

SPH Foundation Solar Innovations 2006

Category A (Primary Schools): Top 10 teams

Ang Mo Kio Primary School

Team name: JSSJ4

A skit performance by the pupils entitled the Frog Prince. It is not the conventional fairytale but it has a twist at the end to carry the message of the importance of saving the environment – water pollution and the ways to stop water pollution. The pupils will act out the skit to bring out the idea of saving the environment. This is a creative and innovative way that appeals to both the adults and the children. The pupils will be in their various costumes and they will be wearing masks specially drawn by them to relate better to the younger audience.

South View Primary School

Team name: 3K+A

Most people do not realize that the things around us such as empty cans, plastic bottles and boxes could be reused to suit other purposes. People simply discarded them conveniently. Our team's idea came about when one of our group members noticed that plastic waste such as soft drink bottles, rubber hose and fishing line often becomes litter found on beaches. Thus, our group decided to make a harp out of plastic bottle, rubber hose and fishing line.

Catholic High Primary

Team name: Greeny Greenist

We, humans, rely a lot on nature. That includes the wildlife on earth, plants and marine life. The oceans on earth take up most of its space. People treat the sea as a rubbish dump, polluting the sea. Pesticide poisons such as DDT harm much wildlife, hurting the life of the oceans. Also, pollution is not confined to the place it occurred. The pollutants spread in the water and the result? More marine wildlife gets affected and mutations and death occur. The two issues that we will be focusing on are our vulnerable coral reefs and endangered animals – sharks. We have also created a vegetarian shark's fin soup.

Fuhua Primary School

Team name: Solar Power

Fossil fuels, coal, oil and natural gas are non-renewable source of energy. They are formed from plants and animals that lived up to 300 million years ago, fossil fuels are found in deposits beneath the earth. The fuels are burned to release the chemical energy that is stored within this resource. Energy is essential to modern society as we know it. Though fossil fuels, oil and coal supplied energy to our

daily lives, they are the main contributor to the air pollution. We have come up with a prototype model house that is powered by solar power, a renewable energy source. With solar power, we are able to turn on electrical appliances such as fans and lights.

Evergreen Primary School

Team name: POR

In this skit, our young environmentalists will share with us their own personal experience going through the rainforest. They will explain their amazement and fascination about the things they found inside the forest. They will relate to us how the organisms found living in the tropical rainforest are interconnected to one another. They will share with us their research findings on what a tropical rainforest is, where we can find them and how they affect our ecological system. Moving on from here, they will also share with us the numerous activities that teachers could carry out when they bring their pupils into the forest.

Fuhua Primary School

Team name: The Animal Crusaders

Biodiversity includes the plants, animals, fungi and micro-organisms around us. In a world where organisms are disappearing at a very fast rate, it is therefore an important task to protect this biodiversity that we have. There are a number of threats to biodiversity and poaching is one of them which have driven the once flourishing population of some animals to their pitiful state of endangered species. It is therefore important to stop poaching in order to protect what is left of our current biodiversity. If not, more animals will end up the same fate as the Tasmanian Tiger and the Dodo Bird, both extinct today. Our future generation can only depend on pictures, video recording to see and learn about such animals and zoo excursions will become an outing to see and observe robot animals.

Nan Chiau Primary School

Team name: Wonder Girls

The earthlings are polluting Mother Nature. They do not know the dangers of littering. Together, our team put up a presentation to teach the Earthlings how to recycle. Our skit and song tells people about the importance of recycling. We will promote the importance of recycling by showing the audience the things we can make by using plastic bottles, toilet rolls.

Ang Mo Kio Primary School

Team name: Ecosaviours

This project was developed due to the problem that most of the people staying in HDB flats face: the wastage of precious tap water and hassles of watering the

plants along the corridors. This was discovered when our team mentioned that most of their neighbours grew potted plants along the corridor and they were watering their plants frequently. Then, it occurred to us that the amount of precious and clean water that they are wasting away is unimaginable. Therefore, we came up with this project, which collects rain water and uses it to water the plants automatically. This project "Hydro Saviour" is created to provide a cost-saving and innovative way of eliminating the wastage and hassles that HDB residents face currently. We also filmed a news report on how "Hydro Saviour" can help to reduce wastage of water and save cost in the future.

Princess Elizabeth Primary School

Team name: PEPS

Before global warming sets in, forests are in abundance, habitats of animals in the forests are unaffected, the air in the environment is fresh. Greenhouse gases continue to rise around the world due to, and the result has been a gradual increase in temperatures over recent decades. How can we overcome global warming? Recycle and reduce the wastage of paper so that we can reduce the number of trees chopped down, use of environment-friendly products that do not contain CFCs, use of solar cars on the road to reduce pollution in the air. We bring across this message through a model of earth before and after global warming, and also a skit.

Category B (Secondary Schools): Top 10 teams

Raffles Institution

Team name: Alpha Team

The team observed that many Singaporeans were wasteful, especially in terms of water, a precious resource for our country. We are highly dependent on our neighboring countries for water despite much effort towards self-sufficiency. We had also observed that the Public Utilities Board had put much effort into the education of the public regarding water awareness, such as the introduction of the water mascot, Water Wally, as well as the 10-Litre Challenge launched recently to encourage Singaporeans to cut down on their wastage of water.

Thus, to counter the problem of water wastage, the Alpha team decided to build a device to tell people instantly of the amount of water that had flowed out from their taps. This idea originated from our observation of the petrol pump operational petrol kiosks. When petrol is pumped, the petrol kiosk machine reflects the total cost for the volume of petrol pumped based on the cost of the different grades of petrol per volume unit (e.g. litres, gallons, etc.) as well as the total amount of the petrol pumped in terms of volume and cost. If this analogy can be similarly applied to water taps, and the cost per litre is immediately reflected on a small LCD panel, perhaps users will be more mindful and would make conscious attempt not to waste the precious resource-WATER.

St Margaret's Secondary School

Team name: Exothermic

In Singapore, natural resources such as water, land and fuel are limited in supply. Growth in our population continues to put strain on these natural resources. We need to carefully manage our resources if we want to continue drinking clean water and enjoy modern living using electricity. Electricity especially is a very precious commodity in modern living.

Thus, the most practical, sustainable and creative solution: Instead of walking pets in the park, let it run on a larger version of a hamster wheel. The kinetic energy created by the moving wheel can be converted into electricity using a dynamo. The electricity can be used to power electrical appliances

Raffles Institution

Team name: 2Q Group A

Our idea is to build a green building which is self sufficient and does not need to rely on external energy sources and materials to run the building. A green building is a building which makes uses of clean and green resources, and it protects the environment and well-being of the people inside and outside of the building. This minimizes the negative environmental impact of the building on

nature.

Our green building will include: Rooftop movable solar panels, rooftop garden and garden around the building, district cooling system, pneumatic waste conveyance system and 'Composting toilet', recycling hot water, channeling heat from car park, stormwater Collection, 'Transitions' window panels, and waterless Urinals.

CHIJ St Nicholas Girls' School

Team name: TLC (Tender Lovin' Care)

Garbage is collected in an untidy manner (huge black plastic bags) and this tends to occupy much land space, a factor which in Singapore is limited to a great extent. (Incinerator plants deliver much less pollution as the harmful by-products pass through catalytic converters.)

We have input a possible idea of packaging the compressed rubbish collected in the trash-can in small boxes, thus the area occupied by the rubbish in these landfills are greatly reduced. This would at least, extend the life-span of the landfills in Singapore.

CHIJ St Joseph's Convent

Team name: Watercatcher

In view of the recent dengue fever crisis, our group has come up with a unique, practical yet simple design which will be able to tackle the problem of mosquito breeding in standing water of flower pots. Our product is a fake base and storage area that is made to fit the bottom of all flower pots; the flower pot will be placed directly on top of the base. Our product prevents the breeding of mosquitoes; acting as a 'water-catcher' and thus protects us from the dengue mosquitoes. The process cleanses the water, removing impurities from the water, as such, the water can be reused (e.g. to water plants). It also prevents the growth of mosquitoes as stagnant water will be drained.

Yishun Town Secondary School

Team name: Yishun towners

In our school, there are two roof-top platforms, the Quadrangle and Ellipse. These two places are ideal for outdoor learning and recreational activities. However, they have been left unused as it is too hot during the day.

On the Quadrangle, We proposed to have a roof-top garden consists of a netted-house for hydroponics and a fern garden. The netted-house occupies one third of the roof top area and the rest of the area will be an open air fern garden. We will use timed pumps to supply nutrient solution to the plants and nozzles to spray mist (mixed with nutritional solution) intermittently on the ferns. The mist and the

running irrigation water will create big cooling effects. The power will be generated by solar energy captured on solar panel.

On the Ellipse, since there is already a rounded steel structure, we will plant creeping plants like gourds to create a gourd pavilion. It provides shades and freshes the air, cools down the surround temperature. Furthermore, it makes the skyline more aesthetic. The power used for irrigating the gourds comes from the same solar panel for hydroponics.

Hwa Chong Institution

Team name: Rooftop garden

This project is a two-pronged approach, with the formation of two products that form a self rejuvenating cycle. This involves the formulation of fertilizer from canteen waste and using that to sustain rooftop gardens atop our schools.

The first prong is the formation of fertilizer through the collection and fermentation of canteen waste such as eggshells and fruits peels. The second prong involves creating rooftop gardens grown from the fertilizer created in the previous steps. With proper selection of seeds and careful positioning, we strongly believe that our rooftop gardens would be the solution to the rapid urbanization and can bring about numerous benefits. The rooftop garden would not only serve as a source of edible vegetable, but also as a temperature regulating mechanism.

Yu Ying Secondary

Team name: Fascination 4

In June 2004, tenders have been called to convert the Marina Basin into Singapore's fifteen reservoirs. This is to increase the amount of water supply in Singapore. It will be the first reservoir to be created in the city. In addition, the dam at Marina basin will be used to prevent flooding and to encourage water sports. Invariably, this will introduce oil pollutants into the water. Our group is studying ways how to remove oil contaminants from the water by finding ways employing the use of green, eco-friendly and natural used products (cost effective) to minimise this foreseeable pollution problem.

After experimenting, we found that sawdust absorbs the most oil among all the other materials that we have tried. Also, by increasing the amount of sawdust, more oil will be absorbed. Sawdust is available freely, cheap and most importantly environmentally friendly.

Temasek Academy
Team name: SOFC

In this project, an application that makes use of alternative energy sources was designed. After much thought, it was decided that using the fuel cell technology to replace conventional batteries would be a good choice. In doing so, the fuel cell must be understood, so must the processes behind it and how it can be incorporated into a common product. With this knowledge, it was decided that a portable USB Charger and as part of the system, a Solar Hydrolysis Kit are to be constructed.

This USB charger can be used to power devices that work on USB battery charging. Such devices are plugged into a USB port on any computer or laptop to be charged. The main purpose of constructing such a product is to ensure that it is highly versatile and can be extended for different uses in different situations. Moreover, the USB charger also proves to be a promising idea as it highly portable and allows for charging on the go. In order to ensure the portability of such a product, a Solar Hydrolysis Kit was designed as part of the system.

Temasek Academy
Team name: TL&E

Fossil fuel will eventually run out, this is the fact. Continual pollutions generated from this fossil fuel are also gradually running down both our environment and human health. Alternate sources of energy are constantly being developed, more and more emphasis and research are also placed into this field. One of these alternate sources is the most current technology, fuel cell.

In a nutshell, in this project, we are investigating the plausibility and feasibility of applying fuel cell technology in most aspects of our life, mainly the more important city facilities. Through much research we managed to gather sufficient information and knowledge to decide on the possible ideas. Furthermore with this information, we decided to implement the applications and allow them to function using fuel cell technology. The final ideas that we decided on in the end are the elevator and the traffic light.

Category C (JCs, Polytechnics, and ITEs): Top 10 teams

Ngee Ann Polytechnic

Team name: Bird Abductor

Birds are often found in eating places like the hawker centers and open food canteens and they would salvage foods left over by diners. The birds are potential health hazards as they bring along transmittable diseases with them.

The project attempts to overcome the problem by trapping the birds so as to reduce and control the population of birds patronizing canteen food. It is automated bird cage and the prototype comes in the form of a cage which is 'armed' with a motion sensor. Once the bird is enticed into the cage with food, the sensor would be activated to close the 'trap door'. When the bird is being trapped inside, the floor panel will be opened to get the bird to drop into a bottom pit. The floor panel will be closed and the 'trap door' opens to be ready for the next catch once the bird 'disappears' into the pit. To ensure the trap is a favorite place to feed, an automated feeding machine ensures ample food in the trap.

The cage is camouflaged and placed outdoor. The electronic and electrical devices obtain its power from a storage battery which is being regularly charged by a solar panel. Battery is adopted in the system because in open field, utility supply is not easily available. In the open field, sunlight is plenty hence solar panel fits nicely in this system to charge the battery.

Ngee Ann Polytechnic

Team name: Water saving device

Human beings require water and food for survival. Worldwide, the reliability of water supply has exacerbated with increasing global warming and deforestation. In Singapore, we rely very much of its water supply from Malaysia. It is therefore prudent that every citizen is conscious of its importance and will make every effort to conserve water.

The idea of this water conservation device was conceived as a result of careless users who often forget to shut off the tap after use. The invention attempts to arrest the water wastage for private homes. This device is mounted with an ultra sonic detector which is used to detect the sound pitch along the pipe (when water flows through a water pipe, the turbulence causes a certain sound pitch along the pipe). If the flow is continuous as in when the tap is not shut off due to carelessness of the user, the sonic detector senses the continuous signal and will activate an audio or visual alarm to alert the user. The time at which the alarm will be triggered can be set from 1 minute to 3 hours.

Hwa Chong Institution
Team name: HCI team 2

Comprising over 70% of the Earth's surface and constituting two thirds of the human body, water is undoubtedly the most precious natural resource that exists on our planet. Without the seemingly invaluable compound comprised of hydrogen and oxygen, life on Earth would be non-existent as water is essential for everything on our planet to grow and prosper. However, with increasing sewage and industrial wastes, the water body is severely polluted by various pollutants.

In order to solve this problem one of the way is to build a waterworks nearby to purify the water for all those villagers. Due to the high cost, it is infeasible to build a waterworks or water treatment plant. The method we think of is based on the idea of process of water treatment in a water treatment plant. But it is cheaper and can be practiced in the home.

ITE College West (Dover Campus)
Team name: Conserver

Koi Ponds are getting more popular in schools, company premises and private residential homes. The ponds get dirty and the water in the ponds turns 'green' easily, causing the need for frequent cleanings of the ponds. Nowadays, submersible pumps and biological filtering systems are used to maintain the clarity of the pond water and subsequently the cleanliness of the pond. Operating the pumps continuously for 24 hours a day chokes up a high electrical bill. We have come up with a system that makes use of Mother Nature and modern technology to create a system that saves money and conserves energy. Solar energy and wind energy are free for everyone to use. We can tap the energy from the sun by using solar cell panels and the energy from the wind by using wind generators.

The project involves the design of a Koi Pond that is able to keep the water clean and clear by using solar energy, wind energy and electricity. There are 2 parts to this project. The first is to design a pond which makes use of mechanical and biological filtering systems. The second is to design a system that is able to supply the electrical power required to operate the pumps used in the filtering system, with a low operating cost.

Anderson Junior College
Team name: Rainergy

Our project aims to investigate and design a simple electrostatic generator modified from the Lord Kelvin's water drop electrostatic generator. Our idea was generated due to the increasing demand for fuel in the modern society.

The Lord Kelvin's water drop electrostatic generator is the theoretical background that drives the investigation of our project. It is a simple set up that could generate electricity with water. The idea of this Lord Kelvin's water drop electrostatic generator is to let two streams of dripping water fall through a set of rings (inducers) and into two collector cans and this builds up electric charges in the cans.

We propose our system to be fitted on the roof of flats commonly found in Singapore where it could be wired to power the lighting of the void decks, common corridors or illuminated block signs.

Nanyang Junior College
Team name: Dual power

Singapore, being a small country with no natural resources, depends largely on the burning of fuels to produce electricity. Therefore, with such a large increase in the cost of fuel, the economic repercussions on Singapore will be quite significant. By tapping into the rainfall in Singapore, we are capitalizing on the limited resources Singapore has and providing an alternative method of producing electricity as well as storing energy for future use.

"HDBnerators" is a device used to convert the energy of flowing water to electrical energy. It is a large funnel shaped water tank, located on the top of the HDB block. When it rains, rainwater is collected in the funnel. At the base of the funnel, there is a stopper to prevent the rainwater from flowing out. When the water level reaches a certain height, a sensor is triggered and the stopper opens. The rainwater then rushes out of the funnel base into a pipe. The pipe connects the funnel to the turbine that is located on the ground floor. When the water rushes out from the pipe, with the speed it accumulated by flowing downwards, it turns the turbine that is connected to the electricity generator. Electricity is generated which is used to power the HDB's corridor lights, and excess can be stored up for future or emergency used.

Ngee Ann Polytechnic
Team name: Waste heat refrigeration

Heat generated from automobiles in the tropics is normally dissipated through the radiator to the surrounding atmosphere. The proposal is to utilize the otherwise waste heat to run a small refrigerator or chiller unit (up to 50 liter capacity) by applying the principle of heat absorption using ammonia solution.

In the event that the automobile ceases to run and no waste heat is generated, a temperature sensor will activate the standby battery to supply the heat for continuous system operation. An array of solar PV mounted on top of the

automobile will ensure the standby batteries are in a fully charged condition. This design ensures a continuous operation of the refrigerator.

National Junior College

Team name: Radiance

To play a part in controlling the damage to available energy, we want to reduce energy consumption (A) and find ways to maximize the use of energy (B) in our daily lives. Our product must also be practical, sustainable and of commercial value. Refrigerators waste high amount of thermal energy when hot air is released as a waste product through the air vent. The temperature of hot air released is on average of 40°C. Hence, we want to conserve and utilize the energy in the hot air.

Hot air from the air vent will be captured via a tube and transferred into the outer cavity of the heater. Convection will take place in the outer cavity to ensure the temperature is at the maximum. Thermal energy will be transferred into the inner cavity by radiation and conduction. Anything placed in the inner cavity of the heater can be heated up. One main use of the heater would be in the household. Ordinary families can purchase a set to be used with their refrigerator at home. As it is not at such a high temperature, it cannot be used to cook food. But the main use would be to defrost food and keep cooked food warm.

Category D (Universities)

Nanyang Technological University

Team name: Green Men

In 2005, dengue outbreak occurred in Singapore, the government had already taken some actions to solve this problem. The method implemented was fast enough to overcome dengue. However, long term preventive actions had not been done completely, due to lack of resources.

Our company, **GREENMEN** Pte Ltd spots this problem as an economics opportunity while remains to be environmental friendly. It would be better if natural problems could be solved by the nature itself rather than a synthetic method that is harmful.

Geranium homeanum and lemon grass are ornamental plants which can be functioned as mosquitoes' repellent plant, and based on the research finding, it was proved that geranium is more effective than other plants, in addition it has nice smell, and the beauty of the plant will add the aesthetic value. Those two plants can repel mosquitoes because of their odour, mosquitoes do not like it. Geraniol and Citronelol are the substances which are contained by geranium and lemon grass respectively.

During the early stage, **GREENMEN** Pte Ltd will focus only on ornamental plants marketing to HDBs, private houses, schools and government. And in the later stage, whereby the competitors have started to enter similar business, we will turn the focus to produce a high quality mosquitoes' repellent spray / substance, or even the mosquitoes' extinguisher from the plants.