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Author(s): Dunham, Ryan Q.

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Internship at Los Alamos National Laboratory

P.O. Box 1663
Los Alamos, NM

By

Ryan Q. Dunham

Submitted to Professor James Helbling
College of Engineering

Embry-Riddle Aeronautical University
Prescott, AZ

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Introduction

Los Alamos National Laboratory (LANL) is located in Los Alamos, New Mexico. It provides support for our country's nuclear weapon stockpile as well as many other scientific research projects. I am an Undergraduate Student Intern in the Systems Design and Analysis group within the Nuclear Nonproliferation division of the Global Security directorate at LANL. I have been tasked with data analysis and modeling of particles in a fluidized bed system for the capture of carbon dioxide from power plant flue gas.

MATLAB Statistical Analysis

One of my job functions this summer was to analyze aerosol particle distribution data in MATLAB. Aerosols are small particles suspended in a medium, usually gas (air). Examples of aerosols include smoke, dust, and fog. These particles vary in size and weight depending on the type of aerosol. The data I was manipulating was acquired using a cascade impactor, which samples aerosol particles based on size ranges. The sample was then weighed and the mass was calculated and paired with its specific size range. In MATLAB, I graphed the data in a normalized histogram based on size and mass fraction, shown in Figure 1. To standardize the bins, I created a mass differential plot by dividing the heights of the bins by their widths. The mass differential plot is shown in

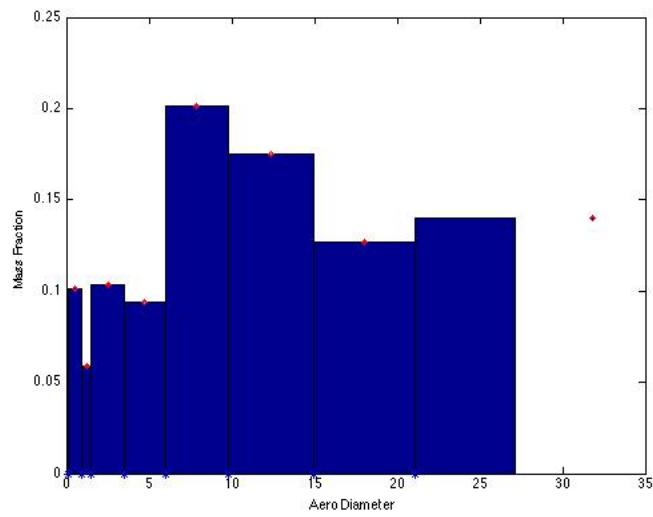


Figure 1, Aerosol Mass Data

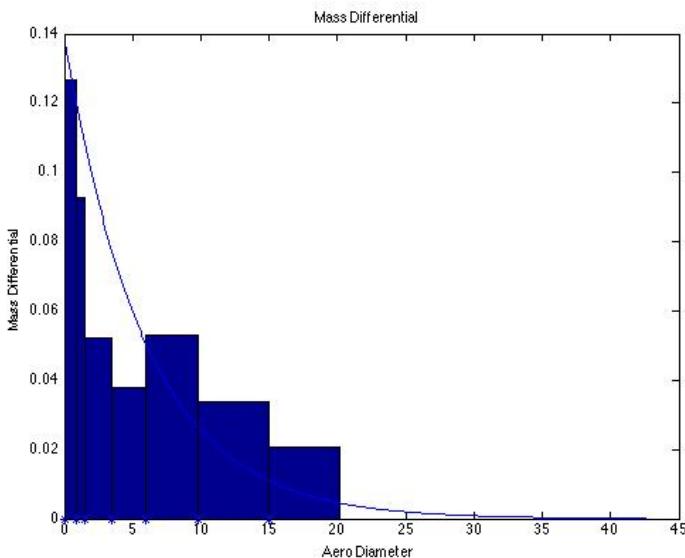


Figure 2, Mass differential Plot

Figure 2 with an estimated exponential fit. My main goal is to find the “fit” of a graph; a smooth function derived from the histogram data to describe the total particle distribution. The function could then be

used in ANSYS Fluent to simulate the aerosol in fluid flows.

ANSYS Fluent Particle Fluid Flows

Using MATLAB, the particle analysis was then performed to apply the distribution data in ANSYS Fluent. Fluent has a type of particle distribution called a Rosin-Rammler distribution built into its particle injection routine. The particles could then interact with the fluid in the system and we are able to estimate their wear rate and motion.

Future Tasks

Uncertainty about the way in which Fluent handles particle distributions lead me to create simple fluid models to insert and capture particle injections. This will allow me to measure and quantify exactly how the software processes particle data. Later this summer, I will also be running more complicated tests with particle injections that are more akin to the original fluidized bed model.

I have enjoyed my work at LANL so far. It keeps me thinking and allows me to apply skills learned at school as well as teaching me about industry applications that I can apply in my career.