**IOT (internet of things) JULY 2020**

**Project**

**On**

**Cold Storage Monitoring**

**Using**

**IOT (internet of things)**

**By Team 05**

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**1)Introduction**

**1.1 Overview:**

Perishable goods are consumed by almost everyone on a daily basis. These products include fruits, vegetables, dairy products, meat and poultry, fresh food, frozen food, seafood and even pharmaceutical products. Since these goods are temperature-sensitive and their storage time varies from a few days to a few years, these items are stored in temperature-controlled rooms. This is essential to ensure their safety and quality. Moreover, it is also important to ensure that the temperature of the room must never exceed the optimal temperature.

Industries dealing with perishable goods have been using cold storage facilities for decades now. These facilities require critical monitoring as well as control of temperature and humidity. Monitoring these facilities has not been an easy task, but the advent of new technologies has made it quite convenient.

Instrumenting your cold storage facility with an IoT-enabled cold storage monitoring solution helps you to record, monitor and maintain the conditions inside the facility on a regular basis.

**1.2 Purpose:**

Real-time monitoring:

Implementation of an IoT solution for cold storage facilities helps to monitor the necessary parameters and adjusts them when deviation occurs from their preset values. This helps to prevent food decay. The solution also sends alerts via SMS text and email whenever an anomaly is detected. Hence, preserving the item and maintaining regulatory compliance becomes easy.

Employee and asset safety:

Smart IoT sensors send you alerts whenever they detect a system failure. It helps you to address risky scenarios in real-time and enables you to take immediate action to avoid a disaster. IoT-enabled systems maintain a detailed record of every activity to improve the security of cold storage facilities.

Well-organized stock management:

A cold storage management system keeps you informed about the empty spaces in your cold storage for its optimal usage. Also, the IoT sensors collect data and record the movement of assets and other items to send alerts in case they detect any abnormal movement suspecting a theft. Not only that, but the system also sends alerts about the expiry of a product to make sure that it is moved out for selling in time.

Minimizes human involvement:

An IoT-enabled monitoring solution automates several processes in your cold storage facility and ensures that you don’t have to involve many staff members for stocking and dispatching goods.

Cold storage temperature monitoring:

As said above, a temperature monitoring solution is beneficial for industries that deal with temperature-sensitive and perishable goods. Furthermore, this solution also helps in maintaining the temperature of goods in the cold chain as well.

A cold storage temperature monitoring solution includes thermostats and sensors that constantly measure the temperature of a closed system, capture data and send it to a centralized platform over a network. This helps the logistics manager to monitor the shipment remotely and ensure the maintenance of optimum temperature.

The implementation of a cold storage temperature monitoring solution is helpful for climate-sensitive perishable items. Smart warehouse solution is easy to incorporate, convenient to use and ensures that the quality of goods does not degrade in warehouse and shipping.

A cold storage monitoring solution would be most beneficial for:

1)Agriculture industry

2)Blood banks

3)Food & beverage industry

4)Healthcare industry

5)Pharmaceutical facilities

6)Restaurant chains

7)Food manufacturing facilities

8)Educational institutions that provide meals to students, etc.

The final say

All in all, the implementation of an IoT-based cold storage monitoring system leads to the optimum utilization of space and resources. It helps to track the usage pattern and power consumption of devices, minimize wastage, detect anomalies within the facility and monitor and control the intensity of light as per the changes in daylight. An IoT-enabled monitoring solution brings terrific value to businesses and enhances profitability. To know more about how IoT-enabled cold storage monitoring helps to increase your ROI, please talk to our experts.

**2)Literature Survey**

2.1 Existing Problem:

a) Problems Only Cold Storage Warehouses Have

b) Different Temperature Zones.

c) Changing Zone Sizes.

d) Cold Temperatures Sap Battery Power.

e) Keeping Workers Warm and Productive.

f) Effect of Cold on Electronics.

g) Maximizing the Cold.

h) Maintaining Product Temperature.

2.2 Proposed Solution:

a) High humidity cold rooms, Cold Storage for fruit and vegetable storage

b) Low humidity cold rooms, Cold Storage for seed and hygroscopic material storage

c) Humidification and automation systems

d) Unique design for generating low humidity environment using specially designed refrigeration systems

e) Rigid polyurethene Foam (RPUF) insulation

f) Pre-painted Galvanised Steel (PPGS) or Stainless Steel (SS) metal laminate

g) Insulation thickness from 60mm up to 200mm

h) Non-corrosive, non-metallic hinges, door handles, and locks

i) Self-closing hinges

j) Audio alarm for 'door-open' condition

k) View port with anti-condensate glass

l) Lock defeat mechanism

m) Positive seal mechanism for all door types to avoid cold air loss

n) P 54 or more protected light fittings

o) Shatter-proof polycarbonate cover glass, which is professionally designed for cold room lighting

p) Weather-proof switched, where required

q) Embedded conduit for wiring

r) Safety devices like relays, SPPs, and timers

s) Alarm annunciators

**3)Theoretical Analysis**

3.1 Block Diagram:

|  |
| --- |
| Setup Environment |

|  |
| --- |
| Install python idle |

|  |
| --- |
| create an IBMaccount |

|  |
| --- |
| Create IBM Watson IOT platform |

|  |
| --- |
| Create MIT App inventor account to bulid theMobile App |

|  |
| --- |
| Setup Hardware and develop the code  Create a Code Snippet for DHTLL sensor to measure the Temperature and Humidity |

|  |
| --- |
| Create a Code Snippet for IR and LDR Sensor |

|  |
| --- |
| Create a Code Snippet to turn the motor On and Off |

|  |
| --- |
| Code Snippet for publishing Data using MQTT Communication |

|  |
| --- |
| Configuring IOT platform and node-red |

|  |
| --- |
| Create HTTP Requests to communicate with the mobile app |

|  |
| --- |
| Create a Node-red flow to send and receive data from the device |

|  |
| --- |
| Building A Mobile App |

|  |
| --- |
| Design your UI to display the sensor values and to control the Motors |

|  |
| --- |
| Configure the Application to receive the Dataform the Cloud |

|  |
| --- |
| Configure the Application to send the Motor Button status to the Cloud |

3.2 Hardware / Software designing :

Python Idle,IBM Cloud,MIT app inventor,Node red,Cloud DB

**4)Experimental Investigation:**

The Internet of things(IoT) aims at connecting different objects, things using internet. The rapid development of the Internet of Things motivate use to apply for the food preservation domain such as maintain the quality of fruits and vegetable. In this project a system has been proposed to analyze the ambient conditions under which the food item is being stored. The proposed solution senses the temperature, moisture, light parameters of surrounding environment as these parameters affect nutritional values of food items. In this project we have designed and implemented Raspberry Pi which works as a sensor node for the fruit and vegetable storage house as well as central base station is connected to cloud where MySQL open source database server to support data storage functionalities. The sensor values are stored in the cloud and sent to the base station by connecting to database using its IP address. Then a data fusion model is experimented which takes multiple sensed data as input and produces single fused information or action to be taken as the output. Thus aggregated several input as temperature, humidity and averages it to produce single consolidated output based on which the future decisions could be made. Finally this project is integrating the android mobile application which is used to facilitate user interaction and connect through IoT based system that is station/gateway and the internet. Keyword Internet of Things, goods safety, Sensing environments, Automation, Remotely monitoring LESS

**5)Result:**

1. We have analyzed continuous monitoring of temperature, humidity and light intensity and Switching ON the motor fan in case of bad condition of temperature by using mobile app,Storing the sensor data in the database
2. Alerts will be sent to the admin if the sensor parameters exceeds the threshold values.
3. Very less latency in communication from device to cloud with MQTT

**6)Advantages and Disadvantages:**

Advantages:

A cold storage room can keep fruits and vegetables at the correct temperature while controlling the moisture level to help extend the life of the fresh produce longer until it can be used.

Disadvantages:

a) limited amount of genetic diversity conserved

b) high maintenance costs

c) Not suitable for long term conservation

**7) Applications:**

a)distribution/logistic center

b)frozen produce

c)processing room

**8) Conclusion:**

IoT based temperature and humidity detecting device provides an efficient and definitive system for monitoring agricultural parameters. The system also provides a corrective movement or decision-making system. IoT based monitoring of area is a handiest, but it also allows the consumers to research the correct modifications within the surroundings and for taking possible action. It is inexpensive and consumes much less electricity. The Gross Domestic Product (GDP) per capitals in agriculture can be multiplied and helps to add our need parameters

**9) Future Scope:**

This set up can also control the DC fan, motor, and water levels for supporting farmers. Then the measured values of humidity and temperature values from the Arduino MCU are uploaded to the cloud. Then the collected data are transferred to the farmers live through the GSM to their cell phones. Based on the water level measuring system, the collected data are sending to the farmer‟s cell phone continuously. They can switch on or off their motor based on the collected data from the water level measuring system. It is beneficial for the farmers to control the motors as well as can watch their plants from their house. Moreover, also it will help the plants from the overwatering. This system is beneficial for water scarcity problems. IoT based system can be extended for controlling extraordinary electronic and electric devices from remote locations. Moreover, the system also can be extended for finding the moisture of soil and the farm monitoring for animals growth.

**10)Bibliography:**

Bhargav Goradiya, and H. N. Pandya, “Real time Monitoring & Data logging Systemusing ARM architecture of Raspberry pi & Ardiuno UNO” International Journal of VLSI and Embedded Systems-IJVES. ISSN: 2249 – 6556. Vol 04, PP: 513-517, July 2013.

[2] M. Rahaman Laskar, R. Bhattacharjee, M. Sau Giri, and P. Bhattacharya, “Weather Forecasting using Arduino Based Cube-Sat”, Twelfth International Multi-Conference on Information Processing (IMCIP) – 2016.

Data repositories:

ibmcloud.in

Algorithms:

Thesmartbridgeteachable.com

**11)Appendix:**

A Source Code :

import time

import sys

import ibmiotf.application

import ibmiotf.device

import random

#Provide your IBM Watson Device Credentials

organization = "cef01x"

deviceType = "raspberrypi"

deviceId = "123456"

authMethod = "token"

authToken = "12345678"

# Initialize GPIO

def myCommandCallback(cmd):

print("Command received: %s" % cmd.data)

i=cmd.data['command']

if i=='motoron':

print("motor is on")

elif i=='motoroff':

print("motor is off")

try:

deviceOptions = {"org": organization, "type": deviceType, "id": deviceId, "auth-method": authMethod, "auth-token": authToken}

deviceCli = ibmiotf.device.Client(deviceOptions)

#..............................................

except Exception as e:

print("Caught exception connecting device: %s" % str(e))

sys.exit()

# Connect and send a datapoint "hello" with value "world" into the cloud as an event of type "greeting" 10 times

deviceCli.connect()

while True:

hum=random.randint(10,40)

#print(hum)

temp =random.randint(30,80)

light=random.randint(10,50)

#Send Temperature & Humidity to IBM Watson

data = { 'Temperature' : temp, 'Humidity': hum,'lightintensity' : light }

#print (data)

def myOnPublishCallback():

print ("Published Temperature = %s C" % temp, "Humidity = %s %%" % hum,"lightintensity= %s C" % light,"to IBM Watson")

success = deviceCli.publishEvent("DHT11", "json", data, qos=0, on\_publish=myOnPublishCallback)

if not success:

print("Not connected to IoTF")

time.sleep(2)

deviceCli.commandCallback = myCommandCallback

# Disconnect the device and application from the cloud

deviceCli.disconnect()