

## Hong Kong Student Science Project Competition 2023

Template of Extended Abstract (Investigation)

(Word Limit: 1,600 words, Pages: 3 pages only)

**Team Number: JBBC244**

**Project Title: Removal of dioxins from the incinerator**

**Project Type: Investigation**

**To our best knowledge, there are / are no\* similar works in the field; (if there are, ) related research links are as below:**

<https://www.jfe-eng.co.jp/en/products/environment/t07.html>

[https://www.aloki.hu/pdf/1603\\_27172728.pdf](https://www.aloki.hu/pdf/1603_27172728.pdf)

<https://aaqr.org/articles/aaqr-08-12-0a-0061.pdf>

<https://www.witpress.com/Secure/elibrary/papers/WM08/WM08058FU1.pdf>

<https://www.gore.com/products/dioxin-furan-filters-for-crematoriums-incinerations-metals-processing>

<https://d3pcsg2wjg9izr.cloudfront.net/files/2204/download/768697/1--1-3.pdf>

<https://www.sciencedirect.com/topics/engineering/rotary-kiln-incinerator>

<https://www.princeton.edu/~ota/disk1/1991/9116/9116.PDF>

<https://www.indiamart.com/proddetail/rotary-kiln-incinerator-21786652830.html>

<https://feeco.com/maintaining-rotary-kiln-incinerators-during-covid-19>

**The enhancement our project made / the difference with related research are:**

Unlike the research we found online, we have summarized the worth-mentioning points and cancelled out unnecessary points. We have also expressed our own concern and opinions about it, which is not in the research. We compared all four methods of Remedial catalyst filter bag, activated carbon, Adiox technology and increasing burning temperature instead of investigating a single method like the research we found online. We made a conclusion that the Remedial catalyst filter bag is the easiest method to decrease the amount of dioxin among all four methods.

*\*Please delete if not applicable. The competition values the originality of works. Students must do enough literature research to ensure that their works are unique and list relevant reference materials before starting research or invention.*

### **I. Background**

In the 21st century, the issue of waste management has become increasingly important, leading to the rise of incinerators as a means of more efficiently dealing with waste. However, while incinerators may relieve the burden of landfills, they also emit dangerous pollutants, particularly dioxin. Dioxins are highly toxic environmental pollutants that can have a detrimental impact on the health of both humans and other organisms living near incinerators. These carcinogenic substances are typically produced as industrial by-products, such as during the incineration and burning of trash. In addition to causing cancer, dioxin has the potential to bioaccumulate in the food chain, posing a risk to fish, birds, and other wildlife, affecting their reproduction and growth.

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## II. Objectives

The aim of this project is found out a method to reduce the amount of exhausted dioxins from incinerators.

## III. Hypothesis

Using Catalytic filter bags can reduce the higher amount of dioxins emitted by incinerators while those without filter bags cannot.

## IV. Methodology

Materials or apparatus needed:

- Two big tanks
- Two plastic bags (Dioxin emitter)
- A Catalytic filter bags
- Two lids for the tanks
- Dioxin detectors
- A timer
- Thermometers
- A lighter

Procedure:

Firstly, make sure that the two tanks have the same physical condition, such as temperature, by using thermometers.

Secondly, put a Catalyst filter bag into one of the tanks, and another one is used as control set-up.

Thirdly, put the plastic bags into each tank and start to burn it with a lighter.

Fourthly, count the time by using the timer.

Fifthly, after one hour, measure the amount of emitted dioxin with dioxin detectors and record it on the Excel file.

## V. Results

From the experiment, we found out that less dioxin particulates were left in the tank with Catalytic filter bag.

**VI. If your team will compete for the Sustainable Development Award, please indicate the specific sustainable development goal the project is related to, and provide justification for competing for this award. (Word limit: 300 words)**

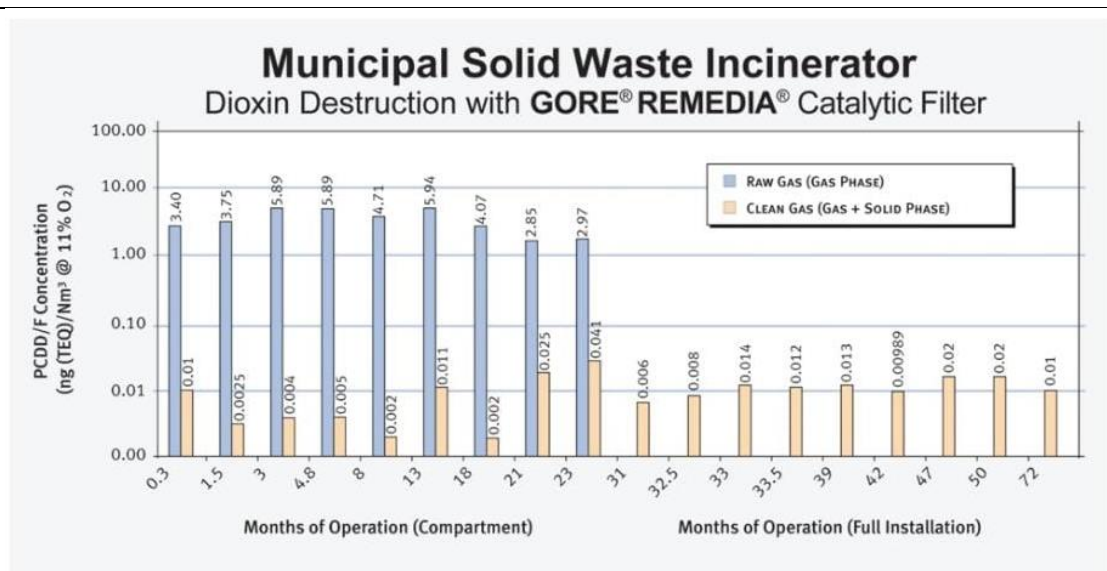
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**VII. If your team will compete the Social Innovation Award, please list the target group or social issue the project focuses on, and provide justification for competing for this award.**

*(Word limit: 300 words)*

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### VIII. Conclusion



After full installation of those catalytic filters bags, there is only clean gas left. From this bar chart, we can prove that the catalytic filters work.

Our project is developed based on previous project and the enhancement is below:

We are inspired from the base of <https://www.witpress.com/Secure/elibrary/papers/WM08/WM08058FU1.pdf>. It only includes the method of Adiox and we include more solutions for the emission of dioxin like Remedia catalyst filter bag, activated carbon and increasing burning temperature. After comparing all four of the solutions, we drew a conclusion that filter bag is the easiest way to decrease the amount of dioxin among them.