

# AGGLOMERATES ANALYZER

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The module is used to analyze properties of agglomerates and export data as file in text format (comma-separated values, .csv). Data for the analysis is taken from the results file (\*.mdem), therefore saving step which was used during the simulation can influence the accuracy of the results. Linear interpolation is used to obtain data between saved time points.

User can obtain information about the following parameters of particles (*Fig. 1 - Property*):

- *Coordinate*: distribution of agglomerates according to space coordinates. As coordinate center of masses of particles are used. Masses of bonds are not considered.  $C = \frac{1}{M} \sum_{i=1}^n m_i c_i$ , where  $C$  – resulting coordinate,  $M$  – total mass of all particles in agglomerate,  $n$  – number of particles in agglomerate;  $m_i$  – mass of a single particle;  $c_i$  – coordinate of a single particle.
- *Diameter*: distribution of agglomerates according to diameters of equivalent sphere. Volumes of particles and bonds are taken into account.
- *Number*: total number of agglomerates.
- *Number of bonds*: distribution of agglomerates by the number of bonds.
- *Number of particles*: distribution of agglomerates by the number of primary particles.
- *Orientation*: distribution of agglomerates by their orientation in 3D space. Is calculated as the orientation of the vector between the outermost particles of the agglomerate.
- *Velocity total*: distribution of agglomerates according to velocities. Velocities of bonds are not considered.  $V = \frac{1}{M} \sum_{i=1}^n m_i v_i$ , where  $V$  – resulting velocity,  $M$  – total mass of all particles in agglomerate,  $n$  – number of particles in agglomerate;  $m_i$  – mass of a single particle;  $v_i$  – velocity of a single particle.

Four following results types can be selected (*Fig. 1 – Results type*):

- *Distribution*: distribution of selected parameter by specified number of classes on specific time interval (list of time points, see below). In this case the results will be generated as a table where each row represents a time point and each column corresponds to the specified property interval. Each cell of the table contains number of agglomerates which have property value within the given interval;
- *Average*: the result is an arithmetic average value of selected property for each time point. Additionally the information about number of considered agglomerates and deviation for each time point will be provided in results;
- *Maximum*: maximum value of selected property for each time point;
- *Minimum*: minimum value of selected property for each time point.

For such properties as coordinate, orientation and total velocity besides the magnitude (*Length*) a specific component of resulting vector (*X, Y, Z*) can be determined (*Fig. 1 – Vector component*).

Each property can be obtained for specific time interval, divided into classes (*Fig. 1 - Time*). Values will be exported for each time point from interval  $[T_{FROM}; T_{TO}]$  starting from  $T_{FROM}$  with specified time step  $\Delta T$ . For example for initial data  $T_{FROM} = 0$  s,  $T_{TO} = 5$  s,  $\Delta T = 1$  s, the results will be generated for time points 0, 1, 2, 3, 4, 5 s. To get values for only one specific time point  $T$  specify  $T_{FROM} = T_{TO} = T$ . There is also a possibility to obtain results only for those time points, which were saved during the simulation (thereby avoiding the interpolated results).

To analyze distribution of some property (*Results type: Distribution* is chosen), there is a possibility to specify range of values for selected property and number of classes on which this interval will be divided (*Fig. 1*). Agglomerates whose properties do not fall within a predetermined range **will not be considered**. The result for each class at a specific time point is a number of agglomerates whose properties fall within this class. If the value is exactly on the boundary between intervals, it will be assigned to a greater interval.

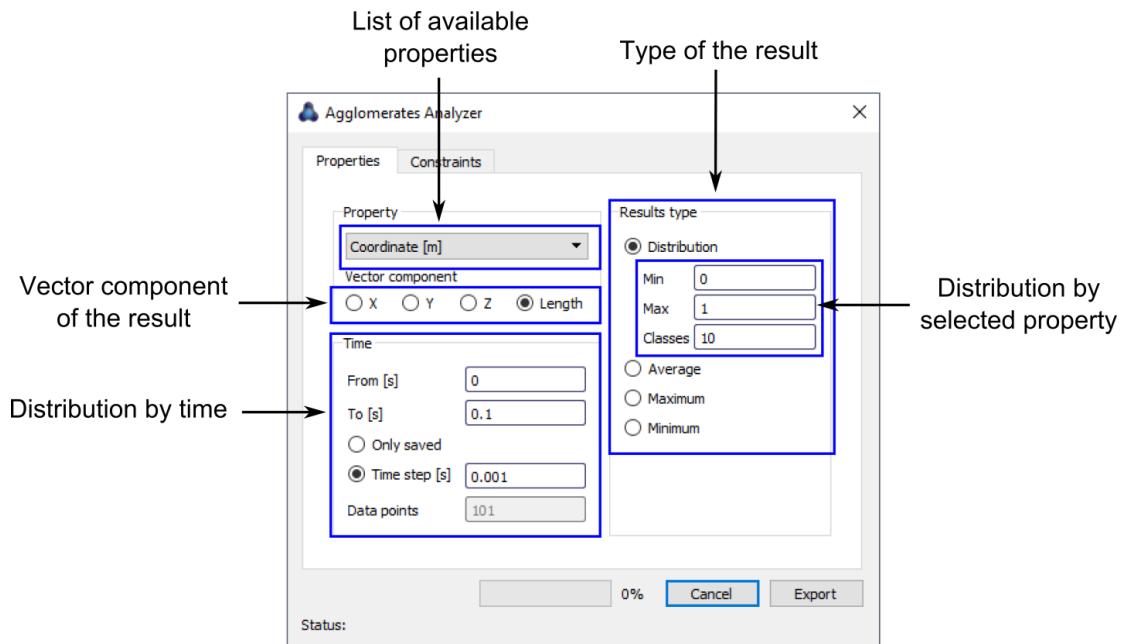


Figure 1. Main dialog of the Agglomerates Analyzer.

One or several constraints can be applied in Agglomerates Analyzer (*Fig. 2*) (**turning on filters can significantly reduce performance of the analysis**):

- *Materials*: only those agglomerates will be taken into account, which consist of particles and bonds of selected materials.
- *Volumes*: only agglomerates which are within one of selected analysis volumes will be taken into account. Centers of mass of the agglomerates are used as their coordinates.