Frequently Asked Questions

1) Query: Was the initial bed height corresponding to one of the packing conditions (packed or fluffed) measured? The values calculated from the geometry (Section = 0.01725 m^2) and bulk density data indicate

- 0.165 m for the packed condition
- 0.173 m for the fluffed condition

However in Addendum 1, sheet "Density calc", the value of B_H is nearly double. I assume these values refer to a different geometry (there is a diameter B_d?), but I would like to make sure I am interpreting data correctly.

Reply: The actual SSCP is self contained in the file "Small Scale Problem description (Zip file) <https://mfix.netl.doe.gov/challenge/SSCP_I.zip>." The addendum data is to just show how the minimum Fluidization, particle COR, Density, etc. were measured. *These were measured in different facilities and not in the Rectangular bed to be simulated for the challenge problem.

The initial bed height in the rectangular bed before turning on the gas flow was close to packed condition (i.e. ~ 0.165m). However, I should note that the facility was run at the set condition (e.g. Gas Flow of 2286.1 slpm) for at least 5 minutes before steady state data was measured.

2) Query: Could you please provide Reference [2] (Gopalan, B. & Jonathan, T., "Dynamic Particle Property Measurement for SSCP-I) as separate attachment? The embedded version is not readable in my excel 2010.

Reply: If you are unable to obtain any documents please send us an email and we will respond promptly

3) Query: Regarding pressure drop data; Mean and RMS pressure drop data is required at locations below the distributor (from -0.0603 to 0.0413 m) to compare with models including plenum chamber. I am going to use DEM simulation in which I -usually- do not model the plenum! should I provide the pressure drop from distributor the specified height (zero-0.0413 m) instead?

Reply: Please provide the pressure drop data corresponding to the region that you are simulating. Hence in your case you can provide the data for 0.0413m to 0.3461m and 0.3461m to exit and leave the first one blank.

4) Query: Regarding velocity output; There are two tabs: one for Eulerian Velocity output and the other is for Lagrangian Velocity output. As I understand the first is for participants with Two Fluid Model while the second is for DEM participants. The required fields are, however, not the same! The granular temperature appears in Eulerian velocity tab but not the Lagrangian velocity tab. The kurtosis does appear in the Lagrangian velocity tab but not the Eulerian one?

Reply: The tabs are provided so as to make it convenient for the two fluid and DEM modelers to submit the results. The required fields are not the same since two fluid model does not provide single particle statistics. Also Granular Temperature is a property of two fluid model and we left it to the DEM modeler to decide if they want to calculate it.**DEM modelers are free to provide the data for the Lagrangian tab and the Eulerian tab** as stated in the document.

5) Query: It is mentioned that the measured data includes the first four moments of distribution. I do calculate the granular temperature (in three dimensions) and use it to calculate both the skewness and kurtosis. Participant, however, should provide a Horizontal and Vertical components of mean, rms, skewness and kurtosis but not the granular temperature. I am wondering wither the granular temperature (calculated based on the three components of velocity fluctuations) be used in calculating vertical and horizontal components of skewness and kurtosis? should I use individual components of velocity fluctuation for each skewness/kurtosis component? I had a look to Reference #4 and could not find related equations for individual components of skewness and kurtosis.

Reply: In the Lagrangian tab we are requesting the first four moments of the for the horizontal and vertical velocity distribution. This does not require the calculation of the granular temperature. Use the standard definition of skewness and kurtosis to provide the values in that tab. If you want to compare Granular Temperature then fill up the Eulerian tab in addition to the Lagrangian one

6) Query: For confirmation purpose, the only time series data required is for pressure drop between 0.0413 and 0.3461 m and Eulerian Velocity (total?).

Reply: Yes.

7) Query: When is the deadline for submitting the simulation results? Is the use of other CFD codes apart from MFIX permitted? Can be accepted results of exclusive Euler-Euler simulations?

Reply: The deadline for submission is September 30. You can use **any modeling technique and even empirical correlations** to arrive at the results as long as you clearly explain how you obtained it.
Also you are not required to completely fill all the sections of the SSCP. If you modeling technique does not allow you to calculate certain quantities or even if you don't feel confident about the results please feel to leave those sections blank. However, if you could give us a reason for the decision it will be helpful to us.

8) Query: Have you have conducted the experiments at the proposed velocity?

Reply: All experimental measurements have been made. We are currently in the process of evaluating the uncertainty and organizing the results.

9) Query: Q1. I am wondering about the rms values required for pressure (and velocity components); Are these values merely the root of averaged instantaneous value squared [e.g. Prms = sqrt((sum(P^2))/n) where n is the number of data points] or it is related to rms of the difference between instantaneous and averaged value (turbulent prospective!) [i.e. Prms= sqrt(sum(P-Pmean)^2)/n)]?

Q2. in calculating the skewness and kurtosis (and the granular temperature), the velocity fluctuations are calculated with respect to the local instantaneous cell average velocity not the time averaged velocity?

Reply: For the "Eulerian Velocity Output" tab, first develop a Eulerian velocity distribution using the instantaneous Eulerian grid velocity over the entire temporal domain
(1) Mean of Eulerian Velocity Distribution -- Mean of the Eulerian Velocity distribution

(2) RMS of Eulerian Velocity Distribution -- Here what we are looking for is the "RMS of the difference between instantaneous and mean of Eulerian velocity distribution", i.e. the standard deviation of the distribution

(3) Skewness of Eulerian Velocity Distribution -- This should be calculated as the third standardized moment of the Eulerian velocity distribution (http://en.wikipedia.org/wiki/Skewness)

(4) Granular Temperature (GT) -- For Eulerian-Eulerian simulations using Kinetic theory this is the granular temperature in your model.
For DEM type simulations, this quantity is calculated by subtracting the **instantaneous Eulerian grid velocity** from each individual particle velocity located in the grid and calculating the **mean square value** of the subtracted velocities. This calculation is done for horizontal and vertical direction and the overall GT is 1/3(Horizontal + Vertical). The wall normal contribution is assumed to be 0 following Gidaspow's works.

For the "Lagrangian Velocity Output" tab, first develop a Lagrangian velocity distribution using all the individual particle velocities that passes through the region of interest (Grid) over the entire duration:
(1) Mean of Lagrangian Velocity Distribution -- Mean of the Lagrangian velocity distribution

(2) RMS of Lagrangian Velocity Distribution -- Standard Deviation of the Lagrangian velocity distribution

(3) Skewness of Lagrangian Velocity Distribution -- Third Standardized moment (http://en.wikipedia.org/wiki/Skewness)

(4) Kurtosis of Lagrangian Velocity Distribution -- Fourth Standardized moment (http://en.wikipedia.org/wiki/Kurtosis)