

新竹科學園區固定污染源排放減量管制策略

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摘 要

新竹科學工業園區自民國 69 年 12 月 15 日設立以來，已成功發展為國內外高科技產業重鎮，其污染物的排放特性為濃度低、風量大，主要以揮發性有機物及無機酸鹼為主。現行竹科廠商的空氣污染管制策略是以符合排放標準為主，但是由於產業群聚效應，使得整個園區的污染物排放總量仍然很高，對於區內的從業人員及週遭居民造成極大的影響。

本研究以 94 年科管局核發 77 家廠商固定污染源許可資料做為 ISCST3 模式面源及點污染源輸入資料，再由污染物濃度模擬結果推估出園區空氣污染物排放總量上限值，若假設污染為“面源”，則硫酸液滴為 252.67 噸/年、鹽酸為 752.80 噸/年、氫氟酸為 262.71 噸/年、硝酸為 520.44 噸/年及氨為 3511.24 噸/年；若假設污染為“點源”，則硫酸液滴為 50.97 噸/年、鹽酸為 213.56 噸/年、氫氟酸為 34.17 噸/年、硝酸為 107.54 噸/年及氨為 449.19 噸/年，由此可知相同的空氣污染物排放總量以“面源”方式模擬之結果所推估的污染物上限值較點源方式高很多。由於許可排放量為各廠推估最大產能的排放量，實際排放量應低於許可排放量，若以各廠硫酸液滴、鹽酸、氫氟酸及硝酸實際排放量進行模擬，結果最大小時濃度值分別為 5.90、9.76、11.48 及 $0.24\mu\text{g}/\text{m}^3$ ，皆未超過其個別周界標準 50、149、52 及 $103\mu\text{g}/\text{m}^3$ ，而推估出的排放總量遠低於目前的各污染物排放總量上限值。

本研究針對個別廠商進行模擬，發現各廠所在位置、排放量及煙囪高度為影響最大小時濃度值的主因。若要降低園區空氣污染物最大小時濃度值，最簡單可行的方法即針對該值之最大貢獻者進行排放量削減或要求增加煙囪高度，並不需要對園區所有廠商進行排放量削減或要求增加煙囪高度。而既設廠商若要增加排放量或新設廠商申請排放量時，主管機關可先進行 ISCST3 模式模擬，瞭解既設廠商增加排放量後或新設廠商所在位置及排放條件對空氣污染物最大小時濃度值之影響，作為核定之依據。

關鍵字：新竹科學園區、ISCST3、空氣污染、減量管制

Emission reduction control strategies of stationary sources
in Hsinchu Science Park

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ABSTRACT

Hsinchu Science Park (HSP) has developed into a high-tech industrial park since December 15, 1980. Air pollutant emissions from the companies in HSP are characterized by low concentration and high discharge flow rate. The primary pollutants are VOCs, inorganic acidic and basic gases. The goal of air pollution control of an individual HSP company is to meet the existing emission standards only. But the integrated amount of the pollutants emitted in the park is high due to the clustering effect, which may deteriorate the air quality and pose health threat to workers and surrounding residents.

This study used 77 stationary pollution sources in 2005 permitted by the HSP Administration as the input data assuming area or point sources in the ISCST3 simulation model. The upper limits of the integrated amount of discharged air pollutants in HSP were estimated from the simulated pollutant concentrations. From the simulation, the upper limits for H₂SO₄, HCl, HF, HNO₃ and NH₃ are 252.67, 752.80, 262.71, 520.44 and 3,511.24 tons/year, respectively, assuming the area source model, while the limits of H₂SO₄, HCl, HF, HNO₃ and NH₃ are 50.97, 213.56, 34.17, 107.54 and 449.19 tons/year assuming the point source model. Therefore, the upper discharged limits of air pollutants from the area source model are much higher than those calculated assuming the point source model. Simulation using the actual emissions of the pollutants indicates that the maximum hourly average concentrations of H₂SO₄, HCl, HF, HNO₃ and NH₃ are 5.90, 9.76, 11.48 and 0.24 µg/Nm³, respectively,

which are below the surrounding air quality standard of 50, 149, 52 and 103 $\mu\text{g}/\text{Nm}^3$. The calculated upper discharged limits of air pollutants are well below the promagulated values.

It is found that the amount of pollutants emitted by each company, the location and stack height are the primary factors influencing the maximum hourly average concentration. The simplest and feasible way is to reduce the emission and the stack height of the company which contributes the most to the maximum average hourly concentration. It is not necessary to reduce the emssions and the stack heights of all companies. When an existing company wants to increase the amount of emission or a new company applies for an emission permit, HSP Administration can conduct the simulation by using the ISCST3 model in advance. The decision on the permitting process can then be based on the influence of the maximum hourly average concentration by the increase of emission by the existing company or by permitting the emission of the new company.



Key Word : Hsinchu Science Park 、 ISCST3 、 Air pollutant 、 Emission reduction control