GPU-DEM

GPU-DEM flow chart

Exert on CPU

Exert on GPU

Normal and tangential forces

Graphic Processing Unit (GPU) thread hierarchy:


```
Monash Massive3 V100 GPU cluster:
Max threads per block:  1024
Max thread dimensions xyz: (2048, 2048, 64)
Max grid dimensions xyz: (65536, 65536, 65536)
Total threads:
1024*2048*2048*64*65536*65536*65536
```
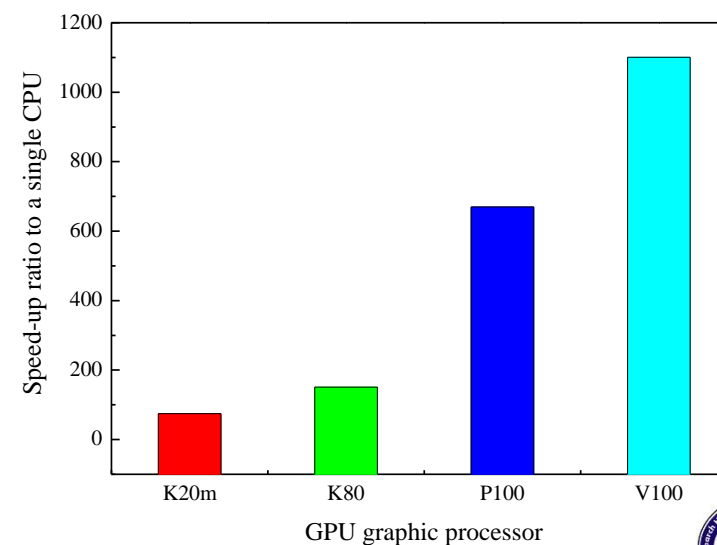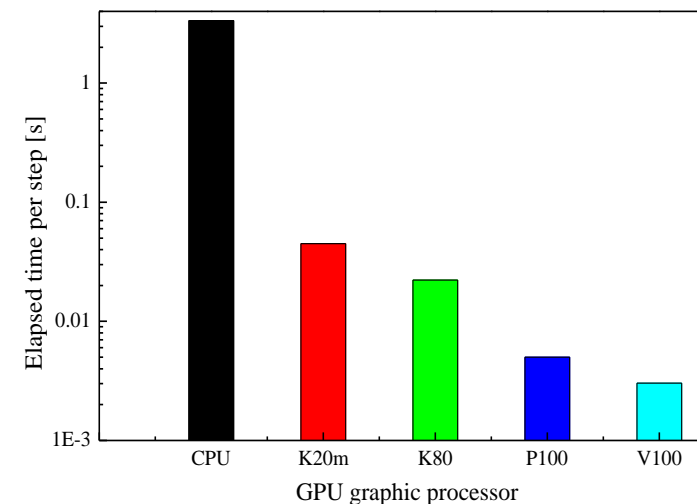
GPU - DEM

Specification of different GPU graphic processors

Model name	Tesla K20m (UNSW)	Tesla K80 (Massive 3)	Tesla P100 (Massive 3)	Tesla V100 (Massive 3)
Memory clock, GHz	2.6	5	715	876
Maximum band width, GB/s	208	480	732.2	897.0
Peak performance of double precision, TFlops	1.17	2.91	4.763	7.066

For the **homogenous** case of packing in a rectangular box with
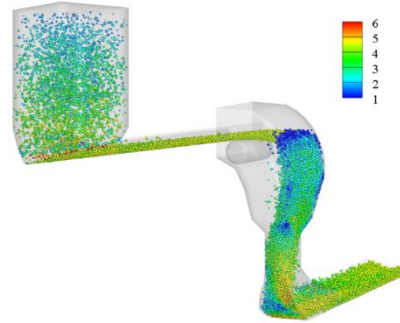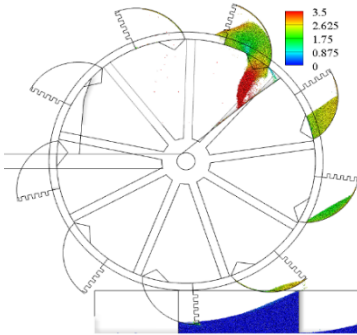
300,000 spheres :
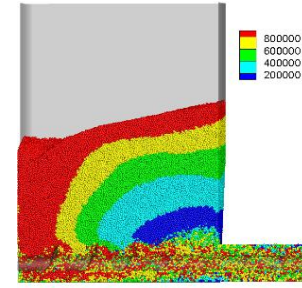
Speed-up ratio of V100 to a single CPU >1000 times

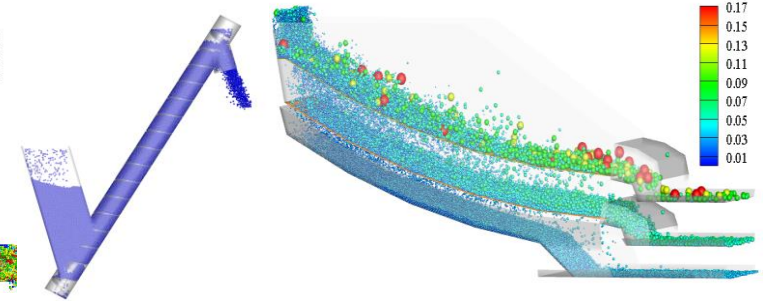# Whole process scale: Application of GPU-DEM from mine site to blast furnace [1]
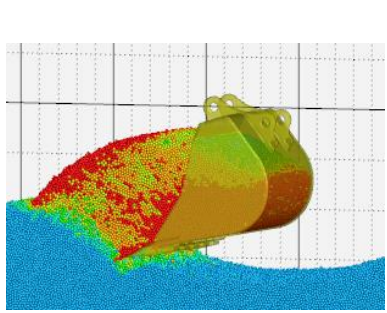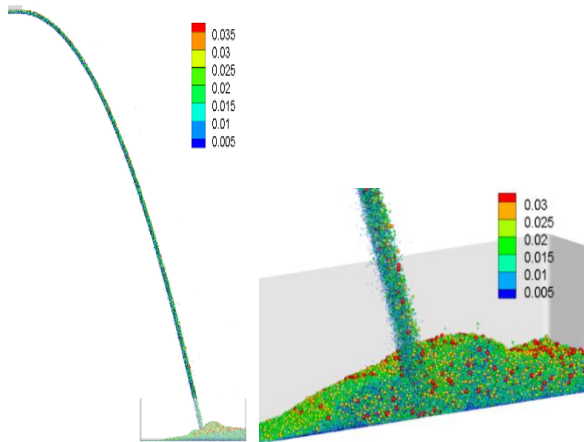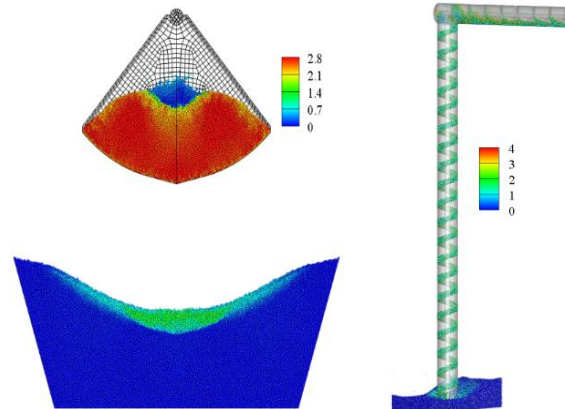

Excavating / Reclaiming

Belt conveying
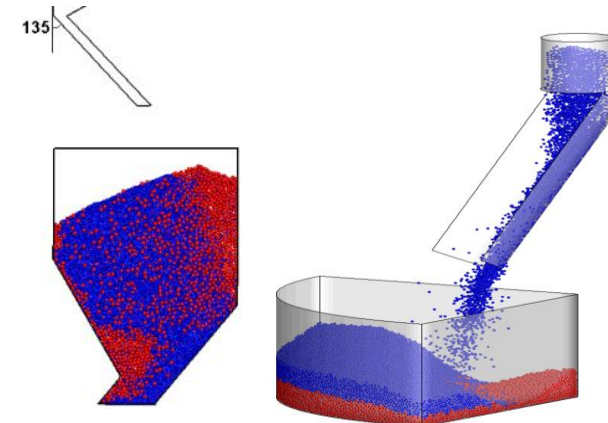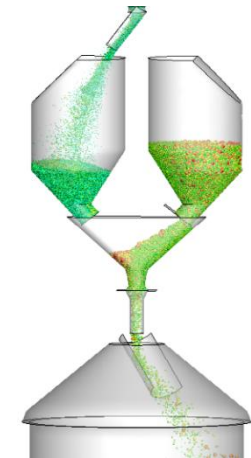
Screw conveying

Screening
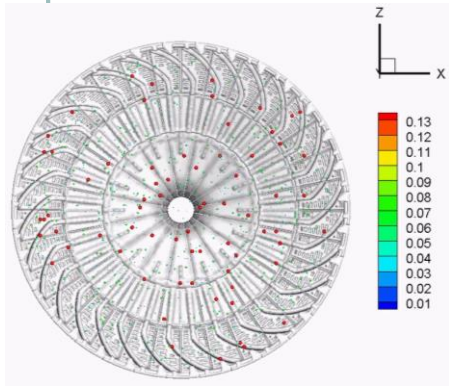
Ship loading

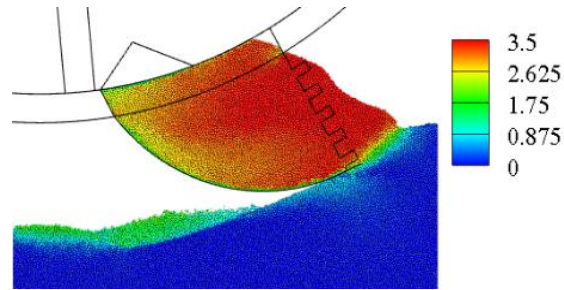**Ship unloading**

Hopper flow / BF top charging

[1].   J. Gan, T. Evans, A. Yu, Application of GPU-DEM simulation on large-scale granular handling and processing in ironmaking related industries, Powder Technology, 361 (2020) 258-273.
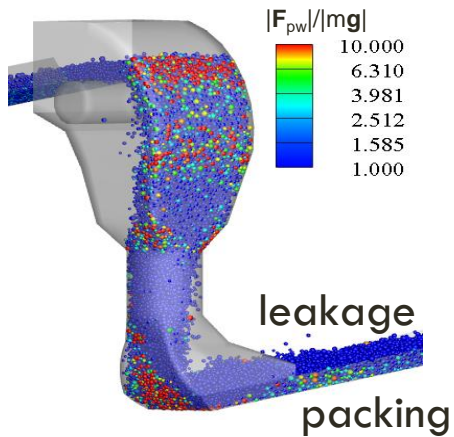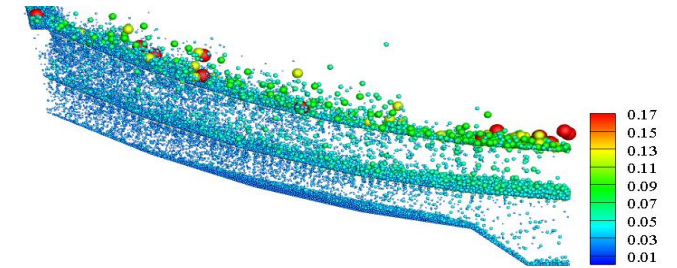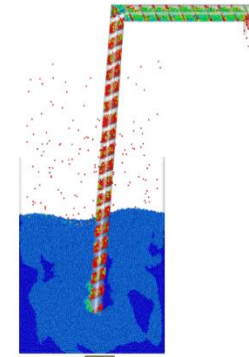
3

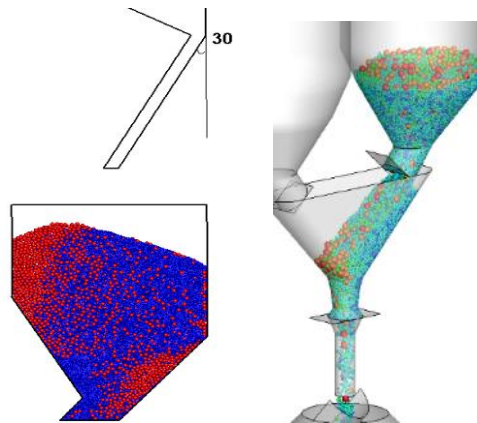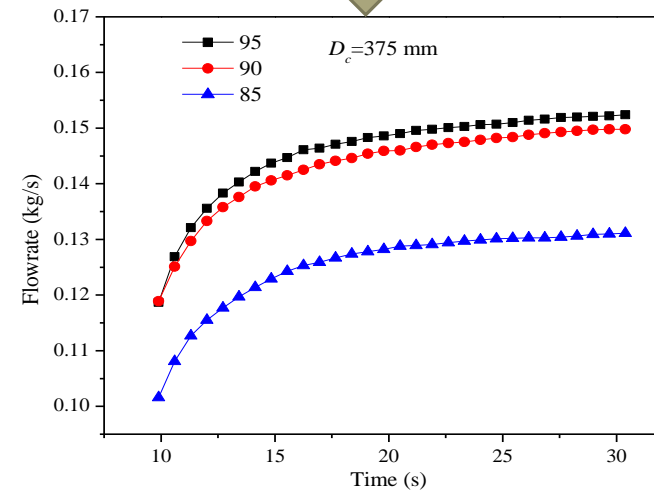# Process performance and efficiency
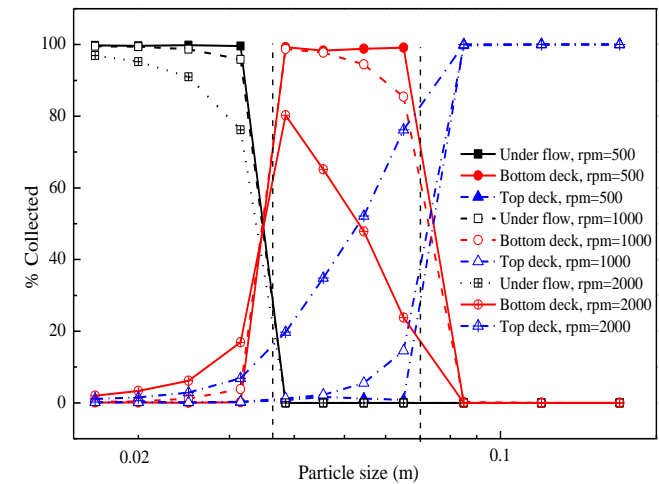

Particle behavior

Particle dynamics

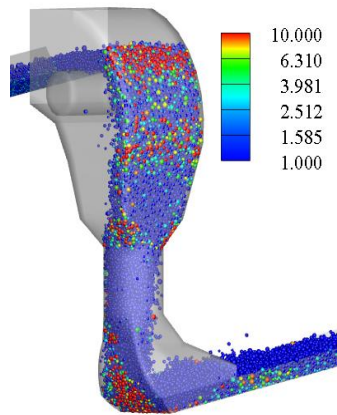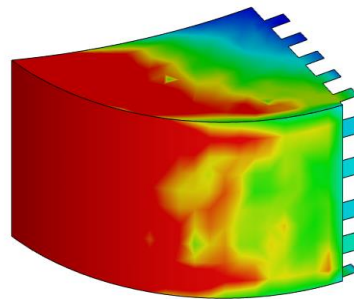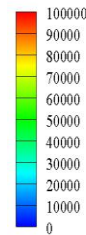Smoothness

Segregation

Mass flow rate

Screening efficiency

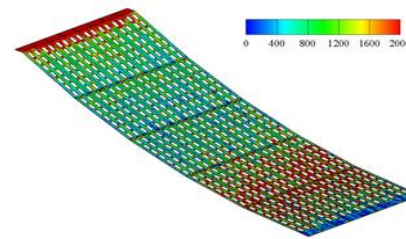# Wall stress / particle-wall forces / wear

Particle-wall forces

Conveyor transfer chute

Energy dissipation

$E_{d,p\text{-}p}$, J/kg

Ship loading

Wall stress

Reclaimer bucket

Double deck banana screen
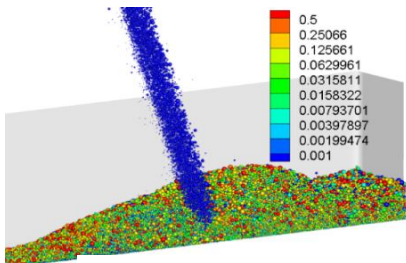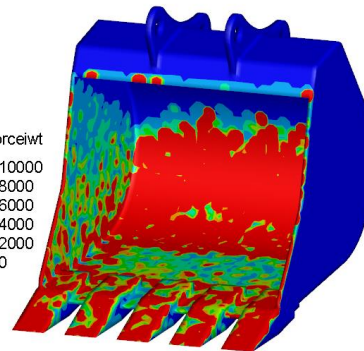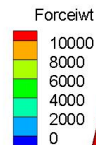
Excavator bucket

Grabs

Wear

Finnie wear weight

Archard wear depth