

## Energy Efficiency National Partnership Awards 2020

### Background

1 The National Environment Agency (NEA), the Economic Development Board (EDB) and the Energy Market Authority (EMA) launched the Energy Efficiency National Partnership (EENP) programme on 29 April 2010. The EENP programme is an initiative aimed at supporting companies in their energy efficiency efforts through providing networking opportunities, resources and sharing of best practices, thereby enhancing their long-term business competitiveness and reducing their carbon footprint.

2 Under the EENP programme, the annual EENP Awards provides recognition to companies and organisations that have adopted a proactive approach towards better energy management and highlights their accomplishments as a resource guide for the industry to benefit from.

### EENP Awards 2020

3 This year, 11 companies, organisations and individuals are receiving the Award under five categories. The categories and their recipients are:

#### a) Excellence in Energy Management

This award recognises companies that have demonstrated a high level of commitment to excellence in energy management. The award recipient under this category is:

- Zeon Chemicals Singapore Pte. Ltd.

#### b) Outstanding SME of the Year

This award recognises SMEs (in manufacturing or industrial business activities) that have demonstrated a high level of commitment to energy management. The award recipient under this category is:

- Ardentec Singapore Pte Ltd

Under this category, one other company also received the “Outstanding SME of the Year (Honourable Mention)” Award:

- Fuisland Offset Printing (S) Pte Ltd

#### c) Best Practices

This award recognises corporate teams who had implemented energy efficiency (EE) projects that have led to improvements in the energy performance of their facilities. The award recipients under this category are:

- ExxonMobil Asia Pacific Pte Ltd
- Petrochemical Corporation of Singapore (Private) Limited
- Stepan Asia Pte Ltd

Under this category, one other company also received the “Best Practices (Honourable Mention)” Award:

- Roche Singapore Technical Operations

**d) Outstanding Energy Manager of the Year**

This award recognises outstanding energy managers who have demonstrated leadership in driving EE improvements across their organisation; and played an instrumental role in promoting EE initiatives within their organisation. The award recipients under this category are:

- Mr Lee Kim Leng – HP Inc.
- Mr Francis Tan Kok Vui – Petrochemical Corporation of Singapore (Private) Limited

**e) Best Energy Efficiency Practices in the Public Sector**

The award recognises outstanding public sector agencies that have demonstrated exemplary performance and commitment to energy management efforts and have been proactive in implementing EE improvements. The award recipients are:

- Ministry of Communications and Information
- Science Centre Board

4 Please refer to **Annex B** for the details of the Award recipients' energy efficiency accomplishments.

## Energy Efficiency National Partnership Awards 2020 Recipients

### Award Category: Excellence in Energy Management

#### Zeon Chemicals Singapore Pte. Ltd.

ZEON Chemicals Singapore (ZEON) has an Energy Management framework that encompasses all the departments in the organisation. Globally, ZEON Group sets an energy target of 1 per cent energy reduction year on year. In Singapore, ZEON sets a goal to have at least one energy reduction project every year. A regular session call “PDCA Meeting”, chaired by the Plant Manager, provides a platform for all employees in the Plant to come forward to contribute their ideas and discuss topics on improvements and energy reduction initiatives. This was the key enabler for many of ZEON’s past energy reduction projects to be successfully implemented.

ZEON provides equal opportunities to employees to level up their knowledge and skillsets in energy management. Apart from attending external courses and in-house trainings, ZEON went a step further and held ZEON’s inaugural Energy Day in 2019. This was a breakaway from the usual “classroom style” learning. Through a series of fun and games, the event aims to educate ZEON’s community on the importance and benefits of energy efficiency, as well as update employees on the efficiency improvements that has been done in the Plant.

Key energy improvement projects completed by ZEON in 2018 and 2019 includes:

Energy improvement projects	Energy savings
Electrical reduction during rank cleaning activities	863 MWh of electricity
Steam reduction for distillation column CL-103Fx	10,873 tons of steam
Steam reduction for SSBR process	1,011 tons of steam
Chiller Operation Optimisation	579 MWh of electricity
LED lighting retrofit for warehouse	70 MWh of electricity

### Award Category: Outstanding SME of the Year

#### Ardentec Singapore Pte Ltd

Ardentec Singapore Pte Ltd (Ardentec) started its energy saving journey in 2012. In 2018, Ardentec’s energy management system was certified ISO 50001:2011. As an organisation, Ardentec plays its part to protect the environment and mother nature through saving energy; and reducing waste and carbon emissions. This aligns with the promotion of the spirit of “4E”, which represents – Essential, Efficiency, Effectiveness and Environmental – to every staff in the company.

Ardentec formed a dedicated Task Force Team to drive energy saving projects with the support and commitment of the top management, and set an energy saving target of 3% year-on-year for these projects.

The Facility and ESH departments provide in-house energy saving awareness training to all the new employees during the orientation programme. The facility and ESH personnel have also participated in external energy saving exhibitions and seminars. Other energy awareness initiatives include:

- Screening video of energy saving information at the lift lobby

- Sharing of energy saving information at common walkway notice boards and through email
- Publishing energy, environment, safety and health (EESH) activities and articles quarterly in the company's newsletter

Ardentec received the EENP Awards under the Excellence in Energy Management category in 2017. Between 2018 and 2019, Ardentec attained the ISO 50001 certification and completed the following EE improvement projects:

Project	Energy savings (kWh/yr)
Power down wafer testing machines when in idle mode	834,232
Replacement of lighting to LED	150,350
Improvement to chiller system (replaced air purge system)	67,160
Split unit air-conditioners were removed at the office areas and linked to the centralised chilled water system for cooling	96,220

Ardentec's annual energy consumption reduced by more than 7% (equivalent to 0.8 GWh) from 2017 to 2019 despite the increase in production needs. Ardentec also achieved the ISO14064(Green House Gas) certification.

**Award Category: Outstanding SME of the Year (Honourable Mention)**

**Fuisland Offset Printing (S) Pte Ltd**

The executive and management teams at Fuisland Offset Printing (S) Pte Ltd (Fuisland) oversee the environmental and energy initiatives; track and monitor the company's energy usage; and identifies opportunities to reduce carbon emissions. Every year, the executive team will review improvement strategies for environmental sustainability and energy with the management team.

Fuisland educates its staff to be environmentally responsible, such as switching off the lights when not in use and maintaining aircon temperature at 25°C. Every staff at Fuisland is also responsible to upkeep its environmental policies which includes recycling and reducing wastage. Fuisland obtained the Forest Stewardship Council (FSC) license; uses vegetable ink for all its printing works; and recycles all paper trimmings and printing plates from its operations.

In 2019, Fuisland embarked on two projects to improve its energy consumption:

- Installation of solar panels to generate renewable energy to be used in the printing process. This initiative resulted in an annual carbon abatement of 71.4 tonnes (~170 MWh) and helped reduce the amount of energy required to cool the building. The use of solar panels, as well as purchasing of Renewable Energy Credits (RECs), has allowed Fuisland to use 100% clean energy.
- Retrofitted 178 nos. of lamps with energy efficient LED bulbs resulting in an annual energy savings of 13,584 kWh.

**Award Category: Best Practices**

**ExxonMobil Asia Pacific Pte Ltd***Project title: ExxonMobil Singapore Chemical Plant Blowdown Modifications*

Before project implementation, process condensate was first heated up in a preheater before entering a dilution steam drum, where a portion of it was boiled to generate steam. The dilution steam was then topped up with on-purpose make-up steam to meet the needs of the plant. Blowdown from the dilution steam generation system needs to be cooled down before it is subsequently sent to the downstream wastewater treatment system.

In this project, some of the process condensate will bypass the dilution steam generation system and be directly sent to the wastewater treatment system. In parallel, as the duty in the preheater is fixed, the reduced condensate flow through the preheater translates into a hotter medium entering the steam drum. This enables more condensate to be boiled off as dilution steam, resulting in less make-up steam needed, thus saving energy.

This project has delivered a total annual energy savings of over 35 GWh, which is equivalent to about 8.5 per cent reduction of energy consumption in the dilution steam circuit. The CO<sub>2</sub> savings as a result of lower fuel gas consumption translates to about 2,300 cars removed from Singapore roads each year.

**Petrochemical Corporation of Singapore (Private) Limited***Project title: Innovative Approach to Improve Valuable Ethylene Product Recovery*

Petrochemical Corporation of Singapore (Private) Limited (PCS) adopted a phased approach using the Plan-Do-Check-Act (PDCA) cycle, to recover excess Ethylene Boil-Off Gas (C<sub>2</sub>' BOG) from low temperature (LT) storage tanks.

The increase in capacity of PCS ethylene plants and enhanced integration with neighbouring companies caused an increase in frequency of C<sub>2</sub>' imbalances which resulted in higher C<sub>2</sub>' rundowns to the LT tanks and an increase in C<sub>2</sub>' BOG generation. The existing C<sub>2</sub>' BOG compressor has a capacity limit to recover the additional C<sub>2</sub>' BOG generation. Henceforth, PCS designed an in-house C<sub>2</sub>' BOG Roots blower system which was commissioned to recover excess C<sub>2</sub>' BOG, which would otherwise be flared.

The project involves two phases:

Phase	Description
1	<p>Commissioned a blower with a capacity of 0.38 tonnes/hr. The enhancements include:</p> <ul style="list-style-type: none"> <li>• Increasing the size of suction drum level control valves for adequate top-up of C<sub>2</sub>' refrigerant</li> <li>• Re-routing blower minimum flow line to suction drum to maintain cooler suction temperatures for optimum performance during turndown operation</li> <li>• Installing dedicated discharge line to reduce backpressure</li> </ul>
2	<p>Increased the size of blower to a capacity of 0.55 tonnes/hr to accommodate the increase of C<sub>2</sub>' BOG generation as a result of higher C<sub>2</sub>' import from neighbouring plants.</p>

The reduction of C<sub>2</sub>' BOG flaring resulted in the following benefits:

- Reduction in energy consumption at system level by 41.0 per cent
- Reduction in CO<sub>2</sub> emissions of approximately 2.2 kilo-tonnes/year

Additional recovery of C<sub>2</sub>' BOG yielded higher ethylene gross production without corresponding feed increase.

**Stepan Asia Pte Ltd**

*Project title: Energy Saving by Optimising the Plant Start Up Duration*

Stepan Asia's manufacturing plant operates on campaign basis to produce smaller carbon chain products via fractional distillation of crude methyl ester (ME). During production, crude ME is first produced from raw materials and stored in buffer tank (Day Tank T003). Traditionally, the buffer tank will be emptied after each campaign for cleaning and removal of impurities from upstream processes. This leads to long start-up times and wastage of energy. Stepan optimised the pH controls in its upstream processes to reduce amount of impurities carried over to the buffer tanks, thereby allowing Stepan to carry out the following activities to reduce start-up duration and improve specific energy consumption for start-up:

- To hold 100MT Crude ME in Day Tank T003 once campaign finished. As a result, Fractionation Plant start up time in the next campaign will be shorten by at least 10 hours.
- To hold 10 ~ 12MT material in day tank T003 once Run 1 finish, which will shorten Run 2 condition time.

The project started from Jan 2018 and the duration of starting up the plant was carefully optimized in order not to compromise product quality, as well as the process yield.

Data was tabulated after the project was completed and compared against the baseline data. The project resulted in an improvement of the specific energy consumption by 29 per cent and energy cost savings of S\$63,899 in the year 2019.

**Award Category: Best Practices (Honourable Mention)**

## **Roche Singapore Technical Operations (RSTO)**

*Project Title:* Boiler Controls Upgrade

The project came about as part of the asset renewal of RSTO's ageing controls system for its B1 Boilers. Upon further evaluation, several gaps such as poor vendor support for the controls system, inefficient boiler combustion, increasing natural gas (NG) consumption, and unplanned breakdowns were identified. The team looked for a solution that can meet both the asset renewal and the operational gaps, which led them to select a parallel positioning system for boiler combustion linked with a user-friendly controller.

The parallel positioning works with a servo actuator, which provides directly connected and precise modulating control of fuel valves and combustion air control dampers. The precision and repeatability ensure that the boiler combustion stays efficient throughout the fluctuations of the firing rate.

The control system allows RSTO's operator to view input and output status directly from the human machine interface and provides alarm details to quickly narrow down on the interlock or limit faults. It also allows the engineers to run trending on boiler parameters, which can aid troubleshooting or understanding the operation performance.

The project resulted in an annual energy savings of 3.23 TJ of NG which is 10 per cent and 2.4 per cent energy savings at system and facility levels respectively.

### **Award Category: Outstanding Energy Manager of the Year**

#### **Mr Lee Kim Leng**

HP Inc.

Mr Lee Kim Leng is the Energy & Sustainability Region Program Lead at HP Inc. and his key roles include:

- Developing energy strategy plan for HP (e.g. provide input to set new reduction goals, new footprint, new baseline etc.)
- Working with project management teams to review conceptual designs of regional projects and to drive Leadership in Energy and Environmental Design (LEED) construction
- Leading regional energy saving initiatives such as retro-commissioning and smart building implementation
- Evaluate renewable energy options and pursue those that provide financial and environmental benefits
- Engage employees by promoting HP's environmental activities

Some of the energy saving and CO<sub>2</sub> emission reduction projects managed by Mr Lee Kim Leng include:

- Installing 3.1MWp solar PV systems across the rooftops of all the three advanced manufacturing sites which power plant operations
- Achieving the ISO50001 certification by rolling out energy management systems across three manufacturing plants and was certified with zero-non-conformance in 2018
- Initiated several projects such as the installation of energy sub-metering data analytics for better energy management, optimisation of high-energy consumption systems and installation of new energy efficient equipment at HP's manufacturing sites

- Organised an Energy Treasure Hunt where more than 40 participants comprising HP staff and external partners joined in a two-day event to drive new ideas for energy improvement. Close to 80 ideas were generated, with some of these delivering US\$40,000 annual savings achieved within the first month of implementation

**Mr Francis Tan Kok Vui**

Petrochemical Corporation of Singapore (Private) Limited (PCS)

Mr Francis Tan Kok Vui is the Manager of Process & Operation Technology (Utilities & Logistics) in Technology & Optimisation Function in PCS. He is also the Energy Manager who leads the Structured Energy Management Team consisting of members across functions from Operations, Maintenance, Engineering and Technology & Optimisation.

PCS Plant I & II started operations in 1984 and 1997 respectively. Mr Francis Tan and his team leveraged on PCS’s four strategies to improve energy performance for both plants as part of process safety excellence to maintain its position in the 1st quartile of the worldwide Solomon benchmarking study among similar plants. The four strategies are:

- Best Practice Technology (BPT) chemical processes
- Operations and maintenance of existing facilities
- Retrofitting plant facilities
- Process optimisation and control

Some of the energy saving and CO<sub>2</sub> emission reduction projects managed by Mr Francis Tan include:

- Increased capacity for Ethylene Boiled-Off Gas (BOG) root blower for excess BOG recovery
- Revamped PCS-I Ethylene plant main compressors
- Implemented the backflushing of seawater heat exchangers to recover heat transfer coefficient due to fouling

Mr Francis Tan also managed the initiatives below:

- Created awareness in energy management among all engineers and frontline supervisory staff by encouraging engineers and frontline supervisory staff to continually share and learn about energy management through participation in local energy conferences and sharing seminars.
- Shared best practice on industrial energy management such as the implementation of Energy Real Time Optimiser (ERTO) – Open Loop, at the Technical Seminar on Energy Use in Process Industries organised by The Institution of Engineers Singapore (IES)

**Award Category: Best Energy Efficiency Practices in the Public Sector**

**Ministry of Communications and Information (MCI)**

MCI’s energy policy reflects their commitment in energy saving and efficiency which is “To ensure the efficient usage of energy and exhibit environmental responsibility in the best

possible manner. MCI will do so by continuously improving its energy usage efficiently through effective energy management.”

MCI has been able to reduce its energy consumption by 32 per cent in 2019 from 2017 consumption level through completing various energy improvement projects. The energy improvement projects completed by MCI includes:

- Replaced air-cooled chillers with water-cooled chillers

<b>Roof-Top Chiller Plant</b>	<b>Efficiency BEFORE retrofit (kW/RT)</b>	<b>Efficiency AFTER retrofit (kW/RT)</b>
<b>Type of System</b>	Air-cooled chiller System	Water-cooled chiller System
<b>Total System Efficiency</b>	1.518	0.591

- Retrofitted chiller plant located at the basement with more efficient air-cooled chillers

<b>Basement Chiller Plant</b>	<b>Efficiency BEFORE retrofit (kW/RT)</b>	<b>Efficiency AFTER retrofit (kW/RT)</b>
Air-Cooled Chiller	2.156 kW/RT 71RT x 2	1.115 kW/RT 73RT x 2
Chilled Water Pump	0.070	0.038
<b>Total System Efficiency</b>	<b>2.226</b>	<b>1.153</b>

- More than 80 per cent of the lights have been replaced with efficient LED lightings over the past 3 years with various control features such as photocells and motion sensors
- All AHUs were fitted with VSD to improve air side efficiency

MCI’s interim and long-term objective beyond 2020 is to achieve 1 per cent of energy savings over the next two years and 2 per cent over the next five years respectively. To achieve its goals and targets, MCI believes that it is important to upkeep the capability of the stakeholders by encouraging them to attend the relevant environment sustainability courses such as the Singapore Certified Energy Manager and Green Mark Facilities Manager so that they are up to date with the latest technology and regulations.

MCI also actively reaches out to its community to foster sustainability awareness through MCI’s ECO-Ambassador mascot, Miss Leafy which can be seen at different corners of the building. Decals and posters of Miss Leafy are aimed to cultivate the community on green habits and saving tips. In addition, MCI actively holds social activities for the MCI family to participate and commemorate Earth Hour and World Car-Free Day.

### **Science Centre Board (SCB)**

SCB’s strategy is to meet or exceed environmental legislation or approved code of practice and to minimise environmental impact where possible. SCB endeavours to practise responsible and prudent energy management throughout their operations and activities.

SCB is committed to make continuing efforts to:

- Improve energy efficiency
- Reduce environment impact and carbon footprint
- Promote sustainability to the public through our exhibitions and events
- Incorporate environmental sensitive designs
- Identify and implement energy saving measures

SCB will be implementing the following strategies to improve energy efficiency:

- Retrofit the chiller plant system
- Replace all the existing lightings to LEDs
- Retrofit CHW AHUs and convert all DX to CHW AHUs
- Monitor and review the energy performance regularly to achieve energy reduction of 5% from 2019 to 2021
- Create awareness and educate the staff and tenants continuously on energy savings
- Train facilities management staff on energy management

SCB completed the following energy improvement projects:

<b>Project</b>	<b>Energy savings (kWh/yr)</b>
Retrofit of chilled water plant system achieving system efficiency of 0.602 kW/RT	532,692
Retrofit of AHUs achieving system efficiency of 0.199 kW/RT	201,698
Replace existing lightings to energy efficient LEDs	139,480