

# DETERMINATION OF CONTROL SYSTEM EFFICIENCY USING LIQUID CO<sub>2</sub> INJECTION

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## 1. Introduction

Steel manufacturing is an indicator of country's economic development, with that being an iron and carbon alloy, with less than 2% carbon and less than 1% of elements such as silicon, manganese, phosphorus and sulfur. During the steelmaking production process, which goes from the preparation of the raw material to its storage, there is generation of fugitive emissions. One of steelmaking processes that requires attention is the production of pig iron, an alloy used as an input for steel production. This study aims to determine the system's control efficiency of the system control using liquid CO<sub>2</sub> injection in pig iron converting process, through comparative tests in the converting yard of a steel mill plant.

## 2. Materials and Methodology

OTM 32 - Exposure Profiling Method (US EPA, 2013) is one of the best methods to monitor fugitive emissions. This method was developed to measure pollutant open source emissions, with exposure defined as the time-integrated mass flux of a pollutant at a sampling point.

## 3. Results and Discussions

Tests were performed with and without liquid CO<sub>2</sub> injection. It was monitored concentrations of different particulate matter fractions: Total Suspended Particles (TSP), Inhalable Particles (PM<sub>10</sub>) and Respirable Particles (PM<sub>2.5</sub>). Tests with and without CO<sub>2</sub> application were compared.

The comparative analysis allowed to identify the differences in particulate concentrations and emission rates. The results showed concentrations percentage decay of 90% for TPS, 91% for PM<sub>10</sub> and 115% for PM<sub>2.5</sub>. As for the particulate matter emission rate, it was obtained a percentage drop of 90% for TPS, 91% of PM<sub>10</sub> and 100% of PM<sub>2.5</sub>.



Fig 2. Liquid CO<sub>2</sub> injection.

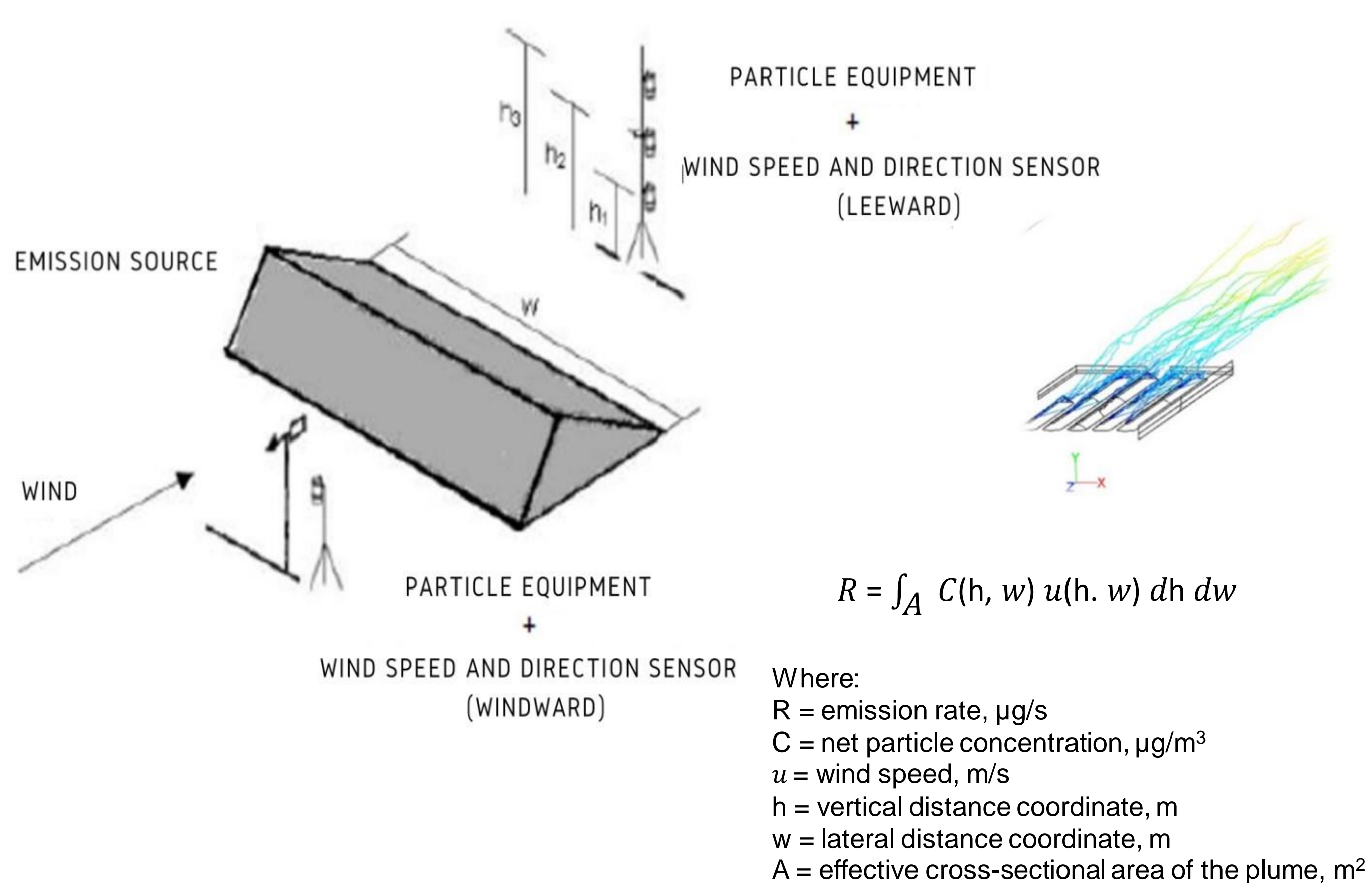


Fig 1. Open source measurement scheme - Exposure profile method

## 4. Conclusions

The tests results without the application of liquid CO<sub>2</sub> showed that the high temperatures reached by pig iron elevates the vertical gradient plume dispersion, provoking a quick rise of the plume and less horizontal reach. As expected, it was noticed the increase of particulate matter concentration during the pig iron converting without the CO<sub>2</sub> injection.