

## Sub-Station Monitoring System

**Challenge faced by Customer:** Customer has approximately 5000 sub-station transformers located at 5000 different locations. There were several parameters which were to be measured and monitored, simultaneously. It was very difficult work and quite costly to deploy a person at every location. Further, it would also have been error prone as the process would be manual. The biggest challenge was to have all the data available in a single console available at a glance. Also, it was difficult to have remedial measures to be taken immediately in case of emergencies.

**Solution provided by Arun InfoTech:** Arun Info Tech provided an online real time solution for all the above challenges. The solution provided is cost effective and replaced the error prone manual system. There is a sensor network connected to an embedded device, which senses the factors and parameters; the values are then transferred via GPRS to a predefined port on an IP address or a domain name. From this IP address the readings are taken and then displayed in the correct format on screen.

Arun Info Tech designed a monitoring & reporting system in which all different parameters can be seen in a single console. Refer the screen shot below:

The screenshot displays the 'Sub-Station Monitoring System' web interface. The central 'MONITORING PANEL' shows the following data for transformer ID 1S-DL-HM-25-990H:

- Oil Level: Medium
- Oil Temp.: 170
- Oil Leak: 0
- LT Palm: 166
- R Temp.: 169
- Y Temp.: 167
- B Temp.: 167

The 'METER PARAMETERS' table on the right contains the following data:

Parameter	Value
Phase Voltage V1N	242.5
Phase Voltage V2N	242.5
Phase Voltage V3N	242.4
Avg. Voltage LN	242.0
Line Voltage V12	0.0
Line Voltage V23	0.0
Line Voltage V31	0.0
Avg. Line Volt. LL	0.0
Phase Current I1	0.0
Phase Current I2	0.0
Phase Current I3	0.0
Average Current	0.0
Phase Power kW1	0.0
Phase Power kW2	0.0
Phase Power kW3	0.0
Phase Apparent Power KVA1	0.0
Phase Apparent Power KVA2	0.0
Phase Apparent Power KVA3	0.0
Phase Reactive Power KVar1	0.0
Phase Reactive Power KVar2	0.0
Phase Reactive Power KVar3	0.0
Total Power kW	0.0
Total Apparent Power kVA	0.0
Total Reactive KVar	0.0
Phase Pw Factor PF1	0.1
Phase Pw Factor PF2	0.1
Phase Pw Factor PF3	0.1
Average PF	0.1
Frequency	49.8
Total Energy kWh	0.58
Total Apparent Energy kVAh	0.88
Total Reactive Energy KVarh	0.48
kW MAX Active Power	0.48
kW MIN Active Power	-0.5
kVar MAX Reactive Power	0.55

As we can see in above capture left hand side block shows the different measured factors which are enumerated as below:

1. Temperature
2. Voltage
3. Current
4. Door is locked or open
5. Fire and
6. Intrusion
7. Presence of SIM Card and njetwork information

Numbers on it show all factors, status at all locations. For example, if the number is 2 on fire symbol then it means that there is fire at 2 locations. In this manner the personnel observing the console is intimated about the various factors status.

In the middle portion, the display allows the user to search for a particular transformer and after searching shows Oil level, temp and leak for the searched transformer. It also shows that transformers temperature at R, Y and B. Time when data is last updated is also available at bottom of the screen. On the right hand side block, meter parameters like voltage, current, power, energy frequency etcetera are shown.

Customized reports can also be generated using different parameters like temperature level report, power consumption report etcetera as below:

The screenshot displays a web-based interface for a Sub-Station Monitoring System. The browser address bar shows 'localhost:54419/Report.aspx#'. The application title is 'Sub-Station Monitoring System'. The main content area is titled 'REPORT' and includes the following elements:

- Transformer ID:** 1S-DL-HM-25-990H
- Start Date:** 09/08/2013
- End Date:** 25/08/2014
- Select Columns to View:** A section with three columns: 'Metering Parameters', 'Sensor Parameters', and 'Selected Columns'.
  - Metering Parameters:** Phase Voltage V1N, Phase Voltage V2N, Phase Voltage V3N, Avg. Voltage LN, Line Voltage V12, Line Voltage V23, Line Voltage V31, Avg. Line Volt. LL, Phase Current I1, Phase Current I2, Phase Current I3.
  - Sensor Parameters:** Oil Level, Oil Temp., LT Palm R Temp., LT Palm Y Temp., LT Palm B Temp., Door Sensors, SIM Removal, Fire Detector, Intrusion Detection, Mains Power Available.
  - Selected Columns:** Phase Voltage V3N, Avg. Voltage LN, LT Palm R Temp., LT Palm B Temp.
- Select Filters:** A series of dropdown menus for Door Sensor (On), Intrusion Detection (On), Device reset (No), Mains Power (Available), Fire Detector (Off), and Oil Level (Low).
- Search:** A search button and a search input field.
- Table Headers:** Transformer ID, Date Stamp.
- Table Content:** Date: 25/08/2014, 1 of 1.

The Windows taskbar at the bottom shows the system time as 5:19 PM on 8/25/2014.

Temperature Profile & Oil ...

localhost:54419/ReoprtTemp.aspx

Sub-Station Monitoring System

### Temperature Level Report

Transformer ID: BSES-R-SEC7-SUB15-T1 Date: 28/08/2014

Report Name: t

Description:

Report

1 of 1

BESRajdhani Power Lim

Report Name: t

Report Date: 25/08/2014

Report Date: From: 28/08/2014 To: 28/08/2014

Description:

Transformer ID: BSES-R-SEC7-SUB15-T1

Time	R Temp	Y Temp	B Temp	Oil Temp
Temperature Profile No Data Available				

Date :25/08/2014

5:25 PM 8/25/2014

Report

localhost:54419/Power\_Consume.aspx

Sub-Station Monitoring System

### Power Consumption Report

Transformer ID: 1S-DL-HM-25-990H Start Date: 03/08/2013 End Date: 25/08/2014

Report Name: Power Consumption Report

Description:

Report

1 of 1

Report Name: Power Consumption Report

Report Date: 25/08/2014

Report Date: From: 03/08/2013 To: 25/08/2014

Description:

Duration	Total Energy (kWh)
03 Dec 2013	0.000

Power consumption

12/3/2013  
Duration

5:28 PM 8/25/2014