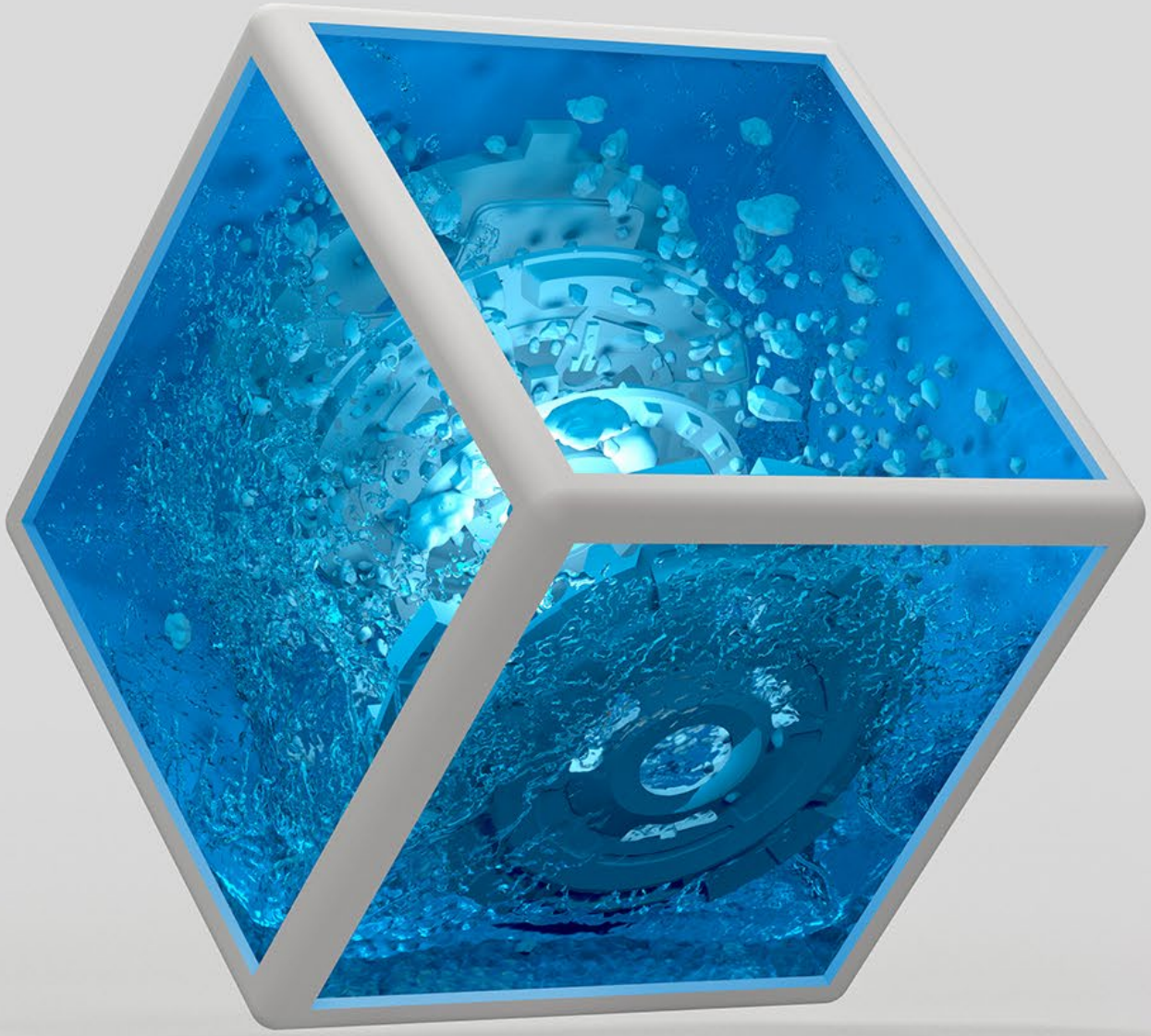

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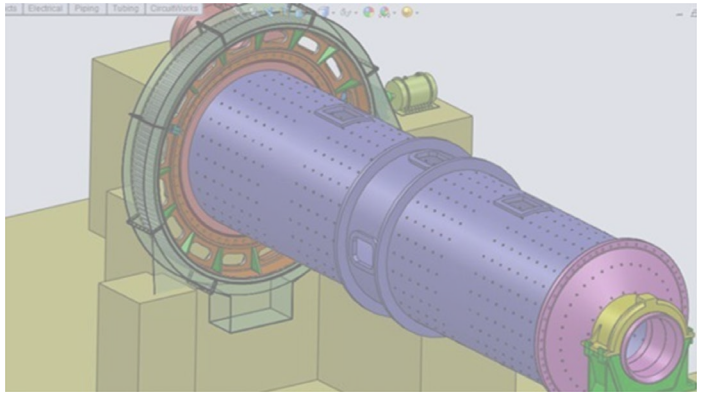
WET BALLMILL

Integrated twin wet ball mill with hybrid discharge

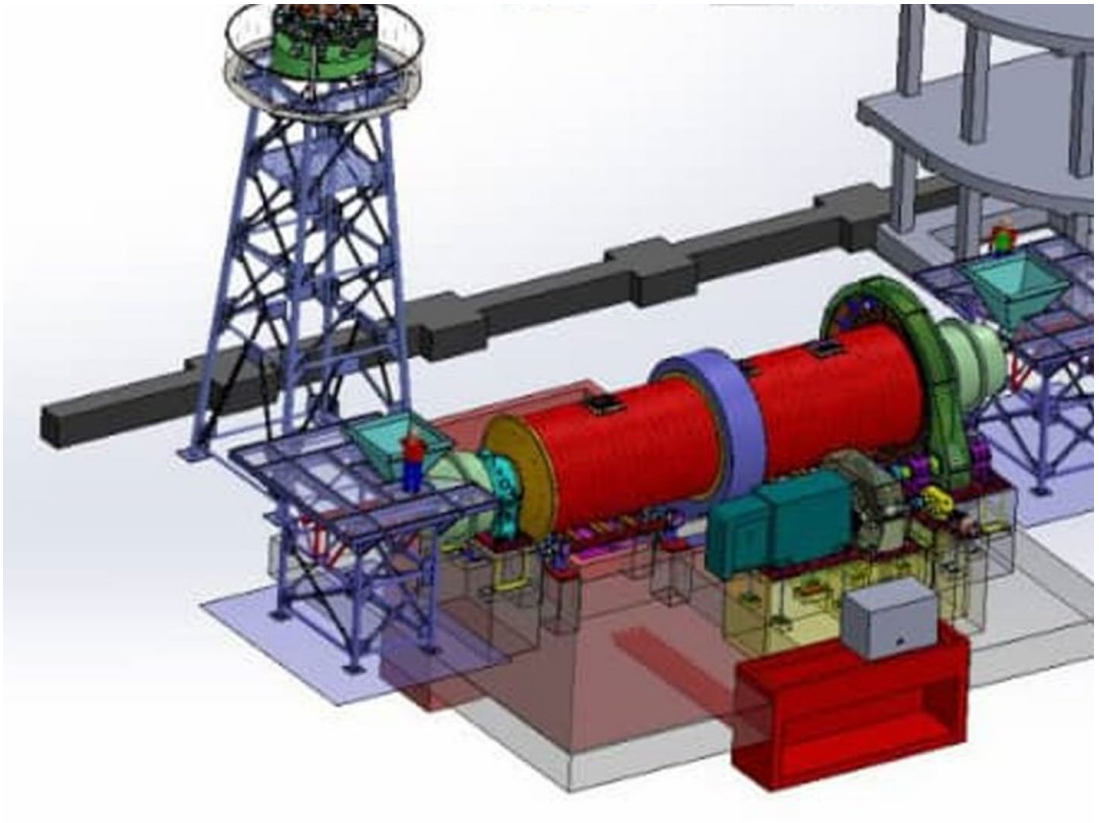
A) What is a wet ball mill?

- Water, balls and mineral material are feed to the ball mill for mineral processing purposes.
- Wet ball mills in addition to milling are important for mixing water with mineral materials to produce slurry that is needed in the next steps of separation process.
- In addition to that, water avoid spreading dust during milling process that should be filtered and is very harmful to the nature.
- Another advantage is the cooling effect of water in wet ball mills. Since the process of milling is exothermic because of high abrasion between materials and balls. Water is lubricant and cooling liquid inside mills. As the temperature is low inside wet ball mills, rubber parts can be used as liners to protect the ball mill cylinder and heads from hits and abrasion and lift materials during rotations.

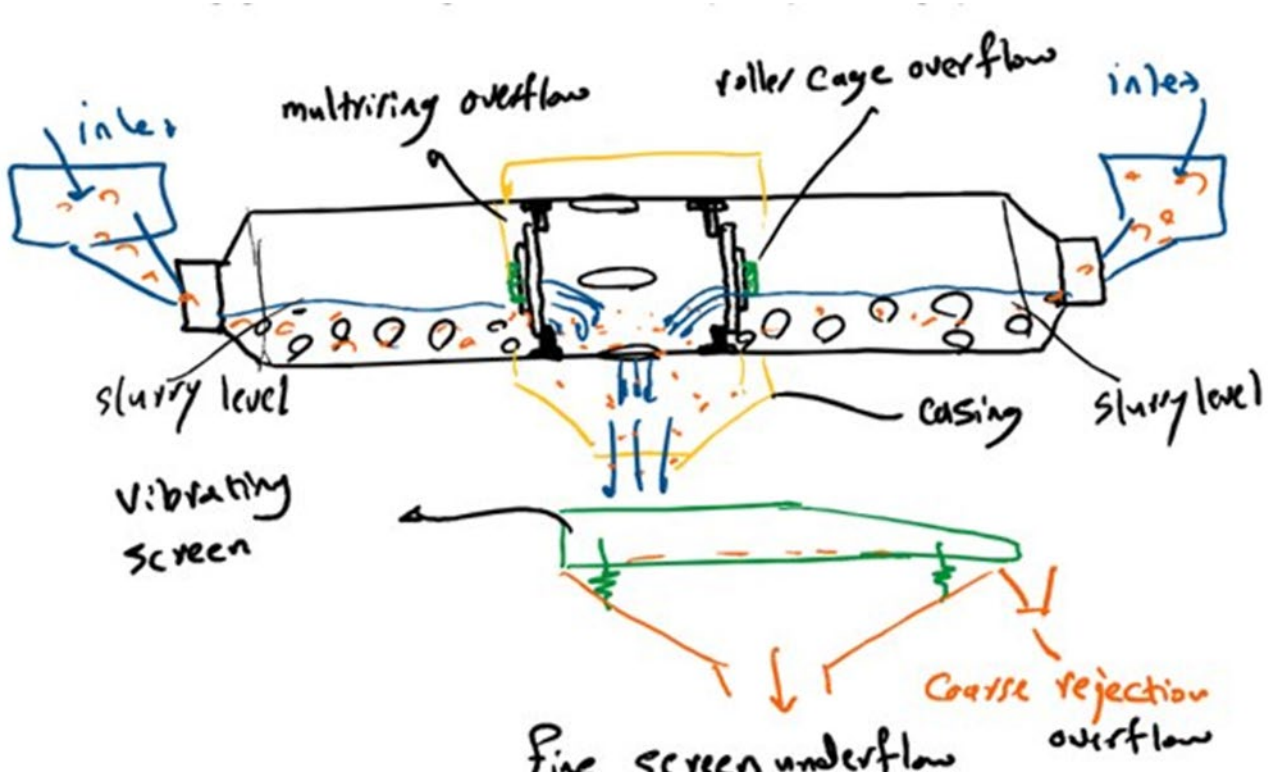


B) Goal of the project

To get more efficiency that means to maximize the feed rate with minimum costs



C) Intergrated twin wet ball mill with Hybrid discharge

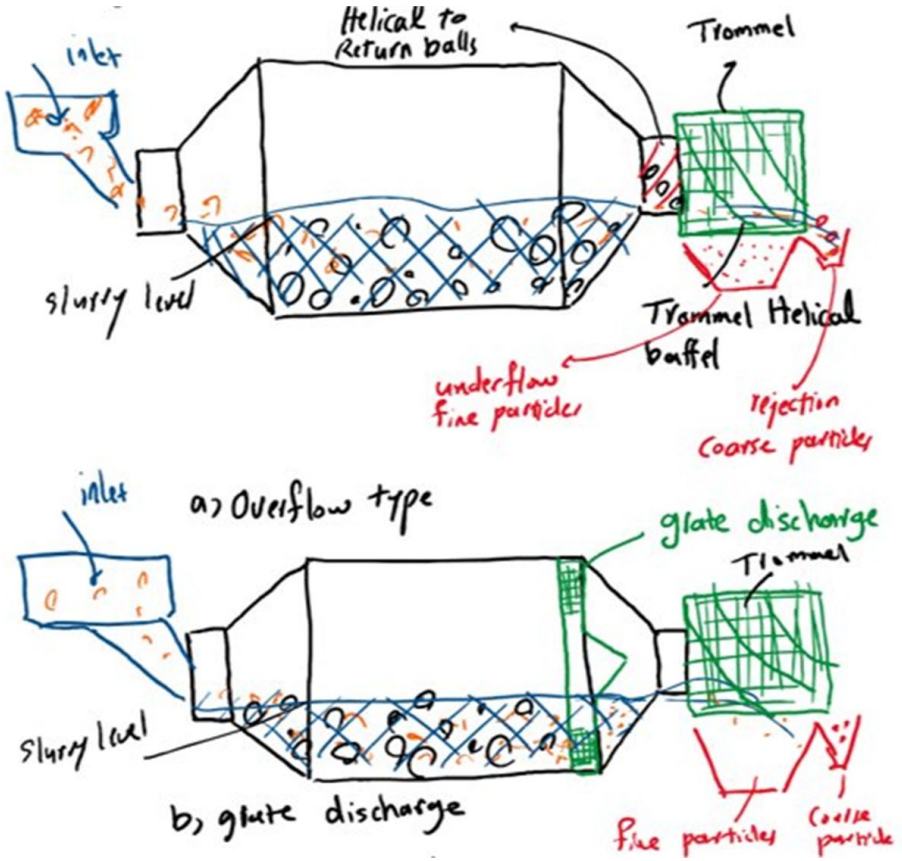


Our suggestion is Integrated Twin Wet Ball Mill (IT-WBL), that means we have a long tube that from outside look likes one ball mill with only two headwalls and two trunnions, one girth gear, one pinion, one pinion shaft, one GB, and one EM, one controlling system, one set of cabling and piping, everything just for one ball mill, and then inside we have two special diaphragms that are look like head walls, diaphragms separate the internal space of the cylinder to three stages, left and right stages are two completely separate ball mills and the space in middle is a gap to collect the overflow from both sides and then with a side flow housing we drain off the slurry flow and guide to the next steps of the process.

D) Why special design of diaphragm is needed to integrate two parallel ball mills in one

- The idea is to integrate two parallel wet ball mills from outlet side and keep the parts just for one ball mill, to double the production rate with approximately the same energy and capital cost.
- For better understanding it is needed to review different typs of outlets in excisting ball mills.

E) Review different types of existing outlets in ordinary ball mills

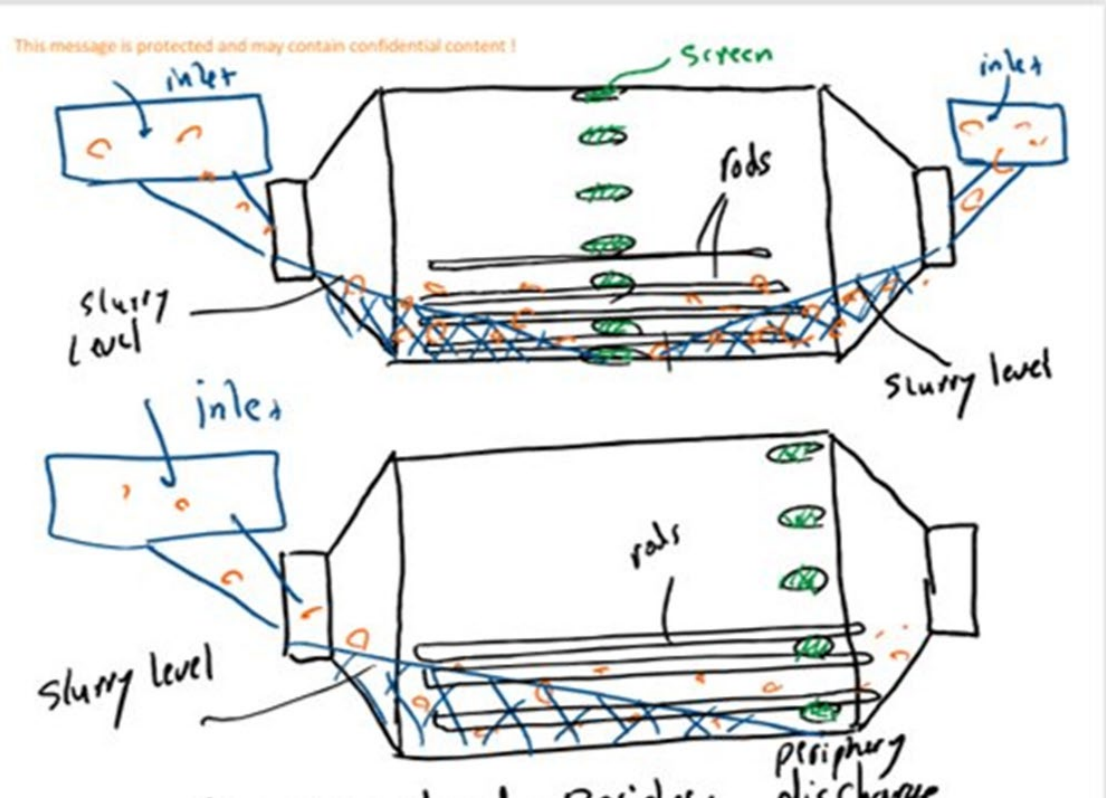


Type a) overflow

Type b) grate discharge

Type c) periphery discharge

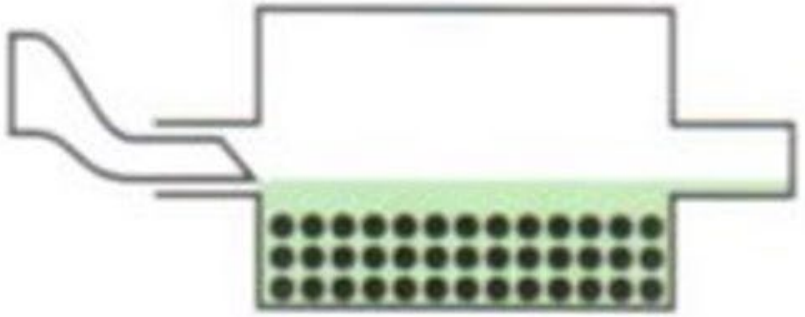
F) Periphery discharge



- This type is commonly used in Rod Mills. The main reason of using this type of discharge in Rod Mills is to avoid rods to leave the ball mill from the end outlet. The blue hatched area in fig. 1a,b &c; shows the level of slurry flow inside ball mills. As it can be seen in overflow and grate discharge the level of slurry and balls is approximately 40% of the volume but in periphery discharge due to slurry drain off; half of the effective volume is missing and at the same rate the outlet slurry is coarser since, the residence time of materials in Rod Mills in similar condition is lower and outflow is coarser, because of that, rod mills are used as pre-milling machines and after Rod Mills we need ball mills again.

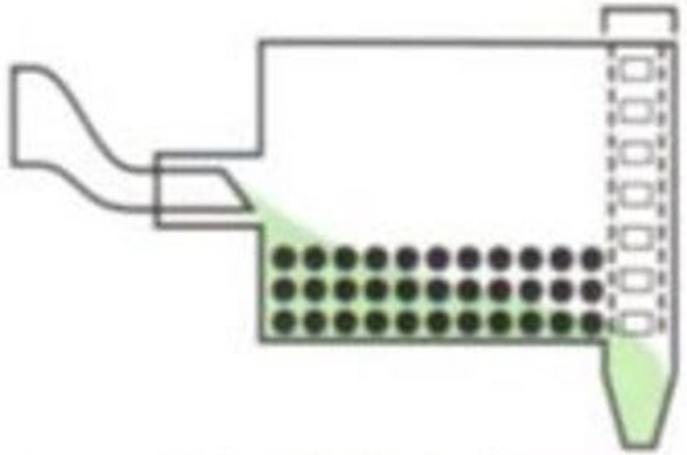
G) The differences between two types of overflow and periphery ball mills.

[Overflow discharge]



While a certain amount of the material has accumulated in the mill, the amount fed into the mill is discharged under pressure. Fine powder is easily made.

[End periphery discharge]

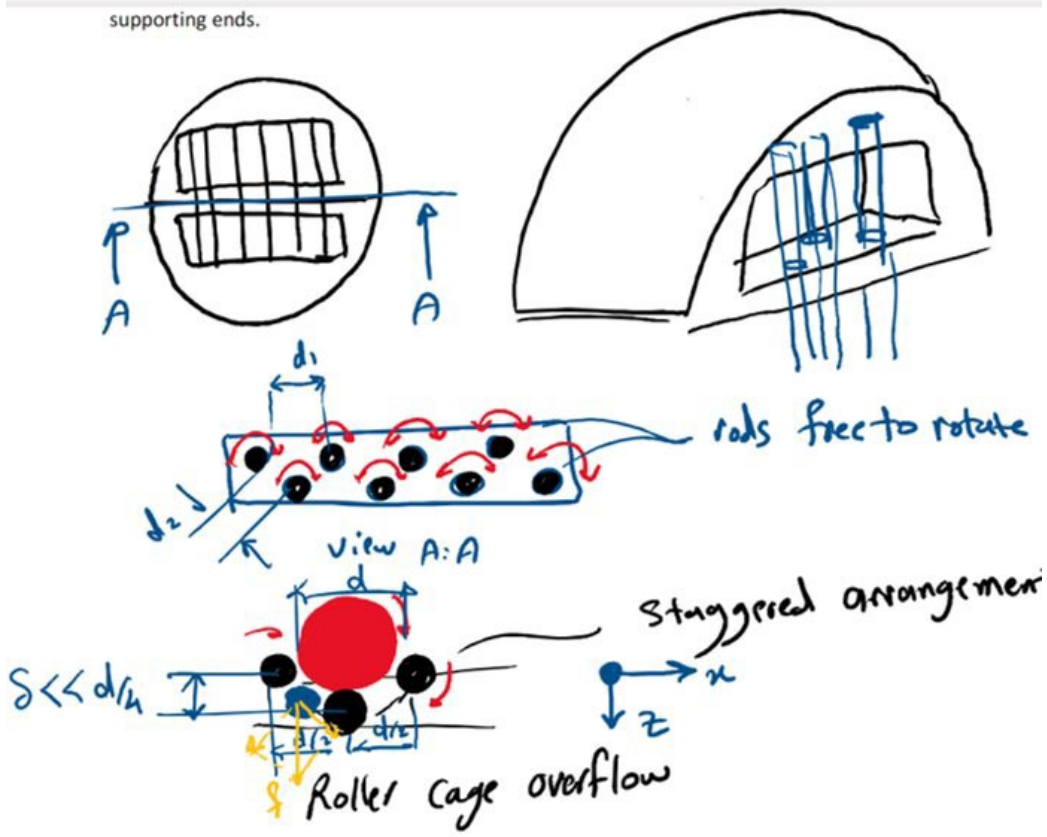


After accumulating in the mill for a short time, the material is discharged in a short time. Fine powder is difficult to make, and the grain size is coarse.

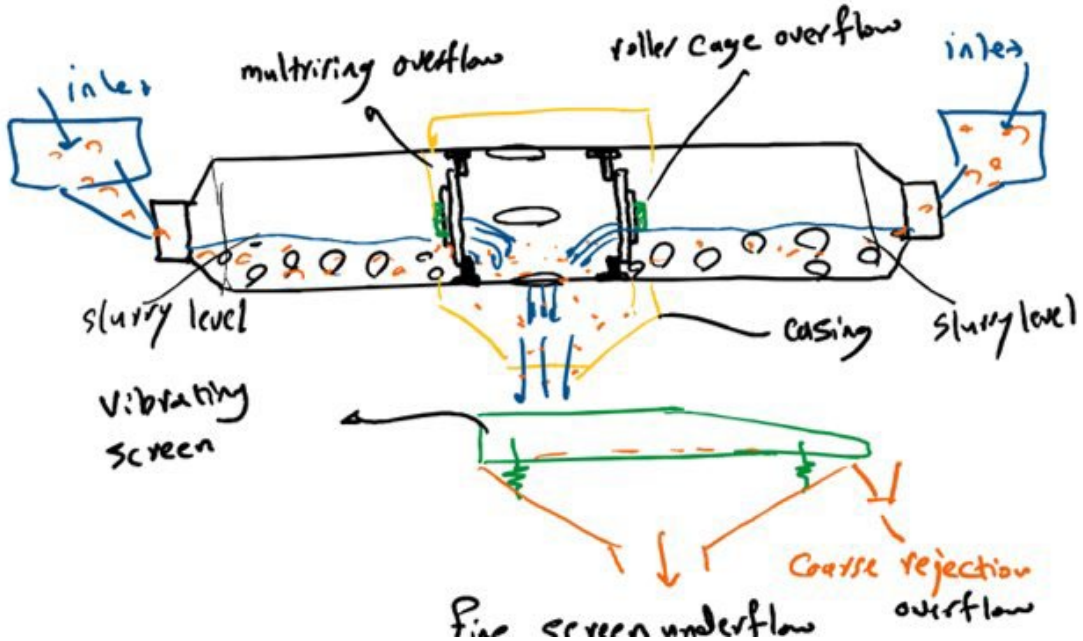
H) Roller cage overflow

7- These multiring diaphragms are novel. In addition, these diaphragms are made of metal sheets with different thicknesses and no casting needed that reduce the manufacturing costs and time.

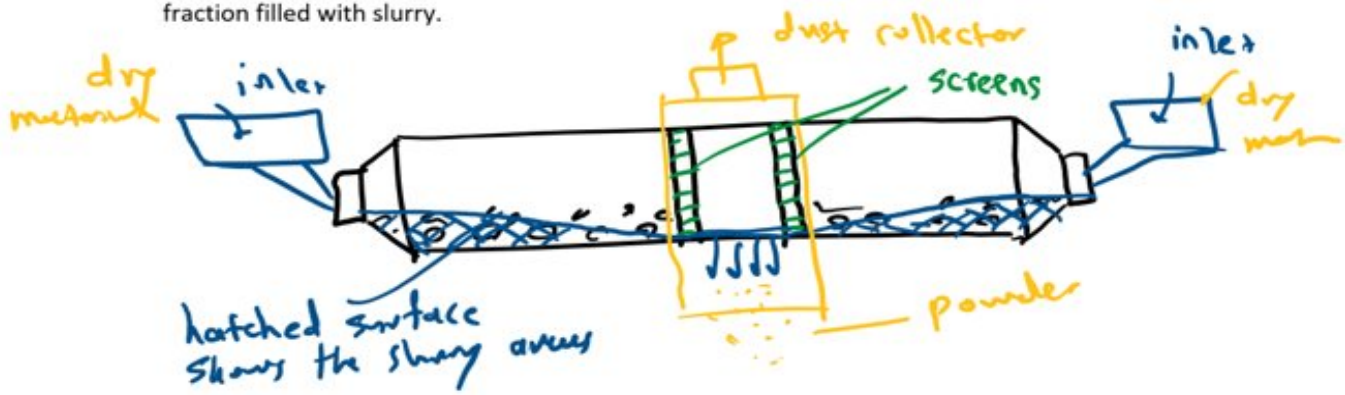
supporting ends.



I) Comparison of active volume in our special overflow and similar dry ball mills



fraction filled with slurry.



J) Half production time and costs

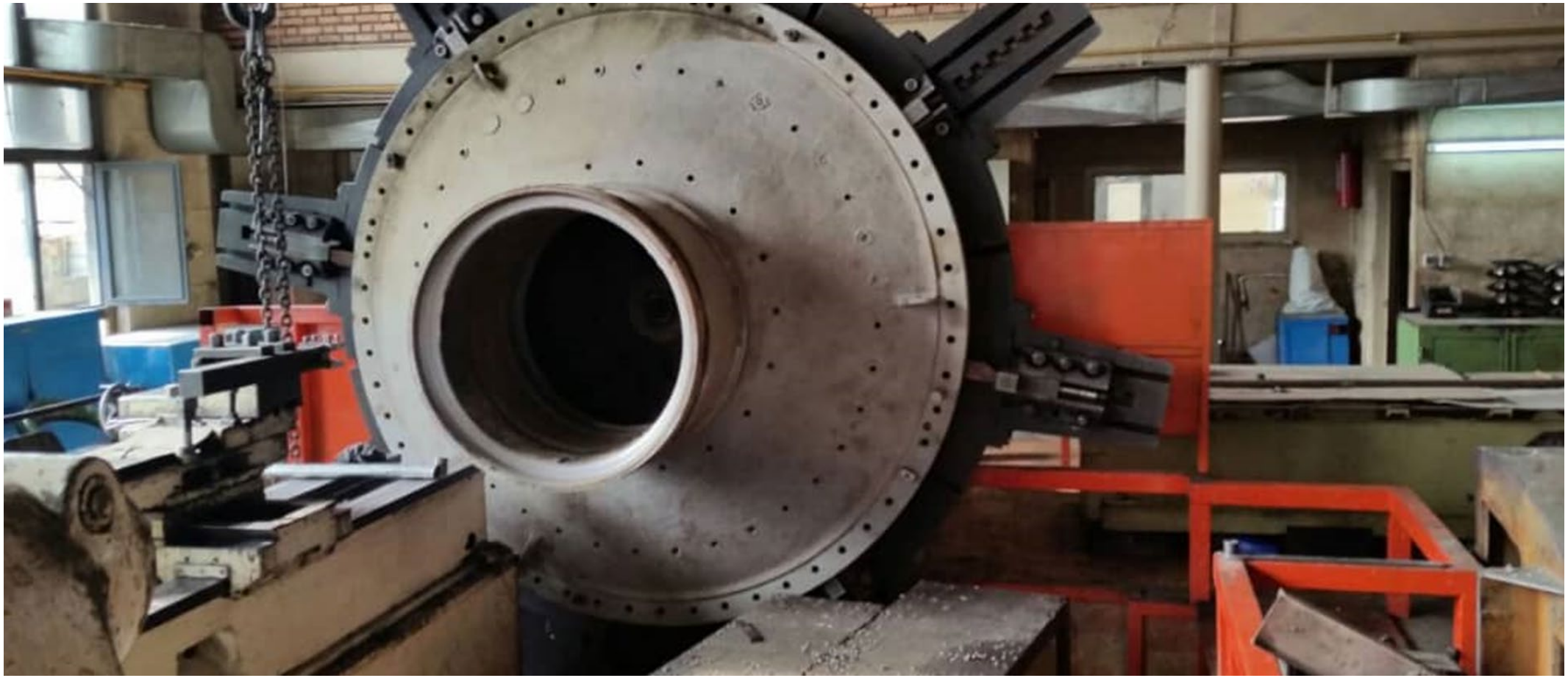
Foundation and structure

Montage

J-2) Forming and casting

J-3) Lathe Machining

alsim Paint Shop



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J-4) Drillings

J-5) Hobbing

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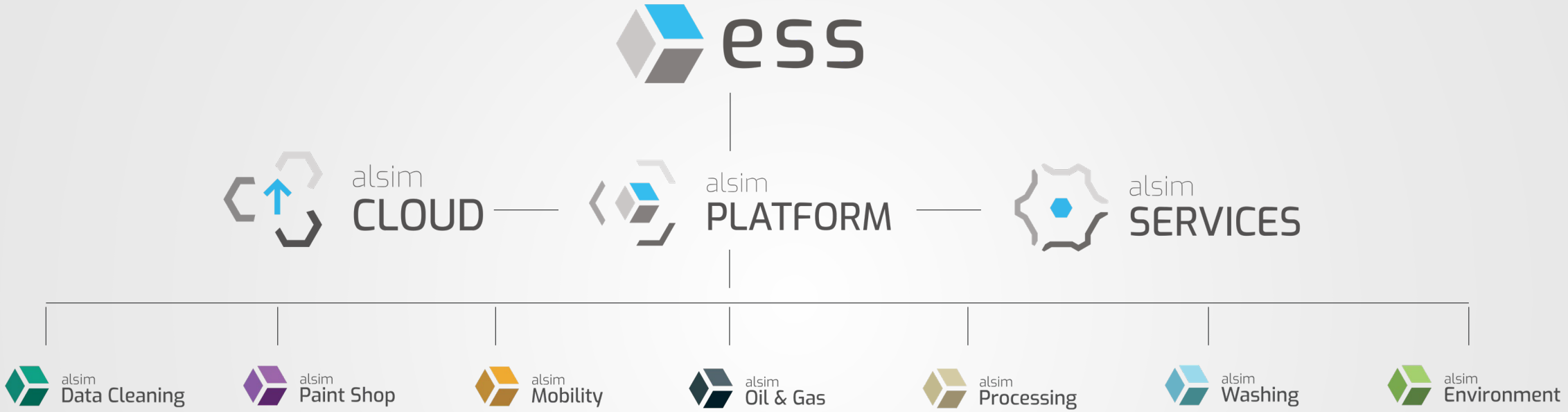

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