# Study of Temperature and Flow Fields of Downward Combustion Incinerator


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**ABSTRACT**

In this study, we simulate the thermo-flow field inside the downward combustion incinerator. The purpose of this, is to analyze the structure of the flow field and the combustion efficiency. In the analytical aspect of thermo-flow field of combustion, we adopt not only the κ - ε turbulence model with three-dimensional geometry, and figure out the continuity equation, momentum equation, energy equation and spices equation to discuss the influence of the combustion inside the incinerator in different circulating volume of the exhaust gas. The results of this study not only improve the design and analysis of the incinerator, but also helpful to the control terms. The exhaust gas that contains carbon in the Downward Combustion Incinerator will recycle into the combustion chamber to burning again and to improve the combustion temperature.



Keywords : Downward Combustion Incinerator ; Computational Fluid Dynamics? ; Exhaust gas Circulating ; Methane Combustion


**Table of Contents**



**REFERENCES**


[1] Collings M. E., Mann M. D., and Young B. C.,“ Effect of Coal Rank and Circluating Fluided-Bed Openating Parameters On Nitrous Oxide Emission, ” Energy and Fuels, Vol. 7, pp.554-558, 1993.

[2] Dellinger B., Graham M.D., and Tirey, D.A.,“ Predicting Emissions From the Thermal Processing Hazardous Wastes, ” Hazardous Waste & Hazardous Materdous Materials, Vol. 3, pp. 293-307, 1986.

[3] Takeno T., and Sato K.,“ An Excess Enthalpy Flame Theory, ” Combustion Science and Technology, Vol. 20, pp.73-84, 1974.

[4] Sathe S. B., Pack R. E., and Tong T. W.,“ Flame Stabilization and Multimode Heat Transfer in Inert Porous Media: A Numerical Study, ” Combustion Science and Technology, Vol. 70, pp.93-109, 1990.

[5] Leger C. B., Cundy V. A. and Sterling A. M.,“ A Three-Dimensional Detailed Numerical Model of A Field-Scale Rotary Kiln Incinerator, ” Environmental Science & Technology, Vol. 27, pp.677-690, 1993.

[6] Jakway A. L., Sterling A. M., Cundy V. A., and Cook C. A.,“ Three-Dimensional Numerical Modeling of A Field-Scale Rotary Kiln Incinerator, ” Environmental Science & Technology, Vol. 30, pp.1699-1712, 1996.

[7] Veranth J. M., Gao D., and Silcox G. D.,“ Field Investigation of The Temperature Distribution In A Commercial Hazardous Waste Slagging Rotary Kiln, ” Environmental Science & Technology, Vol. 30, pp.3053-3060, 1996.

[8] Veranth J. M., Silcox G. D., and Pershing D. W.,“ Numerical Modeling of The Temperature Distribution In A Commercial Hazardous Waste Slagging Rotary Kiln, ” Environmental Science & Technology, Vol. 31, pp.2534-2539, 1997.

[9] 賴嘉祥，小型都市垃圾焚化爐燃燒熱流場之模擬，碩士論文，中山大學環境工程研究所，高雄，1997。

[10] Korobitsyn M. A., Jellema P., and Hirs G. G.,“ Possibilities for Gas Turbine and Waste Incinerator Integration, ” Energy, Vol. 24, pp.783-793, 1999.

[11] Hartge E. U., Luecke K., and J. Werther,“ The Role of Mixing In The Performance of CFD Reactors, ” Chemical Engineering Science, Vol. 54, pp.5393-5407, 1999.

[12] Mastorakos E.,“ CFD Predictions for Cement Kilns Including Flame Modeling, Heat Transfer and Clinker Chemistry, ” Applied

Mathematical Modeling, Vol. 23, pp.55-76, 1999.
[13] 賴嘉祥，流體化焚化爐二相流模擬分析，碩士論文，東海大學環境科學與工程研究所，台中，1999。
[14] Chen K. S., Hsu W. T., Lin Y. C., Ho Y. T., and Wu C. H.,“ Combustion Modeling and Performance Evaluation In A Full-Scale Rotary Kiln Incinerator, ” Journal of the Air & Waste Management Association, Vol. 51, pp.885-894, June 2001.
[15] Pillai, K. K.,“ The Influnce of Coal Type on Devolatilization and Combustion in Fluidized Beds, ” J. Inst. Energy, Vol. 54, pp.142-150, 1981.
[16] Fluent 6.1 Manuals, Fluent Incorporation.