IOT Enabled Lubrication Pumps For Industries

INTRODUCTION

a) OVERVIEW :

IoT refers to connecting everyday things embedded with electronics, software and sensors to the internet enabling them to collect and exchange data. It applies applications in various sectors, one of them being the industrial sector for machine diagnosis and monitoring. In the industrial sector, lubricant pumps play a vital role as the supply the required lubricant to the respective system. The lubricant pump is connected to the lubricant reservoir. The lubricant is transferred from the reservoir to the pump which then sends it to the required system that is operating.

b) PURPOSE :

Enabling IoT has several benefits such as technical optimization, improved data collection, improved performance, improved customer engagement, new revenue streams. As lubricant pumps are extrmely essential in industries and IoT provides excellent features, connecting the two together would have drastic positive outcomes. For instance, the lubricant level can be monitored through the web UI or mobile app which would also has the option available to switch on the pump and automatically switching off the pump if desired amount of lubricant is pumped into the system. Another feature would be that the admin could set the amount of lubricant needed to be pumped through the mobile app.

LITERATURE SURVEY

a) EXISTING PROBLEM :

It is difficult to implement IoT devices in some sectors like the oil and gas sector because of extremely hostile operating conditions make access to these sites difficult and expensive and a large percentage of equipments have been hardwired for many years. Pumps are one of the most vital components of any lubricant based application and the hard wired piece of equipments use up 10% of the world's overall electricity. 90% of the pumps are inefficient and there is a huge amount of legacy equipments persisting in the oil and gas sector. The main reason would be extreme operating conditions that means drills, compressors and pumps that must withstand severe abrasion for decades at a time and would have a high cost for getting it removed from the fields .

Futhermore, it's not as simple as connecting sensors to the cloud,as one of the main problems of enabling IoT in these sectors now is ownership of the data that is being produced.It consists of the owner of the pump, the compressor, other engines, etc, each with the manufacturer's own IoT edge gateway, but there is also shared operationship of the site. Everyone wants a part of it.

b) PROPOSED SOLUTION :

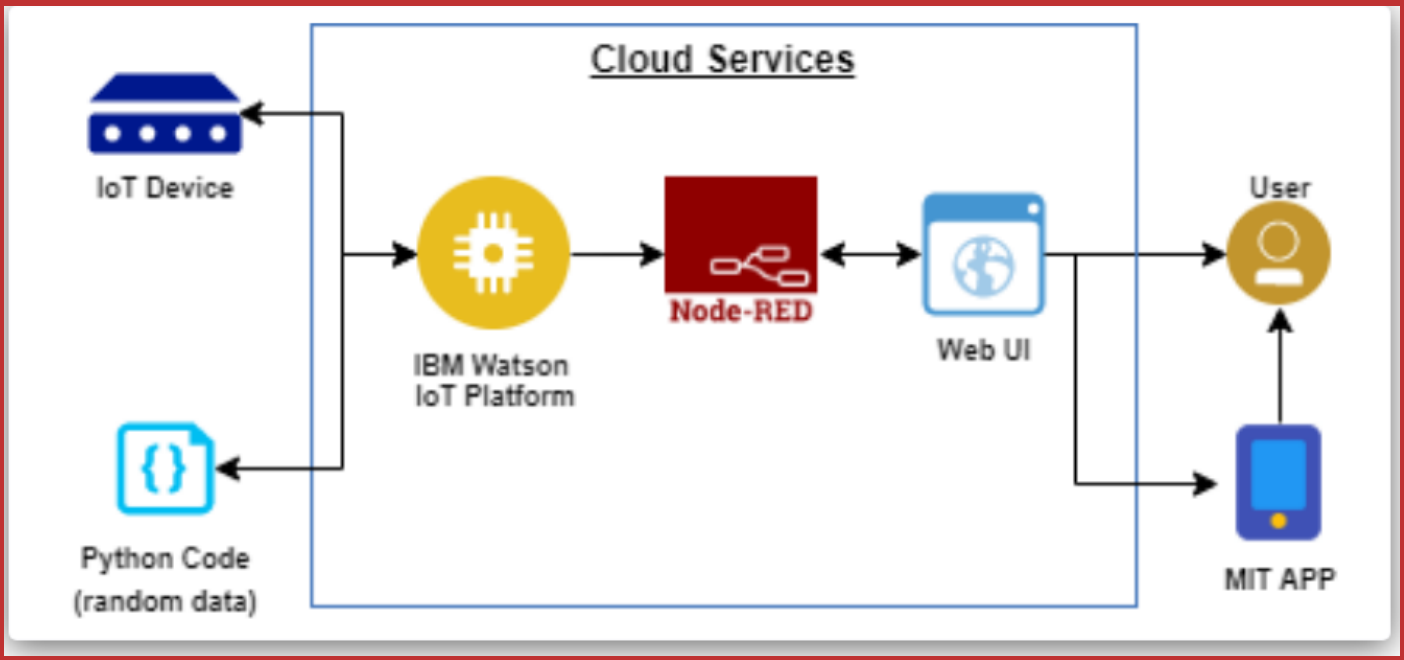
Introducing IoT to sectors like the Oil and Gas sector will revolutionize the sector and also save costs. It will also a part of helping mitigate some of the more harmful effects of climate change that inefficient pumps and other machinery perpetuate. The oil and gas sector is certainly due for a digital overhaul. If these sectors can capitalize on the insights it already has into operations on the ground, and consolidate the knowledge that exists at each site into a collective data analytics platform, the sector, and the planet, could be much better off. However, to properly connect these sectors and improve the way equipment and operation functioning there needs to be more focus on the free movement of data between sites and between stakeholders. To make sure that data is used and equipment insight is accessible enough to all

that is involved in the operating site, vibration sensors can be retro-fitted to monitor for faults, leakage and can provide actionable data for predictive analytics.

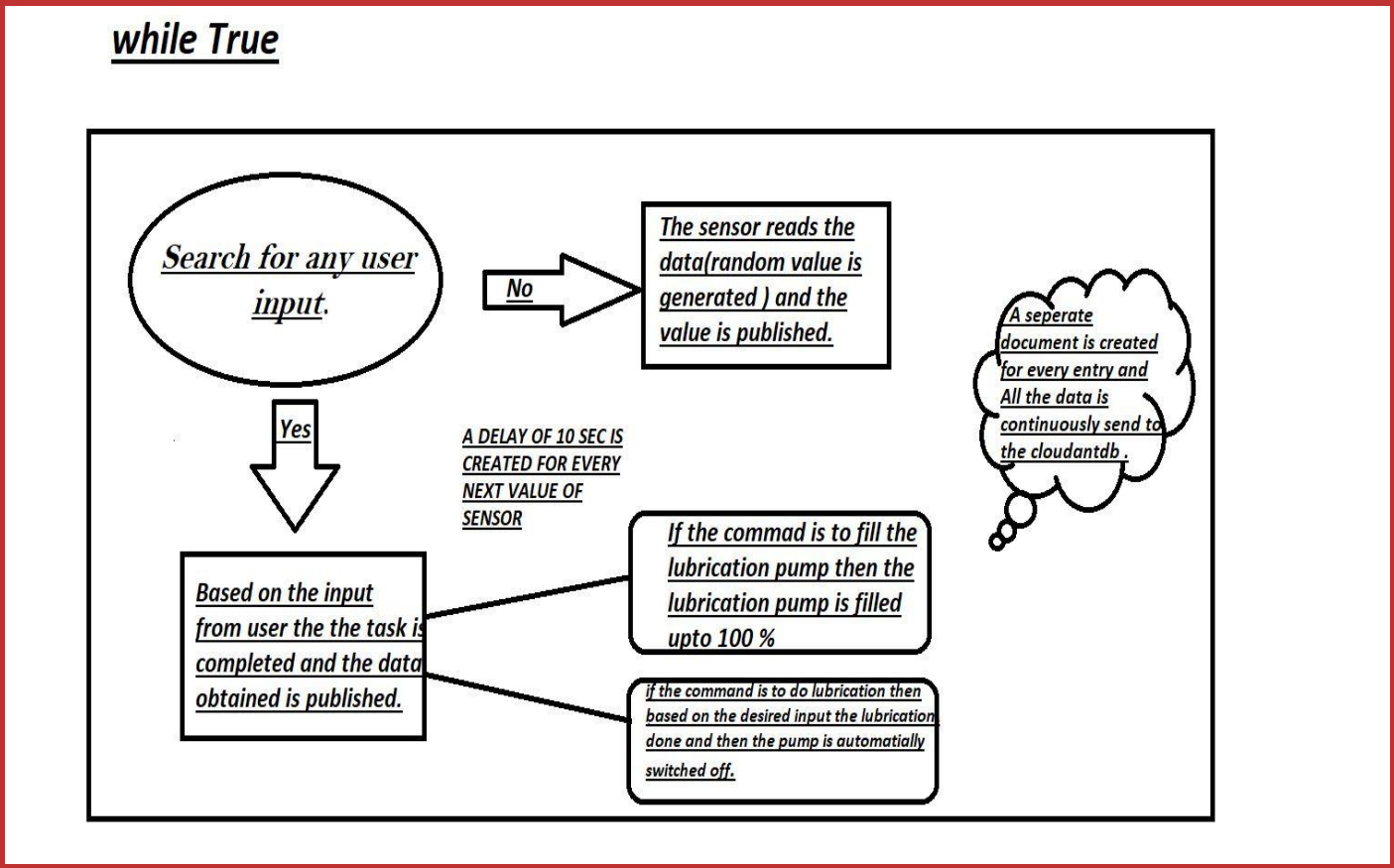
Translating analysis from IoT sensors into 'trend data that is understandable to everyone' is way that could increase the idea of enabling emerging technology in a sector that requires optimization and that has some of the harshest and deeply embedded working conditions.Making technology more accessible rather than trying to teach complex data science to those doing the field work would be suggested to get the most out of IoT efficiencies that need to be implemented. IoT-based application to monitor and measure the level capacity of lubricating oil as one of the important ingredients. This system is made to be accessible through the web desks and mobile web. The volume reading results on webphone and webdesk based applications can be the same and produce realtime data so that it can be used as a periodic reporting and can solve the problem of monitoring and controlling tank volume.

THEORETICAL ANALYSIS

a) BLOCK DIAGRAM :



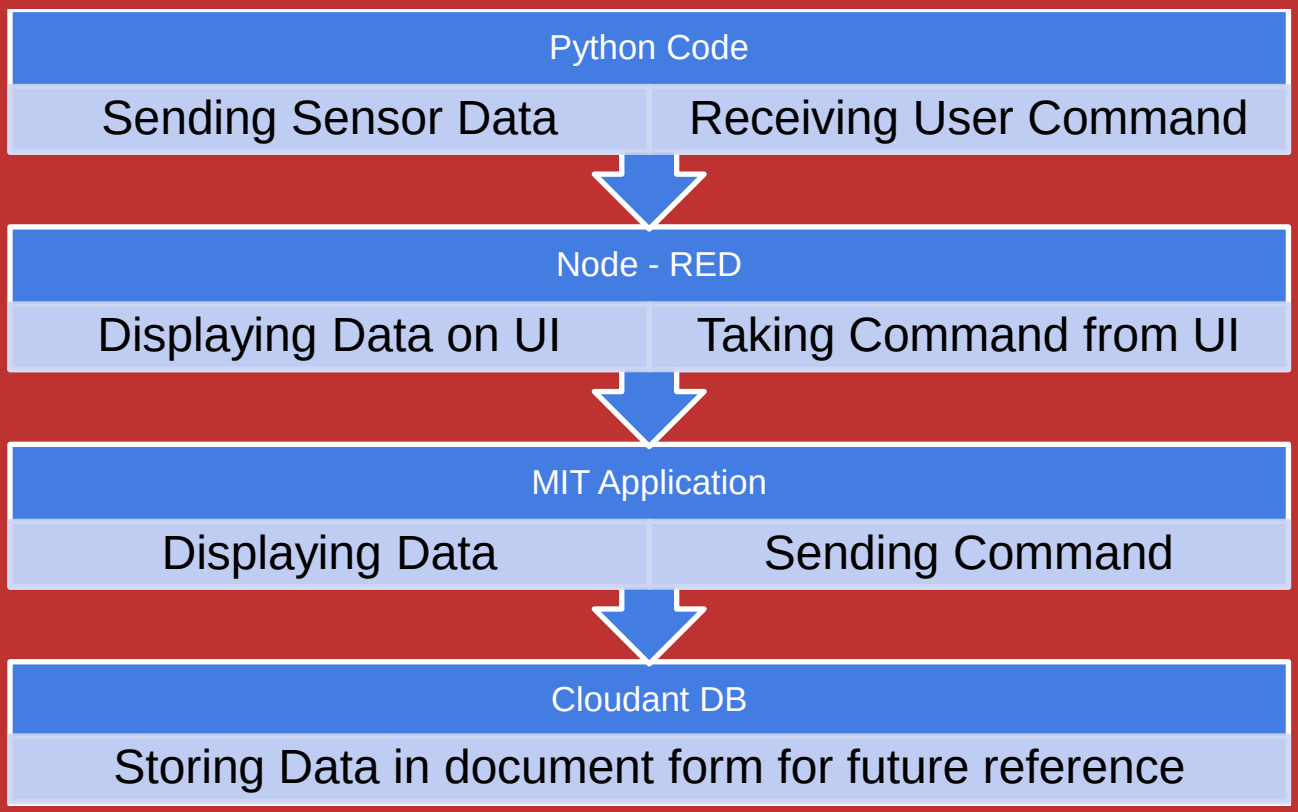
b) HARDWARE/SOFTWARE DESIGNING :



EXPERIMENTAL INVESTIGATIONS

Experimental investigations have concluded that the use of automated lubrication pumps have increased the equipment lifetime by upto 85%. This is because of accurate and timely lubrication for the equipments. Automatic lubrication pumps are cost effective and have reduced both maintainance cost and lubricant consumption. Also,all the data are easily accessible and one can operate it even when not near the equipment. it doesnt require an on-site personnel. Reports have also confirmed that the failure of machineries due to lack of lubrication has decreased by over 54% since the introduction of automatic lubrication pumps.

FLOWCHART



RESULT

Lubrication pumps pumps lubricant from the reservoir containing lubricant into the tubing system of the lubrication system. Lubrication pumps are important to maintain a proper and sufficient supply of oil lubricants to a system.

Features:

- We can monitor the lubricant level and if there is very less lubricant we can switch on the lubricant pump.
- Automatically switching off the pump if the desired amount of lubricant is pumped into the system.
- We can even monitor the amount of lubricant supplied to the system every time.

- Through the mobile app, admin can set the amount of lubricant which is to be pumped.
- Admin can monitor the entire data using the mobile App.

ADVANTAGES

- Scale back in operation expenses by managing manual operations remotely
- Improve statement and contour power-consumption
- Improve client service through identification and segmentation
- By collecting information from sensors and devices to quickly check current conditions, recognize any warning signs, delivering alerts and automatically starting maintenance process on its own, IoT turns maintenance into a dynamic, speedy and automatic task which comes very handy.
- This approach results in price savings over routine or time based preventive maintenance resulting in less time loss, since tasks are performed only when required.
- This will allow users to know which device needs maintenance and can be better planned for same. Other advantages include increased lifetime of machines, increased plant safety and fewer accidents.

DISADVANTAGES

- Keeping the information gathered and transmitted by IoT devices safely is difficult, as they change and expand in use. Though cybersecurity could be a high priority, IoT Devices should be protected from physical meddling, internet-based attacks, network-based attacks and hardware-based attacks and can cause in loss of data.

- Data privacy is another concern, specially because IoT devices are being used in more industries such as healthcare and finance containing more important and sensitive data information.
- Encrypting can be more time consuming and difficult tasks with lot of devices and complex procedures can result in high rate of errors which could be end up as catastrophic.
- For dealing with more advance and complex programs there would be requirement of more highly skilled labours and less demand of low skilled ones.
- Many iot devices depend on continuous power or internet connectivity for their proper functioning. When either one goes down, so does the particular device and anything connected to it. Given how intertwined IoT devices are with today's businesses, everything can grind to a halt when they're down causing lots of loss either in terms of money or time.

APPLICATIONS

- The development of iot machines has enabled real-time monitoring which helps in improvisation of productivity and reduces downtime. Intelligence is also being increasingly embedded with online monitoring to help analyze information in real time and improve the chances of identifying problems to perform diagnostic and prognostic calculations.
- Lubrication pumps pumps lubricant from the reservoir containing lubricant into the tubing system of the lubrication system. Lubrication pumps are important to maintain a proper and sufficient supply of oil lubricants to a system.
- IOT connected Lubrication pumps also enable predictive maintenance with the ability to monitor and regulate pump efficiency and thereby improve both uptime and energy efficiency. The use of connected

pumps allows the transmission of important informations with a long range of different IoT applications within no time.

CONCLUSION

The world of IoT is incessantly growing. Advancements in intelligent digital technologies have changed our world to an another level. IoT has made our life much easier and comfortable. What we are able to do till date far surpasses everything we used to do in past and what we can achieve in future.

IoT devices can be used in mostly all technology and development oriented industries such as healthcare, production plants, business and financial and many more.

FUTURE SCOPE

With IoT connected devices, it will become much easier to proactively fix client issues, possibly even before they are aware of the problem. This will strengthen the value for service providers who are already offering maintenance contracts. By collecting informations from sensors and devices to quickly check current conditions, recognize any warning signs, delivering alerts and automatically starting maintenance process on its own, IoT turns maintenance into a dynamic, speedy and automatic task which comes very handy. Connected devices give the opportunity for service providers to come prepared on the first visit, saving valuable time.

BIBLIOGRAPHY

•http://www.ijsrd.com/articles/IJSRDV7I10199.pdf

•https://www.ibm.com/blogs/internet-of-things/

•https://www.forbes.com/sites/charlestowersclark/?sh=6e5edbfb60b5

Appendix

a. Source Code:

```
import wiotp.sdk.device
from datetime import datetime
import time
import random
import json
import ibm_boto3
from os.path import join, dirname
from ibm_watson import SpeechToTextV1
from ibm_cloud_sdk_core.authenticators import IAMAuthenticator
from ibmcloudant.cloudant_v1 import CloudantV1
from ibmcloudant import CouchDbSessionAuthenticator
from ibm_cloud_sdk_core.authenticators import
BasicAuthenticator


authenticator = BasicAuthenticator("apikey-v2-
1x76tp54wlzxvziy003n0hhrvo0art1l5zj7amwvt6u2","01ecd22c6e9
b02ae338e4e07956a29f2")

service = CloudantV1(authenticator=authenticator)

service.set_service_url('https://apikey-v2-
1x76tp54wlzxvziy003n0hhrvo0art1l5zj7amwvt6u2:01ecd22c6e9b
02ae338e4e07956a29f2@cc4dc272-85d7-450a-a536-
30c09d73a555-bluemix.cloudantnosqldb.appdomain.cloud')
```

```
myConfig = {
    "identity": {
        "orgId": "d7luey",
        "typeId": "IOTPumpSystem",
        "deviceId":"5684"
    },
    "auth": {
        "token": "0123456789"

    }
}


lubricationlevel = 100
lubinpump = 100
activity = ""
msgadmin = ""
error = None

def lubricant_in_pump(a,b,c):
    x = a-(c-b)
    return x

def myCommandCallback(cmd):
    global lubricationlevel
    global lubinpump
    global error
    global msgadmin
    m = cmd.data['command']
    if(m == "fill pump"):
        lubinpump = 100
        recentactpublish("PUMP IS FILLED WITH LUBRICANT")
        publishdata()
```

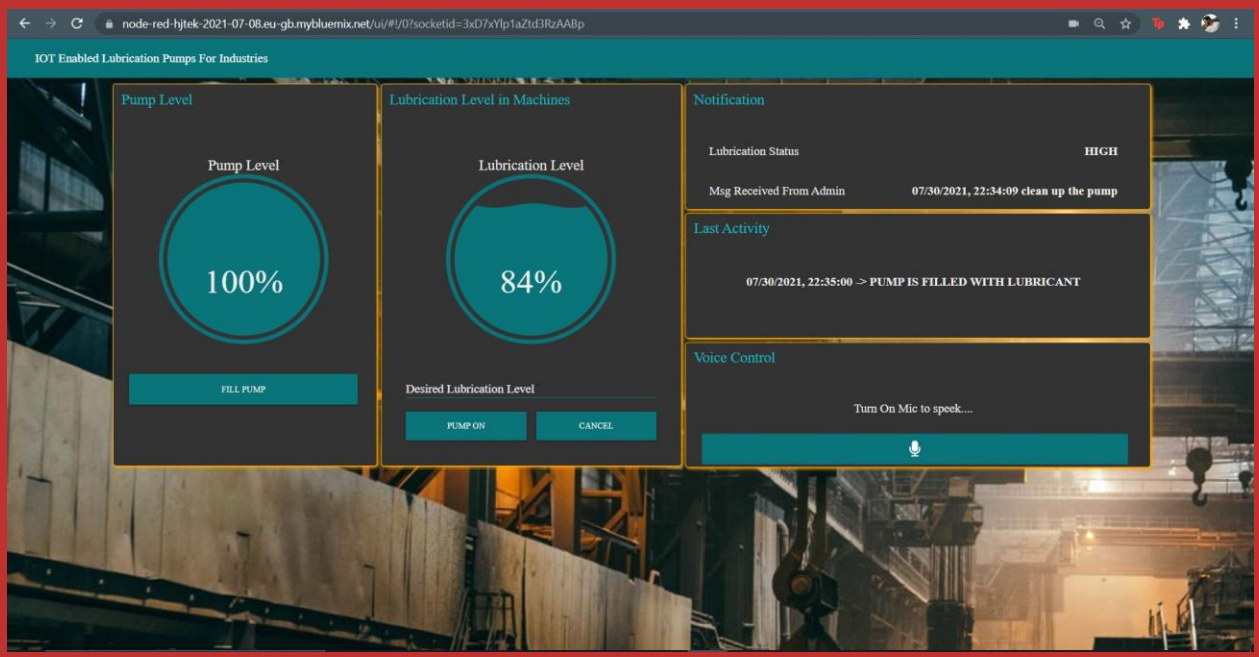
```
    elif(isinstance(m, int)):
        if(m<=lubricationlevel):
            error = "The desired lubrication level is less than the actual
lubrication level"
            publishdata()
        elif(m>=0 and m<=100):
            publishdata()
            lubinpump =
lubricant_in_pump(lubinpump,lubricationlevel,m)
            time.sleep(2)
            lubricationlevel = m
            xyz = "machine is lubricated upto "+ str(m) + "  % "
            recentactpublish(xyz)
            publishdata()
            #print("Message received from IBM IoT Platform: %s" %
cmd.data['command'])

    elif(m.isdigit()):
        if(int(m)<=lubricationlevel):
            error = " The desired lubrication level is less than the actual
lubrication level"
            publishdata()
        elif(int(m)>=0 and int(m)<=100):
            publishdata()
            lubinpump =
lubricant_in_pump(lubinpump,lubricationlevel,int(m))
            time.sleep(2)
            lubricationlevel = int(m)
            xyz = "machine is lubricated upto "+ m + "  % "
            recentactpublish(xyz)
            publishdata()

    else:
        now = datetime.now()
        date_time = now.strftime("%m/%d/%Y, %H:%M:%S")
```

```
        msgadmin = date_time + '  '+m
        publishdata()


def publishdata():
    global stats
    if(lubricationlevel>=80):
        stats = "HIGH"
    elif(lubricationlevel>=50 and lubricationlevel<80):
        stats = "FINE"
    elif(lubricationlevel>=20 and lubricationlevel<50):
        stats = "LOW"
    elif(lubricationlevel<20):
        stats = "VERY LOW"

    myData =
{'Lubricationlevel':lubricationlevel,'Pumplevel':lubinpump,'Stats':st
ats,'Recentactiv':activity,'msgfromadmin':msgadmin,'er':error}
    response = service.post_document(db='lubrication_pump_data',
document=myData).get_result()
    client.publishEvent(eventId="status", msgFormat="json",
data=myData, qos=0, onPublish=None)
    print("Published data Successfully: ", myData)




def recentactpublish(recact):
    global msg
    global activity
    now = datetime.now()
    date_time = now.strftime("%m/%d/%Y, %H:%M:%S")
    msg = recact
    activity = date_time+" -> "+msg
```

```
client = wiotp.sdk.device.DeviceClient(config=myConfig,
logHandlers=None)
client.connect()

while True:
    client.commandCallback = myCommandCallback
    publishdata()
    time.sleep(10)
    lubricationlevel = random.randint(0,100)
    error = None



client.disconnect()
```

b. UI Output Screenshot

1. Web UI



2. Mobile App