen, 1999.
17. "Water Spray Simulation", Amirrudin Ali, 1999.

2000

18. "A Study on The Behaviour of Transient Perponse in Turbocharged Diesel Engine", Mohamad Nasir Mat Hussein, 2000.
19. "A Theoritical Analysis of Noise Reduction of the Automotive Exhaust Muffler System (Insertion Loss)", Chin Yew Sin, 2000.
20. "Analisa Kaedah Berangka Untuk Aliran Udara Dalam Bahagian Penumpang Kereta Proton", Haslinda Mohammad, 2000.
21. "Analisis Kaedah Berangka Bagi Aliran Udara Dalam Proses Masukan Untuk Enjin Diesel", Rozie Nani Ahmad, 2000.
22. "Analysis on the Engine Performance of the Two-Stroke Engine", Ong Kooi Leong/Ong Kean Leong, 2000.
23. "Design of New Fuel Injector for Compressed Natural Gas Engine", Yeap Hun Meng, 2000.
24. "Effect of Engine and Fuel Characteristics on the Engine Performance with Turbocharger for Diesel Engine", Wee Chong Seong, 2000.
25. "Kajian Potensi Bahanapi Yang Sedia Ada Bagi Kegunaan Enjin Diesel", Syahrul Manap, 2000.
26. "Kajian Terhadap Ciri-ciri Sistem Suntikan Bahanapi Bagi Sebuah Enjin Diesel", Maniram a/l Subramaniam, 2000.
27. "Kerja-kerja Pembaikan Dan Penyelengaraan Kenderaan Dan Loji Jentera Di Bengkel, Jabatan Jurutera Mekanikal, Dewan Bandaraya Kuala Lumpur", Mohammad Azmi Saari, 2000.
28. "Kesan Kelajuan Pergerakan Api Terhadap Prestasi Enjin", Syahmi Farhan Mohamed, 2000.
29. "Kesan Pengaliran Udara Ke Atas Prestasi Enjin Bagi Enjin Diesel", Munif Bakar, 2000.

30. "Kesan Suhu Penyejukan Ke Atas Prestasi Enjin CNG", Mohammad Tamizi Mukhtar, 2000.
31. "Membina Perisian Untuk Aliran Yang Melalui Jasad", Wong Chee Yeen, 2000.
32. Peningkatan Ciri Dinamik Kereta Melalui Pembaikan Sifat Keselesaan Dan Kestabilan", Abdul Wahab Long, 2000.
33. "Sistem Kawalan Dynamometer Froude", Muhamad Ridzuan Othman, 2000.
34. "The Effect of Fuel Type on the Engine Performance of Gasoline Engine", Ho Hock Woo, 2000.

2001

35. "Analisis Berangka Ke Atas Aliran Semasa Proses Pembakaran Dalam Kebuk Pembakaran", Lim Chin Seong, 2001.
36. "Analyzing the Effect of Fin Radiator on Water-Cooled Cooling System for Automotive", Teoh Ka Jin, 2001.
37. "Computational Fluid Dynamics (CFD) Analysis for Intake Process (Combustion Chamber Design) in Four-Stroke Diesel Engine", Ho Shuang Tien, 2001.
38. "Design and Develop New Mixer for Compressed Natural Gas Engine", Phuah Cheng Peng, 2001.
39. "Design of an Electronic Control System for CNG Fuelled SI Engine", Sew Wey Ping, 2001.
40. "Development of a Dedicated Agro-Based Dryer Equipped with Temperature Controller", Navaraj s/o C. Sree Dharan, 2001.
41. "Mangkaji Prestasi Enjin Diesel Yang Dilengkapi Pengecas Turbo", Mohd. Rizal Jailan, 2001.
42. "Modification of Air-Cooling System for Low Power Engine", Tee Fuh Min, 2001.
43. "New Design of Compressed Natural Gas Mixer", Ngo Jian Yee, 2001.

44. "New Design of Valve Train for Low Power Diesel Engine", Loh Choo Koo, 2001.

2002

45. "Analysis of Heat Transfer Characteristic in Compressed Natural Gas (CNG) Engine", Low Kean Aun, 2002.
46. "Fuel Atomization Technology of Fuel", Ooi Teik Hua, 2002.
47. "Kajian Simulasi Terhadap Kesan Bentuk Panca Rongga Masukkan Udara Bagi Enjin Diesel", Mohd. Faidz Ishak, 2002.
48. "Kajian Terhadap Kesan aliran Udara Dalam Ruang Penumpang Kereta Nasional", Tan Chin Kee, 2002.
49. "Numerical Analysis of Scavenging Process for Two-Stroke Engine", Yip Lay Huat, 2002.
50. "Numerical Analysis on the Effect of Intake Flow in Intake Manifold", Ng Chee Onn, 2002.
51. "Numerical Analysis (CFD) for Two-Stroke Engine (Crankcase Flow)", Nithianada Vennayagam, 2002.
52. "Pembangunan Rekabentuk Sistem Rangkaian Injap Untuk Enjin Diesel Berkuasa Rendah", Muhammad Imran Mohmad Sairaji, 2002.
53. "Simulation Analysis on Engine Performance for Spark Ignition Engine", Low Cheng Yee, 2002.
54. "The Effect of Piston Surface on Intake Process Using Computational Fluid Dynamics (CFD)", Lim Chin Ling, 2002.
55. "Electronic Control System For CNG Engine", Surenthan Ramasamy, 2002.

2003

56. "Analysis on The Intake Flow of Hydrogen Fueled Engine by CFD Approach" Goh Boon Keat, 2003.
57. "Design and Development of Two Stroke Engine With Blower", Gan Leong Ming, 2003.

58. "Effect of Variable Valve Timing VVT on Engine Performance", Tan Ching Siong, 2003.
59. "Analysis of Combustion Process in Two Stroke Engine by Using Computional Fluid Dynamics", Ong Chee Wei, 2003.
60. "Intake Generated Swirl and Tumble Flow Motion", Lee Wai Nun, 2003
61. "The Effect of Piston Surface on Intake Process", Muhammad Zahari Sukimi Mat Zaid, 2003.
62. "Analysis of Fuel Injection System For CNG", Low Tze Jin, 2003.
63. "Improving Cooling System in ICE Using CFD', Khor Thuan Khim, 2003.
64. "A Numerical Study on the Level of CO and CO_2 Produced From the Combustion Process in CNG DI and GDI by Using Fluent", Khaw Hoe Soon, 2003.
65. "Analysis Exhaust Manifold (Four in One) for Turbocharged Engine", Ong Kok Hon, 2003.
66. "Development of Two-Stroke Engine Without Valve Using Blower Mechanics", Chiew Chen Wee, 2003
67. "CFD Analysis on Spoiler for Automotive Application", Paul Chung Jing Kiat, 2003.
68. "Flow Analysis of CNG Turbocharger Intake and Exhaust Manifold Process", Harris Abd Rahman Sabri, 2003.
69. "Design of V Type Engine For Two Stroke Engine", Nik Mohd Izual Nik Ibrahim, 2003.
70. "Effect of Air Flow in New Two Stroke Engine", Mohd Izwan Ishak, 2003.
71. "Design of Two Stroke Diesel Engine", Mohd Yassin Ali, 2003.

2006

72. "Design an Development of engine Testing Apparatus and Methodology on KUKTEM Hydraulic Dynamometer", Tuan Mohd Imran Tuan Zakaria, 2006.

2007

73. "Design and Development of Intake Measurement System for Gasoline Compress Natural Gas Hydraulic Engine Test Rig", Mohd Zulikram Mohamed Mustafa, 2007.
74. "In Cylinder Flow Modeling of 4 Stroke Gasoline Engine Using Computational Fluif Dynamics (CFD)', Anis Amilah Ab Rahman, 2007
75. "Analysis of Cooling Effect on New Customized Cooling System for 4 Cylinder Gasoline Engine Using Modelling Aooroach", Mohd Syafiq Hj Mohd Ayob, 2007.
76. "Numerical analysis of In Cylinder Flow Two Stroke Spark Ignition Engine", Mohd Hafiz Bin Mohd Yunus, 2007.
77. "Effect of Exhaust Gas Flow in Exhaust System Using Computational Fluid Dynamics (CFD)', Wang Pok Leong, 2007.
78. "Simulationn of Air Flow in Intake System Using Computional Fluid Dynamics (CFD)", Kwan Tech Heng, 2007.

2008

79. "Prediction Studies for The Performance of a Single Cylinder High Speed SI Linear Engine", Mohd Nordin Zazalli, 2008.
80. "Simulation of Four Stroke Free Piston Diesel Engine", Hafnizar Muhamad Shaharuddin, 2008.
81. "Simulation of Electromechanical Valve Drive on Single Cylinder Four Stroke Free Piston Diesel Engine", Fyroz Ziffa Mohd Mustafa Kamal, 2008.
82. "Design and Development of Exhaust Gas Calorimeter for Gasoline/ Compressed Natural Gas Hydraulic Dynanometer Engine (Gacohyde) Test-Rig", Tengku Mohd Hairil Azwan Bin Tengku Abdullah,2008.

2009

83. "Influence of Ethanol Fuel In Engine Emission", Harisuddin Idris, 2009

84. "Simulation of Gaseous Fuel Injector Geometric of Multi Holes Nozzles by Using CNG Engine", Muhamad Akbar Osman Md Hashim, 2009
85. "Experimental Study of Heat Tranfer Natural Convection In Internally Finned Tube", Mohd Waqiuddin Nordin, 2009
86. "Influence of Ethanol Fue El In Spark Ignition Engine Fuel Consumption", Mohd Waspi Kassim Krismaran, 2009
87. "Modeling the performance Characteristics of Hydrogen Engine with Fuel Injection System Using GT-Power", Mohd Adzahari Adnan, 2009
88. "Small Two Stroke Engine Test Rig Design and Its Performance Analysis", Rosman Razali, 2009
89. "Engine Performance and Combustion Characteistics of Hydrogen in a Direct Injection Engine", Muhamad Adlan Abdullah, 2009

2010

90. "Deceleration Performance Comparison for Passenger Car Under On-Road and Off-Road Driving Condition". Mohd Khairul Asri bin Kamaluddin, 2010
91. "Vibration Investigation for Passenger Car Front Suspension System Under Various Raod Condition and Driving Maneuvers". Tanti Zanariah binti Shamsir Ali, 2010.
92. "Reverse Modeling of Car Door Using Laser Scanning Methodology". Nur Fasehah binti Ma'arop, 2010.
93. "Performance Analysis on Percentage of Wheel Slip for A Passenger Car Using GPS and Wheel Speed Sensor". Lawrence Blasius, 2010.
94. "Vibration Investigation of Passenger Car Gear Suspension System Under Various Road Condition and Driving Maneuver". Mohd Farid bin Zainudin, 2010.
95. "Understeer Performance Analysis for Front Wheel Drive (FF) Sedan Vehicle Under Steady and Ride Road Driving Condition". Muhammad Faizul Izreen bin Othman, 2010.

2011

96. "Manufacturing of 10 cc Volumetric Displacement Four Stroke Petrol Model Engine Cylinder Block Using Casting Process", Norazlin Md. Kalil, 2011.

2012

97. "One Dimensional Simulation Of Diesel Hydrogen Dual Fuel", Benedict Maurice Lojikip, 2012.
98. "Design and Development of Cross Flow Delta Wing Water Turbine For Pahang River", Mohd Izzat Kamaulzaman, 2012.
99. Design, Analysis and Fabricate Small Cross Flow Turbine For Sungai Pahang", Mohamad Normazuan Mustafa, 2012.
100. "Performance of Diesel Engine Using Hydrogen As a Fuel", Nur Izzati Khairuddin, 2012.
101. Analysis on The Behaviour of The transient Response in Turbocharger Diesel Engine by Using Simulation", Ahmad Nasrullah Norazaman, 2012.
102. "Study of Effect of Fuel Injection Pressure on The Performance For Diesel Engine", Ahmad Muiz Ishak, 2012.

2013

103. "Development of Rough Grinding Equipment For Raw Biomass Resource", Muhammad Haikal Abdullah, 2013
104. "Fabrication of Aquaponic Gravity Flow Plantation System For Lettuce Plant', Amierul Amin Abdul Razak, 2013

2014

105. "Evaluation on the Influent of New to Aged Road Roughness to Car Body Translational Vibration", Ahmad Bazli Abd Malek, 2014.
106. "Development of Pelton Whell Powered Mechanical Water Pumping System", Tan Hong Boon, 2014.

107. "Comparatve Analysis For Electric Vehicle Battery Heat Management Using Liquid Based Air Based Cooling", Shin Yee, 2014.
108. "Computational Analysis on Stirling Engine Performance using Single Dimensional Approach", Teo Sir Hiang, 2014.
109. "Driving Behavior Analysis: Influent of Driver's Gender and Age Factor in Normal Road Meneuver", Nur Naqaie Yuddin Nor Adzhar, 2014.
110. "Experimental Evaluation of The Performance of Suspension System to Car Body Rotational Vibration Responses", Teoh Ing Hooi, 2014.
111. "Experimental Analysis on The Performance of Waste Biomass Solid Fuel Combustion Characteristics", Law Hoon Chit, 2014.
112. "Experimental Analysis on the Performance of Waste Biomass Grinding Process", Gan Hui Leng, 2014.
113. "Experimental Analysis on the Tire Slips Performance on The Straight Road Maneuver", Tan Thang Wu, 2014.
114. "Driving Behavior Analysis: Influent of Driver's Activities in Normal Road Maneuver", Siti Farahin Ismail, 2014.
115. "Experimental Analysis on the Influent of Road Roughness To Steering Vibration", Vincent Tiong Kung Yin, 2014.

3. Examiner Thesis

Master Tesis

1. "New Throttle Body Injection Systems Using Natural Gas for Small Engine ", Chin Vie Dee, Universiti Teknologi Malaysia (UTM), 2006.
2. "Engine Performance and Combustion Characteristics of Hydrogen in a Direct Injection Spark Ignition Engine", Muhamad Adlan Abdullah, Universiti Teknologi Petronas (UTP), 2008.

3. “Kesan Bahan Tambah Asid Oleik Dalam Bahan Api Diesel Keatas Prestasi Enjin dan Emisi Ekzos”,Yos Nofendri, Universiti Kebangsaan Malaysia (UKM), 2009
4. “Development of a Spark Plug Fuel Injector for Compressed Natural Gas Direct Injection in Spark Ignition Engine”, How Heoy Geok, Universiti Kebangsaan Malaysia (UKM), 2010
5. “Sonochemistry Approach for a New Process of Biodiesel Production From Jatropha Curcas Oil”, Achmad Praptijanto, Universiti Tun Hussein Onn Malaysia (UTHM), 2011.
6. “Elector Mechanical Single Acting Pulley Rubber V-Belt Continuosly VariableTransmission (EMSAP RVB-CVT) For Scooter”, Nur Cholis, Universiti Malaysia Pahang (UMP), 2012.
7. “CHARACTERISTICS OF BIODIESEL DERIVED LIQUID FUELS”, Rafidah Binte Rahim, Universiti Malaysia Pahang (UMP), 2012.
8. “Numerical Investigation of theAerodynamic Induced Velocity Dueto Vortex Generated by Vehicles onHighway”, Ab. Malik Awang Hamat @ Mohamaed, Universiti Teknologi Malaysia (UTM), 2013.
9. “The Effect of Carbon Dioxcide Content-Natural Gas on The Performance Characteristics of a Direct Injection Compressed Natural Gas Engine’, Ayandotun Masiu Babatunde, Universiti Teknologi Petronas (UTP), 2013.
10. ” Angkatan dan Pemasaan injap Adaptif Berpandukan Tekanan Untuk peningkatan Prestasi Enjin”, Ahmad Fuad Bin Abdul Rasid, Universiti Kebangsaan Malaysia (UKM), 2013.
11. “Feasibility Studies of the Application of Crank Rocker Mechanism in an Internal Combustion Engine”, Safwan Hanis Mohd Murad, Universiti Teknologi Petronas (UTP), 2013.
12. “A STUDY ON DIESEL ENGINE PERFORMANCE USING BIODIESEL FROM WASTE COOKING OIL ”, Nur Atiqah Ramlan, Universiti Malaysia Pahang (UMP), 2014.

13. ” Exhaust Waste Energy Recovery Using Electric Turbo Compound in a Turbocharged Gasoline Engine”, Rosnizam Che Putih, Universiti Teknologi Malaysia (UTM), 2014.
14. “Microvawe Pyrolysis of Scrap Tires and Its Performance in Diesel Engine”, Alex Lu Chia Yang, Universiti Teknologi Malaysia (UTM), 2016.
15. “Variable Capacity Control Strategy for an Automobile Air Conditioning System”, Afiq Aiman Bin Dahlan, Universiti Teknologi Malaysia (UTM), 2016.
16. “REAL TIME WATER-IN-DIESEL EMULSION FUEL SUPPLY SYSTEM INVESTIGATE OF PERFORMANCE IN DIESEL ENGINE”, MOHAMAD AZRIN BIN AHMAD, Universiti Teknologi Malaysia (UTM), 2016.

Ph D Tesis

1. “Analisis Termodinamik dan Pemindahan Haba Untuk Enjin Penjana Linear “, Tulus, Universiti Kebangsaan Malaysia (UKM), 2007,
2. ”Experimental Investigation on the Performance of Variable Compression Ratio Direct Injection Diesel Engine Using Preheated Cottonseed Methyl Ester”, Velamala Rambabu, Andhra University, India, 2011.
3. ”Early Flame Characteristic Study In A Lean CNG DI Combustion”, Yohannes T Anbese, Universiti Teknologi Petronas (UTP), 2011.
4. ”Study of Heat Transfer in Hydrogen Fualed Internal Combustion Engine”, Khalaf Ibrahim Hamada, Universiti Malaysia Pahang (UMP), 2011.
5. ”Sonochemistry Approach for A New Process of Biodesiel Production From Jatropha Curcas Oil”, Achmad Praptijanto, Universiti Tun Hussein Onn Malaysia (UTHM), 2011.

6. ”Modeling and Performance Enchancements of Gas Turbine Combined Cycle Power Plant”, Thamir Khalil Ibrahim, Universiti Malaysia Pahang (UMP), 2012.
7. “An Experimental and Analytical Investigation of Free Piston Linear Generator Engine”, Abdulwehad Adem Ibrahim, Universiti Teknologi Petronas (UTP), 2012
8. “Potential of Liquefied Petroleum Gas as Sustainable Refrigerant in Adiabatic Capillary Tube Used in Split Type Air Conditioner”, Shodiya Suliamon, Universiti Teknologi Malaysia (UTM), 2013.
9. “Experimental Investigation on Combustion Characteristic of One Controlled Auto-Ignition Two-Stroke Cycle Engine”, Amin Mahmoudzadeh Andwari, Universiti Teknologi Malaysia (UTM), 2013.
10. “Modeling and Experimental Analysis of Exhaust Gas Temperature and Misfire in a Converted Diesel HCCI Engine Fuelled with Ethanol”, Bahram Bahri, Universiti Teknologi Malaysia (UTM), 2013.
11. ”A Theoretical Analysis on Film Condensation of Vapor in Cross Flow Over a Horizontal Circular Tube”, B. Vijaya Lakshmi, Andhra University, India, 2013.
12. ”Experimental Investigation on Combustion Characteristic of a Controlled Auto-Ignition Two-Stroke Cycle Engine”, Amin Mahmoudzadeh Andwari, Universiti Teknologi Malaysia (UTM), 2014.
13. ” Numerical and Experimental Study of Nanofluid Flow and Heat Transfer Characteristics in a Triangular Duct with Vortex Generators”, Hamdi Emaduldeen Ahmed, Universiti Tenaga Malaysia (UNITEN), 2014.
14. ”CHARACTERISTICS OF A MEDIUM DUTY CI ENGINE OPERATED USING RETROFIT MONGAS FUELLING CONCEPT”, Shahrul Azmir Osman, Universiti Tun Hussein Onn Malaysia (UTHM), 2014.

15. ”1 D Gas Dynamic Modelling of Twin Entry and Variable Geometry Turbine for Automotive Turbochagres”, Chiong Meng Soo, Universiti Teknologi Malaysia (UTM), 2014.
16. ”Experimental Investigation on Combustion Characteristic of a Controlled Auto-Ignition Two-Stroke Cycle Engine”, Amin Mahmoudzadeh Andwari, Universiti Teknologi Malaysia (UTM), 2014.
17. ”A Modified Turbocharger Centrifugal Compressor For Improved Performance Map”, Layth Hasan Jawad, Universiti Kebangsaan Malaysia (UKM), 2014.
18. ” Exhaust Waste Energy Recovery Using Electric Turbo Compound in a Turbocharged Gasoline Engine”, Rosnizam Che Putih, Universiti Teknologi Malaysia (UTM), 2014.
19. ”Experimental and Computational Analysis of Vortex Flame in Mesco-Scale Combustor”, Mostafa Khaleghi, Universiti Teknologi Malaysia (UTM), 2015.
20. ”Some studies on Surface Characteristics of Electric Disharge Macined Aerospace Super Alloy Inconel X750”, K J Sabereesaan, Annamalai University, India, 2016.
21. ”A New Integrated DC Motor Rotary Vane Compressor”, Abd Rahim Mat Sarip, Universiti Teknologi Malaysia (UTM), 2016.
22. ”Performance Simulation of a Direct Current Operated Automotive Air-Conditioning System”, Mohamad Firdaus Bin Sukri, Universiti Teknologi Malaysia (UTM), 2016.
23. ”Deactivation Strategy and Optimization For Malaysia Urban Driving Pattern”, Mohd Azman Bin Abas, Universiti Teknologi Malaysia (UTM), 2016.
24. ”Fabrication and analysis of ceramic Coated Material for Application as an Automotive Turbocharger Turbine Volute Casing”, Muhammad Rabiu Abbas, Universiti Teknologi Malaysia (UTM), 2016.

8. RESEARCH EXPERIENCE

i. Number of Years of Experience in the Field Related to the Fields of Specialization

Years of Experience : 19 Years

Specialization :

i. Internal Combustion Engine
ii. Automotive Technology
iii. Combustion Technology
iv. Thermodynamics
v. Alternative Fuel
vi. Automotive Electronic and Electric Systems
vii. Power Plant Technology
viii. Boiler Technology
ix. Numerical Analysis
x. Heat Transfer Technology
xi. Energy Management

ii. Major Research Programmes/Projects Completed

1993

1. Pyrolysis Biomass, EC, Member, 1993~1995, Selesai, (RM500,000).

1994

2. Super Chilled Water Storage System, IRPA, Member,1994~1995, Selesai, (RM20,000)

1995

3. Diesel Engine Simulation and Experimental, Hanyang Universiti, Leader, 1995~1998, Selesai.

1998

4. Engine Preformance Test Using CNG as Fuel the 4 Stroke Engine, RMC UTM, Leader, 1998~2000, Selesai, (RM20,000)

5. Design and Development of pumps use in Power Plants and Cars, IRPA, Member, 1998~2001, Selesai, (RM341,000)

1999

6. Development of Indigenous Incinerator System, IRPA, Member, 1999~2001, Selesai, (RM321,000)

2000

7. Design an d Development of New CNG Compress Natural Gas Engine, RMC UTM, Leader, 2000~2001, Selesai, (RM20,000)
8. Design an d Development of New CNG Compress Natural Gas Engine,IRPA, Leader, 2000~2001, Selesai, (RM350,000).
9. Continuously Variable Transmission (CVT) for Automotive Application, IRPA, Member, 2000~2003, Selesai, (RM550,000).

2002

10. Utilisation of Noise Suppression Techniques In the Development of Two- Stroke Stratified Charge, Lean-Burn Gasoline Engines, IRPA, Member, 2002~2005, Selesai, (RM1.700,000).
11. Design and Development of Auxilliary Components of Two-Stroke Stratified Charge, Lean-Burn Gasoline Engines, IRPA, Leader, 2002~2005, Selesai, (RM2.006,000).
12. Design and Development of New Two- Stroke (80 to 125 cc) Stratified Charge, Lean-Burn Gasoline Engines, IRPA, Member, 2002~2005, Selesai, (RM3.900,000).

2004

13. Design and Development of New Modular Engine, ORGS KUKTEM, Leader, 2004~2008, Selesai, (RM90,000).

2005

14. Design of ZUMP Chair, ORGS KUKTEM, Leader, 2004~2008, Selesai, (RM20,000).

2006

15. Hybrid Electric Vehicle Development Programmer, UMP, Leader, 2006~2009, Selesai, (RM300,000).

2007

16. Fuzzy Cruise Controller For Paralel HEV Proposal (GRS070150), Leader, 23/08/2007, 22/08/2010, Tamat
17. Penerapan Fuzzy Kontroler Pada Sistem Injeksi Bahan Bakar Mesin Diesel Kapal (GRS070140), Leader, 14/08/2007, 13/08/2010, Tamat
18. Alternative Fuels For Future Road Vehicles In Malaysia (GRS070142), Leader, 11/03/2007, 11/12/2010, Tamat
19. The Influence of fuel Angle Spray Nozzle Towards Power and Sfoc of Diesel Engine (GRS070121), Leader, 04/01/2007, 30/06/2009, Selesai
20. Development of vehicle Fuel tank using Kevlar Honeycomb Material (GRS070112), Leader, 04/01/2007, 30/06/2008, Selesai
21. A new design of a two-stroke modular diesel engine. (GRS070111), Leader, 04/01/2007, 30/06/2008, Selesai
22. The Study of combustion process and performance of diesel engine with multi components of biodiesel fuel as supplement diesel engine in Indonesia (GRS070123), Leader, 04/01/2007, 30/06/2009, Selesai
23. Merekabentuk dan Memfabrikasi Kerusi Khas Pacuan Motor (RDU070333), Leader, 04/01/2007, 31/10/2007, Selesai, (RM20,000)
24. CNG Pressure regulator Study to Increase The SI Engine Performance. (GRS070122), Leader, 04/01/2007, 30/06/2009, Selesai

2008

25. An Experiment and Computational of Vehicle Rear Shape Drag Improvement to Increase the Vehicle Performance (GRS070155), Member,02/01/2008, 31/01/2011, Tamat

2009

26. An Investigation of Wind Power Potential at Kuala Pahang, Pekan. (RDU0903126), Member, 01/11/2009, 30/11/2011, Tamat, (RM40,000)

27. Heat Transfer Augmentation with Aluminium Oxide Nanofluid in a Plain Tube and With Inserts (RDU0903100), Member, 01/10/2009, 30/09/2010, Tamat, (RM40,000)
28. Design Of mixer System For Diesel-Water Emulsion As New Renewable Fuel (RDU0903123), Member, 01/10/2009, 30/11/2010, Selesai, (RM39,600).
29. Experimental Study of an Energy Performance of Hybrid Electrical Vehicle System (RDU090343), Member, 01/05/2009, 31/10/2011, Selesai, (RM27,000)
30. Development of Water Technology Thermo Explosive Energy Injector for Alternative Fuel Application (RDU090395), Leader, 01/05/2009,31/12/2011, Tamat, (RM40,000)
31. Design And Efficient Performance Appraisal Of Hydrogen Fueled Automobile Engines Combustion Chamber And Port Injector (RDU090397),Member, 01/05/2009, 30/04/2010, Selesai,(RM40,000)
32. Development of Heat Transfer Techniques for Hydrogen Fuelled Internal Combustion Engine (RDU090393), Member, 01/05/2009, 30/11/2010,Selesai, (RM40,000)
33. Development Of Harsh Vibration Control Algorithm For Semi Active Suspension System (GRS090122), Leader, 03/01/2009, 28/02/2012, Tamat

2010

34. Characterization of Heat Transfer Process for Hydrogen Fueled Internal Combustion Engine (RDU100387), Member, 15/11/2010, 14/11/2011,Selesai,(RM24,340).
35. Machining of Nickel Superalloly Material Using Nanofluid as Coolant for Light Alloy Piston (RDU100380), Leader, 15/10/2010, 14/10/2011,Tamat, (RM39,000)
36. Hybrid Optimization Model to Enhanced the Machinability of Titanium Alloys (RDU100108), Member, 15/09/2010, 14/09/2012, Tamat, (RM49,880)

2011

37. Development of New Lubricant Dispersed with Nanoparticles (RDU110336), Member, 01/08/2011, 01/11/2012, Tamat, (RM35,000)
38. Development of a New Algorithm to Characterize the Heat Transfer of Fins in Automotive Applications (RDU110332), Member, 15/07/2011,15/07/2013, Selesai, (RM30,800).

2012

39. Development Of Plug In Hybrid Air Motorcycles Based On Single Cylinder Small Volumetric Displacement 4 Stroke Engine Compressor (RDU120335), Member, 01/06/2012, 28/02/2015, Tamat, (RM30,100)
40. Development Of Plug In Hybrid Single Cylinder Four Stroke Motorcycle With Alternative Drivetrain (RDU120352), Leader, 01/06/2012, 31/05/2015, Tamat, (RM30,100)
41. Optimization Of Micro Hydro Power Generator Configuration For Balance Efficiency And Sustainability (RDU120354), Member, 01/06/2012, 31/05/2014, Tamat, (RM24,500).
42. Construct the schlieren optical visualization and modeling on image processing technique for flame development and fuel-air mixture formation (RDU121201), Leader, 01/06/2012, 30/06/2014, Tamat, (RM5000)

2013

43. Development of Multiaxial Fatigue Modelling for Lightweight Automotive Suspension Components (RDU1303127), Member, 25/12/2013,24/12/2015, Sedang Berjalan, RM34,000)
44. The Effect of Steam Injection on Power and Emission of Hybrid Air-Diesel Engine Using Steam Injector (RDU130134), Member, 01/12/2013, 30/11/2016, Sedang Berjalan, (RM120,500)
45. Concentrating Solar Thermal-Powered Biomass Syngas Modelling Process for Green Electricity Conversion (RDU130135), Leader, 01/12/2013,30/11/2016, Sedang Berjalan, (100,000)

46. The Influent of Driving Behavior Factors To Road Vehicle Safety and Accident Reduction (RDU130130), Member, 01/12/2013, 30/11/2016,Sedang Berjalan, (RM110,000)
47. Characteristiction of Engine Oil with Nano Particle as an Additives (RDU130393), Member, 25/11/2013, 24/11/2015, Sedang Berjalan, (RM34,500).
48. Development of Ultrasonic Superfine Waste Biomass Particles Pulverisation Equipment for Multiple Energy Conversion Utilisation (RDU131401),Member, 17/09/2013, 16/09/2015, Sedang Berjalan, (36,000)
49. Development of Fuel Testing System on Chassis Dynamometer for Compressed Natural Gas Direct Injection Powered Vehicle (RDU130313),Member, 15/05/2013, 14/05/2015, Tamat, (RM35,000)
50. Turbulent Flow Forced Convection Nano Fluid in Heated Tube (GRS130319), Leader, 01/04/2013, 31/03/2016, Sedang Berjalan
51. Development of Concentrating Solar Collector System for Renewable Energy Generation (GRS120371), Leader, 01/04/2013, 31/03/2015,Tamat
52. Development of Plug-in Hybrid Air Motorcycle Based on single Cylinder Small Volumetric Displacement four Stroke Engine-Compressors (GRS130354), Leader, 01/04/2013, 31/03/2015, Tamat
53. Development of Gamma-Type Sirling Engine for Moderate Operating Temperature (GRS120348), Leader, 01/04/2013, 31/03/2015, Tamat
54. Development of Hybrid Solar Thermal Energy Storing System for Modular Dish/Stirling Engine Application (GRS120349), Leader, 01/04/2013,31/03/2015, Tamat

55. Pembangunan Kerusi boleh Alih (X-axis, Y-axis dan z-axis) untuk pelajar Kenit Zulhanif Sekolah Menengah Kebangsaan Pekan (RDU130303),Leader, 15/02/2013, 31/07/2013, Tamat, (RM19,000)

2014

56. Hybrid Nanoparticles with Ethylene Glycol for Car Radiator Application (RDU1403134), Member, 25/11/2014, 24/11/2016, Sedang Berjalan, (RM35,200).
57. Impact Biodiesel Fuel Characteristics on Ultra-Low Emission Homogeneous Charge Compression Ignition Engine (RDU1403126), Member,15/11/2014, 14/11/2016, Sedang Berjalan, (RM38,575).
58. Valve Wear Analysis with Nano Coating for Compressed Natural Gas (CNG) Engine (RDU1403124), Member, 15/11/2014, 14/11/2016, Sedang Berjalan, (RM21,750)
59. Characterization of Biodegradable Composites Based on Pineapple Leaf Fibre and Tapioca Bioplastic Resin (RDU140120), Member, 01/07/2014, 30/06/2016, Sedang Berjalan, (RM83,000)
60. Engine Valve Seat wear study on Compressed Natural Gas (CNG)by using Nano Powder (RDU140125), Member, 01/07/2014, 30/06/2017, Sedang Berjalan,(RM125,000).
61. Computational Fluid Dynamics (CFD) Study for Flow pattern and heat Transfer in Refrigeration and air Conditionng Systems (GRS140311), Leader, 25/02/2014, 24/02/2017, Sedang Berjalan
62. Development of Plug-in Hybrid Electric Single Cylinder Four Stroke Motorcyle (GRS140312), Leader, 25/02/2014, 24/02/2016, Sedang Berjalan
63. Experimental Study on Exhaust Gas Recirculation (EGR) with Liquefied Petroleum Gas (LPG) on-Board Injection Operating with a Single Cylinder Diesel Engine (RDU140302), Member, 15/01/2014, 14/01/2016, Sedang Berjalan, (RM27,500)

9. CONSULTANCY WORK

1. Laboratory evaluation and development work on fuel enhancer, voltage booster, additives and fuel preheaters for:
   - *Edaran Otomobil Nasional*, EON,
   - AR^2 Ltd (Singapore),
   - N.V Nivon Sdn. Bhd
   - Air Care International (Malaysia) Sdn. Bhd
   - Marvel Zone (Malaysia) Sdn. Bhd

   The work are being undertaken since November 2001 at the Automotive Development Centre (ADC), UTM,2001~present
2. A member of the technical committee for the procurement of automotive teaching equipment for 8 *Institiut Kemahiran Belia Negara* (IKBN), 2002~present
3. Consulting committee member for Faculty of Mechanical Engineering laboratory technical specification, Kolej Universiti Kejuruteraan & Teknologi Malaysia (KUKTEM), Pahang, 2002~present
4. Design and Development of two unit of Tramcar for Taman Botani in Putrajaya for Champino Sdn Bhd/Perbadanan Putrajaya Bhd., 17th. February – 30th. May, 2003
5. Vibration investigation problem of the 1st. unit of 4-stroke 125cc of the millennium model produced by *MZ Mottorad* Sdn. Bhd. 2nd. April – 2nd. July 2003.
6. Implementation of computational fluid dynamic (CFD) work for *Modu-Logic Sdn. Bhd*. for the exhaust system dedicated to the *Proton Campro* engine 1.6 litre model, June-July 2003.
7. Invited Associate Professor (Profesor Madya Tamu) for Kolej Universiti Kejuruteraan & Teknologi Malaysia (KUKTEM), Pahang, 1 November 2003.~31 Oktober 2004.
8. Official discussion with Proton, Shah Alam, 2005,(Pehak proton memberi sebanyak 4 buah kereta dan 4 buah engine yang anggaran nilaiannya RM 300,000.00).

9. Official discussion with Dynalec, India, 2005.Syarikat ini telah bersetuju memberi dua buah dynamometer dengan nilaian RM 400,000.00.
10. Official discussion with Proton, Shah Alam, 2007,(Pehak proton memberi sebanyak 3 buah kereta yang anggaran nilaiannya RM 180,000.00).
11. External Consultant VTC Solition Sdn Bhd., 2012~present
12. Consultant UMK Business Ventures Sdn. Bhd., 2013
13. Labynite sdn.Bhd, Energy Comsuption, Vot.No: UMP.14.04/12.20/3(76), August 2013
14. External Consultant OC Technology Sdn Bhd., 2013
15. External Consultant CSP Sdn Bhd., 2013~present

10. MAJOR PUBLICATIONS

Books

i. "Pembakaran Turbine Gas" UTM and Renong, 1997
i. "Enjin Diesel dan Sistem Bahan Api", UTM, 2002.
ii. "Dinamik Gas", UTM-ITNMB, 2005
iii. "Automotive Technology", OUM, 2005
iv. "Alternative for Tomorrow: Core Development In the Near Future", Professorial Lecture, UMP Press, 2010.
v. "Computer Numerical Control", UMP Press, 2012.

Chapter in Book

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2. K.Kadirgama, M.M.Noor, M.M.Rahman, M.S.M.Sani, **Rosli A.Bakar**, K. A. Abou-El-Hossein, "Prediction Modelling of Power and Torque in End-Milling", 11th International Conference on Optimum Design of Structures and Materials in Engineering (OPTI09), 8-10 June, Algarve, Portugal, 2009.
3. M.M.Noor, K.Kadirgama, M.M.Rahman**, Rosli A. Bakar**, C.H.C.Haron, "Response Surface Method and Neural Network to Determine Surface Roughness for Laser Cutting on Acrylic Sheets", 12th CIRP International Conference On Modelling Of Machining Operations, (CIRP CMMO'09), 7-8 May, Donostia-San Sebastian, Spain, Vol. 2, 851-858, ISBN: 978-84-608-0866-4, 2009.
4. K.Kadirgama, M.M.Noor, M.M.Rahman, **Rosli A.Bakar**, B.Mohammad, "Experimental and Numerical Study of Cutting Force in End-Milling Operation Using Statistical Method", 12th CIRP International Conference On Modelling Of Machining Operations, (CIRP CMMO'09), 7-8 May, Donostia-San Sebastian, Spain, Vol. 2, 843-850, ISBN: 978-84-608-0866-4, 2009.
5. M.M.Noor, K.Kadirgama, M.M.Rahman, M.R.M.Rejab**, Rosli A.Bakar**, Abdullah Ibrahim "The Implementation of OBE at Faculty of Mechanical Engineering, Universiti Malaysia Pahang", 'Selected Papers in University Teaching and Learning', UiTM Shah Alam, Selangor, 2009.
6. K.Kadirgama, M.M.Noor, M.M.Rahman, M.S.M.Sani, **Rosli A. Bakar**, Abdullah Ibrahim, "Development of Artificial Intelligent and Statistical Model to Study the Importance of Pre-Requisite for Heat Transfer", 'Selected Papers in University Teaching and Learning', UiTM Shah Alam, Selangor, 2009.

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7. M.M. Rahman, Md. Ashikur Rahman Khan, K. Kadirgama and **Rosli A. Bakar**,"Prediction of Material Removal Rate for Ti-5Al-2.5Sn in EDM using MultiLayered Perceptron Neural Network Technique. Recent Researches in Neural Networks,

Fuzzy Systems", Evolutionary Computing and Automation, pp. 17-23 (ISI/SCI indexed), 2010.

8. M.M. Rahman, Md. Ashikur Rahman Khan, K. Kadirgama, M.M. Noor and **Rosli A. Bakar**, " Mathematical Modeling of material Removal Rate for Ti-5Al-2.5Sn through EMD Process: A Response Surface Method", Advances in Control, Chemical Engineering, Civil Engineering and Mechanical Engineering, pp. 34- 37, 2010.
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10. K. Kadirgama, M.M. Noor, M.M. Rahman, M.S.M. Sani, M.R.M. Rejab, **Rosli A. Bakar**, K.A. Abou-El-Hossein,"Prediction Modelling of Power and Torque in End-Milling", WIT Transactions on the Built Environment, 112: 409-418, 2010.

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2. **Rosli Abu Bakar**, "Computational and Experimental Investigation of the Combustion Performance in a Diesel Engine", Ph. D Thesis, Hanyang University, Seoul, Korea, 1997.

Research report

1. **Rosli Abu Bakar,** "Engine Performance Test Using CNG as Fuel in the 4 Stroke Engine", A 82 page technical report presented to the Research Management Centre (RMC) upon the completion to the RMC funded project (Vot No. 71276), 2000

2. **Rosli Abu Bakar,** "Design and Development of a New CNG (Compressed Natural Gas) Engine", A 157 page technical report presented to the Research Management Centre (RMC) upon the completion to the RMC funded project (Vot No. 71426), 2000.
3. **Rosli Abu Bakar,** "Design and Development of a New CNG (Compressed Natural Gas) Engine", A 76 page technical report presented to the Research Management Centre (RMC) upon the completion to the IRPA funded project (Vot No. 72351), 2002.
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1. **Rosli Abu Bakar** "A Study on the Performance Factors of Combustion In Swirl Combustion Chamber Type Diesel Engine", Buletin Jentera Jil. 12, Bil.2, Universiti Teknologi Malaysia, 1992.

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22. Seminand **Rosli Abu Bakar**, "Nozzle Holes Effect on Unburned Fuel in Injected and In-Cylinder Fuel of Four Stroke Direct Injection Diesel Engine", Research Journal of Applied Sciences 2 (11): 1165-1169, 2007. ISSN: 1815-932X, 2007.
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25. Semin, **Rosli Abu Bakar**, and Abdul Rahim Ismail, "Engine Power Calculation using Air Flow through Engine from Flow-bench Test Flow of Four Stroke DI Diesel Engines", Journal of Engineering and Applied Sciences 2 (12), pp: 1812-1817, ISSN: 1816-949X, 2007.

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31. Abdul Rahim Ismail, **Rosli Abu Bakar** and Semin, "An Investigation of Valve Lift Effect on Air Flow and CD of Four Stroke Engines Based on Experiment", American Journal of Applied Sciences 5 (8), pp: 963-971, 2008. ISSN: 1546-9239, 2008.
32. Semin, N. M. I. N. Ibrahim, **Rosli Abu Bakar** and Abdul R. Ismail, "In-Cylinder Flow through Piston-Port Engines Modeling using Dynamic Mesh", Journal of Applied Sciences Research Vol. 3, No. 1, pp: 58-64,ISSN: 1816-157X, 2008.
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41. “The Effect of Important Parameters on the Natural Gas Vehicles Driving Range”, Journal of Automobile Engineering,Proceedings of the Institution of Mechanical Engineers, 2011.
42. “A Study on the Potential of Cost and Energy Savings at an Academic Building - A Survey at Playford Building, University of South Australia (UniSA)”,Journal of Mechanical Engineering and Sciences (JMES), 2011.
43. “A Study on Lean Combustion and Emission Characteristics of Bioethanol and Its Blends in a SI Engine”, Journal Energy and Fuel,ACS Publications, 2011.
44. “Analysis the Pressure and Temperature Characteristics of Diesel Engine Convert to Sequential Port Injection CNG Engine”, International Journal of Engineering, 2011.
45. “Effect of engine load on the injection spray, combustion, and exhaust emissions characteristics in a diesel-bioetha-

nol blended fuel engine",Journal Energy and Fuel, ACS Publications, 2011.

46. "Parametric Simulation of Triple-Pressure Reheat Combined Cycle: A Case Study", International symposium on Mechanical Science and Technology (ISMST), 2011.
47. "Multidimensional Computational Modeling of Direct Injection for Hydrogen Fueled Engine", International symposium on Mechanical Science and Technology (ISMST), 2011.
48. "Force and Moment Measurements for a Generic Car Model in Proximity to a Side-Wall", Journal of Automobile Engineering, Proceedings of the Institution of Mechanical Engineers, 2011.

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49. "The Implementation of the Outcome-Based Education (OBE) Curriculum for Electrical Engineering Department in Malaysian Polytechnics", Educational Research Journal, 2012
50. "Improvement of High End Performance of a Spark Ignition Engine Using Adaptive Valve Lift and Timing Mechanism ", International Journal of Automotive and Mechanical Engineering (IJAME), 2012.
51. "Finite Element Simulation of Axial Crushes of Multiple Corners Square Cotton Composites", Proceedings of the 2nd. International Conference on Arts, Social Sciences & Technology Penang, Malaysia, 3rd. – 5th.March, 2012.
52. "Effect of Minimum Quantity Lubricant (MQL), Dry and Flooded Lubricant Conditions on Tool Wear and Surface Roughness in Turning AI 6061", Proceedings of the 2nd. International Conference on Arts, Social Sciences & Technology Penang, Malaysia, 3rd. – 5th.March, 2012.
53. "Aspects Regarding Technical and Economic Upgrade Elements in the Case of an A.D. Missile System ", Math-

ematical and Computational Methods in Science and Engineering (MACMESE '12) Conference, 2012.
54. "Waveform-adapted wavelet denoising of ECG signals",Mathematical and Computational Methods in Science and Engineering (MACMESE '12) Conference, 2012.
55. "Effect of Minimum Quantity Lubricant (MQL), Dry and Flooded Lubricant Conditions on Tool Wear and Surface Roughness in Turning AI 6061",Proceedings of the 2nd. International Conference on Arts, Social Sciences & Technology, Penang, Malaysia, 3rd. – 5th.March, 2012.
56. "Heat Transfer on Peristaltic Transport with Slip Condition in an Asymmetric Porous Channel", International Journal of Engineering, 2012.
57. "Soot Reduction Strategy: A Review",International Conference on Production, Energy and Reliability (ICPER2012), 2012
58. "Technical And Economic Feasibility Of Biomass CHP Plants AndPhotovoltaic Systems For The Thermal And Electrical EnergyRequirements Of A University Campus",International Conference on Production, Energy and Reliability (ICPER2012), 2012
59. "Fast Speed and Energy Efficient Four-ports Hydraulic Actuators",International Conference on Production, Energy and Reliability (ICPER2012), 2012
60. "Comparative Study on the Policy in Promoting Sustainable Construction in Developed Asian Countries", IEEE Symposium on Business, Engineering and Industrial Applications (ISBEIA 2012), (Green Technology and Sustainable Development), 2012
61. "Removal of reactive dyes from single and binary mixture by Mg/Al-NO3-layered double hydroxide", IEEE Symposium on Business, Engineering and Industrial Applica-

tions (ISBEIA 2012), (Green Technology and Sustainable Development), 2012

62. "Passive damping network in dc distributed power system driven by photovoltaic system",2012 IEEE International Conference on Power and Energy (PECon 2012) 2012.
63. "A simulation of Aerosols in Asia with the use of ADAM2 and CAMQ" Heat Transfer, Thermal Engineering and Environment (HTE '12) Conference 2012,Istanbul, Turkey.
64. "Experimental Investigations on Augmentation of Turbulent Flow Heat Transfer in a Horizontal Tube Using Square Leaf Inserts", International Conference on Mathematical and Computational Methods in Science and Engineering (MACMESE '12), 2012, Paris
65. "Optimizing the shape of piston ring face using an inverse method", Proceedings of the Institution of Mechanical Engineers, Part D, Journal ofAutomobile Engineering, 2012.
66. "An investigation on the stress-strain relationship of cold-rolled steel sheets in automotive industry",Proceedings of the Institution of Mechanical Engineers, Part D, Journal of Automobile Engineering, 2012.
67. "Aspects Regarding Technical and Economic Upgrade Elements in the Case of an A.D. Missile System",MATHEMATICAL and COMPUTATIONAL METHODS in SCIENCE and ENGINEERING (MACMESE '12) Conference, 2012,Malta.
68. "MAJORS EFFECTS OF TOURISM ENVIRONMENT ISSUES IN MOUNTAIN OF ROMANIA",Development, Energy, Environment, Economics (DEEE '12) Conference 2012,Paris.
69. "Free Convection in a Porous Cavity Filled with Nanofluids",ENVIRONMENTAL and GEOLOGICAL SCIENCE and ENGINEERING (EG '12) Conference, 2012,

Vienna.

70. "Waveform-adapted wavelet denoising of ECG signals", MATHEMATICAL and COMPUTATIONAL METHODS in SCIENCE and ENGINEERING (MACMESE '12) Conference, 2012,Malta.
71. "Degradation of Dye Azure B by Electrochemical Advanced Oxidation Processes", Development, Energy, Environment, Economics (DEEE '12) Conference, 2012,Paris.
72. "A Study on Heat Transfer by Electric Arcs and Performance Prediction in Gas Circuit Breaker", EUROPEAN CONFERENCE of CIRCUITS TECHNOLOGY and DEVICES (ECCTD '12) Conference 2012,Paris.
73. "Dielectrophoretic technique for the treatment of oily wastewater",ENVIRONMENTAL and GEOLOGICAL SCIENCE and ENGINEERING (EG '12) Conference 2012,Vienna.
74. "Optimum Selection of Air Surveillance System in Mountainous Airports",EUROPEAN CONFERENCE of CIVIL ENGINEERING (ECCIE '12) Conference 2012, Paris.
75. "Modelling the Evacuation of People from a Train on Fire in a Railway Tunnel",EUROPEAN CONFERENCE of CIVIL ENGINEERING (ECCIE '12) Conference 2012, Paris.
76. "Design and Implementation of Digital Beam Former Architecture for Phased Array Radar ", CIRCUITS, SYSTEMS, ELECTRONICS, CONTROL & SIGNAL PROCESSING (CSECS '12) Conference.
77. "Experimental Investigations on Augmentation of Turbulent Flow Heat Transfer in a Horizontal Tube Using Square Leaf Inserts",PEUROPEAN CONFERENCE of MECHANICAL ENGINEERING (ECME '12) Conference 2012, Paris.

78. "Performance and emission characteristic on a two cylinder DI diesel engine fuelled with ethanol-diesel blends", International Conference on Sustainable Energy Engineering and Application (ICSEEA 2012), Indonesia.
79. "REGENERATIVE PIEZOELECTRIC LINEAR GENERATOR ACTUATION PART DEVELOPMENT ", Journal of Mechanical Engineering and Sciences (JMES), 2012.

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80. "Development and Experimental Validation of a Model for Bio Filtration for Hydrogen Sulfide Removal: Effect of Biofilm Development",APPLIED MATHEMATICS (AMERICAN-MATH '13) Conference 2013, USA.
81. "Open Formula of Runge-Kutta Method for Solving the Initial Value Problem of the Ordinary Differential Equation", MATHEMATICAL METHODS, COMPUTATIONAL TECHNIQUES and INTELLIGENT SYSTEMS (MAMECTIS '13) Conference 2013, Lemesos.
82. "Some Factors Affecting Hours Worked Weekly in USA, China, and Turkey", APPLIED MATHEMATICS (AMERICAN-MATH '13) Conference, Cambridge, USA, WSEAS, 2013
83. "Performance and emission characteristic on a two cylinder DI diesel engine fuelled with ethanol-diesel blends", International Conference on Sustainable Energy Engineering and Application (ICSEEA 2012), Indonesia.
84. "REGENERATIVE PIEZOELECTRIC LINEAR GENERATOR ACTUATION PART DEVELOPMENT ", Journal of Mechanical Engineering and Sciences (JMES), 2012.
85. "A Critical Review on Carbon Emission Reduction in the Malaysian Construction Industry: A Proposed Model of Construction Cost and Carbon Emission Best Practice",

2013 IEEE Symposium on Humanities, Science & Engineering Research, 2013.
86. "Weld Zone Development for Dissimilar Resistance Spot Welds of Low Carbon Steel and DP600: Simulation and Experimental Investigation", 2013 IEEE Symposium on Humanities, Science & Engineering Research, 2013.
87. "Effect of Post Annealing on the Resistive Switching of Plasma Treated Titania Thin Films",2013 IEEE Symposium on Humanities, Science & Engineering Research, 2013.
88. "Short-Circuit Resistance Capacity of a 250MVA High-Power Transformer ", INDUSTRIAL and MANUFACTURING TECHNOLOGIES (INMAT '13) Conference, WSEAS, 2013
89. "Manufacturing technology by pressing the cylinder head covers composite polymer type SMC (Sheet Moulding Compounds) for the automotive industry of agriculture ", INDUSTRIAL and MANUFACTURING TECHNOLOGIES (INMAT '13) Conference, WSEAS, 2013
90. "Calculation Method for the Energy Loss in the Pneumatic Mining Networks ", INDUSTRIAL and MANUFACTURING TECHNOLOGIES (INMAT '13) Conference, WSEAS, 2013
91. "Flexible public transport in low density urban areas",URBAN PLANNING and TRANSPORTATION (UPT '13) Conference, Cambridge, UK, WSEAS, 2013
92. "Public transport towards sustainability in midsized municipalities", URBAN PLANNING and TRANSPORTATION (UPT '13) Conference, Cambridge, UK, WSEAS, 2013
93. "Analysis and optimization of PEM fuel cell biphasic model", URBAN PLANNING and TRANSPORTATION (UPT '13) Conference, Cambridge, UK, WSEAS, 2013

94. "Determination of Hygroscopicity of Composite Materials Used in Furniture Industry", MANUFACTURING ENGINEERING, QUALITY and PRODUCTION SYSTEMS (MEQAPS '13) Conference, Brasov, WSEAS, 2013.
95. "Safety Management Diagnostic Method Regarding Work Cost Accidents from Electrical Power Installations", INDUSTRIAL and MANUFACTURING TECHNOLOGIES (INMAT '13) Conference, Vouliagmeni, WSEAS, 2013
96. "Safety Management Diagnostic Method Regarding Work Cost Accidents from Electrical Power Installations", INDUSTRIAL and MANUFACTURING TECHNOLOGIES (INMAT '13) Conference, Vouliagmeni, WSEAS, 2013
97. "Manufacturing technology by pressing the cylinder head covers composite polymer type SMC (Sheet Moulding Compounds) for the automotive industry of agriculture", INDUSTRIAL and MANUFACTURING TECHNOLOGIES (INMAT '13) Conference, Vouliagmeni, WSEAS, 2013
98. "A Study of Centerless Grinding", MANUFACTURING ENGINEERING, QUALITY and PRODUCTION SYSTEMS (MEQAPS '13) Conference, Brasov, WSEAS, 2013
99. "The pyrography, from solar radiation to laser radiation", MANUFACTURING ENGINEERING, QUALITY and PRODUCTION SYSTEMS (MEQAPS '13) Conference, Brasov, WSEAS, 2013
100. "Comparison of weathering behavior of heat-treated jack pine during different artificial weathering conditions", FLUID MECHANICS and HEAT & MASS TRANSFER (FLUIDSHEAT '13) Conference, Dubrovnik, WSEAS, 2013.

101. “Effect of pressure in Proton Exchange Membrane Fuel Cell (PEMFC)”, International Journal of Energy Engineering, Scientific & Academic Publishing (SAP),2013.
102. “PRELIMINARY INVESTIGATION OF THE INFLUENCE OF 2 CYLINDER DIESEL ENGINE MODIFICATION (IDI TO DI) ON THE PERFORMANCE AND ITS EMISSION”, Mechatronics, Electrical Power, and Vehicular Technology (MEV), 2013
103. “Dynamic Analysis of the Human Walk”, MANUFACTURING ENGINEERING, QUALITY and PRODUCTION SYSTEMS (MEQAPS ‘13) Conference, Brasov, WSEAS, 2013.
104. “A Passivity Approach to Control of Markovian Jump Systems with Mixed Time-Varying Delays”, Rhodes - SYSTEMS (part of CSCC ‘13) Conference, WSEAS, 2013.
105. “Modeling and Simulation of Coal Winning Process on the Mechanized Face”, INDUSTRIAL and MANUFACTURING TECHNOLOGIES (INMAT ‘13) Conference, Vouliagmeni, WSEAS, 2013.
106. “Improvement of Fire Resistance Determination Process for Buildings and Metal Structures under the Influence of Fire”, ENVIRONMENT, ECOSYSTEMS and DEVELOPMENT (EED ‘13) Conference, Brasov, WSEAS 13.
107. “Multi-Fuel Modeling of Oxygen Ion Transport in Solid Oxide Fuel Cell”,ENERGY& ENVIRONMENT (EE ‘13) Conference Rhodes, WSEAS 2013.
108. “Assurance of CSR and Sustainability Reports Standards and Empirical Evidence”, IEEE Symposium on Business, Engineering and Industrial Applications (ISBEIA 2013), 2013

109. "Modeling, Simulation and Control of a Parallel Hybrid Electric Vehicle", Dubrovnik - CIRCUITS, SYSTEMS, COMMUNICATIONS, COMPUTERS and APPLICATIONS Conference (CSCCA '13), Dubrovnik, 2013.
110. "Complex Model for Risk Assessment and Treatment in Industrial Processes ", ENERGY & ENVIRONMENT (EE '13) Conference Rhodes, WSEAS 2013.
111. "Alteration of Nano Metakaolin for Ultra High Performance Concrete (UHPC) ",InCIEC 2013 International Civil and Infrastructure Engineering Conference, 2013.
112. "Assessment of heavy metal content and leaching characteristics of ash from a coal-fired power plant in Romania", POWER and ENERGY SYSTEMS (POES '13) Conference, Chania, 2013.
113. "Possibilities of using Miscanthus giganteus as additional fuel in large coal fired power plants", POWER and ENERGY SYSTEMS (POES '13) Conference, Chania, 2013.
114. "The influence of digital controllers on the operation of boilers with natural circulation", POWER and ENERGY SYSTEMS (POES '13) Conference, Chania, 2013.
115. "Integrated Development Environment for the Ambient Calculus ", AUTOMATION & INFORMATION (ICAI '13) Conference, Valencia,2013
116. "Shape Optimization of Rubber Boot", AUTOMATION & INFORMATION (ICAI '13) Conference, Valencia,2013
117. "Lean Supply Chain Management and Rubber Industry: Case Study Block Rubber Industry", Engineering Sciences & Industry Applications (ISBEIA 2013), 2013.
118. "Thermochemical Non-Equilibrium Reentry Flows in Two-Dimensions: Eleven Species Model – Part II", WSEAS Transactions on Computers Journal, 2013

119. "Tsunami Wave Simulation Models Based on Hexagonal Cellular Automata", WSEAS Transactions on Computers Journal, 2013
120. "Study of Centrifugal Pump Operating as Turbine in Small Hydropower Plants", POWER and ENERGY SYSTEMS (POES '13) Conference, Chania, 2013.
121. "Hybrid Renewable Energy System - Configuration and Control", ELECTRIC POWER SYSTEMS, HIGH VOLTAGES, ELECTRIC MACHINES (POWER '13) Conference, Chania, 2013.
122. "Effect of shading photovoltaic panel interception rods in lightning protection", ELECTRIC POWER SYSTEMS, HIGH VOLTAGES, ELECTRIC MACHINES (POWER '13) Conference, Chania, 2013.
123. "Thermochemical Non-Equilibrium Reentry Flows in Two-Dimensions: Eleven Species Model – Part I", WSEAS Transactions on Computers Journal, 2013.
124. "Thermochemical Non-Equilibrium Reentry Flows in Two-Dimensions: Eleven Species Model – Part II", WSEAS Transactions on Computers Journal, 2013.
125. "Recovery of the waste heat by large capacity heat pumps for Riga city district heating system", POWER and ENERGY SYSTEMS (POES '13) Conference, Chania, 2013.
126. "Avoided CO2 Cost for Parallel Operation of Conventional Power Plants and Renewable Energy Sources", POWER and ENERGY SYSTEMS (POES '13) Conference, Chania, 2013.
127. "Effect of Substrate Temperature on the Growth of CZTS Thin Films by RF Magnetron Sputtering", IEEE International Conference on Clean Energy & Technologies (CEAT 2013), 2013

128. "Evaluation of the Efficiency Energy of Wood Stove from Irati Brazilian City",International Journal of Agriculture and Forestry from Scientific & Academic Publishing, USA, 2013.
129. "Predicting Braking Distance based on the Polished Stone Value of Aggregates in the Wear Layer ", CIVIL ENGINEERING (ECCIE '13) Conference, Antalya, 2013.
130. "Monitoring the Conflict Situations Using the Video Analysis in the Czech Republic",CIVIL ENGINEERING (ECCIE '13) Conference, Antalya, 2013.
131. "Laminar and Turbulent Simulations of Several TVD Schemes in Two-Dimensions – Part III ", WSEAS Transactions on Computers Journal, 2013.
132. "An Efficient Layered FFT Approach for Reduction of PAPR, Spectral Re-growth and CFO on the Performance of an OFDM System", WSEAS Transactions on Communications Journal, 2013.
133. "An maximal clique mining algorithm for highway network optimization problem", WSEAS Transactions on Communications Journal, 2013.
134. "Combustion simulation for the marine engines", MECHANICAL ENGINEERING (ECME' 13) Conference, Paris, 2013
135. "Impact Damage Response of Osteoporosis Hip Bone", MECHANICAL ENGINEERING (ECME' 13) Conference, Paris, 2013
136. "Convenience yields and arbitrage revenues of emission allowances between spot and futures", WSEAS Transactions on Systems Journal, 2013.
137. "Removal of Copper Using Groundwater Treatment Plant Sludge (GWTPS) Adsorbent in Continuous Flow Activated Sludge System", SUSTAINABLE URBAN

TRANSPORT and ENVIRONMENT (SUTREN '13) Conference, Budapest, 2013

138. "The utilization of electrical cutting signal for the quality control of the metallic carbide plates, of the edge of the drill, and for the appreciation of the temperature in the cutting zone" CIRCUITS, SYSTEMS, ELECTRONICS, CONTROL & SIGNAL PROCESSING (CSECS '13) Conference, Budapest, 2013
139. "Simulation of Coverage of WiMAX ", CIRCUITS, SYSTEMS, ELECTRONICS, CONTROL & SIGNAL PROCESSING (CSECS '13) Conference, Budapest, 2013
140. "Testing method of materials for enthalpy wheels", DEVELOPMENT, ENERGY, ENVIRONMENT, ECONOMICS (DEEE '13) Conference, Paris, 2013
141. "Numerical and experimental models of the load of an object due to the effects of a flow field", APPLIED MATHEMATICS (AMATH '13) Conference, Budapest, 2013
142. "Numerical algorithm for solving the elasto-plastic problem with isotropic hardening and the plane stress state", APPLIED MATHEMATICS (AMATH '13) Conference, Budapest, 2013
143. "Additive and Multiplicative Heat Load Models Comparison", CIRCUITS, SYSTEMS, ELECTRONICS, CONTROL & SIGNAL PROCESSING (CSECS '13) Conference, Budapest, 2013
144. "Additive and Multiplicative Heat Load Models Comparison", WSEAS Transactions on Heat and Mass Transfer Journal, 2013
145. " Choosing the optimal fuel cell technology for application in the field of passive houses", URBAN SUSTAINABILITY, CULTURAL SUSTAINABILITY, GREEN

DEVELOPMENT, GREEN STRUCTURES and CLEAN CARS (USCUDAR '13) Conference, Budapes, 2013

146. "Monitoring of Photovoltaic Wind-Turbine Battery Hybrid System",WSEAS Transactions on Power Systems Journal, 2013
147. "Comparative advantages using solar and wind energy in hybrid systems at the same site",WSEAS Transactions on Power Systems Journal, 2013
148. " Selected issues connected with urban transport systems operation", SUSTAINABLE CITIES, URBAN SUSTAINABILITY and TRANSPORTATION (SCUST '13) Conference, Baltimore, 2013

2014

149. "Analysis of Steel Made Leaf spring using FEA tool Ansys ", International ConferenceonAutomotive Technology, ICAT 2014
150. "Mathematical Modeling of Electromagnetic Levitation Based Active Suspension using Bond Graph ", International Conference on Automotive Technology, ICAT 2014
151. "Experimental Analysis of Automotive Microchannel Condenser withHFC 134a and Hydrocarbon Mixture of R290 and R600a", International Conference on Automotive Technology,ICAT 2014
152. "FLUID DYNAMIC SIMULATION STUDIES OF FLOWCHARECTERISTICS FOR PREPARTION OF MIXTURETOWARDS BETTER COMBUSTION AND PERFOMANCEBY USING STAR CD SOFTWARE", International Conference on Automotive Technology, ICAT 2014.
153. "Single Zone Modeling of Homogeneous Charge Combustion Ignition Engine", International Conference on Automotive Technology, ICAT 2014.

154. "Vision Based Smart "Door Open Alert System" ", International Conference on Automotive Technology, ICAT 2014.
155. "Anthropomorphism in Political Cartoon: Case Study of the 1965 Malaysia- Indonesia Confrontation", International Colloquium of Art and Design Education Research 2014 - Cultural Studies and Social Implication of Art (i-CADER2014) - Cultural Studies and Social Implication of Art (Cultural Studies and Social Implication of Art), Kuala Lumpur, 2014.
156. "Preservation Characteristics of Malay Garden: A Catalyst for Sustainable Cultural Landscape in Malaysia", International Colloquium of Art and Design Education Research 2014 - Cultural Studies and Social Implication of Art (i-CADER201 (Cultural Studies and Social Implication of Art), Kuala Lumpur, 2014.
157. "Preliminary consideration on GPS signal reconstruction in real driving cycle analysis", URBAN PLANNING and TRANSPORTATION (UPT '14) Conference, Salerno, 2014.
158. "Imminent Smart DC Nano-Grid for Green Buildings — A Contemplative View", ENERGY, ENVIRONMENT, ECOSYSTEMS and SUSTAINABLE DEVELOPMENT (EEESD '14) Conference, Tenerife, 2014.
159. "Analysis of the Power Quality using Intelligent Techniques", INTELLIGENT CONTROL, MODELLING and SYSTEMS ENGINEERING (ICMS '14) Conference, Cambridge, 2014.
160. "Observer-Based Fault Detection and Isolation of MZSH System Sensors", CIRCUITS, SYSTEMS, SIGNAL and TELECOMMUNICATIONS (CSST '14) Conference, Tenerife, 2014.

161. "A new approach to problem solving construction crew rotations", URBAN PLANNING and TRANSPORTATION (UPT '14) Conference, Salerno, 2014.
162. "Comparative study regarding the global influence of energy storage medium on autonomous hybrid systems for a building with economical energy consumption", RENEWABLE ENERGY SOURCES (RES '14) Conference, Kuala Lumpur, 2014.
163. "Thermochemical Non-Equilibrium Entry Flows in Mars in Two-Dimensions – Some Results", WSEAS Transactions on Computers Journal, 2014.
164. "Relation of Surface Roughness and Photo-induced Charge Trapping of Porous Si Nanowires", RENEWABLE ENERGY SOURCES (RES '14) Conference, Kuala Lumpur, 2014.
165. "Renewable Energy Generation and Deployment Model by Wind and Vehicular Mobility with Discharge Stations", RENEWABLE ENERGY SOURCES (RES '14) Conference, Kuala Lumpur, 2014.
166. "Thermo-magnetic Innovative Technology for Green Automotive Applications", ENERGY, ENVIRONMENT, ECOSYSTEMS and SUSTAINABLE DEVELOPMENT (EEESD '14) Conference, Tenerife, 2014.
167. "Performance of Variable Design Configurations for Wind Driven Rain (WDR) Shading Device in Tropical Climate", RENEWABLE ENERGY SOURCES (RES '14) Conference, Kuala Lumpur, 2014.
168. "An Initial Study on Wind Speed in Mersing, Malaysia", RENEWABLE ENERGY SOURCES (RES '14) Conference, Kuala Lumpur, 2014.
169. "Thermochemical Non-Equilibrium Reentry Flows in Two-Dimensions: Eleven Species Model – Part II",WSEAS Transactions on Computers Journal, 2014.

170. "A clique-based and degree-based clustering algorithm for expressway network simplification problem",WSEAS Transactions on Computers Journal, 2014.
171. "Energy Harvesting Bridge",WSEAS Transactions on Power Systems, 2014.
172. "Load Flow Solution for Unbalanced Radial Power Distribution using Monte-Carlo Simulation",WSEAS Transactions on Power Systems Journal, 2014.
173. "Optimization of Non Reheat Steam Cycles for CHPP", ENERGY, ENVIRONMENT, ECOSYSTEMS and SUSTAINABLE DEVELOPMENT (EEESD '14) Conference, Tenerife, 2014.
174. "Throughfall deposition of N and S to mangrove ecosystems in the Southeast of Mexico", ENVIRONMENTAL and GEOLOGICAL SCIENCE and ENGINEERING (EG '14) Conference, Salerno, 2014.
175. "The Numerical Simulation of Double-Diffusive Laminar Mixed Convection Flow in a Lid-Driven Porous Cavity", WSEAS Transactions on Heat and Mass Transfer Journal, 2014.
176. "Convenience yields and arbitrage revenues of emission allowances between spot and futures", WSEAS Transactions on Systems Journal, 2014.
177. "Monitoring of Photovoltaic Wind-Turbine Battery Hybrid System", WSEAS Transactions on Power Systems, 2014.
178. CONGESTION MANAGEMENT IN DEREGULATED POWER SYSTEM BY FUZZY BASED OPTIMAL LOCATION AND SIZING OF UPFC "",WSEAS Transactions on Power Systems Journal, 2014.
179. "Laminar and Turbulent Simulations of Several TVD Schemes in Two-Dimensions – Part III",WSEAS Transactions on Computers Journal, 2014.

180. "Comparative advantages using solar and wind energy in hybrid systems at the same site", WSEAS Transactions on Power Systems Journal, 2014.
181. "Mathematical models of the system of management of technical maintenance of water pipeline networks", EUROPMENT Journal, 2014.
182. "EXPERIMENTAL STUDIES ON THE PERFORMANCE OF C.I ENGINE USING FISH OIL METHYL ESTER (FME) AS A FUEL FOR VARIOUS BLENDS OF LPG ", International Journal of Automotive and Mechanical Engineering (IJAME), 2014.
183. "FUTURE PROSPECTS OF LOW COMPRESSION IGNITION ENGINE", International Journal of Automotive and Mechanical Engineering (IJAME), 2014.
184. "FORCES SPEEDS IN INTERNAL COMBUSTION HEAT ENGINES", International Journal of Engineering (IJE), 2014.
185. "Simulation of boiling heat transfer within water jacket of 4 cylinder gasoline", International Journal of Engineering (IJE), 2014.
186. "Evaluation of continuous convection and radiation ovens in automobile cure industry", International Journal of Engineering (IJE), 2014.
187. "Numerical simulation of double-diffusive natural convection in n-shaped enclosures", International Journal of Engineering (IJE), 2014.
188. "Social Indicators in Preliminary Studies for the Installation of Solar Panels. Province of Salta, Argentina", Journal of Energy and Power Engineering,JEPE, 2014.
189. "STRESS ANALYSIS OF RADIAL AND NON-RADIAL NOZZLE CONNECTIONS IN ELLIPSOIDAL HEAD PRESSURE VESSEL", MAKALAH JURNAL TERBAIK ANUGERAH MAPIM-KPM 2013.

190. "Analytical solution for investigating of thermal analysis and efficiency of convective-radiative a moving fin with various cross-sectional profiles with temperature-dependent thermal conductivity", International Journal of Engineering (IJE), 2014.
191. "Effect of hydroxy gas addition to air inlet of a SI engine, to investigate Power, torque and exhaust gas emission variation", International Journal of Engineering (IJE), 2014.
192. "Preliminary consideration on GPS signal reconstruction in real driving cycle analysis", URBAN PLANNING and TRANSPORTATION (UPT '14) Conference, Salerno, 2014.
193. "Photovoltaic Panel Modelling Using a Stochastic Approach in MATLAB®&Simulink®", AUTOMATIC CONTROL, MODELLING & SIMULATION (ACMOS '14) Conference, Brasov, 2014.
194. "Bioremediation of Ni2+ polluted soils by plant-associated bacteria in heavy metal phytoremediation process ", ENVIRONMENTAL and GEOLOGICAL SCIENCE and ENGINEERING (EG '14) Conference, Salerno, 2014.
195. "Non-Stationary Dynamics in Reliability Analysis of Adaptive Multi-Agent Systems", AUTOMATIC CONTROL, MODELLING & SIMULATION (ACMOS '14) Conference, Brasov, 2014.
196. "Un-used arable land evaluation in Romania for low indirect impact biofuel production", ENVIRONMENT, ECOSYSTEMS and DEVELOPMENT (EED '14) Conference, Brasov, 2014.
197. "Finite Element Analysis for Estimating the Effect of Various Working Conditions on the Temperature Gradients Created Inside a Rolling Tire", International Journal of Engineering (IJE), 2014.

198. "State Space Based Modeling and Control of Jet Impingement Cooling of Steel Plate", International Journal of Engineering (IJE), 2014.
199. "Construction of 3-D model and its visualization of Road based on terrain", WSEAS Transactions on Computers Journal, 2014.
200. "Researches on the Thermal Stress Influences over the Brakes Performances", AUTOMATIC CONTROL, MODELLING & SIMULATION (ACMOS '14) Conference, Brasov, 2014.
201. "Evaluation method and modelling of electro magnethic processes in the power stage of closed loop DC drive system in condition of periodic speed reverse with current limitation", AUTOMATIC CONTROL, MODELLING & SIMULATION (ACMOS '14) Conference, Brasov, 2014.
202. "Aerospace Hybrid Lightweight Metallic Structures. Case Study – Design of a Turboprop Engine Support", MANUFACTURING ENGINEERING, QUALITY and PRODUCTION SYSTEMS (MEQAPS '14) Conference, Brasov, 2014.
203. "THERMODYNAMIC ANALYSIS OF THE ATKINSON CYCLE", International Workshop on Model Engineering (conference) (IWME), 2014.
204. "Squeal Noise of an Automotive Wiper Blade", International Workshop on Model Engineering (conference) (IWME), 2014.
205. "Reducing Speed and Fuel Transfer of the Green Flag Program in Kaohsiung Port Taiwan ", Transportation Research Part D: Transport and Environment. 2014.
206. "Matlab/Simulink Based Dynamic Modeling of Microturbine Generator for Grid and Islanding Modes of Operation", WSEAS Transactions on Power Systems Journal, 2014

207. “BRAKING SYSTEM MODELING AND BRAKE TEMPERATURE MONITORING”, Mechatronics, Electrical Power, and Vehicular Technology (MEV), 2014.
208. “Electrostatic Precipitator Device for Reduce of Diesel Engine Particulate Matter”, 2nd International Conference on Sustainable Energy and Application (ICSEEA 2014), Research Center for Electrical Power and Mechatronics, Indonesian Institute of Sciences, 2014.
209. “Sonochemistry Approach to Reducing Biodiesel Reaction Time from Jatropha Curcas Oil by Clamp on Tubular Reactor”, 2nd International Conference on Sustainable Energy and Application (ICSEEA 2014), Research Center for Electrical Power and Mechatronics, Indonesian Institute of Sciences, 2014.
210. “A NUMERICAL INVESTIGATION ABOUT THE EGR EFFECT UNDER THE CONDITION OF BOOST PRESSURE ON HCCI AUTOIGNITION”,2nd International Conference on Sustainable Energy and Application (ICSEEA 2014), Research Center for Electrical Power and Mechatronics, Indonesian Institute of Sciences, 2014.
211. “Performance Characteristic of Indirect Diesel Engine Fuelled with Diesel-Bioethanol using Uniplot Software”, 2nd International Conference on Sustainable Energy and Application (ICSEEA 2014), Research Center for Electrical Power and Mechatronics, Indonesian Institute of Sciences, 2014.
212. “Effect of Ethanol Percentage for Diesel Engine Performance using Virtual Engine Simulation Tool”,2nd International Conference on Sustainable Energy and Application (ICSEEA 2014), Research Center for Electrical Power and Mechatronics, Indonesian Institute of Sciences, 2014.

213. "POME (Palm Oil Mill Effluent) – as an Alternative Energy Model to Increase Electrification Ratio in Remote Area in East Kalimantan", 2nd International Conference on Sustainable Energy and Application (ICSEEA 2014), Research Center for Electrical Power and Mechatronics, Indonesian Institute of Sciences, 2014.
214. "Guidance and Control Laws for Quadrotor UAV", WSEAS Transactions on Systems and Control Journal, 2014.
215. "THE ENVIRONMENT- A FACTOR OF SUSTAINABLE DEVELOPMENT AND OF TOURISM'S COMPETITIVENESS IN ROMANIA", SUSTAINABLE TOURISM and CULTURAL HERITAGE (STACH '14) Conference, WSEAS, 2014.
216. "EFFECTS ON TOURISM AND SUSTAINABLE DEVELOPMENT OF ECONOMIC EVOLUTION IN SOUTH EAST ROMANIA", SUSTAINABLE TOURISM and CULTURAL HERITAGE (STACH '14) Conference, WSEAS, 2014.
217. "Effect of CaO, Al2O3, MnO and Fe2O3 in coal ash on the retention of acid-forming elements during coal combustion", WSEAS Transactions on Power Systems Journal, 2014.
218. "Towards an Accurate Modeling of Frequency-Dependent Wind Farm Components under transient conditions", WSEAS Transactions on Power Systems Journal, 2014.
219. "ON SOME PARACOMPACTNESS-TYPE PROPERTIES OF FUZZY TOPOLOGICAL SPACES", MATHEMATICAL METHODS, COMPUTATIONAL TECHNIQUES and INTELLIGENT SYSTEMS (MAMECTIS '14) Conference, 2014.

220. “Characterization of Hyraulic Oil Based Ferrofluid with Various Concentration of γ-Fe 2O3 Particles and Surfactant in “Off-State” Condition”, Journal Teknologi UTM, 2014.
221. “Calibration of Speed-Density Relationships for Freeways in Aimsun”, CIVIL ENGINEERING (ECCIE ‘14) Conference, Florence, 2014.
222. “Influence of the test procedure for setting the external air movement on the thermal performance of open multideck display case”, FLUID MECHANICS and HEAT & MASS TRANSFER (FLUIDSHEAT ‘14) Conference. Lisbon, 2014.
223. “Existence and Exponential Stability of Anti-periodic Solutions for A Cellular Neural Networks with Impulsive Effects”, WSEAS Transactions on Signal Processing Journal, 2014.
224. “A Grünwald-Letnikov scheme for fractional operators of Havriliak-Negami type”, APPLIED MATHEMATICS, SIMULATION, MODELLING (ASM ‘14) Conference, Florence, 2014.
225. “BRICS Mosaic Model for IoT Feasibility Barriers”, CIRCUITS, SYSTEMS, ELECTRONICS, CONTROL & SIGNAL PROCESSING (CSECS ‘14) Conference, Lisbon, 2014.
226. “Penning ionization of simple molecules and their possible role in planetary atmospheres”, DEVELOPMENT, ENERGY, ENVIRONMENT, ECONOMICS (DEEE ‘14) Conference, Florence, 2014.
227. “Performance of indexes used for model validation”, CIRCUITS, SYSTEMS, ELECTRONICS, CONTROL & SIGNAL PROCESSING (CSECS ‘14),Conference, Lisbon, 2014

228. "Distance Laboratory to Explore Electrical Drive", ENERGY & ENVIRONMENT (EE '14) Conference, Geneva, 2014.
229. "Comparison of High Resolution Spectral Methods for Spectrum Estimation of Synthetic Power Signals", WSEAS Transactions on Signal Processing Journal,2014.
230. "Gap acceptance analysis in an urban intersection through a video acquired by an UAV", Florence - CIVIL ENGINEERING (ECCIE '14) Conference, Florence, 2014.
231. "Thermal remote sensing of urban climate change in a post earthquake depopulation: the case study of L'Aquila (Italy)", DEVELOPMENT, ENERGY, ENVIRONMENT, ECONOMICS (DEEE '14) Conference, Florence, 2014.
232. "A Multi-Objective Sequencing Problem in a Mixed-Model Assembly Line using Metaheuristic Algorithms in JIT manufacturing", ROBOTICS, CONTROL and MANUFACTURING TECHNOLOGY (ROCOM '15) Conference, Kuala Lumpur,2014.
233. "Equilibrium-based simulation of lignocellulosic biomass pyrolysis via Aspen Plus®", APPLIED MATHEMATICS, SIMULATION, MODELLING (ASM '14) Conference, Florence,2014.
234. "Energy saving through Building Envelope Innovation: Smart Skin Design", URBAN SUSTAINABILITY, CULTURAL SUSTAINABILITY, GREEN DEVELOPMENT, GREEN STRUCTURES and CLEAN CARS (USCUDAR '14) Conference, Florence, 2014.
235. "Biomechanics Parameters in the Vehicle-Cyclist Crash with Accident Analysis in Palermo", MECHANICAL ENGINEERING (ECME' 14) Conference, Florence, 2014.

236. "A Comparison of the Performance of a Composite Pattern and a Mathematic Expression Parser and Interpreter", APPLIED MATHEMATICS, SIMULATION, MODELLING (ASM '14) Conference, Florence, 2014.
237. "Blast loading of inelastic conical shells with stiffeners", MECHANICAL ENGINEERING (ECME' 14) Conference, Florence, 2014.
238. "A Comparison of a dynamic compilation and mathematic parser libraries in .NET for expression evaluation", APPLIED MATHEMATICS, SIMULATION, MODELLING (ASM '14) Conference, Florence, 2014.
239. "Stochastic models for ordinal panel data with individual and time-varying latent effects", APPLIED MATHEMATICS, SIMULATION, MODELLING (ASM '14) Conference, Florence, 2014.
240. "Research on Properties of Fluid Pressure Drop for Electric Vehicle IGPT Pin fin heat sink", International Journal of Engineering (IJE), 2014

2015

241. "Intensification of Electrical Conductivity of Molten Chloride Electolytes of Lanthanum and Neodymium", ENERGY, ENVIRONMENT, ECOSYSTEMS and SUSTAINABLE DEVELOPMENT (EEESD '15) Conference, Tenerife, 2015.
242. "Combustion Performance of Palm-Diesel Blends in an Oil Burner", ENERGY, ENVIRONMENT, ECOSYSTEMS and SUSTAINABLE DEVELOPMENT (EEESD '15) Conference, Tenerife, 2015.
243. "THE FORMATION OF CO-NO IN A CONFINED CAN COMBUSTOR DUE TO SWIRLING FLOW", ENERGY, ENVIRONMENT, ECOSYSTEMS and SUSTAINABLE DEVELOPMENT (EEESD '15) Conference, Tenerife, 2015.

244. "Utilization of nanotechnologies in agriculture", ENERGY, ENVIRONMENT, ECOSYSTEMS and SUSTAINABLE DEVELOPMENT (EEESD '15) Conference, Tenerife, 2015.
245. "The Numerical solution of systems of Singular Integral Equations by reduction methods in generalized Holder spaces", MATHEMATICAL and COMPUTATIONAL METHODS in SCIENCE and ENGINEERING (MACMESE '15) Conference, Kuala Lumpur, 2015.
246. "Passivity based Controller for Doubly Fed Induction Generator with Wind Turbine", WSEAS Transactions on Systems and Control Journal, 2015.
247. "Similarities between Cell Method and Non-Standard Calculus", APPLIED and COMPUTATIONAL MATHEMATICS (ICACM '14) Conference, Geneva, 2014
248. "DESIGN AND ANALYSIS OF FAULT CURRENT LIMITER BY USING SFCL FOR GRID CONNECTED DISTRIBUTION SYSTEM ", WSEAS Transactions on Power Systems Journal, 2015.
249. "Optimal location and sizing of multiple DGs to enhance the voltage stability in the distribution system using a chaotic ABC algorithm", WSEAS Transactions on Power Systems Journal, 2015.
250. "A New Maximum Power Point Tracking Control Technique of Solar Photovoltaic Water Pumping System", WSEAS Transactions on Power Systems Journal, 2015.
251. "Two novel approximation methods of calculating the reliability Parameters of base-load power plants located in two independent weather conditions", WSEAS Transactions on Power Systems Journal, 2015.
252. "Geometric modelling of low concentrating photovoltaic system", WSEAS Transactions on Power Systems Journal, 2015.

253. “Performance of cascaded doubly fed induction generator in wind energy system ”,WSEAS Transactions on Power Systems Journal, 2015.
254. “A New Maximum Power Point Tracking Control Technique of Solar Photovoltaic Water Pumping System”, WSEAS Transactions on Power Systems Journal, 2015.
255. “Preventive Risk-Management of Power System for Its Reliability Increasing”, WSEAS Transactions on Power Systems Journal, 2015.
256. “SLID: Hybrid Learning Model and Acoustic Approach to Spoken Language Identification using Machine Learning”, WSEAS Transactions on Signal Processing Journal, 2015
257. “Dynamical Analysis of a Delayed Hepatitis B Virus Model with Immune Responses ”, WSEAS Transactions on Mathematics Journal, 2015
258. “Arabic Isolated Word Speaker Dependent Recognition System ”, WSEAS Transactions on Signal Processing Journal, 2015
259. “Advance Trends of Hybrid Electric Vehicles”, AUTOMOTIVE and TRANSPORTATION SYSTEMS (ICAT ‘15) Conference, Salerno, 2015
260. “Novel Method of 2D Data Simulation and Modeling”,APPLIED MATHEMATICS, SIMULATION, MODELLING (ASM ‘15) Conference, Konya, 2015
261. “Contribution of integration the TCSC device and wind farms on power system”, WSEAS Transactions on Power Systems Journal, 2015
262. “Optimization of droop setting using Genetic Algorithm for Speed tronic Governor controlled Heavy Duty Gas Turbine Power Plants”, WSEAS Transactions on Power Systems Journal, 2015.

263. "Simulated Thermal Response of the Bedrock Heat Battery System", ENVIRONMENTAL and GEOLOGICAL SCIENCE and ENGINEERING (EG '15) Conference, Salerno, 2015
264. "Acceptability Evaluation and Experimental Comparison of DTMF and Speech for Accessing Flight Schedule Information in Nigeria", AUTOMATIC CONTROL, SOFT COMPUTING and HUMAN-MACHINE INTERACTION (ASME '15) Conference, Salerno, 2015.
265. "Application of Restoration Indices for Automatic Generation Control in a Restructured Power System", WSEAS Transactions on Power Systems Journal, 2015.
266. "Mitigation of Voltage Stability and Power Flow Control by Using Distributed Power Flow Controller", WSEAS Transactions on Power Systems Journal, 2015.
267. "ASSESSING INDUCED SHEATH VOLTAGE IN MULTI-CIRCUIT CABLES: REVISING THE METHODOLOGY", WSEAS Transactions on Power Systems Journal, 2015
268. "Research on thermal and infrared characteristics of an infrared suppressor embedding exhaust system into helicopter tail", HEAT TRANSFER, THERMAL ENGINEERING and ENVIRONMENT (HTE '15) Conference, Salerno, 2015.
269. "DEVELOPMENT OF A METHOD FOR ANALYSING THE ROAD SAFETY CONDITIONS RELATED TO FRICTION", AUTOMOTIVE and TRANSPORTATION SYSTEMS (ICAT '15) Conference, Salerno, 2015.
270. "Spectacular Simulation Review - Analysis Of different wind turbine companies by Wei bull Analysis for powers", WSEAS Transactions on Power Systems Journal, 2015

11. CO-CURRICULUM

Society

i. Vice President for the Parents and Teacher Association (PIBG) 2000~2001
ii. President for the Parents and Teacher Association (PIBG) 2001~2002
iii. President for the Parents and Teacher Association (PIBG) 2002~2003
iv. President for the Parents and Teacher Association (PIBG) 2003~2004
v. President for the Welfare Board of Religious School 2002~2003
vi. President for the Welfare Board of Religious School 2003~2004
vii. Committee member of Lembaga Akreditasi Negara (LAN) 1999~2007
viii. Committee member of Malaysia Qualification Agency (MQA) 2007~present
ix. Major Kehormat Rejimen Askar Wataniah 505 Batalion Pertama, 2009~present

Games

i. Badminton representing the university faculty sports 1993.
ii. Volleyball representing the university faculty sports 1993.
iii. Badminton representing the university faculty sports 1994.
iv. Volleyball representing the university faculty sports 1994.
v. Badminton representing the university faculty sports 1998.
vi. Volleyball representing the university faculty sports 1998.
vii. Badminton representing the university faculty sports 1999.
viii. Volleyball representing the university faculty sports 1999.
ix. Badminton representing the university faculty sports 2000.
x. Volleyball representing the university faculty sports 2000.
xi. Badminton representing the university faculty sports 2001.
xii. Volleyball representing the university faculty sports 2001.

xiii. Badminton representing the university faculty sports 2002.
xiv. Volleyball representing the university faculty sports 2002.
xv. Volleyball representing the university faculty sports 2003.
xvi. Chief de-mission for the KUKTEM sports team to the Inter IPTA/IPTS sports 2005.
xvii. Chief de-mission for the KUKTEM sports team to the Inter IPTA/IPTS sports 2006.
xviii. Chief de-mission for the UMP sports team to the Inter IPTA/IPTS sports 2007.

12. SIGNIFICANT ACHIEVEMENTS

Honors and Awards

1. The Eighth International Pacific Conference (IPC - 8) Papers Award for Efforts in Contribution. Yokohama, JAPAN, 1995.
2. UTM Research Award 1995. UTM, MALAYSIA
3. The Vice Chancellor Publication Award, UTM, Appreciation certificate, 2001
4. The Vice Chancellor Publication Award, UTM, Appreciation certificate, 2002
5. Excellent Service Award, UTM, 2002
6. Innovation Award, FKM, UTM, 2002
7. Bronze Medal for the Invention/Innovation of "New Pump Impeller Design for Engine Cooling System" at EXPO S&T 2002, Kuala Lumpur, Ministry of Science Technology and Environment of Malaysia.
8. The Vice Chancellor Publication Award, UTM, Appreciation certificate, 2003
9. Silver Medal for "New Pump Impeller Designs for Engine Cooling System", at International Invention Innovation Industrial Design and Technology Exhibition, I-TEX 2003, 14~16, May 2003.

10. Bronze Medal for "New Pump Impeller Designs For Engine Cooling System", at Industrial Art and Technology Exhibition, INATEX 2002/2003, UTM, 2003
11. Best Research Project Award 2003 for "New Design of a 2-Stroke Modular Engine for Multipurpose Usage with Lean Burn Capability"project, KUKTEM, 2004
12. Brown Medal "New Design of a 2-Stroke Modular Engine for Multipurpose Usage with Lean Burn Capability "at 16th International Invention Innovation Industrial Design & Technology Exhibition (ITEX) 2005, 2005
13. Silver Medal "New Design of a 2-Stroke Modular Engine for Multipurpose Usage with Lean Burn Capability "at IPTA R&D EXPO2005, 2005
14. Best Research Project Award 2004 for "New Design of a 2-Stroke Modular Engine for Multipurpose Usage with Lean Burn Capability"project, KUKTEM, 2005
15. Bronze Medal "New Design of a 2-Stroke Modular Engine for Multipurpose Usage with Lean Burn Capability"Salon International Des Inventions, Geneva 2006.
16. Excellent Service Award, UMP, 2006
17. Bronze Medal "ZUMP Chair", MTE 2007, KLCC, Kuala Lumpur, 2007
18. Bronze Medal "Design and development for interchangeable Shock Absorber.", ITEX 2007 KLCC, Kuala Lumpur, 2007
19. Bronze Medal "Development of In Campus Vehicle (IV) For UMP Application",Anugerah Projek Penyelidikan Terbaik UMP, 2007
20. Silver Medal "Hybrid Electric Vehicle Development Programme",Anugerah Projek Penyelidikan Terbaik UMP, 2007
21. Brozen Medal "Intelligent Height and Reach Adjustable Electronic Chair For Dwarfism Application (ZUMP), ITEX 2007, Kuala Lumpur, 2007.
22. Silver Medal "Hybrid Electric Vehicle Development Programme", ITEX 2008 KLCC, Kuala Lumpur, 2008

23. Hadiah Sanjungan," Kategori Penerbitan (Jurnal)", Malam Anugerah Cendekia Bitara 2008, UMP, 2008
24. Hadiah Sanjungan," Kategori Patent ", Malam Anugerah Cendekia Bitara 2010, UMP, 2010
25. Excellent Service Award, UMP, 2012
26. Darjah Indera Mahkota Pahang, Anugerah yang membawa gelaran Dato', Negeri Pahang, 2012.
27. Vice President of Board of the World Congress of Arts, Sciences and Communications, Great Britain,2013.
28. 2000 Outstanding Intellectuals of 21st Century, International Biographical Centre, Great Britain, 2013
29. M.T. Musthafah, M.A. Alfaiz, M.A. Salim, M.Z. Akop, M.R. Mansor and R.A. Bakar. (2015) Innovative Design of "UTeM-MUS" Scaled Hydraulic Engine Dynamometer for Teaching and Learning. Gold Medal at Innovative Practices in Higher Education Expo (I-PHEX) 2015.

Major Commercial Achievement

i. Commercialisation of the pyrolyser (Portable Combustor) by UTM.
ii. Commercialisation of the Indigenious Incinerator System by UTM.

Number of Patents

Patent pending for the following projects:

1. Biomass Pyrolyser, Vote No. 68003.
2. 15 tonne capacity Modular Incinerator System, Vote No. 72224.
3. New Mixture Formation Unit for Liquid and Gas Fuel in Internal Combustion Engine, Vote No. 72351.
4. Design and Development of New Water-Cooled Two Stroke Engine, Vote No. 74516
5. New Optimization Technique "Response Ant Colony Algorithm (RACA)", (Status: Application), 2009.
6. Method and System for Enhancing Moulding Machining Performance. PI20093258, 2009

7. Car Jack Assembly and Method, PI20093259, 2009
8. Method and System for Determining End of Life Strategy for Products, PI20095013, 2009
9. Heat Transfer Nanofluids, PI 20110022027, 2011

13. OTHER ACHIEVEMENTS

Keynote Speaker/Professorial Lecture

1. Keynote Speaker on "Automobile Industry : Now and Future", Society of Manufacturing Engineers, Student Chapter, UTM, 1999
2. Keynote Speaker on "Perkembangan Automotif di Alaf Baru", Fakulti Pendidikan, UTM, 2002
3. Keynote Speaker on "Managing the Challenge of the coming AFTA and Beyond (New Technologies & Practices for Automotive Industry)", Virtual Tech Consulating Sdn. Bhd & SIRIM Bhd, 2003.
4. Keynote Speaker on "Design and Development of Hybrid Vehicle", Proton, Shah Alam, 2004.
5. Keynote Speaker on "Linear 2 Stroke Engine for Electric Power Generation", Proton, Shah Alam 2004
6. Keynote Speaker on "A Briefing on Malaysian Automotive Industry and R&D Scene", Hanyang University, Seoul, Korea, 2005.
7. Keynote Speaker on "Halatuju Latihan Kemahiran Automotif Negara", CIAST and Jabatan Tenaga Malaysia, 2006.
8. Keynote Speaker on "Measurement of Alternative Fuel Combustion", Chulalongkorn University, Thailand, 2006.
9. Keynote Speaker on "A Briefing on Malaysian Automotive Industry", Institut Teknologi Sepuluh Nopember (ITS), Surabaya, Indonesia, 2007.
10. Keynote Speaker on "A Briefing on Malaysian Automotive Industry", Muhammadiyah University of Surakarta, Central Java, Indonesia, 2008.
11. Keynote Speaker on "The Role of Alternative Energy Exploting to Reduce Global Warming Effect", International Seminary of

Technology Perspecty, State Polytechnic of Semarang, Semarang, Indonesia, 2010.

12. Keynote Speaker on"Alternative for Tomorrow: Core Development In The Near Future", 2nd International Conference on Environmental Management (ICEM 2010), Hyderabad, India, 2010.
13. Professorial Lecture "Alternative for Tomorrow: Core Development In The Near Future",Universiti Malaysia Pahang, Malaysia, 2010.
14. Penceramah bagi perkongsian Pengalaman proses Akreditasi Program Pengajian Politeknik KPT Jabatan Pengajian Politeknik, 2011.
15. Penceramah Bengkel OBE POLISAS Politeknik Sultan Haji Ahmad Shah, 2011
16. Keynote Speaker on "Digging all About Teaching Field in Industrial Society World", Universitas Negeri Malang (UM),Malang, Indonesia, 2011.
17. Penceramah Akerditasi Program Persediaan dan Cabaran Di Politeknik Malaysia, Politeknik Kota Kinabalu, 2011
18. Keynote Speaker on "Alternative Energy for Small Island", Institut Teknologi Sepuluh Nopember (ITS), Surabaya, Indonesia, 2011.
19. Penceramah bagi perkongsian Pengalaman proses Akreditasi Program Pengajian Politeknik KPT Jabatan Pengajian Politeknik, 2012.
20. Penceramah bagi perkongsian Pengalaman proses Akreditasi Program Pengajian Kolej Komuntiti, KPT, 2013.

Exhibition

1. "New Pump Impeller Design for Engine Cooling System" at EXPO S&T 2002, Kuala Lumpur, Ministry of Science Technology and Environment of Malaysia.
2. "New Pump Impeller Designs for Engine Cooling System", at International Invention Innovation Industrial Design and Technology Exhibition, I-TEX 2003, Johor, Malaysia, 14~16, May 2003
3. "New Pump Impeller Designs For Engine Cooling System", at Industrial Art and Technology Exhibition, INATEX 2002/2003, UTM, Malaysia, 2003

4. "Design and Development of an Air Cooled Two Stroke Engine", Industrial Art and Technology Exhibition, INATEX 2002/2003, UTM, Malaysia, 2003.
5. "Design and Development of Optimum Compressed Natural Gas (CNG) Engine Mixer",Industrial Art and Technology Exhibition, INATEX 2002/2003,UTM, Malaysia 2003.
6. "Design and Development of an Water Cooled Two Stroke Engine", Virtual Tech Consulting Sdn. Bhd & SIRIM Bhd, Exhibition 2003, SIRIM, Shah Alam, Malaysia, 2003.
7. "New Design of a 2-Stroke Modular Engine for Multipurpose Usage with Lean Burn Capability "at The Anugerah Projek Penyelidikan Terbaik 2004 Exhibition, KUKTEM, Pahang, Malaysia, 2004.
8. "New Design of a 2-Stroke Modular Engine for Multipurpose Usage with Lean Burn Capability "at The Anugerah Projek Penyelidikan Terbaik 2005 Exhibition, KUKTEM, Pahang, Malaysia, 2005
9. "New Design of a 2-Stroke Modular Engine for Multipurpose Usage with Lean Burn Capability ",Pameran Sains dan Teknologi Peringkat Negeri Pahang, 2005, Kuantan, Pahang, Malaysia, 2005.
10. "New Design of a 2-Stroke Modular Engine for Multipurpose Usage with Lean Burn Capability",The16th International Invention Innovation Industrial Design & Technology Exhibition (ITEX) 2005, PWTC, Kuala Lumpur, Malaysia, 2005.
11. "New Design of a 2-Stroke Modular Engine for Multipurpose Usage with Lean Burn Capability ", The IPTA R&D EXPO 2005, Kuala Lumpur, Malaysia, 2005.
12. "New Design of a 2-Stroke Modular Engine for Multipurpose Usage with Lean Burn Capability ", The Automotive Fiesta CarnivalExhibition, Sepang, Kuala Lumpur, Malaysia, 2005.
13. "New Design of a 2-Stroke Modular Engine for Multipurpose Usage with Lean Burn Capability ", The Salon International Des Inventions Exhibitions, Geneva 2006.
14. "Intellingent Height and Reach Adjustable Electronic Chair For Dowmstream Application (ZUMP)", 18th International Invention,

Innovation & Technology Exhibition (ITEX 2007) Kuala Lumpur, Malaysia, 2007.
15. "LITTLE MANTIS : Short Mobility Electric Scooter Development"", Malaysia Technology Expo 2009, Kuala Lumpur 2009.

