IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

# Humidity Control using Ultrasonic Atomization Transducer

## *A Commercial Purpose Humidifier*

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***Abstract***
This research paper aims to explore the utilization of ultrasonic atomization transducer in the hotel industry and its potential impact on guest satisfaction and well-being. The study investigates the specific application of ultrasonic atomization transducers in hotels, focusing on their functions, benefits, and considerations for implementation. Ultrasonic atomization transducers are devices designed to increase moisture levels in indoor environments, which can contribute to improved air quality and enhanced guest comfort.
The paper examines the potential benefits of using ultrasonic atomization transducers in hotels, including mitigating the negative effects of dry air on guests, such as dry skin, irritated respiratory systems, and discomfort. Adequate humidity levels can promote better sleep, alleviate allergies and asthma symptoms, and enhance overall well-being. Moreover, the research explores the potential positive impact of proper humidity control on the preservation of furniture, artwork, and other materials within the hotel environment. Additionally, the study considers the practical aspects of implementing ultrasonic atomization transducers in hotels, such as selecting appropriate ultrasonic atomization transducer types and models, determining optimal humidity levels, and ensuring proper maintenance and hygiene protocols. It emphasizes the significance of integrating ultrasonic atomization transducers into hotel design and operational practices, considering factors such as energy efficiency and noise levels. By analyzing existing literature, industry practices, and potential guest preferences, this research paper aims to provide valuable insights into the implementation and impact of ultrasonic atomization transducers in hotels.

## I.INTRODUCTION

Ultrasonic atomization circuits are devices designed to increase moisture levels in indoor environments, mitigating the negative effects of dry air and creating a more comfortable and pleasant atmosphere. In the context of hotels, where guest comfort is of utmost importance, the integration of ultrasonic atomization transducers holds significant promise.
The implementation of ultrasonic atomization transducers in hotels offers several potential advantages. Firstly, maintaining optimal humidity levels can alleviate dryness-related symptoms, promoting guest comfort and enhancing their overall stay experience. By reducing dry air-induced issues such as dry skin, chapped lips, and irritated nasal passages, ultrasonic atomization transducers can contribute to a more pleasant and rejuvenating environment for hotel guests. Additionally, adequate humidity levels can alleviate symptoms for individuals with allergies, asthma, or respiratory conditions, providing a more accommodating space for a wider range of guests.

While the integration of ultrasonic atomization transducers in hotels offers potential benefits, there are also practical considerations that need to be addressed. Selecting the appropriate ultrasonic atomization transducer type, considering factors such as room size, maintenance requirements, and noise levels, is crucial for effective implementation. Regular cleaning and maintenance protocols are essential to ensure the safe and hygienic operation of ultrasonic atomization transducers, as neglect can lead to microbial growth or other indoor air quality concerns.

To maximize the potential benefits of ultrasonic atomization transducers in hotels, effective communication and education for hotel staff and guests are paramount. Staff should be knowledgeable about the benefits of ultrasonic atomization transducers, proper usage guidelines, and maintenance protocols to address any guest inquiries or concerns. Transparent communication with guests regarding the use and benefits of ultrasonic atomization transducers can also contribute to a more informed and satisfied guest base. By examining existing literature, industry practices, and guest preferences, this study seeks to provide valuable insights and practical

recommendations for hoteliers and hospitality professionals looking to optimize guest comfort and create a more favorable indoor environment through the integration of ultrasonic atomization transducers.

## II. NEED OF THE STUDY

The study of ultrasonic atomization circuit and their ability to produce mist is important for several reasons:

1. Indoor Air Quality: Ultrasonic atomization transducers play a crucial role in maintaining optimal humidity levels in indoor environments. Dry air can lead to various health issues such as dry skin, irritated respiratory passages, and increased susceptibility to respiratory infections. By adding moisture to the air, ultrasonic atomization transducers improve indoor air quality and create a more comfortable and healthier living or working environment.
2. Respiratory Health: Ultrasonic atomization transducers that produce a fine mist can help alleviate symptoms associated with respiratory conditions such as asthma, allergies, and congestion. The mist helps to moisten the nasal passages, throat, and airways, reducing irritation and promoting easier breathing. Studying how ultrasonic atomization transducers generate and disperse mist can contribute to improving respiratory health outcomes.
3. Home Comfort: Dry air can cause discomfort, especially during colder months when heating systems further deplete indoor humidity. Ultrasonic atomization transducers that release a mist can increase moisture levels, creating a more pleasant indoor environment. Understanding the mechanisms behind mist production allows for the development of efficient and effective humidification systems.
4. Plant and Furniture Health: Certain plants and wooden furniture can suffer from excessively dry air. Lack of moisture can lead to wilting, dryness, and cracking, impacting the health and longevity of plants and furniture items. The study of ultrasonic atomization transducers and their mist-making capabilities helps in maintaining optimal humidity levels to support the well-being of both indoor plants and wooden furnishings.
5. Industrial and Commercial Applications: Humidification systems that generate mist are utilized in various industries such as agriculture, horticulture, manufacturing, and pharmaceuticals. Understanding the science behind mist production helps in designing and optimizing ultrasonic atomization transducers for specific applications, ensuring efficient and controlled moisture delivery.

Overall, studying ultrasonic atomization transducers and their mist-making process enables researchers, engineers, and designers to develop better humidification technologies that enhance indoor air quality, promote respiratory health, improve comfort, and support various industrial applications.

## III. RESEARCH METHODOLOGY

### 1. Components:

### i) Ultrasonic Atomization Transducer

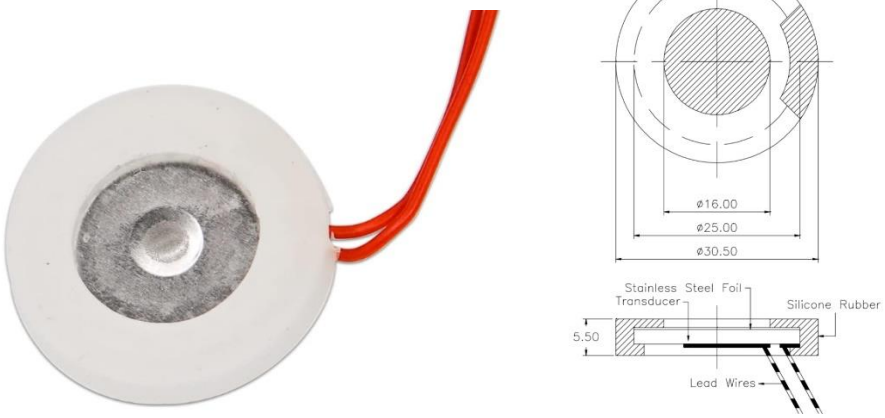
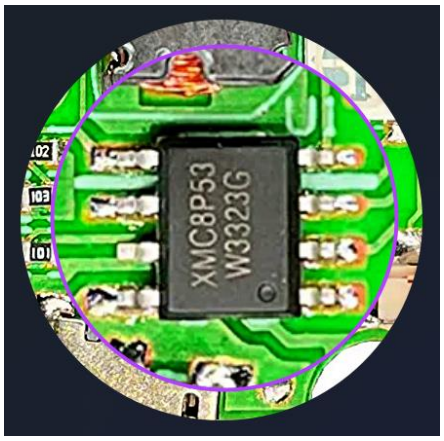



Fig. Ultrasonic atomization transducer

**Features:**

- Piezoelectric ceramic element clad with stainless steel.
- Produces particle less than 3µm.
- Less power consumption.
- High stability and durability.

**ii) XMC8P53 microcontroller**




**Features:**

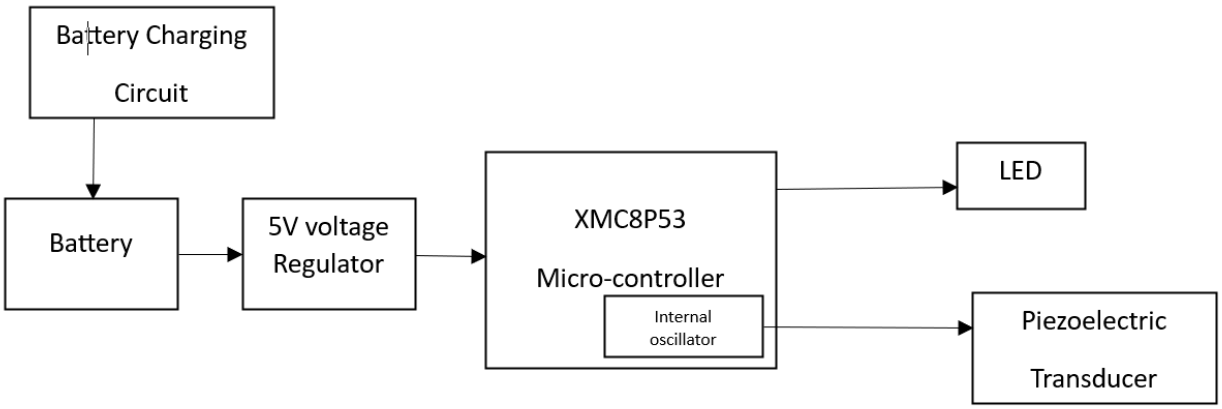
- Provides 113 kHz ± 3 kHz gate drive pulse
- 1KB 48 byte One Time Programmable (OTP) memory
- 2V to 5.5V operating voltage
- RISC architecture
- SOP-8 package

**iii) Batteries**


**Features:**

- 3.7V rechargeable batteries
- 2000 mAH
- Highly efficient
- Long cycle life
- Portable

**2. Block Diagram:**



**3. Circuit Diagram:**

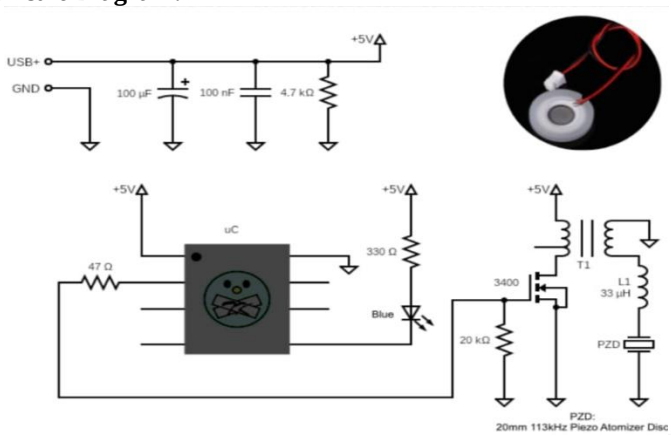



Fig a. Ultrasonic atomization circuit

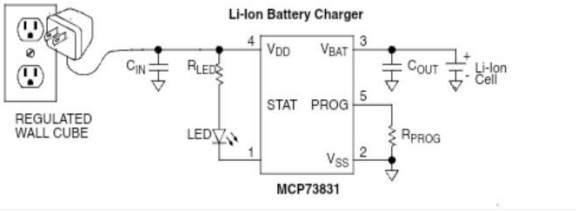



Fig b. Charging circuit

**4. Working:**

The whole device consist of three main parts – Ultrasonic Atomization Transducer, the microcontroller and the charging unit.
The 230V AC power supply is used to charge the lithium-ion batteries of 3.7V using IC MCP73831. The circuit diagram of charging unit is given in fig. (b). Once the batteries are charged, the whole device is ready to run on the batteries. Two batteries of 3.7V are connected in series which generates 7.4V. But the operating voltage microcontroller is 5V hence voltage regulator IC7805 is used in between them.
It's core electronics consists of two main parts- 8 pin microcontroller and 113 kHz piezo atomizer disc. One pin of the microcontroller is used for driving a blue LED and other provides atomizer drive pulses. The drive pulse is a square wave with a frequency of about 112 kHz. The 113 kHz square wave drive pulses are generated by a cheap microcontroller with internal oscillator. The waveform across the piezo atomizer disc is roughly a sine wave due to 33uH inductor in series with it. When the frequency of the input signal matches the resonant frequency of the LC resonant circuit , resonance is achieved and the resonance manifests itself as a sine wave.

**5. Proposed Hardware photos:**

**IV. Conclusion:**
In today's era of fans and ACs, using such a device which works on only on 5V and having a option of batteries is a good choice. The basic and main application of this device is to use in the commercial sectors such restaurants, cafes, hospitals and airplanes. What makes this device different from others is it's low power consumption and it requires very less amount of water to be converted into mist. Also, the droplet size is too small (approx. 3 micron) which even when falls on a human's body, we can't sense. We can control the time of spraying of the mist as per our convenience.

**V. ACKNOWLEDGMENT**

We would like to express our sincere gratitude to everyone who contributed to the completion of this research paper on the topic 'Humidity Control using Ultrasonic Atomization Transducer'.

We would also like to extend our thanks to the faculty members of KIT's College of Engineering, Dr. A.R. Nigvekar Sir and Mr. Mandar Sontakke Sir for their encouragement and providing us necessary resources to carry out this research.

## REFERENCES

**[1]** G.A Ibrahim and M.B.W Nabhan, An investigation into a falling film type cooling tower, Int J. Refrig, Vol. 18, pp. 557-564, 199

**[2]**https://www.researchgate.net/publication/324944950_Experimental_Study_of_Humidification_AndDehumidification_Desalination_Process

**[3]** https://www.sciencegate.app/keyword/733657

**[4]** https://www.ipl.org/essay/Humidifiers-Research-Paper-FJLCB85XYNR

**[5]** https://www.science.gov/topicpages/h/humidifiers.html