

BATTERY DRYING OVEN - A REVIEW

¹A.I.Lohia, ²S.S.Kulkarni, ³N.D.Mahamune, ⁴O.S.Kulkarni

Final Year Mechanical Engineering Students

G. H. Raisoni College of Engineering & Management, Ahmednagar, India

Abstract: In today's world, energy efficiency has become important part of life. It is tough challenge for scientists, engineers & industrialists of world to maintain heat energy demand. Heating is important process which is used to dry the moisture content in the batteries & also used for increasing the life and efficiency of batteries. Lead acid batteries plates are dried in drying oven so as to remove moisture and hence plates are suffered from burning, paste creakiness and thermo passivation during drying process.

Keywords- Heater, Oven, Heating, Conveyor, Battery.

I. INTRODUCTION

Improvement in efficiency & life is tedious job in front of every engineer in any field. Energy issue in use in somewhat percentage can be reduced by employing proper methodology and design improvement in process to occur. As per the recent trends used for heating the batteries using drying oven to remove moisture for increasing life & efficiency of battery has wider scope in industry. To remove the moisture optimum selection of chained process of heating should be processed. Previously the use of belt conveyor for continued motion of lot leads to more accumulation of time for small weight lot size. In lead acid batteries, moisture content is serious problem during manufacturing of batteries in industries. To overcome this serious problem, proper type of heating chamber is to be designed. Designing of heating chamber by scientific & statistical way helps in improving system and process performance. Conveyrised oven is best suited for proper propagation of heating process. Drying oven helps to remove moisture from product depending upon process & production requirement. Depending upon the application, batch or conveyor oven is selected but conveyrised oven is more economical for mass production. Releasing system is developed to get proper moisture release rate in order to meet process and safety requirement for uniform heating, proper air flow ventilation is provided planetary gear box with motor speed as input speed is used to convert rotary motion of gear box to translatory motion of conveyor to achieve the conveyor motion. Horizontal shaped drying oven is used to dry & de-moisturizes positive plates of lead acid batteries.

II. LITERATURE SURVEY

Jim Reeb, Mike Milota (1999) ^[1] says that oven drying test along with stress test are very important tool, for tool operator required for this disposals. Even oven operator does not believe moisture meter readings because accuracy of such meter should be defendable. Choice of moisture meter depends upon its accuracy is that it gives same information immediately and with small effort.

Michael Vollmer et.al(2003) ^[2] says that it was among first two articles which is related about physics of microwave oven it gives us information such as generation of microwave in oven, also including the operation of magnetrons, waveguides & standing waves in resonant cavities. He also considers the absorption of microwaves by foods and also discussed about dielectric relaxation of water, penetration depths electromagnetic waves in matter and possible chemical changes during heating multi photon ionization or dissociation was also taken into consideration.

Yifan Li, Shujun Li, Zhao (2007) ^[3] says that combined drying of hot air & microwave vacuum plays a vital role in application of scallion. Different drying condition along with drying methods & their effects on drying time & sensory quality like color, superfiication aspect & shape of dried scallion was successfully investigated. Different cutting length and different microwave power were used to discuss about the effects of combined hot air & microwave power performance of different drying methods such as hot air & microwave vacuum drying, combined hot air & microwave drying was also compared for demonstration.

A.Ganguly et.al (2011) ^[4] says that it deals with understanding analyzing the properties & characteristics of batteries and also their advantages, applications, limitations & disadvantages. This paper focuses on construction and various methods required for production of batteries & also looking for various alternatives means of mass production for future work

Dr. Lash, B. Mapa, et.al(2012) ^[5] says that factors were consider for reducing heat losses & importance was given to design improvements for increasing the efficiency of equipment so to provide value to customer process heat. Major factors such as temperature setting, safety, environmental pollution & energy conservation were considered. State & federal teams are manufacturing ovens to increase energy efficiency but many manufacturers feels that up gradation of heat tunnel energy efficiency will significantly or adverse effect their bottom line.

Kanchanapiya Premrudee, et.al (2013) ^[6] says that in Thailand automobile manufacturing was given main importance for transforming the country into an industrial hub in Asia over the past ten years, this industrial development leads to acid battery manufacturing which results in tremendous growth with increasing new manufacturing technology. Conventional batteries were compared with calcium maintenance free batteries which were manufactured in Thailand to study life cycle assessments of lead acid automobile battery.

Ojo R. O.et.al (2015) ^[7] says that drying efficacy and quality of product such as onion and pepper which were deled using oven sun were compared. Process period required for drying is 1-4 days to accomplish it. Various tests & analysis were carried out for their determination such as proximate analysis, bacterial load, identification of microorganisms, sugar

fermentation, catalysis test & bacteria count. The mean moisture content of product using drying by sun is 6.4% & oven is 4.5%. The oven dried product were significantly ($p < 0.05$) dried as compared to sun dried product.

Fedrick Pask et.al (2016) [8] says that improvement in ovens is the main objective of manufacturer's as they consume considerable amount of energy and also improves the product quality. The main importance for improvement in ovens, was to reduce energy required and enhanced process performance.

III. SUMMARY

Some authors have started that oven dry test & stress test are important tools for the oven operators. They also suggested the choice of moisture meters depending upon the accuracy gives quick information with little effort. Some authors gives information about of microwave oven, also generation of microwaves in the oven along with operation of magnetrons, waveguides and standing waves in resonant cavities. Some authors gives information about combined drying of hot air and microwave vacuum processes & their effects by using different drying methods. Some authors stated about factors which are used to reduce the heat losses and improve the efficiency. Some author's gives information about development in automobile manufacturing using new manufacturing technology and also some of them suggested improvements in oven to consume less energy & enhanced process performance. So, after referring above research & reference papers, it is proved that drying oven is best suited for moisture removal from batteries by sing heating process. Drying ovens is also used for increasing the life and efficiency of batteries. Drying ovens requires less energy requirements & used to enhance the process performance.

IV. METHODOLOGY

Drying oven consisting of heater, blower, conveyor system, gearbox, motor etc. It uses electrical energy to operate total oven system. convective heater system, conveyor system, blower system being start & wait for preferable secure condition as to obtain required temperature, required airflow, conveyor speed . the heating oven is kept open & empty till the temperature attain around 90° - 95° c, then battery lot fed through the one side of oven on conveyor, then motion is transmitted through gear box to conveyor via chain & sprocket assembly for optimum heating. blowers & fans operating in 3 units to provide convection heat transfer, pressure maintain in side oven is just above atmospheric pressure about 1.2 bar .after 180 minutes battery lot will be unloaded from another side of oven.as results occurs that battery plates (lead plates) will be dried & moisture get totally removed from it.

REFERENCES

- [1] Jim Reeb, Mike Milota, Oregon State University ,Corvallis Moisture content by the oven-dry Method for industrial testing, (1999).
- [2] Michael Vollmer, Physikalische Technik, Fachhochschule Brandenburg, Magdeburger Straße 50, (2003), Physics of the microwave oven, 14770 Brandenburg, Germany.
- [3] Yifan Li, Shujun Li, Bingnan Yang, Qinghua Han, Jiwei Ma, Donglin Zhao, (2007) ,Chinese Academy of Agricultural Mechanization Sciences Beijing 100083, China, Study on Combined Hot-air and Microwave Vacuum Drying for Scallion.
- [4] Ganguly¹, S. Sar², et.al. Paper Battery- A Promising Energy Solution for India, International Journal of Advanced Engineering Research and Studies E-Issn2249 – 8974, IJAERS/Vol. I/Issue I/October-December, 2011/130-133 Research Article.
- [5] Dr. Lash B. Mapa, (2012) Purdue University, Calumet, AC 2012-5108: Design of Experiments Modeling Of a Heat Tunnel.
- [6] Kanchanapiya Premrudee¹, Utaka Jantimal¹, Annanon Kittinan¹Lecksiwilai Naruetep², Kitpakonsanti Kittiwan², Boonyananth Sudkla, Life Cycle Assessment Of Lead Acid Battery, Case Study For Thailand, Vol. 39 2013 No. 1,DOI: 10.5277/EPE130108.
- [7] OJO, R. O. Comparative Studies of the Efficiency of Sun Drying and Hot Air Oven in the Preservation of Pepper and Onion, Department of Biological Science (Microbiology),College of Natural and Applied Science, Achievers University, Owo, Ondo State, Nigeria, (2015).
- [8] Frederick Pask¹,Peter Lake¹,Aidong Yang , Hella Tokos, Jhuma Sadhukhan, Industrial oven improvement for energy reduction and enhanced process performance, 12 January 2016 / Accepted: 27 April 2016 / Published online: 18 May 2016.