International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 05 | May - 2024 SJIF Rating: 8.448 ISSN: 2582- 3930

DESIGN AND FABRICATION OF ANIMAL FOOD MAKING MACHINE USING WASTE FRUITS AND VEGETABLE PULP

Chandan M N[1], Keerthan B T[2], Yashwanth N[3], Sankirna Gopi Muttalli[4], Shrimukhi G Shastry[5], Dr. Shadakshari R[6]

[5,6]Asst Professor, Dept. Of ME, Acharya Institute of Technology, Bengaluru-590018

[1,2,3,4]Eighth Semester, Dept. Of ME, Acharya Institute of Technology, Bengaluru-590018, India

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ABSTRACT

Nowadays, the availability of food for cattle is a significant issue for farmers, exacerbated by environmental conditions like drought. Since human life is somewhat dependent on cattle, it is essential to meet their dietary needs. One potential solution involves utilizing the fruit and vegetable pulp that typically goes to waste. By reducing the moisture content, which leads to decay, this pulp can be repurposed effectively. The process, known as "pulp to pedigree," involves heating the pulp to reduce its moisture content and then grinding it into a form that can be fed to animals. This machine not only decreases the moisture content but also aids in storing the pulp. Once dried, the pulp is finely ground into a pedigree that can be readily used as cattle feed, thus saving valuable pulp from being wasted. The machine operates through a heating and drying process using heating elements and hot air flow. By maintaining the furnace temperature and air velocity at optimal levels for the specific fruit pulp and waste from juicers, the moisture content can be minimized without harming the nutrients. This drying process extends the shelf life of the fruit waste, which can then be directly used as animal feed. This approach enhances animal nutrition and reduces fruit waste, providing a practical solution to the cattle food availability problem.

1. INTRODUCTION

Feed production for livestock and poultry involves various activities, including grinding, mixing, pelleting, and drying operations. The machinery required for producing different types of feed includes grinders, mixers, elevators, conveyors, extruders, cookers, dryers, fat sprayers, and steam boilers. Among these, the mixing operation is particularly important, as it combines two or more ingredients to achieve a homogenous mixture that meets the nutritional needs of the target livestock or poultry. Feed mixing can be done manually or mechanically. Manual mixing involves using a shovel to blend the feed ingredients on open concrete floors. This method is characterized by low output, inefficiency, labour intensity, and potential safety hazards for the animals, birds, or fish consuming the feed. In contrast, mechanical mixing uses various types of mechanical mixers developed to overcome the drawbacks of manual methods. These mixers are quick and efficient, especially for incorporating small quantities of additives into large masses of material. The goal of using a mechanical mixer is to achieve uniform distribution of components through mechanically generated flow.

Farm animals play an integral role in supplementing the food demand. As the global population grows, the demand for food supplements also increases. The need for staple crops like corn, wheat, and rice is projected to grow about 50% by 2050, rising slightly faster than the global population. There is also a decreased supply of cereals and crop residues for animal feeding. Developing countries like India and China produce a significant amount of waste. By reducing the moisture content of fruit and vegetable pulp, which prevents nutrient and protein decay, this waste can be repurposed. The "pulp to pedigree" process involves heating the pulp in a furnace to lower its moisture content to a permissible level, preserving its nutrients, and then grinding it into a form that can be fed to animals.

2. LITERATURE SURVEY

Anuja Padole and Abhay Shelar [1]: In their research paper, the authors present evidence that fruit and vegetable processing co-products can be effectively used in farm animal nutrition as functional feed ingredients, leading to the production of higher-quality food products. These ingredients meet consumer demands for clean, natural, and green-label food products. The primary factors influencing the extensive use of fruit and vegetable processing by-products as functional feed ingredients in livestock nutrition include animal-related factors, logistics, and commercial value.

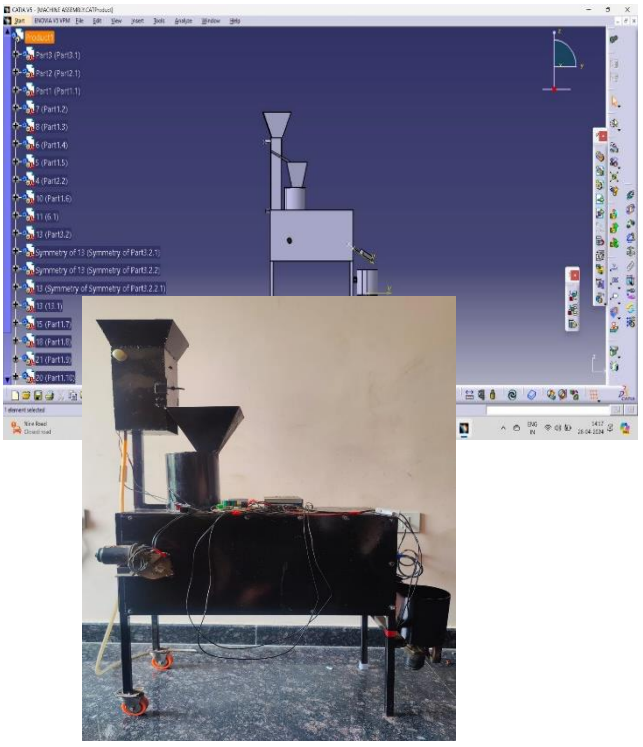
Ajila, C. M., Verma, M. et al [2]: Argo-residues are rich in bioactive and nutraceutical compounds such as polyphenolics, carotenoids, and dietary Fiber. These residues are a valuable biomass and offer potential solutions to animal nutrition and the global supply of protein and calories, provided appropriate technologies for nutrient enrichment are utilized. Technologies exist for the protein enrichment of these wastes.

Baiano, A. (2014) [3]: Food waste is generated from various sources, including agricultural operations and household consumption, with about 38% occurring during food processing. Current European Union legislation promotes the utilization of co-products. This valorization can be achieved by extracting high-value components such as proteins, polysaccharides, fibers, flavor compounds, and phytochemicals, which can be reused as nutritionally and pharmacologically functional ingredients.

Elferink, E. V., Nonhebel, S., et al. (2008) [4]: The environmental impact of meat production is significant, primarily due to the feed required by livestock and the associated impacts of cultivating, transporting, and processing feed crops like tapioca and grains. Livestock also feed on food industry residues, such as pulp, scraps, and peels, which have

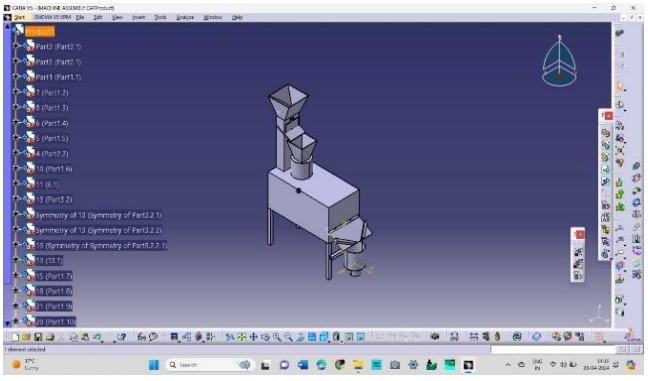
different environmental impacts compared to regular feed crops. Feeding food residue to livestock is an efficient way to convert low-quality material into high-quality food.

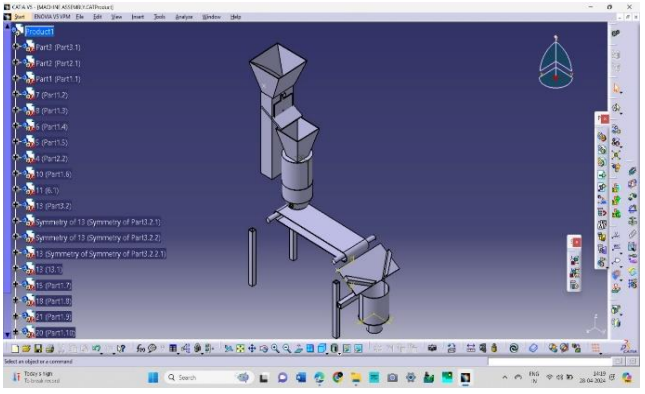
3. PROBLEM STATEMENT

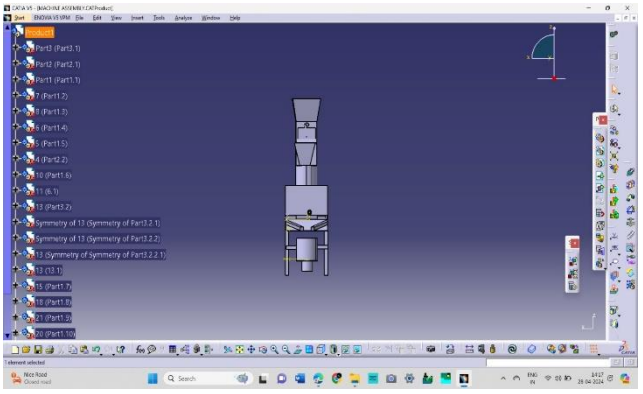


The manual method of mixing feed involves using a shovel to blend the feed's constituents on open concrete floors. This approach is generally characterized by low output, inefficiency, labour intensity, and potential safety hazards for the animals, birds, or fish consuming the feed. Furthermore, manual mixing may result in inconsistent blending, leading to variations in nutrient distribution across batches, which can impact the overall health and performance of the livestock or poultry. In contrast, modern feed production for livestock and poultry entails a range of activities, including grinding, mixing, pelleting, and drying operations. To facilitate these processes efficiently, various types of machinery are utilized, such as grinders, mixers, elevators, conveyors, extruders, cookers, dryers, fat sprayers, and steam boilers. Among these, the mixing operation holds particular significance as it ensures the thorough integration of two or more ingredients to create a homogenous mixture that meets the nutritional requirements of the target animals. Mechanical mixing, enabled by specialized equipment, offers numerous advantages over manual methods. It enhances efficiency, increases output, reduces labor requirements, and ensures greater consistency in feed quality. Additionally, mechanical mixers are designed to achieve precise blending, thereby optimizing nutrient distribution and promoting the overall health and performance of the livestock or poultry.

4. SYSTEM DESIGN







5. IMPLEMENTATION

1.Conveyor Belt

Conveyor belts play a crucial role in the production of animal feed, facilitating the efficient transportation of various ingredients between different processing stages. Ingredients like grains, protein sources, and additives are seamlessly conveyed from storage or mixing areas to processing units where they feed production, conveyor belts ensure a continuous and automated flow of materials to pelletizing machines. This consistent feed contributes to the uniform size and quality of the pellets produced. In pelletizing processes, a heating coil may be incorporated into the animal food making machine. This coil elevates the temperature of the mixture, enhancing the binding properties of the ingredients. As a result, forming pellets becomes easier, and the overall quality of the final feed is improved. Therefore, in the production of animal feed, conveyor belts and heating coils synergistically contribute to streamlining processes, ensuring consistency, and enhancing the quality of the end product.

2. Heating Coil

Heating coils are an integral component of drying systems utilized to achieve the desired moisture content in feed. By generating heat, these coils facilitate the removal of excess moisture from the feed, ensuring optimal quality and storage stability. Moreover, heating coils serve a crucial role in elevating the temperature of the feed to levels that effectively eliminate potentially harmful microorganisms, safeguarding the health and safety of the animals consuming the feed.

6. RESULTS

7. CONCLUSION AND FUTURE SCOPE

- This machine can also be utilized for efficiently processing large volumes of pulp into pedigree.
- To enhance the machine's operational speed, upgrading to a high-grade industrial heater for the furnace can significantly improve its efficiency compared to the current standard-grade heater.
- Implementing a conveyor system for automatic loading of pulp into the furnace area can further streamline the process, reducing manual labor and increasing productivity.
- An automatic packaging system can be integrated at the end of the conveyor to automate the packaging process, enhancing efficiency and ensuring uniformity in packaging.
- Furthermore, the utilization of fruit and vegetable pulp in animal feed can offer valuable nutrients such as essential vitamins, minerals, and antioxidants, which can contribute to the overall health and productivity of livestock.
- Researchers and manufacturers may explore opportunities to optimize the nutritional content of the feed by incorporating specific varieties of fruits and vegetables, thereby maximizing the nutritional benefits for animals.

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