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MONITORING OF INDOOR AIR QUALITY FOR HUMAN HEALTH

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Abstract

Indoor air quality (IAQ) is a term describing the air quality of a building; especially it refers to the health and comfort of building occupants. It refers to the nature of the conditioned air that circulates throughout space/area, where we work and live in. Microbial pollutants (moulds, fungi) that are largely dependent on the temperature and humidity of the room, gaseous contaminants (including carbon monoxide, carbon dioxide, volatile organic compounds, etc.) and dust particles or aerosols may affect the IAQ. These contaminants can have adverse health effects on the inhabitants of buildings. An air quality control system is extremely important to prevent such adverse effects.

Keywords: *Air, Dust, Indoor, Pollution, Sensor, Health Care, Contaminants, Awareness.*

I. INTRODUCTION

Air-conditioning systems have been used in many parts of the world. The purpose of most systems is to provide thermal Comfort and an acceptable indoor air quality (IAQ) for Occupants. With the improvement of standard of living, occupants require more and more comfortable and healthful Indoor environment. People spend 80-90 percent of their time indoors, and human health and work performance are greatly influenced by the indoor climate. Temperature, humidity, air exchange rate, air movement, ventilation, particle pollutants, biological pollutants, and gaseous pollutants are primarily factors influencing the indoor climate [1]. Through reviewing recent research, Seppanen and Fisk (2002) found that as compared to natural ventilation systems, the prevalence of sick building syndrome (SBS) increased by between 30 percent and 200 percent in buildings with air conditioning systems. Death from Legionnaires' disease has also occurred in air-conditioned buildings. Furthermore, SARSoccurred in 2003. Both of these accidents are a sign of AC systems-related indoor environment issues. It is safe to say that many air-conditioned and mechanically ventilated buildings still have issues with the indoor climate, even though current requirements can be met [2].

The public recognition of the value of energy conservation was one of the effects of the worldwide energy crisis of the 1970s. Since then, the buildings constructed are more airtight and use a lot of insulation materials to reduce energy loss through the building envelope. In air-conditioning systems, fresh air is limited in order to minimize the consumption of electricity. Synthetic materials, meanwhile, and chemical goods. Many researchers have studied the control methods of IAQ in order to control the concentration level of indoor contaminants and to enhance IAQ. Recent studies on air-conditioning systems and indoor air quality management for human health will be discussed in this paper. Indoor air environments indoor air environments must meet thermal comfort and IAQ specifications. Many variables, which primarily include air temperature, air humidity, air velocity, mean radiant temperature, human clothing, and activity levels, affect thermal comfort. The wide use of air conditioning helps to increase thermal comfort, but poor IAQ-related health issues occur more often.

The sources of indoor particle pollutants can be divided into Indoor pollution sources and outdoor pollution sources, and the concentrations and composition of indoor particle pollutants are different with different pollution sources. In residential buildings, particles released by indoor pollution sources (e.g., cooking, smoking) were mostly fine particles and ultra-fine particles which were about 80% of the particles in terms of particle counts. Organic carbon (40-60 percent), nitrate (13-14 percent), trace elements (11-12 percent), ammonium (8 percent), elemental carbon (6 percent) and sulphate (6 percent) are the primary composition of PM2.5 and mass percentage inside dwellings (4 percent). Organic carbon (26-50 percent), nitrate (20 percent), trace elements (22 percent), elemental carbon (6-7 percent), and sulphate (6-7 percent) are the primary composition of PM2.5 and mass percentage at the schoolroom sites. From the above findings, it can be found that organic carbon is the largest contributor to PM2.5 and has the greatest effect on the characteristics of organic carbon-containing PM2.5.PM2.5, which not only leads to the spread of bacteria, but also allows the spread of bacteria[3]. The degree of harm to the human body by particle contaminants is related to chemical properties, magnitude of diameter, and quantity. The key consideration is the chemical characteristic of particulate pollutants since the chemical characteristic dictates the degree and pace of biochemical processes involved and disrupted by particulate pollutants in the human body. The majority of airborne particle contaminants are very thin. They have trouble calming down without being caught. Conversely, with inhaled air, it is easy for them to reach deeply into the respiration channel. In addition, toxic chemicals, fluids and bacteria can be absorbed by the surface of particle pollutants, which increases the damage to the human body.

Primary gaseous pollutants: Primary gaseous pollutants mainly include CO, CO2, SO2, NOX, O3, radon and VOCs. Chemical materials have widely been used indoors recently. Many kinds of chemical contaminants can be emitted at room temperature by chemical products, and the primary composition of these chemical pollutants is VOCs. Many symptoms can be caused by VOCs, such as headache; irritations of the eyes, nose, and throat; dry cough; dizziness and nausea; tiredness. There are also poor effects of VOCs on respiratory systems, blood vessel systems, and nervous systems. In addition, VOCs can be carcinogenic. VOCs' physical and chemical characteristics attract many researchers and become a focus of study. Construction materials, decorating materials, and articles used indoors are primarily indoor emission sources of VOCs [4].

Secondary gaseous pollutants: The mix of pollutants in indoor environments can be transformed as a consequence of chemical reaction. Reaction Between ozone and some unsaturated hydrocarbons is an important source of indoor secondary pollutants which mainly include free radicals, aldehydes, ketones, alcohols, carboxylic acids, and fine particulate matter (Sarwar et al., 2003). Secondary pollutants may be more irritating than the original reactants (Wainman et al., 2002; Rohr et al., 2003).During the past few years, many investigations were conducted on indoor secondary pollution due to ozone reacting with limonene. Confirming the significance of radical hydroxyl in indoor transformations. Hydroxyl radical is an ozone/terpene reaction product and tends to react with other products. A large fraction of oxidised materials, including certain products, are responsible for hydroxyl radical, which cannot be produced by ozone pathways alone [5]. Chemical reactions that occur on surfaces indoors. Because of the high indoor surface to volume ratio, such reactions can have a greater effect on IAQ than those that occur in the gas phase. The effect that secondary contaminants have on occupants. The inability to quantify many of the reaction products is a significant disadvantage in assessing the effect of secondary contaminants. Sensory measures are helpful in detecting changes resulting from indoor chemistry and changes absent from the analytical methods widely used to test indoor air. Indoor secondary contaminants have a substantial effect on human health and comfort, but the degree of impact and frequency of occurrence are currently unknown. In addition, due to the complexities of the composition, many secondary contaminants cannot be calculated and it is important to increase the standard of measurement [6].

Environmental monitoring conditions in homes have been inspected. A paradigm for monitoring temperature, humidity and light intensity based on a combination of ubiquitous distributed sensing units, data aggregation information system, and rationale and context understanding is proposed by the author. The accuracy of the sensing data is promising. For environmental pollution control, many monitoring systems have recently been proposed. In the meantime, some of the control systems are unique to CO_2 monitoring. A monitoring system is developed which gives the concentration of Carbon-di-oxide of remote areas. The system also reports temperature humidity and light intensity of the outdoor monitoring area. Similarly, an urban CO_2 monitoring system presented by the author in. The system operates outdoors in an urban area around 100 square kilometers. First and foremost is the extreme environmental pollution that has caused atmospheric deterioration, climate change, depletion of stratospheric ozone, loss of biodiversity, changes in hydrological processes and fresh water

sources, land degradation and stress on food production systems, acid rain and global warming. It is well known that some of these chemical pollutants have increased the occurrence of diseases such as lung cancer, pneumonia, asthma, chronic bronchitis, coronary artery disease, and chronic pulmonary diseases. Hence, there is a growing demand for environmental pollution monitoring.
Gas Sensors: These form the front end of the laboratory IoT systems. These are so called “Things” of the system. Their main purpose is to collect environmental data from surrounding (sensors) or give out data to their surroundings. For low cost environmental pollution monitoring systems, low cost semiconductor sensors are ideal for use in an array form. With additional temperature, pressure and relative humidity sensors, such an array could be expanded to measure the pollutant concentrations along with other physical parameters, with the benefit of improved calibration of the gas sensors. There are no gas sensors, however, which are 100% discerning for a single gas. Therefore, methods that use analytical techniques to classify gases need to be used. Fourier transforms infrared (FTIR) instruments, gas chromatographs, and mass spectrometers are examples of such instruments. Environmental monitoring conditions in homes have been inspected [2]. A paradigm for monitoring temperature, humidity and light intensity based on a combination of ubiquitous distributed sensing units, data aggregation information system, and rationale and context understanding is proposed by the author. The accuracy of the sensing data is promising. For environmental pollution control, many monitoring systems have recently been proposed. In the meantime, some of the control systems are unique to CO2 monitorin.

II. CONCLUSION & DISCUSSION

Commercially available WSN motes, gas sensors and dust monitors were used for air quality monitoring in real time. A sensor data acquisition module and a toolkit were developed in Java. It collects the raw sensor data, parse, extract the IAQ information and save them in sensor database. In the Context Aware Setting, IAQ parameters are published so that the HVAC control application can get the details by subscribing to the IAQ parameters concerned. To recognize the health effect of air pollution on the habitat, the Air Quality Index was determined. Experiments were carried out under various environmental conditions using the established indoor air quality monitoring system. The device acted according to the actual situation and collected adequate quantities of data on air quality in real time.

III. REFERENCES

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