LEE KUAN YEW TECHNOLOGY AWARD 2017
WINNING PROJECTS

Members : Low Zi Ming
Nur Iman Bin Misnawi
Nik Mohammad Farhan Bin Azmil
Che Irham Syukran Bin Che Sulong

Course : *Higher Nitec* in Mechanical Engineering

College : ITE College West

Cleaner Office Air, Anyone?

The ***Air Purifier Using Air-Filtering Plant*** project was inspired by astronauts using common indoor plants to keep air clean in space stations. According to the United States' National Aeronautics and Space Administration Clean Air Study, the Variegated Snake Plant, commonly known as Mother-in-law's Tongue, can remove four air pollutants linked to headaches and eye irritations – benzene, formaldehyde, trichloroethylene and xylene.

While certain Lilies and Chrysanthemums can eliminate up to five air pollutants, the Snake Plant was selected by the winning team as it requires little sunlight and water, making it perfect for the office. The custom-built lava-lamp-shaped structure surrounding the plant contains a filter and two small tunnels to ensure that air enters and exits in a controlled manner, thereby maximising air purification by the plant.

Quote
"There were so many factors to consider. For example, the plant chosen should require little sunlight and water and cannot be too big. The pot used should help minimise watering. Also, the structure surrounding the Snake Plant must be slim and tall to accommodate the plant and yet be aesthetically pleasing. We had to decide amongst shapes resembling a cylinder, a fish bowl and a lava lamp. We realised that we couldn't decide on impulse and a decision matrix really helped us to see what we really needed and could use."

What's So Special?
- The choice of the plant makes this project easy to implement and succeed. The Snake Plant is fuss-free, low-maintenance and requires little sunlight and water.
- It is an attractive and cheap option for home, office or factories.
- The air purifier was developed using commonly available materials so it can be mass-produced at low cost for sale to the public.
- It doesn't use electricity, making it greener for the environment.

Members : Muhammad Sulhi Akid Bin Nizam

Alfian Safwan B Aswandy
Xavier Gabriel Enriquez
Muhammad Khairunnas Bin M N

Course : *Nitec* in Mechanical Technology

College : ITE College East

You Light Up My Nights!

No more stumbling around in the dark with this team's *Beacon Flippers*. Designed to look like ordinary bedroom slippers, this device incorporates a motion-sensor light to enable users to locate the slippers and then use them to find their way around without having to switch on the lights!

Quote

"We wanted to help the elderly and those with night vision problems see better at night. It only works when it's dark so you can wear it in the day and still save battery. We're very proud of the project because we are Year 1 Mechanical Technology students and in a very short time, we could learn about Electronics, apply our knowledge and complete the project.

If we could improve it further, we would make the circuits lighter, smaller and have more lights around the slipper, rather than just in front. This project has been a great experience as we get to learn skills and pick up knowledge beyond our course!"

What's So Special?

- Saves electricity as users do not need to switch on the lights to find their way around
- Safer for the elderly and those with poor night vision as they don't have to stumble around looking for a light switch at night
- Portable – you can even use it on your travels!

Members : Muhammad Haikal
Thyng Chuan Luck Robin
Lim Wei Sheng Benjamin
Cheng Shi Hui

Course : *Higher Nitec* in Mechanical Engineering

College : ITE College West

Keep Clean & Charge On

Imagine generating electricity while you shower. Using just two micro-hydro turbine generators, this team of four from ITE College West is able to do just that. By installing these mini turbines to the water pipes connected to your water heater, electricity is generated when water flows through the pipes when you shower. The electricity generated is then stored in a power bank for future use!

Quote

"We signed up for the Energy Innovation Challenge in January 2016 and had no idea what we wanted to do for 3 months until Robin suggested using running water to generate electricity to light a bulb. This was based on his mother's experience in Indonesia where she often had electricity cut off while she's in the shower.

Aside from the lack of ideas, the greatest challenge we had was when just before the competition deadline, our turbine broke! We had to scramble but we managed to come up with a working prototype by competition day."

What's So Special?

- Little installation is needed and there is zero running cost
- The installation process produces zero carbon emission and is environmentally-friendly
- Electricity generated can be used to light up a room or charge mobile phones and power banks. If the user showers twice a day for about 10 minutes each time, he can generate five hours of electricity every month.
- Each mini turbine cost the team only $8, making it cost-friendly for commercial use
- The team won the Energy Innovation Challenge with this project in July 2016 and showcased it at the Singapore International Energy Week in October, where it generated a lot of interest among companies.

Members : Tong Meiqin
Cheng Zhi Hao
Tan Beng Siang
Han Lianhua

Course : *Higher Nitec* in Process Plant Design and
Higher Nitec in Electronics Engineering

College : ITE College Central

An Easier Pill to Swallow

Many of us don't enjoy taking pills. For those who have difficulty swallowing and digesting tablets, they experience greater ordeal as there is a need to crush or grind the pills. While there are electric grinding and crushing machines available, there are issues such as having to clean container thoroughly to prevent contamination from different pills, and wear and tear of the rotating motor parts. The ***Motorised Pill Crusher*** can be cleaned easily with its easy-to-remove casing while a double-direction gear motor prevents pills from getting stuck in the cutting grooves.

Quote

"Our team leader, Meiqin, saw her grandmother breaking tablets by hand. She had breathing difficulties and took minutes to complete consuming the pills. Meiqin then wondered if that there could be an easier way to crush pills and to help others like her grandmother.

The degree of fineness of the crushed pills was a key performance indicator. The end-users' feedback were vital in our design of the shape of the crushing panels. With several rounds of trials and modifications, a combined concave and convex panel design was eventually designed and fabricated. We are glad that with the knowledge we have learned in ITE, we can design a product to benefit society."

What's So Special?

- The Motorised Pill Crusher is practical, user-friendly and low maintenance, surpassing the standard of many pill crushers available in the market.
- It is affordable and easy to use for families, nursing homes and hospitals to use.
- Its lightness and portability received many positive feedback and endorsements from end-users (caregivers and patients) from Kwong Wai Shiu Hospital and Peacehaven Nursing Home.
- Prior awards won include Student Design Challenge 2016 (Merit Award) and iCreate 2016 (Best Prototype Award)

Members	**:**	Ryan Noel Bangras Koh Zhan Wah Christien Koh Chee Seng Kok Jia Ming
Course	**:**	*Nitec* in Info-Communications Technology (Mobile Networks & Applications)
College	**:**	ITE College West

Byte-ing the RaspberryPi

It's amazing how far an interest in a subject can bring you. The team had no idea of programming languages like Python, PHP, MySQL and Javascript and had to read, learn and follow tutorials on coding and programming online.

The four-member team persevered and applied the technical know-how to design a system using RaspberryPi computer and a camera to capture, analyse and count the number of people passing through an area and transmit the data wirelessly to a cloud server. The result – a very affordable and customisable ***People Sensor System***.

Quote

"Existing commercial solutions are really expensive, can be hard to use and are not customisable. So we wanted to build something that is customisable and cheap. The People Sensor System is very adaptable. While we have designed it mainly for security purposes, it can also be used for crowd management and is scalable. So you can use the same system as a security device at night, and for crowd management in the day, for example.

We think we have a really cool project on hand. In fact, we are in talks with the Facility Management people at ITE College West to install the system at the entrance of the College!"

Why is this a winning project?

- A similar people-sensor system is expensive. This project can cost as little as $50 (the cost of a RaspberryPi computer which this system uses).
- Most sensor-systems do not allow data to be aggregated. This project enables data to be summarised and presented in a professional manner.
- Unlike other systems, this project is highly scalable while remaining affordable. It is also customisable to the user's needs.
- The project was developed through the members' desire to learn more about the different programming language not taught in class, and their ability to apply successfully the technology into the project.

Members : Derrick Goh
Yong Khiang
Ho Wee Chuen Jarryl

Course : *Higher Nitec* in Mechanical Engineering

College : ITE College Central

Clean Windows Safely

The cleaning of a windows' exterior is a common problem, especially in Singapore where most of the dwellings are high-rise. While there are many cleaning gadgets commercially available, their effectiveness may be limited. The project team decided to look at the problem from another angle and created ***Safe Window***, a new window design which allows users to rotate the exterior facing window pane surfaces in, thereby allowing users to clean windows effectively and safely.

Quote

"The greatest challenge my team faced was in finding suitable parts for the windows which were also commercially available. From the hinges of the rotatable windows to the locking mechanism, we had to ensure that the windows are able to open and close properly, and that the locks are flushed to the window frames to allow the window to swing out. Indeed, when there's a will, there's a way".

Why is this a winning project?

- No more danger of user falling while cleaning the exterior of windows since this can be done easily and effectively from inside the apartment with Safe Window.
- Safe Window uses commercially available parts for fabrication so any licensed contractor can purchase the materials to install it.
- Large market of HDB units (estimated 500,000) required to change old windows to comply with regulations, making this a commercially-viable solution.
- Compatibility of product with existing HDB window frames means it's cheaper and quicker to install – no renovation needed.

Members : Muhammad Misharrazzaq
Muhammad Irman
Hoi Zhe Yuan
Shazmeer Zhaswan

Course : *Higher Nitec* in Mechanical Engineering

College : ITE College Central

Keeping Pavement-users Safe

Pedestrians these days have to share pavement space with an increasing number of bicycles and electric mobility devices these days. This team from ITE College Central has come up with a ***Safer Pavement System*** that alerts pedestrians of incoming 'traffic' while ensuring cyclists and e-mobility users slow down at pedestrian crossings.

Quote

"We came up with this project during our Design Thinking module. As cyclists and pedestrians, we noticed that pedestrians can be very unaware of oncoming cyclists, especially if they have their headphones on. We wanted to make it safer for cyclists and pedestrians so we came up with this idea. We're very happy that the cyclists we tested it on gave very good feedback and the NParks officers said that there was potential for our idea to be implemented!"

What's So Special?

- One device, dual purpose – the *Safer Pavement System* consists a hump fitted with an audio device. When activated, a ringing sound alerts pedestrians of oncoming cyclists or e-mobility device users.
- The audio device is spring-activated and requires no electricity or batteries to run.
- The hump also forces cyclists and e-mobility users to slow down so pedestrians have time to react to their presence.
- The System received positive feedback after testing by user groups, LoveCycling.SG, e-scooter users and NParks officers.

Members : Leong Yew Meng Javier
Leonard Aw Wei Jia
Tan Swee Lin
Lim Hong Wei

Course : *Higher Nitec* in Business Information Systems

College : ITE College East

Taking Charge with Technology

This ***Osteoporosis Tracker*** app helps osteoporosis patients keep track of test results, bone mineral density scans and medication issued. Doctors can also use the app to record and dispense medication and exercise schedule reminders. This cuts down on labour required for data collection, reduce clinic visits and empower patients to monitor their own treatment.

Quote

"This project was our entry for the Health Innovation Technology Challenge, which was open to healthcare professionals. A team of doctors from Tan Tock Seng Hospital approached us for help. They presented us with the problem and we helped come up with the solution, which is this app. Although we didn't win the Challenge, we're glad that the doctors were happy with our project. Through this project, we learnt that whatever skills we learn at ITE can be put to good use in real life!"

What's So Special?

- An online web service and database allows data tracking and online communication between doctors and patients.
- App allows for integration of a fitness device so patients can track exercise targets.
- Patients have greater control over their treatment process with the app.
- App can be tweaked to cater to other types of health treatments.

Members : Francis Marcus Leo
Premanathan S/O Kandasamy
Tay Wei Han Raynard
Elayne Lim Yi Ning

Course : *Higher Nitec* in Electrical Engineering

College : ITE College West

No Error in Safety

Safety and efficiency are the two key pillars of this project. Citing the Occupational Health & Safety Act statistics of 85 forklift fatalities and 34,900 injuries per year, the team brainstormed and developed a system that helps forklift drivers safely load pallets onto the racks.

With a seeding cost of only $44, the ***Spotter System***, which comes with a lamp, would blink and warn the forklift driver if the pallet is not above the rack-bed. The line laser alignment would prevent the forklift fork from knocking against the goods rack which could put the forklift driver at risk.

Quote

"We realised that many of the accidents involving forklifts could have been prevented. Usually, these accidents happen because of errors in judgement. So we thought, 'why not build a warning system'? There weren't any in the market so our challenge was to design one from scratch. There were many factors to consider, like making it durable, lightweight, non-obstructive and accurate, but we did it!"

What's So Special?

- The Spotter System costs little to develop but has impressive safety features.
- It is a simple solution that can potentially prevent thousands of forklift injuries from happening.
- The System is easy for forklift driver to use and requires no intensive training and supervision.
- It is non-obstructive so forklift operations will not be affected.

Members : Gavin Ferdinand Chee
Ong Kah Yeoh

Course : *Higher Nitec* in Mechatronics Engineering

College : ITE College West

Greener Way to Chill

Keeping those wine bottles chilled can now be done in a greener way with this ***Thermoelectric Wine Chiller*.** Using thermoelectric coolers, this Chiller cools contents more quickly while using less energy. The Chiller retains all the features of a commercial wine chiller but none of its harmful emissions.

Quote

"Our greatest challenge was the lack of time as we were struggling with two projects at the same time. I (Gavin) was taking part in WorldSkills Singapore but I took a smaller role in order to concentrate on this project. My partner, Kah Yeoh, was taking part in the ASEAN Skills Competition (Mobile Robotics). I encouraged him to concentrate on his training while I handled the project. We ended up having only three months instead of six to finish the project.

But overall, it was an enjoyable and good learning experience. We're really happy with our project, and we even had a lady from China showing interest in our prototype when we showcased it at a competition. She left us her name card and said there was a potential to commercialise this."

What's So Special?

- Lower energy consumption compared to commercial units
- No harmful CFC gases produced
- Costs kept low with plywood and pine wood
- Cooling process quicker and more efficient with improved air circulation due to presence of gaps within each individual rack
- The team participated in the Energy Innovation Challenge (Merit Award), CETI Asia and Green Wave competition, as well as the Tan Kah Kee Young Inventors Award (shortlisted).