

# Machine Performance Monitoring through Web Portal & Mobile App

S.N Shivappriya, M. Ramalatha Marimuthu, K. Maheswari

**Abstract---** Today, production data of machines is maintained manually in notebooks and/or simple Excel files in the computer. This critical information is not available to management in real time to make informed decisions. The scope of Yantra 24x7 software is to capture operational data from machines in real time and make it available to management on their mobile phones with an easy – to – use interface. The idea is to present accurate information in real time and enable the management to make informed decisions

**Keywords:** Web portals, mobile app, excel files, computer, and mobile phone.

## I. INTRODUCTION

With this machine monitoring system Tracking and controlling of machines can takes place from anywhere. This IoT[1] solution brings all connected assets to a single dashboard giving you an overall plant performance. When machines are connected to the IoT platform[2] with the sensors and control units, which provides the powerful data processing unit with real time online data. which can be used to Analyze the condition and monitoring of machines and also predicts productivity, time and load management.

[3]Yantra 24x7 is a real – time platform that makes monitoring of your machines simple. Our machine monitoring system helps manufactures make faster and more informed decisions in real -time. It helps to monitor and improve shop floor productivity and resource utilization. A collection of best lean practices to achieve greater machine efficiency with improved quality and system reliability[4]. Exclusive online store specializing in metal-cutting tools to enable you choose the right tool among various leading brands[5].

### A. Provisions

This report covers requirements only for below modules:

- Dashboard
- Operator
- Operator Allocation

- Shift
- Machine
- User
- Report
- Internet Logs

## II. OVER ALL DESCRIPTION

### A. Product Perspective

Yantra 24x7 product includes the following applications:

Yantra 24x7 Web Portal: This web application will be used by the supervisor user in the shop floor to setup and maintain key data like modules.

Yantra 24x7 Mobile App: This mobile application will provide the management user a dashboard containing real time status of all machines in the shop floor.

### B. Benefits

Yantra 24x7 mobile app empowers the management user to monitor the machines in his factory from anywhere, anytime.

### C. Key Features

Key Features of Yantra 24x7 are listed below:

- Real time machine monitoring of downtime, utilization, idle time, runtime, in a dashboard
- Internet for failure conditions occurring in machines provide log report in a Log page[6].

### D. Data From Node MCU

- Database receive the data from Node MCU via cloud(AWS).
- The receiving Machine Status are: 0 - stop, 1 – idle, 3 – running

Colour Code:

- Green - Running
- Yellow - Idle
- Red - Stop
- Black - No Data

## III. YANTRA 24X7 WEB PORTAL FEATURES

List of features available in Yantra 24x7 Web Portal

- Login
- Dashboard
- Report
- Machine
- Shift
- User
- Operator
- Operator Allocation
- Internet Log

**Manuscript published on 30 December 2018.**

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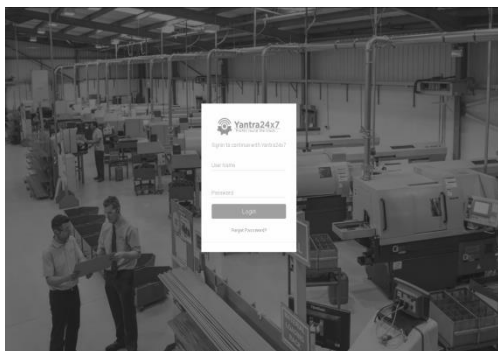
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- Alarm
- Alarm Report

## A. Login



**Figure: 1 Log In**

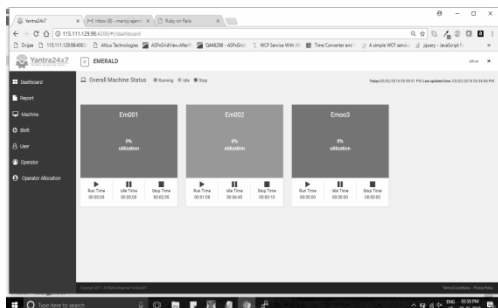
The above login screen in the portal will be used by the supervisor (manager, proprietor, etc.) to get access to dashboard.

## B. Dashboard

Manager is provided with the following dashboard on his web portal on successful login. Dashboard has three main sections. Home section provides critical, real time information of all machines in the shop floor.

In above screen top of the left side overall machine status, Green colour indicate machine Running, Red colour indicate machine stopped, Orange colour indicate machine idle.

In above screen top of the right side last updated time is database timestamp when last record was inserted by NodeMCU for this machine



**Figure: 2 Dashboard Display**

Then the above screen machine status are:

- 0 – Stop time,
  - 1 - Idle time,
  - 3 - Running time,
- Utilization is back end calculation.

## A. Run Time:

Time during which machine is working on the part Last fetched data from NODEMCU gives the Status:3 to database and calculate the total runtime in back-end side.

## B. Idle Time:

Time during which machine is NOT working on the part; this will include load time, unload time and break time that

time from NODEMCU gives the Status:1 to database and calculate the idle time in backend side.

## C. Stop Time:

Time during which machine is Not working on the part Last fetched data from Nodemcu gives the Status:0 to database and calculate the stop time in backend side.

## D. Utilization:

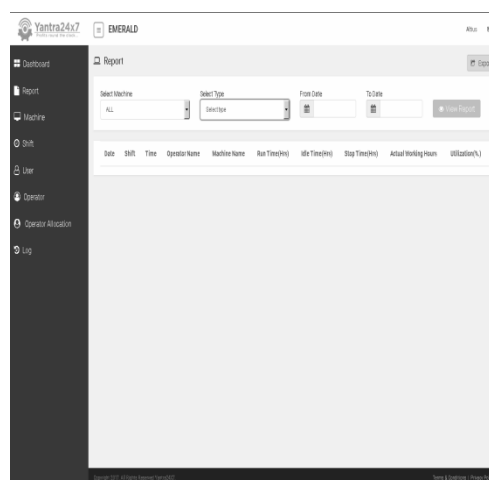
Total time during which machine was working on production of parts when compared to the current shift elapsed time.

It is calculated from runtime as follows-

$$\frac{\text{Run time}}{\text{Shift elapsed time}} \times 100$$

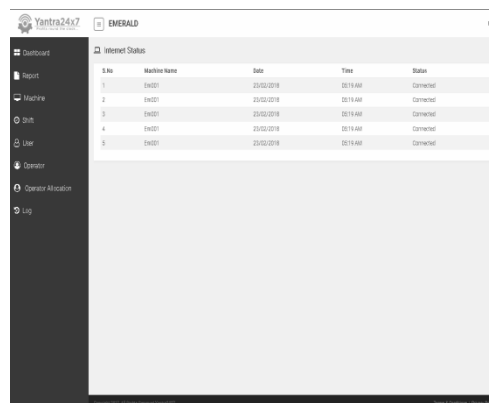
Colour Code:

- Green - Running
- Yellow - Idle
- Red - Stop
- Black - No Data



**Figure: 3 Report Generation**

## C. Report



**Figure: 4 Machine Registration**

The above report page contains 4 options they are below:

1. Select Machine – Its contain the machine list in drop-down.
2. Select type – Its contains which type of Report Customer want.
3. Shift wise Report

Operator wise Report Select the period - From date, To date

#### D. Shift Wise Report

Click shift wise report option. Its shown one option for select shift drop down and select shift get the result for shift wise report.

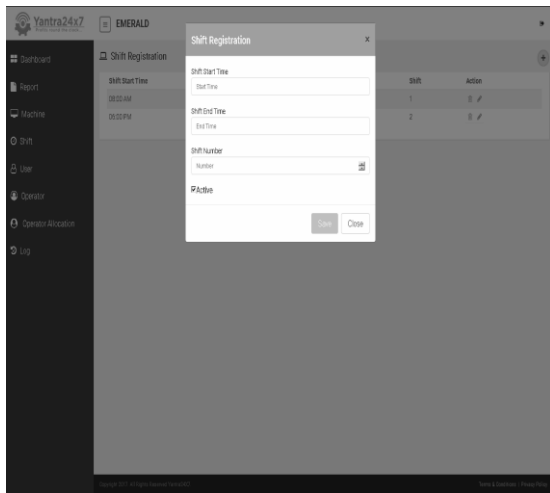


Figure: 5 Shift Registration

#### E. Operator Wise Report

It's same like shift wise report, click Operator wise report option. It's shown one option for select Operators drop down and select Operator name get the result for operator wise report.

#### F. Machine Registration

Machine Registration Page is like a curd option page.(index, create, edit, delete options are available in this screen).When Click the right side top of the page Add button. Its shown pop-up screen.

Given below fields are filled machine was created.

- Machine Name
- Machine Type
- Controller Model Number
- Machine Serial Number
- Active
- Machine Ip(Eg:192.168.1.1)

when click Edit option to change any data's and also Delete option for the record.

#### G. Shift Registration

Shift Registration Page is like a curd option page.(index, create, edit, delete options are available in this screen).

When Click the right side top of the page Add button. Its shown pop-up screen.

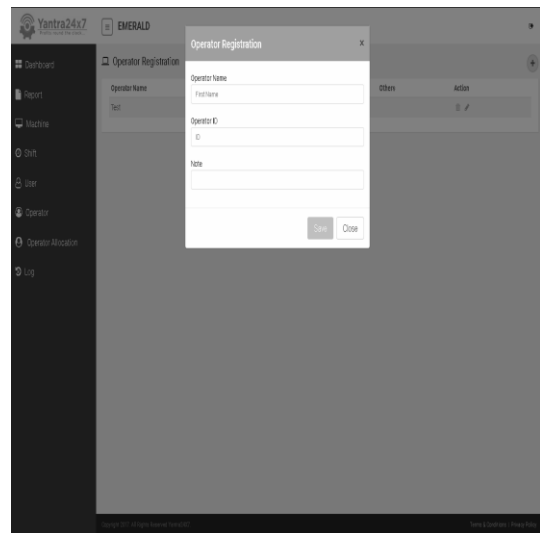


Figure: 6 Operator Registration

Given below fields are filled machine was create.

- Shift Start Time,
- Shift End Time,
- Shift No
- Active

When click Edit option to change any data's and also Delete option for the record.Shift registration page is allocated only to the Manager level log login.The shift timing can be registered according the number of shifts happening the registered machine in the dashboard.

#### H. Operator Registration

In this above screen Operator Registration Page is like a curd option page.(index, create, edit, delete options are available in this screen).When Click the right side top of the page Add button. Its shown pop-up screen.Given below fields are filled machine was created.

- Operator Name
- Operator ID
- Note

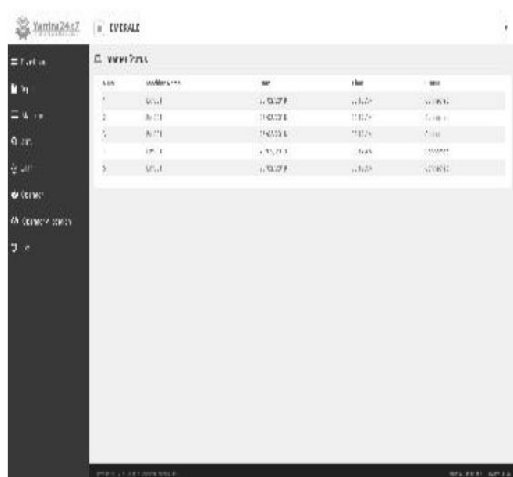
when click Edit option to change any data's and also Delete option for the record.In this above screen Operator Allocation Page is like a curd option page.(index, create, edit, delete options are available in this screen).

When Click the right side top of the page Add button.its shown pop-up screen.

Given below fields are filled machine was created.

- Machine Name
- Operator Name
- Shift No
- Description
- From Date
- To Date
- In this Edit option only allow to edit Operator Name field in the selected date period, other fields are read-only fields. Delete option for the record.

## I. Internet Log



id	machine	ip	time	status
1	Machine 1	192.168.1.1	2018-02-27 06:16:50	Running
2	Machine 2	192.168.1.2	2018-02-27 06:16:50	Idle
3	Machine 3	192.168.1.3	2018-02-27 06:16:50	Stopped
4	Machine 4	192.168.1.4	2018-02-27 06:16:50	Running
5	Machine 5	192.168.1.5	2018-02-27 06:16:50	Idle

Figure: 7 Internet Log

In the above screen Internet failure occurring in machines, Nodemcu provide log reports. The log is created when the ping response is obtained from the server that is registered in the device attached to the machine. Machine log is also available which checks whether the machine is connected to the device or not and it stored locally in the device as well as the database which contains the log information.

## IV. EXPERIMENTAL RESULT FOR YANTRA 24X7 MOBILE APPLICATION

List of features available in Yantra 24x7 Mobile Application

- Login
- Dashboard – Home

Mobile app provides provision to see the dashboard only and all other features are not available in the app. To access the other pages like the operator entry, reports, logs, shift registration etc. one should visit the web portal.

## A. Login

The above login screen in the Mobile App will be used by the supervisor (manager, proprietor, etc.,) to get access to dashboard. Each level of management will get different login which will help us restrict access to the data edit.



Figure: 8 App LogIn

## B. Dashboard

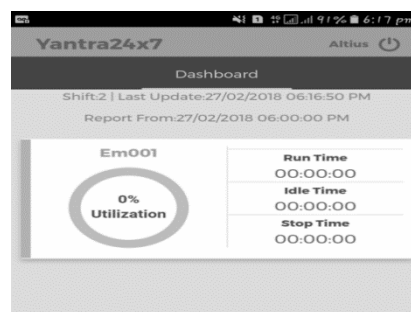


Figure: 9 App Dashboard

- In above screen top of the left side overall machine status, Green colour indicate machine Running, Red colour indicate machine stopped, colour indicate machine idle.
- In above screen top of the right side last updated time is database timestamp when last record was inserted by NodeMCU for this machine.
- Then the above screen machine status are:  
0 – Stop time,  
1 - Idle time,  
3 - Running time,  
Utilization is back end calculation.

## a. Run Time:

- Time during which machine is working on the part Last fetched data from Nodemcu gives the Status:3 to database and calculate the total runtime in back-end side.

## b. Idle Time:

- Time during which machine is NOT working on the part; this will include load time, unload time and break time that time from Nodemcu gives the Status:1 to database and calculate the idle time in backend side.

## c. Stop Time:

- Time during which machine is Not working on the part Last fetched data from Nodemcu gives the Status:0 to database and calculate the stop time in backend side.

## d. Utilization:

- Total time during which machine was working on production of parts when compared to the current shift elapsed time.
- It is calculated from runtime as follows-

$$\frac{\text{Run time}}{\text{Shift elapsed time}} \times 100$$

## C. Node MCU

NodeMCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module.



The term "NodeMCU" by default refers to the firmware rather than the dev kits.

Developer : ESP8266 Open Source Community Type : Single-board microcontroller

Operating system : XTOS

CPU : ESP8266

Memory : 128kBytes

Storage : 4 MBytes

Power : USB

#### D. Node MCU Programming

The Arduino Integrated Development Environment (IDE) is a cross-platform application that is written in the programming language Java. It originated from the IDE for the languages Processing and Wiring. It includes a code editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, brace matching, and syntax highlighting, and provides simple one-click mechanisms to compile and upload programs to an Arduino board. It also contains a message area, a text console, a toolbar with buttons for common functions and a hierarchy of operation menus. The source code for the IDE is released under the GNU General Public License, version 2.



**Figure: 10 Node MCU**

The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub `main()` into an executable cyclic executive program with the GNU toolchain, also included with the IDE distribution. The Arduino IDE employs the program to convert the executable code into a text file in hexadecimal encoding that is loaded into the NodeMCU by a loader program in the board's firmware by using the ESP8266 library. ESP8266 library is used to flash the NodeMCU.

#### E. Communication Protocol

MQTT stands for MQ Telemetry Transport. It is a publish/subscribe, extremely simple and lightweight messaging protocol, designed for constrained devices and low-bandwidth, high-latency or unreliable networks. The design principles are to minimise network bandwidth and device resource requirements whilst also attempting to ensure reliability and some degree of assurance of delivery. These principles also turn out to make the protocol ideal of the emerging "machine-to-machine" (M2M) or "Internet of Things" world of connected devices, and for mobile applications where bandwidth and battery power are at a premium.

Historically, the "MQ" in "MQTT" came from IBM's MQSeries message queuing product line. However, queuing itself is not required to be supported as a standard feature in all situations.

Conditions of link are as below: Connect Disconnect Publish

Connect: Waits for a connection to be established with the server and creates a link between the nodes.

## V. CONCLUSION

Machine monitoring (Yantra 24x7) has simplified Industrial IoT for the factory floor - the new standard in machine monitoring. We help manufacturers make faster, more informed decisions from real-time machine data made intelligent with context from operators. Instant notifications, real-time dashboards and detailed analytics drive manufacturing efficiency by more than 20%.

## VI. FUTURE WORK

This Industry IoT platform provides following features

- Optimizing machine utilization improves productivity
- Predicting and preventing failures gives quality products
- Reducing maintenance costs
- Improving machine performance
- Increasing customer satisfaction

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