TEAM MEDEXTROUS

GRAIN MOISTURE ELIMINATOR & SEPARATOR

PROJECT REPORT

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ABSTRACT

Food grain disinfestations (grains free of dust, impurities and moisture) has an ever growing demand, owing to the damage of food grains that happen during grain handling and storage

INSIGHTS OF OUR PROJECT

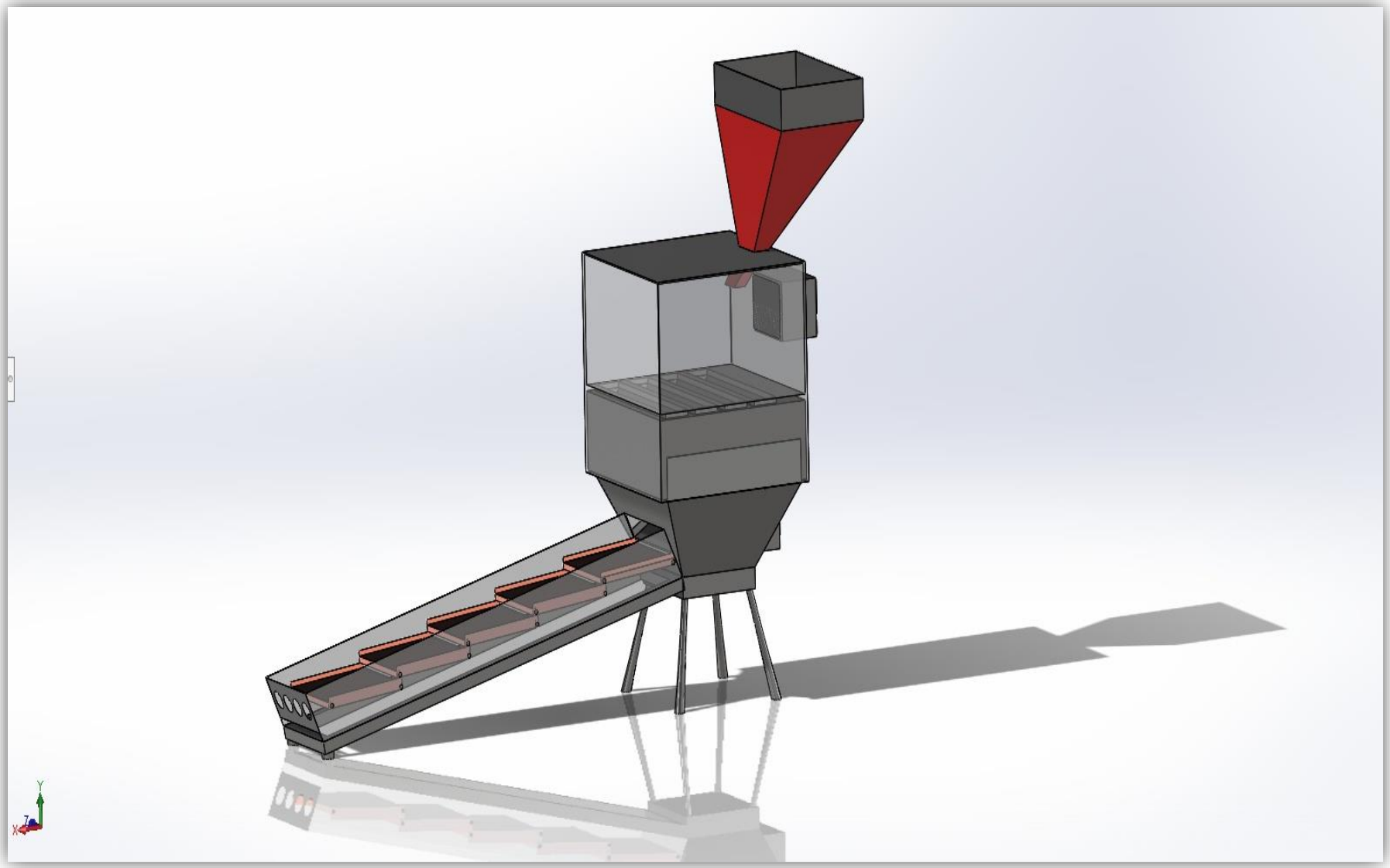
In this project, a Solar assisted food grain disinfestations system is proposed, where food grains are dried with a combined effect of direct Solar drying and Hot air drying. This reduces the moisture content of the food grains, to a recommended level for that grain, which aids in storage and preservation of the grains for a longer duration, and avoid spoilage during storage.

Decrease the time required for dust separation thus it will be supportive for agriculture field.

Problems and its solutions

Technical and social Issues That Need To Be Solved	Most farmers in India still use traditional methods such as sieving, handpicking, winnowing etc. to eliminate unnecessary particles from their harvest which is time consuming & less efficient. Losses are high in food grains due to insects, rodents and moisture etc during storage. Produce gets spoilt during various stages such as while seeding, growth, harvest and storage. It is found that, about 30% of this spoilage occurs during the storage of the produce. The harvested grains are dried using direct sunlight which is not as efficient & also consumes a lot of time of the farmers.
List of Technical and social problems that have been solved	Attain disinfection by reducing moisture using solar energy, and hence the pathogens present, to obtain optimum results. Determine optimum exposure time, required temperature and rate of travel of food grains for disinfestation of food grains. Decrease the time required for dust separation thus it will be supportive for agriculture field.

DESIGN



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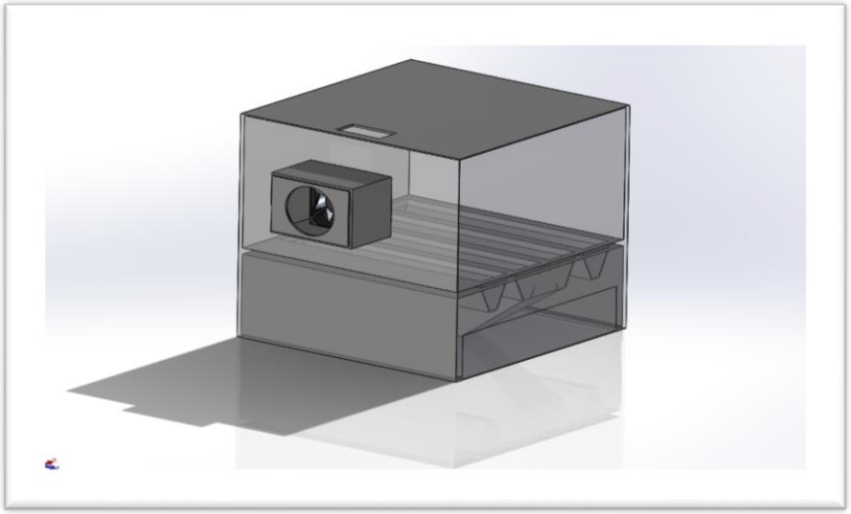
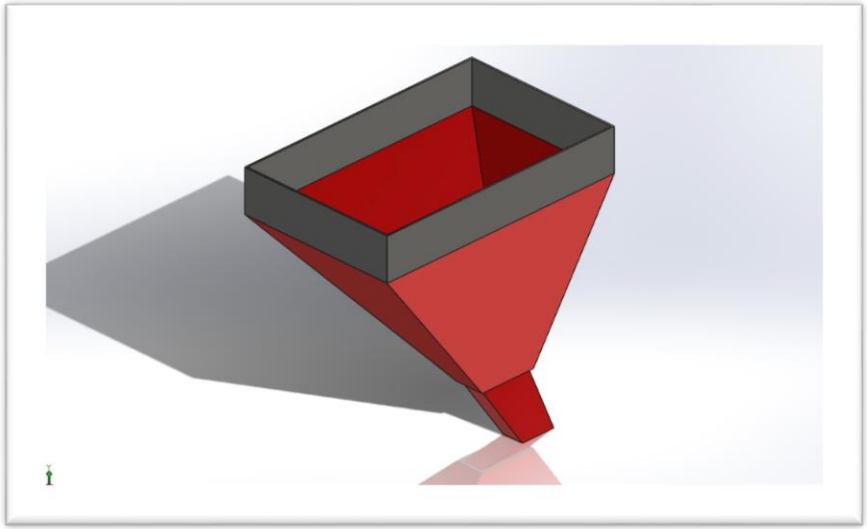
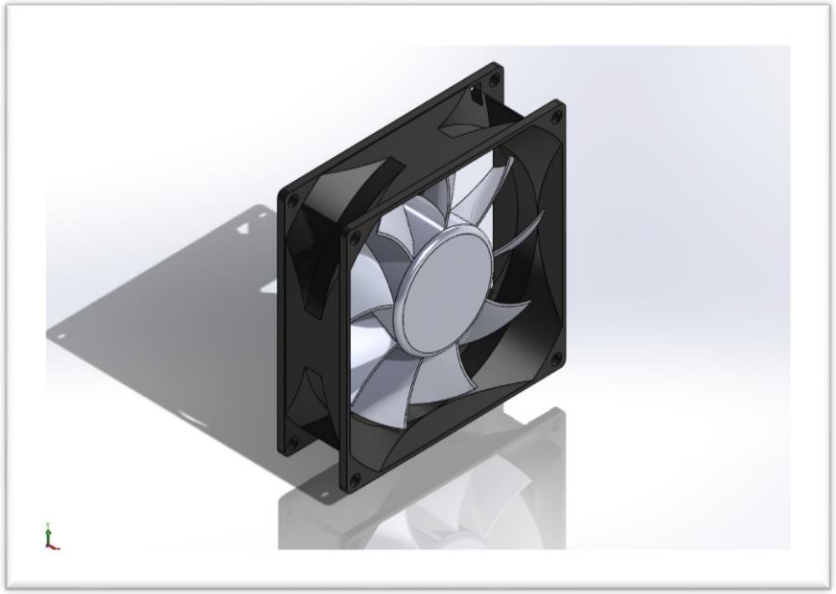


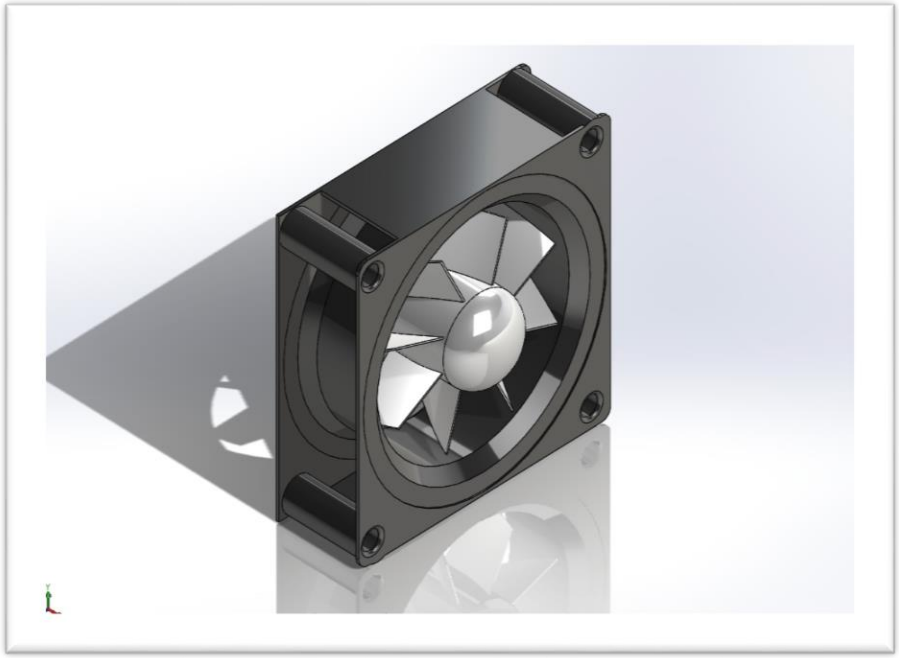
UPPER PART (GRAIN SEPARATOR PART)
For Separation of grains from dust, stones and other impurities



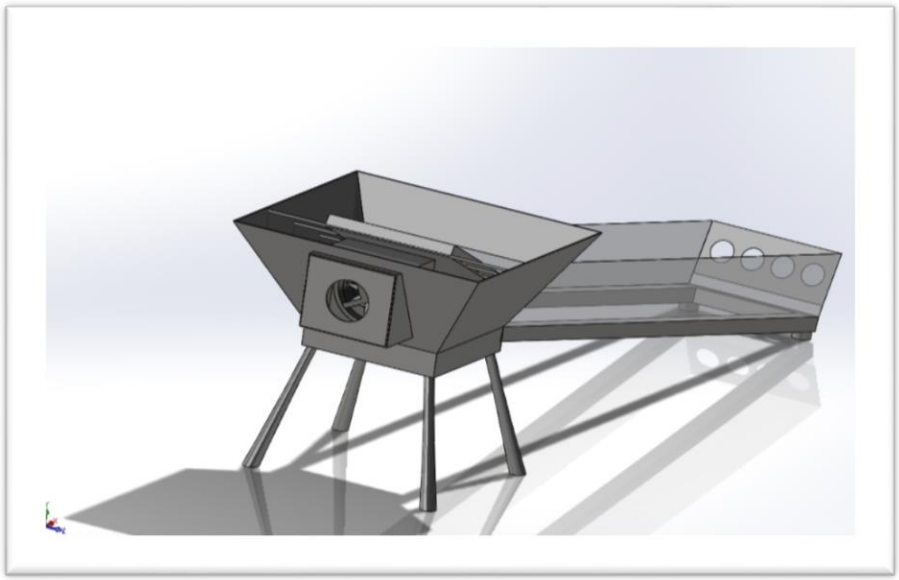
HOPPER
Inlet to feed grains



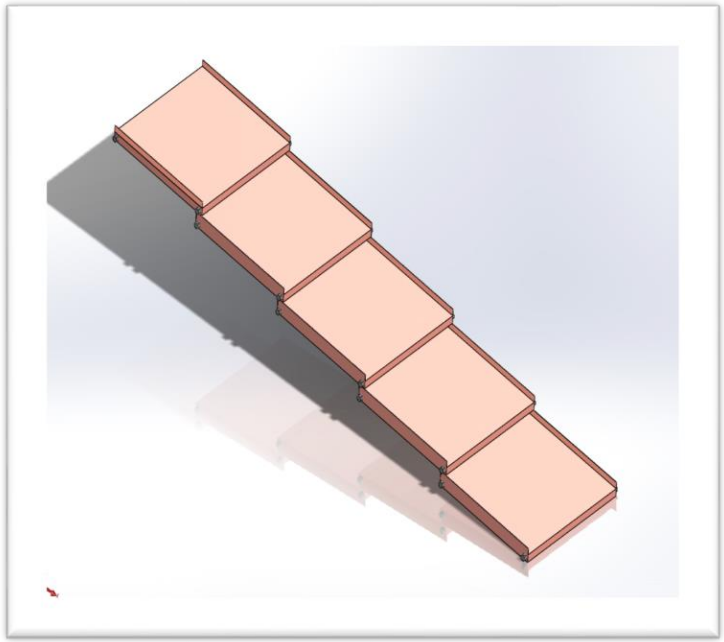
FAN
Blows grain near the hopper



EXHAUST
Draws hot and moisturized air out



LOWER PART (MOISTURE ELIMINATOR PART)
For Removing moisture from grains



COPPER TRAYS
For grain flow inside

EXECUTION

- Grains are fed through hopper. From there, a high-speed fan (whose speed is adjusted according to the grain type) is used which blows air around the hopper opening and thus, stones and heavier impurities fall nearer containers, best grain particles fall in the middle and lighter impurities fall in the last containers.
- The grains, at a controlled flow rate, falls onto the feeder tray, and move down by gravity. The grains fall on the copper trays, which are inclined in two directions. The sideways inclinations, follow a zigzag pattern, hence the grains flow along the tray, fall from the provided opening, onto the next tray, and fall off the opening of that tray, which would be cut in the opposite end of the previous tray.
- The radiation is trapped inside, due to the **Rockwool insulation**, reflective covering on the sides, and the glass itself. The provided exhaust heats up the food grains along with direct drying, drying and carrying the moisture content along with it, like in a hot air dryer. The combined effect of direct solar drying, and hot air drying, reduces the moisture content of the food grains, aiding in its preservation

OPERATIONS

GRAIN SEPARATOR PART

- The grains to be dried and be dust, stones or impurities free are fed in through the hopper. From there, a high-speed fan (whose speed is adjusted according to the grain type) is used which blows air around the hopper opening and thus, stones and heavier impurities fall nearer containers, best grain particles fall in the middle and lighter impurities fall in the last containers.

- All the containers are closed from the bottom except the middle ones in which best grains are going to fall. The best grains are then transferred to the moisture eliminator part.

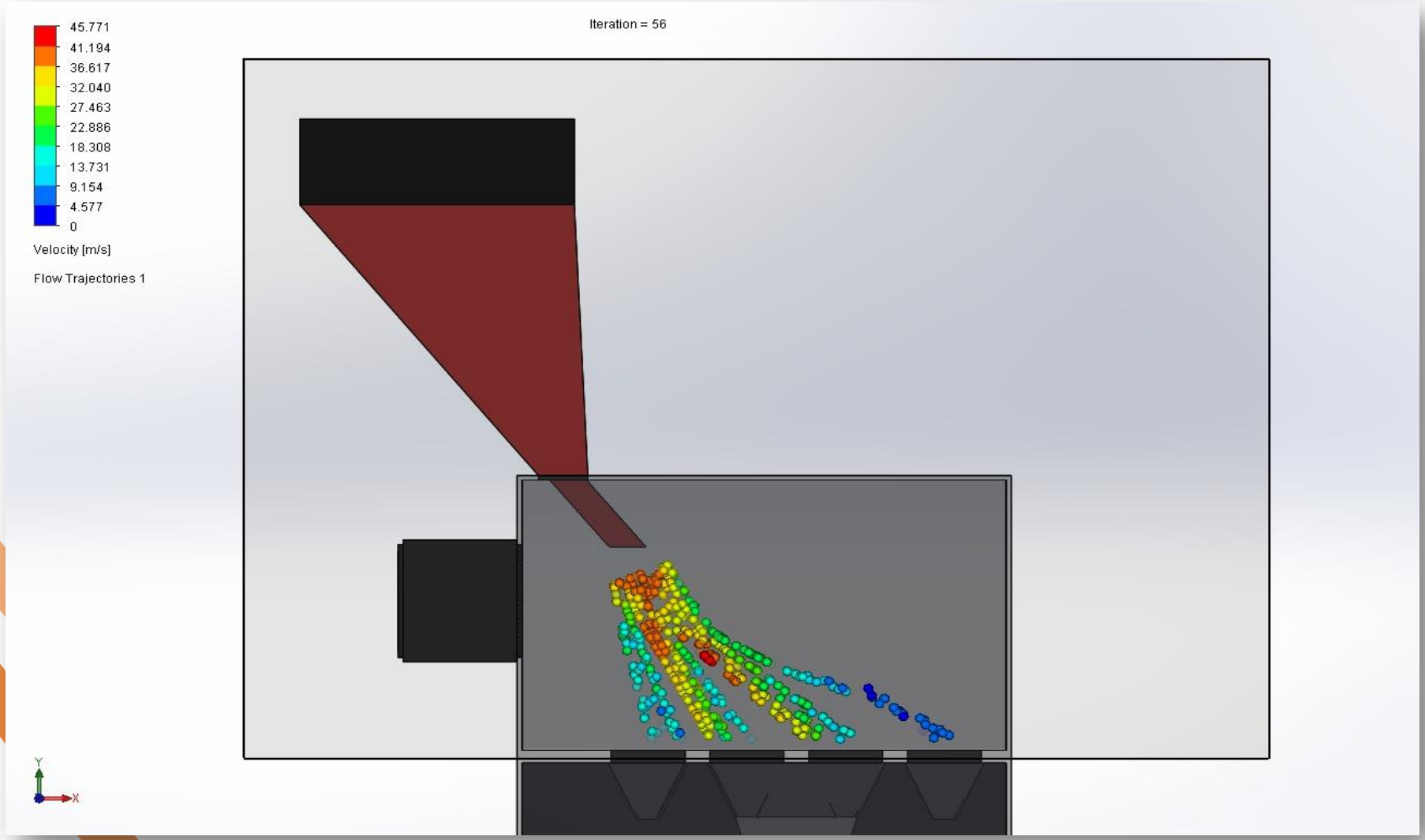
OPERATIONS

MOISTURE ELIMINATOR PART

- In the moisture eliminator part, the grains move onto the feeder tray, and move down by gravity. The solar radiation is incident on the tempered glass, which allows the radiation to seep in. The grains fall on the copper trays, which are declined at an angle and using vibration motors under the trays, following a zigzag pattern, hence the grains flow along the tray, fall from the provided opening, onto the next tray motors and fall off the opening of that tray, which would be cut in the opposite end of the previous tray. The last tray empties the grains onto a grain collector bin, which can be unloaded, once filled.

- An exhaust is also used in the eliminator part which is used to remove humidity and contaminated moisture trapped inside. Thus, this equipment can be effectively used, even in cloudy conditions too. If the moisture removed is not sufficient, then the flow rate of grains or air can be varied, or multiple passes can be used to obtain the required moisture content. Lack of chemical processes involved, can make the food safer for consumption.

SIMULATIONS & CALCULATIONS



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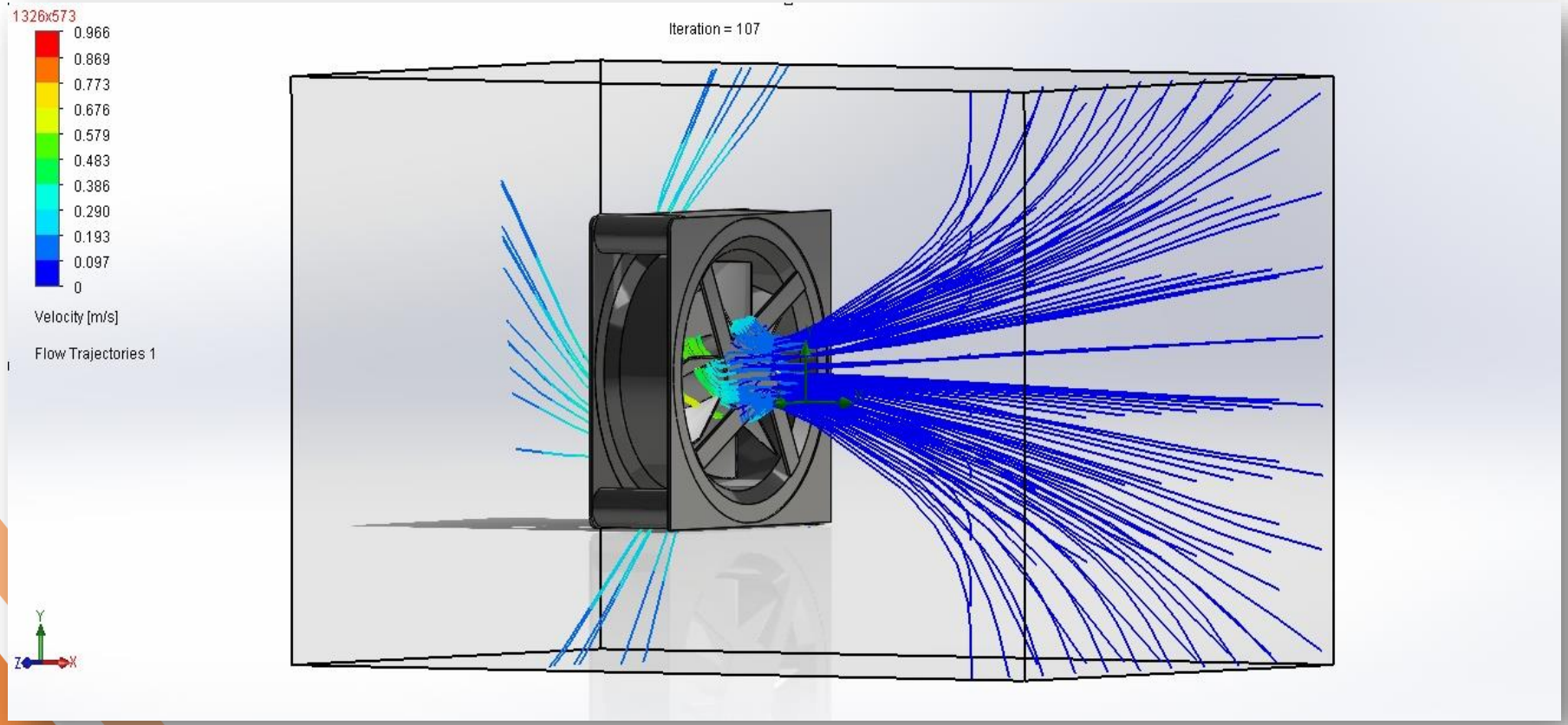


CALCULATIONS

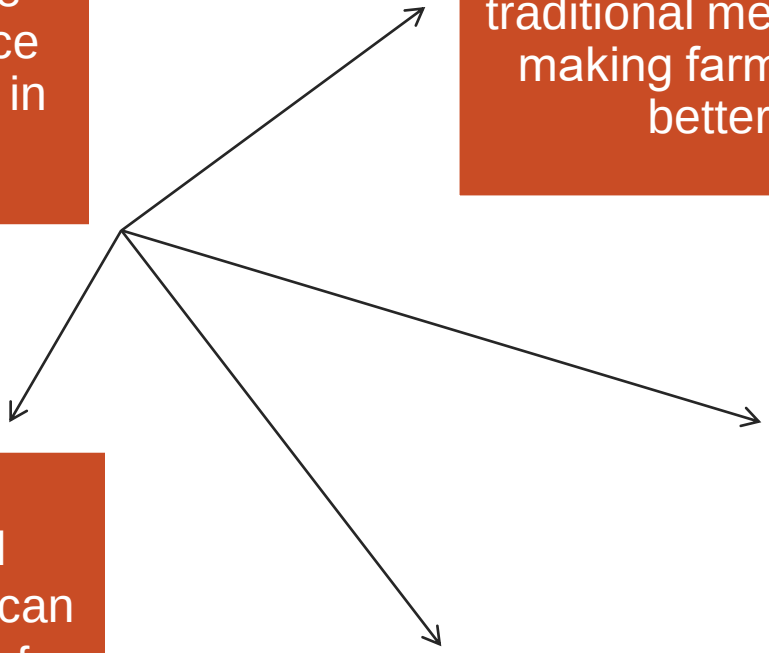
S.No	GRAIN TYPE	RH BEFORE DRYING	RH AFTER DRYING	WEIGHT BEFORE DRYING (gms)	WEIGHT AFTER DRYING (gms)	DRYING TIME (mins)
1.	RICE	13.4	11.2	150	135	31
2.	PADDY	9.4	8.9	150	136	14
3.	WHOLE BENGAL GRAM	13.1	12.8	240	222	10
4.	SPLIT BENGAL GRAM	5.7	5.5	254	240	15
5.	MAIZE	30.4	26.5	200	144	34
6.	HYACINTH BEAN	7.5	7.4	255	240	23.5
7.	WHEAT	11.8	11	1000	985	20
8.	SOYA BEANS	10	9.8	200	188	12.5

It can be seen from the data that moisture content is removed in shorter interval of time, compared to the conventional sun drying. The before drying part is the section of grains that are dried only in sun and not in the equipment.

PROJECT **CONCLUSION**

The main motive of this project is to reduce labour & to introduce modern technology in agriculture.

It requires less labour & time as compared to traditional methods of making farmer' life better.



The equipment discussed is a cost effective method, which uses minimal amounts of electrical energy.

Lack of chemical processes involved can make the food safer for consumption.

This equipment can be effectively used even in cloudy conditions.


thank
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