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PECoF

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ABSTRACT

Our innovation product is focusing more on environmental problems which begin from carbon dioxide that is released by many sources. The rising carbon dioxide concentration in the air has a serious effect on human health as well as the surrounding environment. In addition, we also give full attention regarding the use of non-renewable sources as our country is currently dependent on them to generate power that can cause pollution to the environment and give adverse effects on human health. The objective of this innovation is to extract excessive carbon dioxide in the air and provide an alternative way to generate power by renewable source which is from the wind and sunlight. This innovation has two developments which are extracting carbon dioxide using Direct Air Capture (DAC) and generating power from natural sources. DAC involves a few stages which are sucking the air using the power generated, adsorption and desorption phase. Then, the second development is to generate power from natural sources that involve a turbine that will help to generate power by the wind produced from traffic speeding when vehicles pass by. The solar panel was installed to absorb sunlight and function to generate power. We believe this innovation has the potential to overcome the related problems as it has a unique invention from the combination of two functions (DAC and power generation by natural source) in one product. To conclude, this innovation could be the best way to bring the problems stated under control. Including an environmental monitor could be one of the consideration ideas to improve this innovation.

Keywords: Carbon dioxide; direct air capture; wind; sunlight; power

INTRODUCTION

According to United Nations, renewable energy can be defined as energy that derived from natural sources that are replenished at a higher rate than they are consumed. Natural resources are in limited supply regardless the high demand from around the world especially to power industrial society. Inspired from Devecitech's product of wind turbine, vertical axis wind turbine generates power from the wind produced by the vehicles and traffic speeding through the road.

Greenhouse gases function's is to absorb the sun's heat that radiates from the Earth's surface, trap it in the atmosphere and prevent it from escaping into space. It keeps the Earth warm than it would otherwise be, supporting life on Earth. Most of the greenhouse gases comes naturally in the atmosphere including carbon dioxide, water vapour, methane, and nitrous oxide. Human activities contribute to their accumulation resulting the planet's atmosphere getting altered, a rise in average temperature and more extreme climate events. One of the main greenhouse gases whose concentrations are rising is carbon dioxide. Carbon dioxide relatively nontoxic that appears as a colourless odourless gas in atmospheric temperatures and pressures.

PeCOf is a product that will extract carbon dioxide and extracted carbon dioxide will be reused to produce other relative carbon-product. PeCOf will help in carbon neutral where the carbon are not emitted and go to the cycle of being used and produced using the previous carbon and the cycle continues.

INNOVATION DEVELOPMENT

PeCOf mainly have two significant function which are to generate its own power from natural sources including sunlight and wind and to extract carbon dioxide to be reused and help in achieving carbon neutral.

First main function of PeCOf is extracting carbon dioxide by a process called Direct Air Capture (DAC). DAC is a technology used to remove carbon dioxide that already in our atmosphere. The captured carbon dioxide can be used again for food processing or combined with hydrogen to produce synthetic fuels that will help in carbon neutral and many more. The process will start when the fan generated by power sucks ambient air that consist of 0.04% carbon dioxide. The next stage will be followed by adsorption phase and desorption phase. For this process to be occurred, solid sorbent is chosen which is the amine solid sorbent which is a weak base. Solid sorbent chosen over liquid sorbent because it was at lower production scales, as they need lower regeneration temperatures and avoid evaporative solvent losses making solid sorbent much more convenient than liquid sorbent. The air that sucked by powered fan will go through the adsorbent where there will be adhesion of the carbon dioxide gas molecules to a solid surface of amine sorbent and will produce carbonate salt. Oxygen should be evacuated by vacuum pump before desorption process as oxygen will be exposed to amines with high temperature, which will degenerate and cannot be used in the future cycle. Next, desorption process followed where the absorbent will be heated by the steam with maximum temperature only will be 100 Celsius. Then, desorption phase will be next again to avoid the amine sorbent exposed to oxygen with high temperature. This process happened by cooling down the sorbent. Carbon dioxide extracted and the solid amine sorbent can be used again in the next cycle.

Second significant function of PeCOf is turbine that will help in generating power by traffic speeding produced by vehicles that passed by. Energy from sunlight will be absorbed by PV cells in the panel. The accumulation of electricity produced from both natural resources will be used to generate the system of Direct Air Capture.

COMMERCIAL POTENTIAL

The inventions that are implement in this product could be useful to address problem stated by using CAD system to extract excessive carbon dioxide in the air by undergo few steps which are sucking ambient air followed by adsorption phase and desorption phase for power generation, the solar panel, and the wind turbine installed could generate electricity. Thus, this proves the inventions of this innovation could bring the problems stated under control.

This innovation could give huge contributions to the new knowledge, technology, environment, and society. This innovation helps people to learn a new knowledge that is crucial for their future. Besides, this innovation also helps to give an idea to people in improving technology from this day forth. Environment condition also can be improving with this technology. Lastly, this technology can minimise the health problems on human as the carbon dioxide left is in adequate amount.

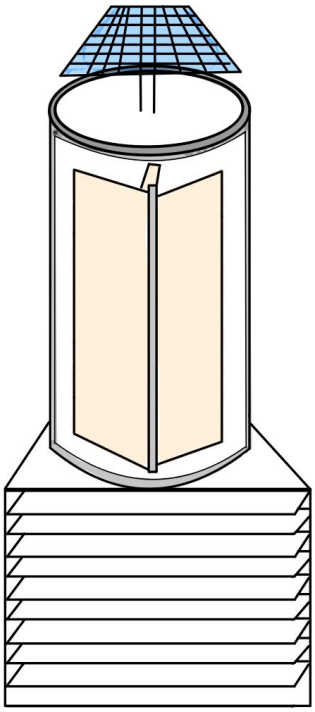

Figure 1: Innovation prototype

Table 1: PECoF price perunit

	Capital Cost (S-DAC)	Operation Cost (S-DAC)	Material Cost
	Adsorbent: RM 4406.97	Adsorption: RM 19.18	Solar Panel: RM 3000
	Blower: RM 61.11	Steam: RM 191.80	PECof body: RM 15000
	Vacuum pump: RM 77.61	Vacuum Pump: RM 1.34	Wind turbine Blade: RM 500
	Condenser: RM 1.78		
	Contactor: RM 37.37		
Total	RM 4584.94	RM 212.32	RM 18500.00
Price per unit	RM 23500.00		

CONCLUSION

Several issues related to this project are this product required large amount of energy and also very expensive. In PecoF, large turbine or fan is used to drive the air to through the part of DAC that contains material to capture carbon dioxide. These large turbines required large amount of energy to fully function. Furthermore, high energy input is necessary to produce material for DAC processes. Besides large amounts of energy, this product also quite expensive. Currently, there are very few markets that willing to use DAC to capture

carbon dioxide as it required a lot of energy not only to operate itself but the part of the DAC is also hard to produced and required full energy to function properly. For example, the sorbent material used to capture the carbon dioxide. However, this might change in the future because we cannot predict how this DAC change in the future. If this DAC concept is used widely in the future, the cost might change.

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