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INFRARED (IR) RADIATION FOR FISH PRESERVATION

Fish is a highly perishable food material with the moisture content up to 80% and has very less storage life. Fish preservation is essential immediately after catch to increase the shelf life of fish. Preservation methods helps to maintain the quality of fish for longer period of time, prevents spoilage and decomposition, retains its original nutritional contents and makes transportation and storage of fish easier. Conventional preservation techniques such as chilling, freezing, drying and chemical preservation are widely being used for fish preservation throughout the world. Among the various preservation techniques drying of fish is the oldest preservation technique and drying means preservation of fish by removing water from it through heating. Fish can be preserved by drying using sunlight, solar dryer, electrical dryer, oven etc.

Conventional hot air drying is commonly used for fish drying and it is not very efficient. Hot air drying process is time consuming since it has low thermal conductivity and case hardening problems. Hot air drying requires long drying times that adversely affect the nutritional composition of fish. Fish dryers have gained acceptance in view of the rising demand for hygienic and quality dried products. Cabinet dryers (electrical dryers) are extensively used for fish drying and various designs of hot air dryers are available to meet different requirements. Even though electrical dryers help in quality dried products, the electricity costs incurred in drying make the fishermen

reluctant to use the same. Also, the process requires more than 8 hours for proper drying of fish and make them shelf stable. Cabinet dryers can be operated in batch mode and has high energy consumption. Exposure of fish to elevated temperature for long time in conventional hot air dryers often causes quality deterioration in fish and fishery products. Thus there is a need for an innovative and new technique which increases drying rate and positively influences the product quality.

Infrared heating is one such method of removal of moisture from foods. IR is an electromagnetic radiation which is in the region of $0.78 - 1000\mu\text{m}$. It is transmitted and absorbed by food surface and gets changed into heat. Generally far-IR region ($3 - 1000\mu\text{m}$) is used for food processing since most of the food materials are having the ability to absorb IR of in this region (Sandu, 1986). IR radiation impinges on the surface of material which has to be dried and penetrates into it. Absorption of radiation increases the molecular vibration inside the material and resulted in heat generation in both inside and surface of material concurrently (Sakai and Hanzawa, 1994). Faster heat generation inside the material increases the movement of moisture towards outer surface. External hot air movement over the surface of material can remove the moisture from surface and influence the further mass transfer from material.

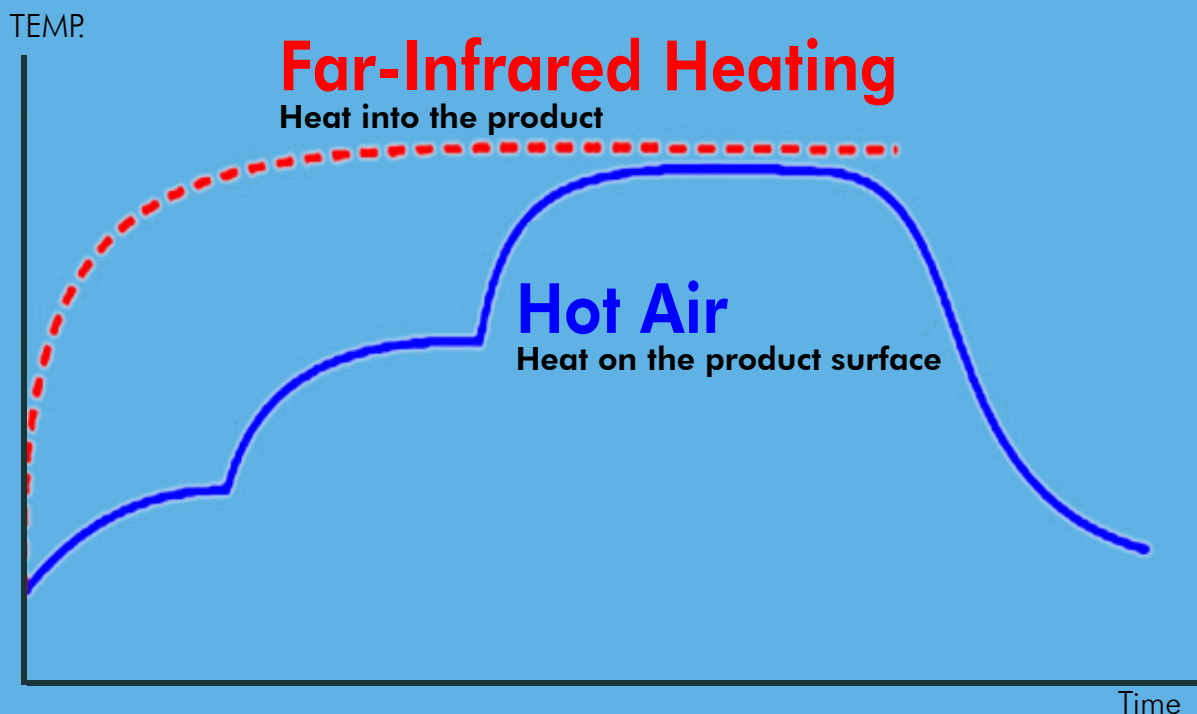
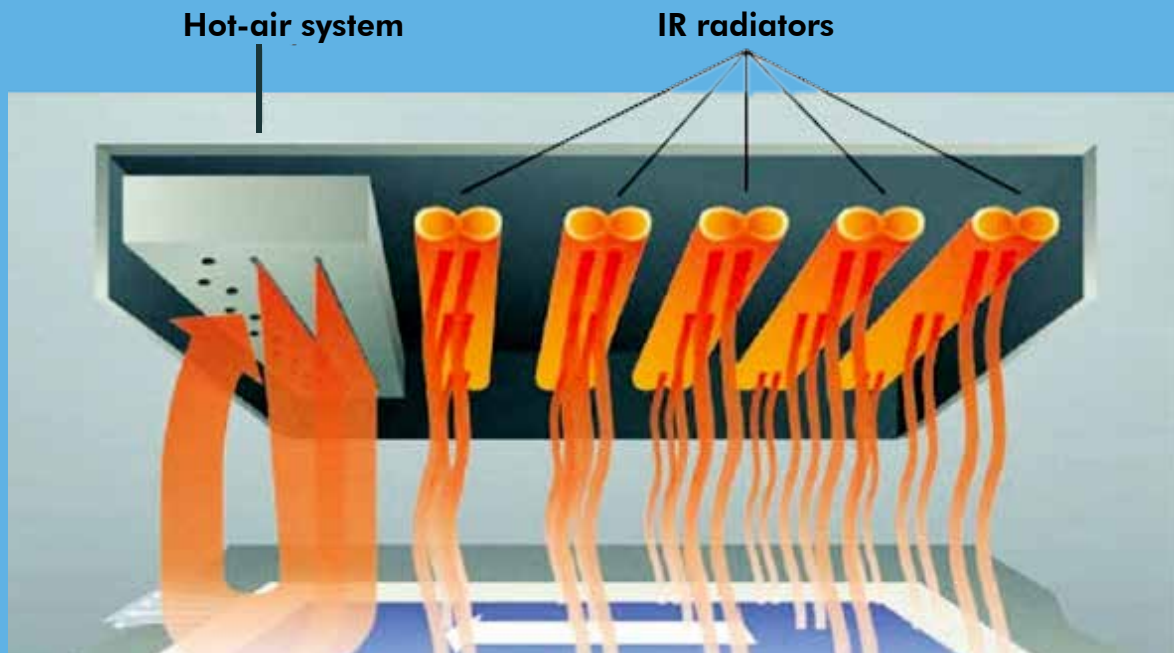
IR drying provides less drying time, highly energy efficient, uniformity in drying and good quality dried products. Infrared offers faster drying of

products with minimum energy consumption and nutrient losses than the conventional dryers. Also IR heating provides high heat transfer with less drying time and energy cost. Drying using IR radiation will be resulted in better quality products than other drying process since the heating is fast and uniform. This novel drying technology ensures quality dried products with minimum drying time which is need of the hour.

Comparison of hot air drying and infrared drying

Effectiveness of drying can be improved by combining both Hot air and IR for drying. This combined drying will provide synergistic effect and faster drying is possible. Combination of IR drying with hot air flow could reduce 20% of drying time than the time required to remove the same amount of moisture in IR drying alone (Sun et al., 2007). Design of IR dryer with hot air assistance will be one of the most commercially viable drying equipment with both less capital cost and operating expenses. Development of continuous type hot air assisted infrared dryer will be helpful to meet out the increasing demands for new and high quality value added fish products and energy efficient drying systems. It will also provide a valuable proposition towards green and clean technologies.

Since IR dryers help to produce dried fish with improved quality in less drying time than conventional drying, generates better livelihood opportunities for small fisherman. Better quality end products can be supplied to consumers. Good quality products help to reap higher income by fish traders and small scale fish processors.



(Source: <http://print-media-technology.blogspot.com/2013/09/drying-process.html>)

This developed system will be helpful to meet out the future demand for good quality fish by consumer. Fish processors can process and preserve the fresh fish without any significant loss of quality. Also they can have a control over drying process to improve dry fish product quality by this up gradation over traditional drying technologies. Using this advanced drying method, entrepreneurs, MSMEs,

Start-ups and self-help groups can prepare ready to eat, ready to cook products etc. in small scale level.

Reference

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