

Dear Fellow Members,

MALAYSIA BRANCH QUARTERLY NEWSLETTER

April 2016
Malaysia Branch

Institution of
**MECHANICAL
ENGINEERS**

Our Annual General Meeting was held on 21st March 2016. We congratulate the newly elected Committee. We also extend our congratulations to Mr. Joel Bharath on being elected as the YMS Chairman. We take this opportunity to thank the past Committee for their valuable contributions to the Institution during their tenure.

Our Immediate Past Chairman, Ir. Mathew Thomas was nominated as the winner of the International Strategy Board (ISB) Volunteer Service Award, for his work over the last 14 years supporting members of all grades within Malaysia. Congratulations to Ir. Mathew.

We continue our knowledge sharing in this issue of newsletter, with an article contributed by our member, Mr. Nicholas Koh. Thanks to Nicholas.

Ir. C.C. Chow

COMMITTEE MEMBERS 2016/2017

| | |
|---------------------------------|----------------------------|
| Chairman: | Prof. Ir. Ong Kok Seng |
| Honorary Secretary: | Dr. Lau Ee Von |
| Honorary Treasurer: | Mr. Gerald Victor |
| Immediate Past Chairman: | Ir. Mathew Thomas |
| Committee Members: | Ir. Eddie Lim |
| | Ir. Michael Kwan |
| | Dr. Albert Thsai |
| | Mr. Edwin Sim |
| | Ir. Danaraj Chandrasegaran |
| | Ir. Chow Chee Choy |

**Young Member Section
(YMS) Chairman:**
Mr. Joel Bharath

Honorary Internal Auditors:
Mr. Hueen Sutherland
Dato' Ahmad Suhaili

ARTICLE

ZERO CARBON HEATING TECHNOLOGIES – CHALLENGES FOR THE FUTURE

by Nicholas Koh

The use of the vapor compression cycle is well known in this region, with the most common applications being for residential, commercial and process cooling. However, with the focus then being on improving cooling efficiency, the energy rejected as part of the same process has not been widely captured to be reused. Sometimes, this rejected energy is of too low a grade as well, which renders it useless for any process. Instead, additional energy is consumed in the form of fossil fuels (via boilers), or element heaters to meet heating requirements.

Thus, heat recovery technologies are now gaining traction in a big way, as this allows the user to both reduce his impact on the environment, as well as reducing operating costs. One such way to recover this waste energy, is to use heat pumps; these machines can capture, move and upgrade energy such that it becomes useful to the user.

The performance of heat pump systems can be measured by the Coefficient of Performance factor (COP), which represents useful work out over energy input. Modern heat pump systems can achieve COPs of anywhere between 1 – 6, depending on the design employed. In comparison, an electric element heater or gas boiler will generally have a $COP < 1$, due to the nature of energy conversion within those devices.

Another factor besides mechanical considerations and efficiency, is the choice of refrigerant used and its impact on the environment. There is a metric to classify this: Global Warming Potential (GWP). The GWP of various refrigerants is as follows:

- R410A, GWP = 2088 (Household AC)
- R407C, GWP = 1770 (Household AC)
- R22, GWP = 1810 (Commercial AC)
- R134A, GWP = 1340 (Vehicle AC, Heat pumps)
- *R744 (Carbon dioxide), GWP = 1

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This GWP number provides a comparison to how strong a greenhouse gas the chemical is, in reference to CO₂ (GWP=1 as above). These refrigerants are all slowly being phased out in the United States and European Union, in search of a better alternative. The goal is to maintain the level of system performance, and not require a radical change in compressor or heat exchanger design. In other words, development of a drop-in replacement refrigerant is needed to be used in existing equipment while also protecting the environment.

Two alternatives have been developed by this effort: R32 (GWP=675) and R1234YF (GWP=4). Compressor manufacturers such as Danfoss have studied the impacts of changing from R410A to R32 and the findings showed that while heating capacity could be improved, there were also drawbacks where drive torque of the compressors would need to be increased. Additional features would also be required in order to maintain system performance eg. Vapour injection, which adds complexity and cost. [1]

R1234YF on the other hand, while offering much better GWP than R134A for example – is classified as flammable and is more expensive than R134A. This refrigerant has shown potential drop-in capability and material/lubrication compatibility with vapour compression systems originally designed for R134A. A study by researchers in Taiwan revealed that R1234yf will yield up to a 27% drop in heat pump system COP, depending on operational conditions. This is due to the differences in refrigerant thermal resistance and frictional loss inside the heat exchange devices. However, the losses can be mitigated in order to achieve comparable performance by addition of an internal heat exchanger, expander or adjustable expansion valve. [2]

In summary, the move towards future sustainability of these systems looks to be a slow one, due to the multi-variable optimisation challenge it presents. Building owners using these systems will no doubt move toward more environmentally friendly solutions, but hope to avoid significant re-investment costs; they will also want to see comparable energy performance with minimal operational impact. Time will tell where the equilibrium point is met, and we look forward to advancements in this area.

References

[1] Danfoss Commercial Compressors, R32 Compressor Technology 2012 Presentation (available online).

[2] CC Wang, 2014, System performance of R1234YF refrigerant in air-conditioning and heat pump system – An overview of current status, Applied Thermal Engineering.



A flagship project in a five-star hotel in Kuala Lumpur, using 5 units of water source heat pumps.

ABOUT THE AUTHOR

Mr. Nicholas is an Associate Member of IMechE (AMIMechE), and now is attached with Ihandal Energy Solutions Sdn. Bhd.

Email:
nicholas@ihandalenergy.com.my

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Past Events

1.0 Technical Talks

Series of Technical Talks were organized by the branch as below:

- a) The following Technical Talks were organized jointly with the Center of Environment and Green Technology (CEGT) of Universiti Tunku Abdul Rahman (UTAR) Kampar:
 - **"Air Pollution And Control Technologies"** on 3rd February 2016, by Mr. Tony Liew.
 - **"The Revival of Bicycle as a Green and Sustainable Means of Transport for Neighborhood Travel"** on 6th April 2016, by Dato' Ir. Foong Choy Chye.
- b) Three Technical Talks were jointly organized with The Institution of Engineers Malaysia (IEM) and Engineers Australia Malaysia Chapter (EAMC) as below:
 - **"Engineering The Global Community"** held in Monash University Malaysia, presented by Mr. John McIntosh on 17th March 2016.
 - **"Nuclear Power Generation – Myths And Facts"** on 23rd March 2016, delivered by Mr. Wayne Soong.
 - **"Using the Engineering Finance Methodology in Creating "Cost Efficient" Projects to Optimise the Return on Investments"** on 12th April 2016, delivered by Prof (R) DR Ir Maulud Abdul Latif.

2.0 Technical Visit

Jointly organized with The Institution of Engineers Malaysia (IEM) and Engineers Australia Malaysia Chapter (EAMC), a technical visit was held on 5th March 2016 to the **Existing Depot LRT Kelana Jay Line, Petaling Jaya.**

3.0 Networkings

A networking session was held in Ipoh on 22nd January 2016. The branch committee members are looking forward to seeing you in the next networking sessions.



Group photo at the end of the visit to the Existing Depot LRT Kelana Jay Line

4.0 Student Chapter Launch at Herriot Watt University Malaysia Campus

After more than a year of preparation, the **Heriot-Watt University Malaysia IMechE Student Chapter** was officially launched on 13th January 2016.

Welcome speeches were presented by the Protem President, Mr. Ong Chin Khai, the then IMechE Malaysia Branch Chairman, Ir. Mathew Thomas, and the Head of Mechanical Engineering Program of Heriot-Watt University Malaysia, Dr. Yap Tze Chuan.

As official launch of IMechE Heriot-Watt University Malaysia Student Chapter, Ir. Mathew presented the Certificate of Launch to Dr. Yap.

Two IMechE pull-up banners were also presented by Ir. Mathew to the Academic Liason Officer, Mrs. Noor Shieela Kalib and the Protem President, Mr. Ong, respectively.

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Ir. Mathew Thomas presents official launch certificate to Dr. Yap Tze Chuan.



Ir. Mathew presents IMechE pull-up banner to Mrs. Noor Shieela Kalib.

5.0 Membership Drives

In conjunction with the membership drive, the then Chairman, Ir. Mathew Thomas visited **Infrastructure University Kuala Lumpur in Putrajaya** on 20th January 2016.

The event was well attended by 43 students and 3 staff of the university.

A membership drive was also held in **KDU University College** on 23rd March 2016, which was well attended.

6.0 Academic Liaison Officer (ALO) Workshop 2016

14 ALO's of Student Chapters (SC) of 17 institutions of higher learning (IHL) were brought together by the IMechE Malaysia Branch at the e.City Hotel@One City, Subang Jaya on 27th February 2016 for a workshop.

The objective of the workshop were to:

- Disseminate information relevant to ALO's for effective running of SC and advising SC Committees
- Provide guidance for managing SC
- Enable consistent practice among all Student Chapters (SC)
- Discuss any other issues in the running of SC
- Network with Branch Committee / YMS Committee Members and other ALO's.

Special thanks goes to IMechE Headquarter and to the South East Asia Regional Chairman for providing the support in terms of the funding to make this workshop possible.



Group photo of all participants and facilitators.

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7.0 Visit by the IMechE International Business Development Manager

Mr. Tom Owen, the IMechE International Business Development Manager visited Kuala Lumpur from 30th March to 4th April. Series of events have been attended:

- a) Seminar on **"The Route to Become A Chartered Engineer (CEng) and Professional Engineer (PEng)"** was organized by **Aerospace Manufacturing Research Centre (AMRC) of Universiti Putra Malaysia (UPM)** on 1st April 2016. The seminar attracted 123 attendees. As part of the program, Tom has given an introduction on the **Professional Registration with IMechE**.



Mr. Tom Owen addressing UPM staff and students.

- b) Half-day Seminar on **"Routes to Professional Registration"** was held on 2nd April 2016 in Kelab Golf Negara Subang. Tom has given clear guidance to those who intends to work towards professional registration with IMechE.
- c) Visits to **Technip Malaysia** and **Petronas** to introduce IMechE membership and routes to professional registration with IMechE.



Group photo of Petronas senior management (technical) after discussion with Tom Owen and Ir. Mathew Thomas.

Coming Events

1.0 Technical Talks and Industrial Visits

A series of technical talks and industrial visits will be organized. We look forward for your participation.

2.0 Networkings

The next networking session will be held on **14th May 2016 (Saturday)** in **Royal Lake Club Kuala Lumpur**. We look forward to meeting up with you.

3.0 ISGST 2017

IMechE Malaysia Branch will be supporting the International Symposium Green and Sustainable Technology (ISGST 2017) to be held in UTAR, Kampar on 10-13th January 2017. Registration fees for members will be at RM800. Please state your membership number when registering. Further information and updates are available in the website: <http://www.utar.edu.my/conference>.

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Contact Us

Ir. Mathew Thomas
(Branch Immediate Past Chairman)

(T): +6012-2184140

(E): mathew49@gmail.com

Ir. C.C. Chow

(T): +6012-6022310

(E): chow@equip-inc.com