



CCSITM
Carbon Capture Simulation Initiative

MFIX-DEM ATTRITION MODEL INSTALLATION GUIDE

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1. INSTALLATION

The installation of the CCSI solid sorbent attrition discrete element model (DEM) generally follows the MFIX manual [1]. The present document solely intends to provide an overview on specific procedures required to enable the Attrition-DEM module within MFIX. Please refer to the User Manual [2] for additional details. **It should be noted that the current Attrition-DEM module only works with MFIX-2012-1 version.**

1.1. Prerequisites

Same hardware and software environment specified by MFIX [1] apply.

1.2. Third Party Software

Open-source, multi-platform data analysis and visualization application *ParaView* is recommend for post-processing of the MFIX simulation and can be downloaded from <https://www.paraview.org>. Other similar visualization software (for example, *Tecplot*, *Visit*) can also serve the same purpose.

1.3. Product Installation

It is assumed that user has downloaded the MFIX source files and created the entire MFIX directory structure.

To install the Attrition-DEM module, the user needs to first create a run folder in the MFIX directory (`$HOME/mfix`), for example, in LINUX system,

```
$HOME/mfix/attrition
```

The source code and the simulation input files for the Attrition-DEM model are available on the CCSI repository, and should be downloaded into `$HOME/mfix/attrition`

Move the following files from `$HOME/mfix/attrition` to `$HOME/mfix/model` to replace the original files:

```
mfix_l.make
mfix_l_not.make
mfix_u.make
mfix_u_not.make
```

and then copy the `desnamelist.inc` and `calc_attrition_des.f` files from `$HOME/mfix/attrition/des` to `$HOME/mfix/model/des`.

Note this replacement will not affect other MFIX capabilities, but only allow the user to enable/disable the attrition module using the `DES_ATTRITION` logical variable.

Follow the MFIX instructions [1] to build the mfix executable in `$HOME/mfix/attrition`. Remember to choose “[2] Force re-compilation for the question” for “Option

to re-compile source files in run directory” during the compilation. Upon successful build, a custom `mfix.exe` is available in `$Home/mfix/attrition`.

2. SIMULATIONS

The DEM model input files `mfix.dat` and `particle_input.dat` are included in `$Home/mfix/attrition/Example`. The present simulation is for the parallel run with 8 processors. Users can choose to run the simulation with different number of processors or in serial by changing the values of `NODESI`, `NODESJ`, and `NODESK` in `mfix.dat` following [1]. Due to the computationally intensive nature of the DEM model, it is recommended to use the distributed memory parallel (MPI) method. The model will run in serial and shared memory parallel (SMP), however the computations are inefficient and will take a very long time.

Note the logical variable `DES_ATTRITION` enables/disables the attrition calculations. If `DES_ATTRITION` is set to `.FALSE.`, then the original 2012 MFIX code is obtained (e.g. the DES attrition calculations are skipped over).

3. REFERENCES

- [1] MFIX – Multiphase Flow with Interphase eXchanges, Version MFIX-2012-1, January 2012. (readme.pdf distributed within MFIX tarball)
- [2] CCSI Solid Sorbent Attrition Model USER MANUAL, version 0.1, August 14, 2013.