

Examining the Framework of Using Ozone as a Non-Thermal Technology in Canned Fish Industry of Parsian Zagros Company

Farhad Fataie¹, Masoom Hatamikia², Kamran Sohrabi³, Armin Yari⁴

¹Quality Control Manager, Parsian Zagros Company

²Food Expert in Food and Drug Department of Lorestan University of Medical Sciences

³B.A of Mechanic

⁴B.A Student of Food Industry, PayamNoor University of Khorramabad

Abstract: Increasing development of studies in health and food industry and the need for using modern technologies with better performance and also the disadvantages of thermal methods encouraged the researchers to study the effective non-thermal alternatives such as ozone in different subjects of health and food industry which are better than the previous time-consuming and less functional thermal methods. The aim of this research is to study the use of ozone as a non-thermal sterilizing agent. The research shows the importance of clean technology in seafood industry. Ozone is a substance with antimicrobial, bacterial and fungal features which is the most powerful oxidant available after fluorine and it is used in the form of liquid and gas. This gas could be used as a modern non-thermal technology in food and health industry for quick effects, being inexpensive and thermal. The effects of this gas include: preventing the undesirable odors from fish, breaking the bonds of bacterial cell walls, disinfecting the equipment and packaging of food industry, treating wastewaters from food factories, eliminating the odors in warehouses and disinfecting the air in the canning industry. This research is done in the laboratory using artificial production of ozone and examining the effects of ozone on fish canning and the equipment. The results are instrumental for experts of food industry, future professional and researchers who work on food and health industries.

Keywords: Ozone, Modern technologies, Sterilization, Canning, Food industry.

1. Introduction

Ozone (O₃) is a gas product of O₂ which is produced by UV in high voltage that is heavier than the air. Ozone is able to eliminate the resistant bacteria and bacterial spores, Cysts and viruses at relatively low concentrations, no need for a long time and it also has strong oxidation properties and the ability to cross biological membranes (A John Wiley & Sons, Ltd., Publication 2012). Ozone is a strong oxidant, disinfectant and antimicrobial, which is available in the form of resonance that is produced in nature through its specific reactions in the upper atmosphere. Ozone can be produced in the laboratory within a generator by passing dry air or oxygen through a high-voltage electric field. This gas has already been tested and shown promising results during its own experiments in food industry of various industrial countries. Two major features of this technology which compete with other technologies in food and health industry to control microorganisms are strong oxidation properties and the ability to cross biological membranes.

In previous studies by researchers of food industry science, the microorganisms of ozone molecules and free radicals are at the result of spontaneous decomposition and are destroyed as such. Since the rate of reaction

between the critical components of microorganisms and ozone is very high, therefore it is difficult to determine the kinetics of cell death. Microorganisms, such as bacillus, ero -thermophilus, Bacillus coagulans, Clostridium botulinum, Clostridiumnigrificans ByfrmntasClostridium, and Clostridiumthermosacroliticom are of microorganisms' types which are destroyed by ozone therapy (A John Wiley & Sons, Ltd., Publication 2012).

During research on the germicidal effects of ozone on bacteria that has been done by various pathogens, for example ozone with low concentrations of vibrio anyuillarum which controls fish pathogen (Laura Pastoriza 2008).Moreover, it is determined in the studies by the researchers that hot positive bacteria are more resistant than hot negative bacteria against ozone. Ozone ability in controlling microorganisms has been studied and confirmed including E coli (Technical Information 1997).This gas can be used in all parts of the canning technology for its rapid and immediate effects, low cost and also as a non-thermal method (Carmen A. Camposa,b 2005).The positive effects of ozone in controlling microorganisms and sterilization of agar level and the surface of inoculated fish were compared with a variety of bacteria and the results indicate that the very low concentration of ozone reduces the number of microorganisms in fish surface without any trace of its unpleasant appearance, organoleptic and nutritional effects compared to samples used in the past (Shigezo Naito1& Hirofumi Takahara,2006).

According to the studies, researchers found that ozone gas successfully is used for increasing the shelf life of fresh fish based on the international standards (George J. Flick, Jr., Ph.D, 2004).Ozone can be used in the growth and activity of fungal spore in the stored foods. Due to the above studies, ozone may be applied for sterilization food products. Likewise, the aim of the mentioned studies is to explore the potential of this gas for controlling some of these microorganisms in the canning technology at zero degree and preserving its quality and microbiological features (Zeynep B. Guzel-Seydima,*, Annel K. Greeneb, A. C. Seydim, 2004).

It may be used for canning factories. The results of such researches are instrumental as a modern technology in food industries, packing and sterilization.

2. Material and Methods

Ozone therapy is used within the cube compartment and movable rails which are produced under liquid and gaseous ozone, according to the previous research studies done in the similar industries. The severity of the passage of oxygen into ozone generator is set to100liters per hour and the produced ozone from the interface pipe into the chamber..According to the calculations, the concentration of ozone gas in the chamberwas6.6mgper minute. After ozone therapy, the Samples are immediately expelled from the chamber and the air inside the chamber is ventilated quickly (Maktabi, Watson, Parthon, 1385).



3. Discussion and Conclusion

The method for identifying charts and statistical distribution is based on logarithm and performed tests and also the frequency table is concluded in four different chambers based on the similar experiments. The method of Ozone therapy is similar to the previous articles in the same industries, which are almost identical.

Ozone was discovered by F-Schonbein in 1839 and was used commercially for the first time in 1907 in St. Petersburg. Ozone decomposes rapidly at room temperature and its smell is like fresh air after a thunderstorm. Confirming the antibacterial characteristic of ozone in many experiments has shown that in accordance with the laws of FAD sterilizing with ozone gas is unintentional. There are two methods of using ozone in the form of gas or bubbles in the liquid environments where they have already been used for sterilizing poultry and cattle. The equipment with ozone are used in a research about the function of ozone (Yunus ALPARSLAN, Taçnur BAYGAR, Duygu YILDIZ, 2012).

According to the findings, this research is carried out to study the effects of ozone on the combined microorganisms on the culture media of fish, the equipment of canning factories and their comparisons. The results showed that ozone is effective on all bacteria. Food industry seeks for the strategies and functions of new technologies to ensure food health. The benefits of ozone in food industry is confirmed in the hygiene of food surface, hygiene in the equipment of food factories, reuse of wastewater and also treatment and reduction of BOD and COD from the wastages of factories (Maktabi et.al. ,2006). As documented antibacterial effects in a wide range of organisms, including gram positive and negative bacteria and spores and growth of cells has been confirmed (Prepared by COWI Consulting Engineers and Planners 2009).It is used in the industry to disinfect vegetables, fish, grains, meat and meat products and finally the extra ozone decomposes quickly in the normal air which its concentration is different depending on the material treated with microorganisms and environmental conditions (A John Wiley & Sons, 2012).

4. Suggestions

A prerequisite for using ozone therapy in the food industry is establishing systems of haccp and iso22000 which is a positive approach in designing health program design and technical principles in the product companies. Quality and safety are the highest priorities in food and health and food industry including the fishing industry. The ozone gas technology can guarantee the microbiological quality for fresh fish and seafood. However there are many factors that could affect these results and ensure it like the method used, temperature and pH.

To minimize the spread of the harmful effects of bacteria and microorganisms on products, the sanitary control and the risky factors of production lines are necessary. Therefore, many studies and research should be done to show the best concentration and method for ozone therapy in various industry food.

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