Computational of Air Flow analysis for Cold Chamber

Yogesh Kumar Patel*, Pushpraj Singh**

*M.Tech. Scholar, Rewa Institute of Technology, Rewa (M.P)India

**H.O.D Department of Mechanical Engineering, RIT, Rewa

Abstract-This thesis represents the effect of air circulation on cold storage with the help of experimental analysis to improving performance of cold storage and food preservation quality. Air circulation can be possible better by experimental analysis with help of hot wire anemometer. In this paper presents air velocity and temperature distribution at different point of cold storage. Air flow model is based on Experimental analysis of air flow by evaporator arrangement at top, medium and bottom Thus result investigated from this arrangement based. A parametric analysis was performed by using the equivalent model with different result of blowing air velocity and location of cooling units there was found a better cooling effectiveness and uniformity of temperature in cold store. And it is achieved by using higher blowing velocity and locating the cooling units lower and closer towards the array of the produce packages. In this research spatial distribution of air velocity was determined at ceiling medium floor for experimental cold storage and also temperature variation in different location of cold storage.

Keywords: Cold storage; Frozen food; Air circulation analysis, Temperature Distribution.

I. INTRODUCTION

Protection of perishable farming stuff is a major jug neck for present day horticultural practice as creation is exponentially increments in most recent two decades however safe stockpiling for future uses isn't in same extent. India is among the biggest makers of foods grown from the ground on the planet situation however the accessibility of leafy foods per capita is altogether low in view of post reap misfortunes which represent around 25% to 30% of creation. The presentation of cool stockpiling will help them in evacuating the danger of decay of post collect misfortunes.

1.1 Cold Storage:-

Icy stockpiling is where perishable foodstuffs are put away under controlled temperatures with the reason for looking after quality. Protection of nourishment should be possible under solidified or chilled temperatures. For some, different items conditions other than temperature may be required. A chilly stockpiling is where the different things, for example, vegetables natural products, pharmaceuticals and so on are put away to shield them from getting ruined and to draw out their safeguarding period. This is finished by putting away the items at their safeguarding temperature and dampness and so on. Safeguarding temperature is characterized as the temperature at which its breath rate in Cold stockpiling won't be hurt materials as long as the cooling and warming is done in a controlled way, while keeping the dampness substance of the parts settled. Dampness content is a natural property that is affected by the mugginess introduce noticeable all around, and second, by temperature. In an impenetrable compartment dampness rate won't change.

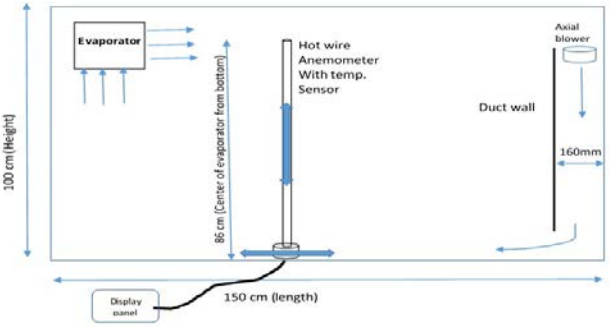
II. OBJECTIVE

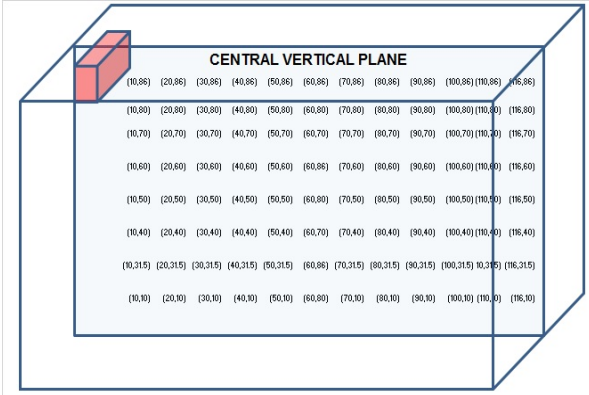
The basic objective of the present study is to see the performance analysis of cold storage with the use of duct with slot arrangement

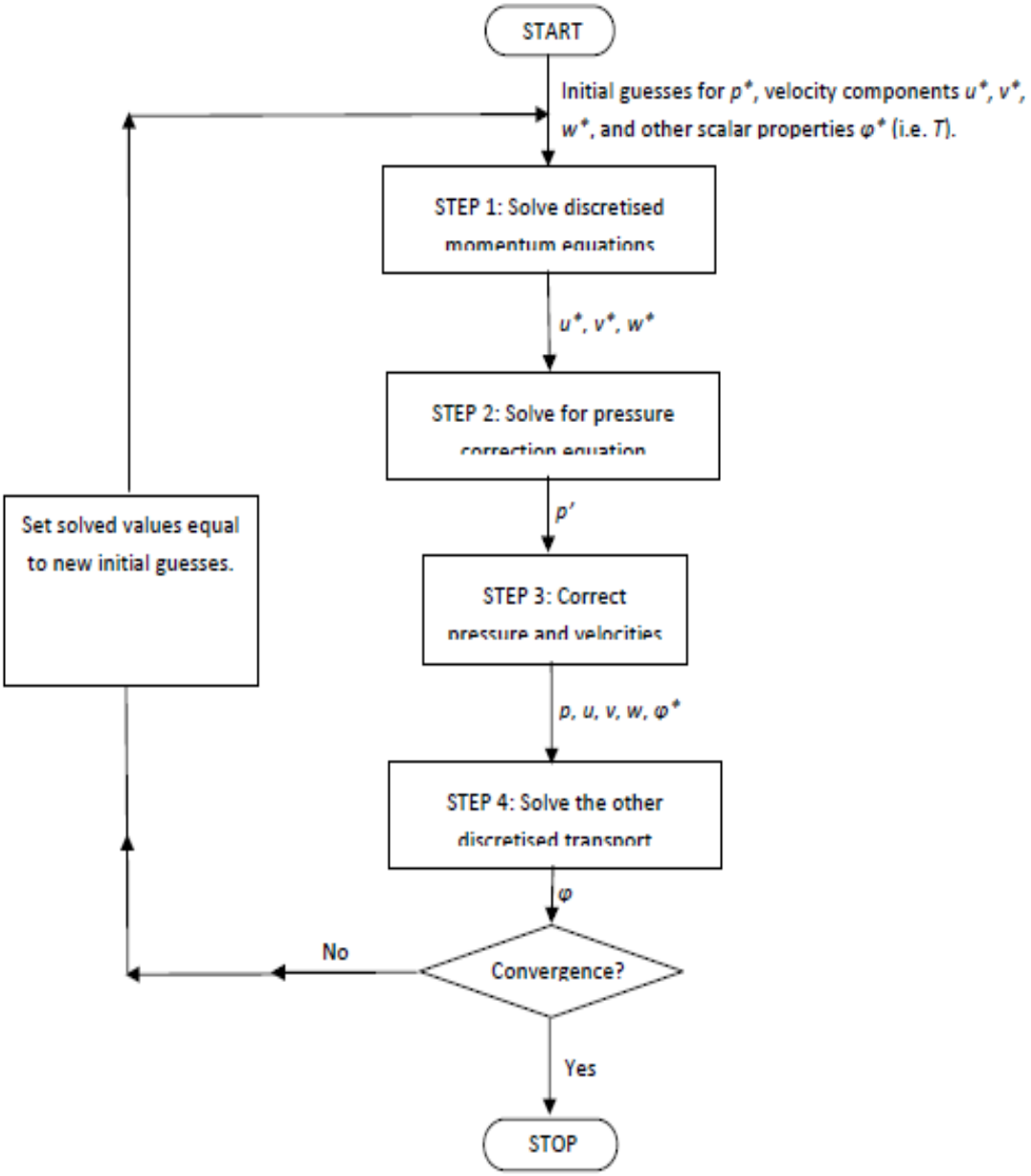
III. METHODOLOGY

3.1 Materials use in Present Study

General configuration deals with only closed chamber equipped with evaporator and measuring arrangements, no other system is applied inside the chamber. It is similar to empty cold storage plant. In this case flow velocity in chamber is measured along the vertical central plane at different locations which are marked along the length and height of vertical plane





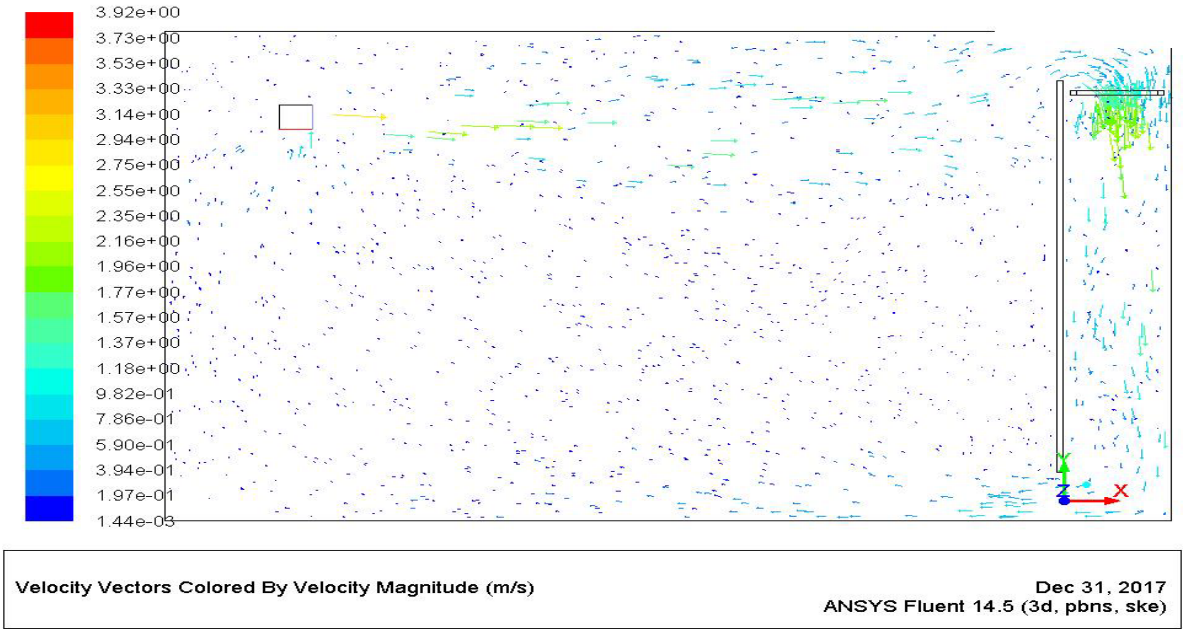


IV. RESULT AND DISCUSSION

In the present work air flow velocity is measured in a modeled cold storage room with the help of ansys. The data collected using ANSYS FLUENT 14.5 included the temperature data, and airflow velocity at the monitor point and the temperature distribution and airflow velocity at all node points in the model room.

On comparison of figure 5.1,5. 2 &5.3 given below following findings are listed-

- Fig shows that velocity at top layer or in front of evaporator is in order of 2.5 m/s to 3 m/s. but drop drastically away from source.
- Velocity at rear section is in range of 0.45 m/s to 0.948 m/s at 80cm above the ground and 90 cm away from evaporator.
- Velocity at mid section and around the buckets was observed in the range of 0.15 m/s to 0.6 m/s.
- Return air velocity just below evaporator is 1.12 m/s.
- With duct fitting at rear section i.e. 110 cm away from evaporator velocity at 86 cm above and ground now maintaining velocity in higher range as compare to last case. i.e. velocity is 0-9 m/s to 1-74 m/s from 80 cm to 100cm from evaporator.
- With use of duct the return air velocity at bottom now is in the range of 0.9 m/s to 1.11 m/s.
- Return air velocity just below evaporator is posses much higher speed as compare to first case.
- Near buckets velocity at mid section is not improve too much.
- In fig 5.3 slotted duct is used and because of slotting improvement at midsection is sighted'
- Velocity near buckets in this case is in the range of 0-9 m/s to 1-2 m/s at mid parts of chamber.



V. CONCLUSION

From the results obtained, the following conclusions were made:

- From the present work results for the airflow and temperature distribution in a cold store, different conclusions have been pointed out:
- From the analysis of the variation of the air velocity at the middle and bottom of the cold store, it was found that the variation is less than the top level of cold store because the evaporator was placed at the top level of cold store.
- Air flow improve in the cold storages with the help of duct with slotted arrangement .
- At 86 cm above ground air circulation in chamber at for this part from the evaporator is better if induced duct with slot are used fig 5.4,5.5 and 5.6 shows at 100cm away from the evaporator velocity of air without duct is 1m/s with duct around 1.5m/s and around 1.9m/s duct with slot condition it shows that proper air distribution happen if duct with slot is used.

VI. FUTURE SCOPE

Future scope of air circulation analysis of cold storage: in India is a growing food industry for improving the product quality broadly used cold storage

- Home appliances: Food preservation, pickle preservation, milk preservation etc.
- Dairy and milk product preservation and storage: Milk, Curd, Ghee, etc
- Fisheries and Meats: chicken, Fishes, meat import and export uses this technique for preservation.
- Thermal power plant for cooling a steam through condenser and cooling tower, etc.

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