MECHANICAL ENGINEERING—ENGINEERING MECHANICS

Graduate Seminar Speaker Series

Proudly Presents:

Dr. Chae Hoon Sohn

Sejong University in Seoul, Korea

Chae Hoon Sohn received his B.S., M.S., and Ph.D. in Mechanical Engineering from Seoul National University, Korea, in 1992, 1994 and 1998, respectively. He worked at Korea Aerospace Research Institute and joined in development of rocket engine combustor in 1999 to 2002. And, he moved to Chosun University in 2002. He is currently a professor in Department of Mechanical Engineering at Sejong University in Seoul, Korea. He was a visiting research scholar at Univ. of California at San Diego and Princeton Univ. in 1995 and 2013, respectively, for collaborative work.

Currently, he is a deputy editor of Journal of the Korean Society of Combustion. The distinguished paper was awarded to him and his co-authors in the laminar flames colloquium of the 35 th International Symposium on Combustion in 2014. And, he was awarded several best paper awards from Korean Societies of Combustion and Propulsion Engineers. He has 7 patents and 107 papers published in international and domestic journals since 1995. His research interests are in the area of combustion, rocket propulsion, and acoustics.

Thursday, January 19, 2017

4:00 pm — 103 EERC

On mechanism and suppression of spontaneous ignition of coal stockpiles based on numerical approaches

The spontaneous ignition of coal stockpiles causes serious economic loss and safety problems. It occurs in a coal stockpile when heat release rate from the coal oxidation process is larger than heat loss rate to the surroundings. In this presentation, mechanism and suppression of spontaneous ignition of coal stockpiles are presented briefly based on numerical approaches of computational fluid dynamics (CFD), which was employed in the previous works to simulate the ignition process of coal stockpiles in a coal storage yard. There are several parameters affecting the process such as air inflow, coal porosity, initial temperature, the shape of a coal stockpile, etc. The numerical results are compared with the experimental results for validation of the approach. Physical mechanisms of hot-spot formation and spontaneous ignition are analyzed. The numerical simulations can be used to predict temperature in the coal stockpile, the position and propagation of hot spots, and their transient behavior. Several conventional or existing methods to suppress spontaneous ignition are tested. And, based on the ignition mechanism, three new methods are proposed in this presentation. They are to adopt internal walls installed inside the pile, air blowing from the bottom of the pile, and a well-designed dual wind barrier installed at both sides of the pile. Each method has been verified to retard spontaneous ignition time more fundamentally than the conventional methods and the expected additional delay is about 10 to 30 days. More delay can be made by a combined application of these new methods. Furthermore, as a method to root out spontaneous ignition, i.e., free of self-ignition, a closed stockpile is proposed here. Spontaneous heating depends strongly on the size of the silo covering the pile and it is verified that a compact one with a small volume can suppress ignition completely for a certain condition, where maximum temperature in the pile increases initially and finally, falls down below a critical value for self-ignition.