



Title: Dynamic Modelling of an Industrial Smelter Furnace and Converter Off-gas System

Author: Helen Shang, Megan Dillabough, Phillip Nelson, Bryan Salt

Source: American J. of Environmental Sciences 4(1): 22-30 , 2008

Abstract: In smelters, metal ores or concentrates are smelted to reduce a metal oxide to a metal through a series of reactions and processes. In a smelting process, a large amount of off-gas emissions are often generated, which can cause serious environmental and plant hygiene problems if not properly treated. Off-gas systems extract and treat the off-gas emissions, and ensure that the smelter operation is in accordance with environmental and industrial hygiene regulations. In this paper, the dynamic models for an industrial smelter furnace and converter off-gas system, tackling hazardous sulfur dioxide (SO₂), carbon monoxide (CO) and carbon dioxide (CO₂), are developed using mass continuity, momentum and energy conservation laws. Based on the developed dynamic models, the effects of important variables on the system's dynamics are studied via simulations. The developed dynamic models provide a necessary basis for high performance control development of smelter off-gas systems because online measurements are limited and additional ones must be justified.