

Research Proposal: Category A

Development of a self-powered cyclone system using thermoelectrical power generation for a sustainable energy industry

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1. Abstract

The U.N. recently reaffirmed its implementation of the "Cheongcheon Project," a clean-air project between South Korea and China, which aims to reduce the waste of disposable plastics and particular matter (PM) based active incorporation between two countries. PM is one of the major environmental issues addressed by the United Nations, in particular two countries. PM is inevitably caused by use of fossil fuels such as exhaust and flue gases from industrial and transport sectors, which may cause various and severe damages to the ecosystem as well as human beings, such as bronchitis and skin diseases. Due to a rapid increase of PM emission in two countries, severe losses from the economics and substantiality perspectives become critical challenges. Thus, with government regulations and guides, active PM reduction processes should be equipped to most plants along with a cyclone collector. In this study, we propose a new self-powered PM collection process, which uses waste heat of emitted PMs to generate electric power. As an active energy-harvesting technologies for PM reduction, the inherent benefits of thermoelectrically generating electricity is to ensure economics by improving energy efficiency as well as environmental protection by cutting down PM emission. Important advantage of thermoelectric generation device is as followings : 1) No noise in this process 2) Long life time 3) No emissions. To illustrate the capability of the proposed process, we designed a new self-powered PM collection process to the flue gas from gasification of coal, which contains 3,000cm³ of approximated 220 C. As a result, we identified that this process can generate 7.14kW/m², which can produce more electricity than electricity used for cyclone gain more energy, which reduced 8954\$/year.