Monitoring toxic pollutants for better air quality

Air quality is imperative for our and the environment’s health. Research around air quality has been focusing on the monitoring, testing, and investigation of toxic pollutants, such as heavy metals, polychlorinated and polybrominated aromatic compounds, and particulate matter (PM).

Professor Guo-Ping Chang-Chien, director of the Super Micro Mass Research and Technology Center at Cheng Shiu University of Science and Technology in Taiwan, and his team have focused their efforts in the area of monitoring and controlling toxic pollutants in flue gas and other exhaust fumes for cars, but in a much larger and continuous format. Controlling the quality of flue gas and, specifically, monitoring the concentration of toxic pollutants that are released in the environment is of imperative importance, especially in the last few years that environmental and health protection agencies have received much attention.

A recent publication by researchers associated with the Super Micro Mass Research and Technology Center on the assessment of potentially toxic elements produced from coal burning boilers and sintering furnaces in a steel production plant highlighted the reduction in toxic pollutants present in effluents. Pollutants’ reduction was attributed to the implementation of available air pollution control devices (APCD) as a step before the release of flue gas into the atmosphere. This research focused on the examination of emission factors (EFs) of toxic pollutants, as they were calculated via field investigations and laboratory experiments, rather than following the available EF guideline from the Taiwan Environmental Protection Agency (EPA), as the standard values could be inadequate to represent the true picture.

Restriction of vehicle idling reduced emissions of PM$_{2.5}$, PM$_{0.1}$, PAHs and black carbon levels.

Flue gas has been a major issue for chemical plants as it is the equivalent of exhaust fumes for cars, but in a much larger and continuous format. Controlling the quality of flue gas and, specifically, monitoring the concentration of toxic pollutants that are released in the atmosphere. This research focused on the examination of emission factors (EFs) of toxic pollutants, as they were calculated via field investigations and laboratory experiments, rather than following the available EF guideline from the Taiwan Environmental Protection Agency (EPA), as the standard values could be inadequate to represent the true picture. Emission factors, a
The highlighted research examples showcase that collaboration between industry and research institutions can lead to spectacular breakthrough.

**Research Objectives**

Professor Chang-Chien and his team study different emission reduction approaches relating to ambient air toxic pollutants, specifically, dioxins, polychlorinated biphenyls (PCBs), polycyclic aromatic compounds, heavy metals, and PM$_{10}$.

**Detail**

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**Bio**

For the past 20 years, researchers at the Super Micro Mass Research and Technology Center have focused on toxic pollutants in flue gas emissions including dioxins, polychlorinated biphenyls (PCBs), polycyclic aromatic compounds, heavy metals, and PM$_{10}$. Taiwan has attained a 90% overall reduction of dioxin concentration in the past 20 years, and under the guidance of the director, Professor Guo-Ping Chang-Chien, the Center offered very instrumental services of testing and investigations.

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- Environmental Protection Bureau, Chiayi City, Taiwan, R.O.C.
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**Collaborators**

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**References**


**Personal Response**

Can findings from this research form the basis of new policy implementation, e.g., controlled burning of biomass, prohibition of idling vehicles around schools, etc.? Yes, the findings from this research can be applied as a basis for new policy implementation. For instance, industrial plants equipped with APCDs could be encouraged to pay air pollution fees for the emission of potentially toxic elements based on specific EFs for their devices rather than the Default EFs from respective environmental protection agencies. This will help industrial companies to save money and, ultimately, encourages them to install and maintain APCDs. Idling of vehicles, especially those with diesel engines, could be limited to a certain number of minutes in crowded places in order to lower the concentrations of ambient air PM$_{10}$. Yes, the findings from this research can be applied as a basis for new policy implementation.