AUTOMATIC AXLE BOX TEMPERATURE RECORDING SYSTEM

Axle box temperatures in coaches/wagons are being recorded manually with non-contact thermo hunters by two staff on either side of the rake after the train halts in a station. The staff on offside is experiencing difficulty in the absence of clear path way for movement and obstructions like water hydrants. Staff on the PF side also experience similar hindrance as it is difficult for him to reach out to the axle box from the PF as the gap between coach and PF is too narrow to allow the focused rays.

To overcome these shortcomings, Chennai Division has developed a computerised temperature recorder and installed at the following locations,

S.No	Location	Working from	Photos
1	DN Main line of AJJ-KPD section near LC53/KPD	19-06-2018	
2	UP Main Line at TPT End/JTJ	18-01-2019	
3	UP Main Line of GDR-MAS section near LC 76/NYP	09-02-2019	

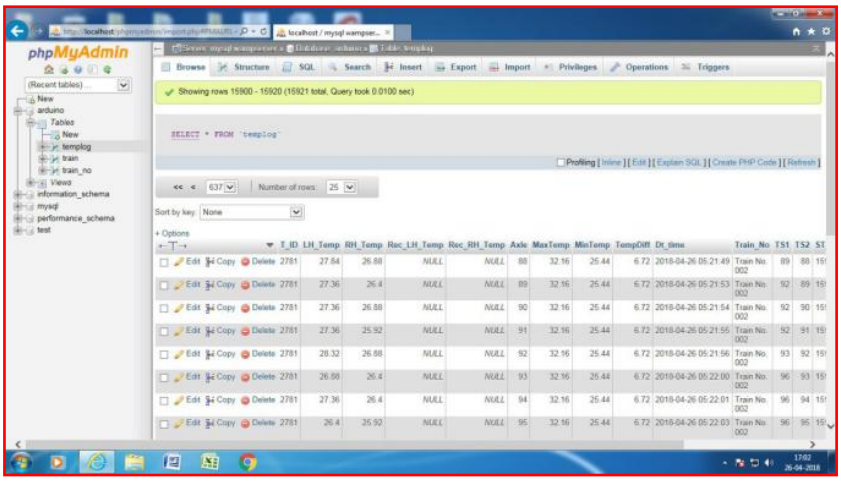
WORKING PRINCIPLE:

This System Consists of 2 recording devices one (proximity sensor) for counting the Axles and the other (infra red thermo sensor) for recording the Axle Box temperature.

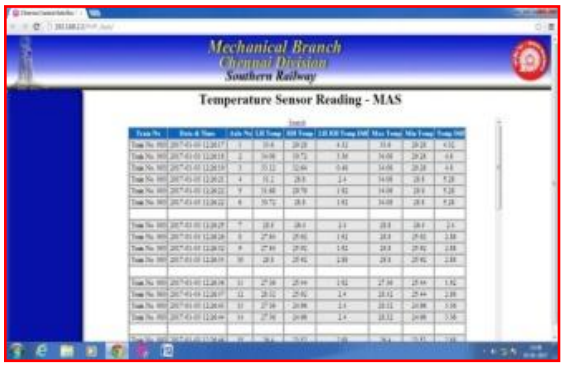
Proximity Sensor fitted inside the track

Infra Red Thermo Sensor fitted on either side

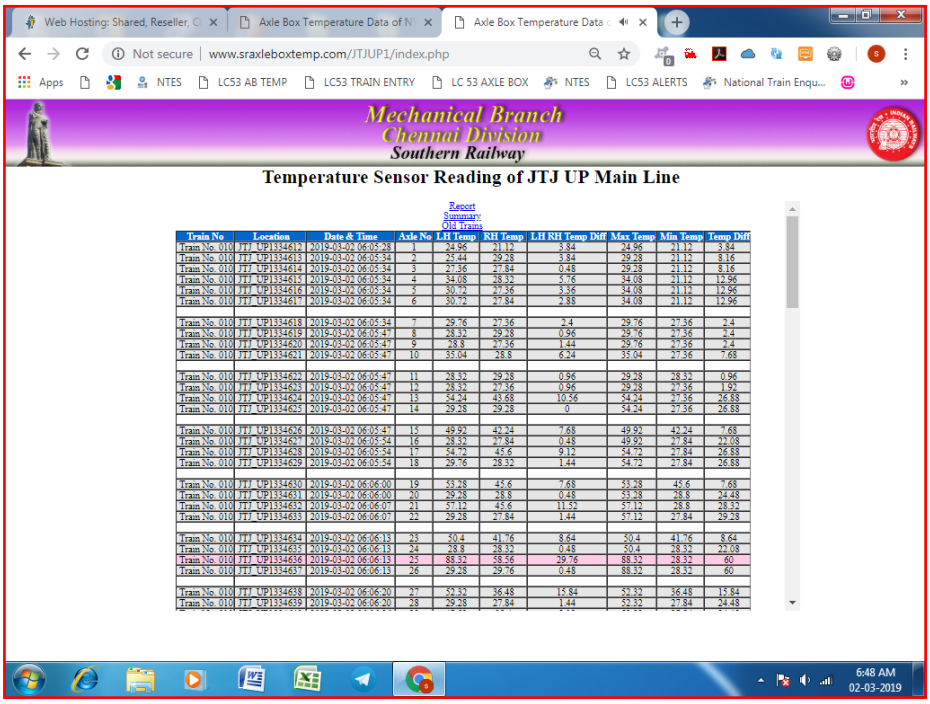
The recorded temperatures are saved in a PC provided at the site in MySQL Database.



The saved data are transferred to centralized web server and that data can be viewed through URL : **www.sraxleboxtemp.com**.

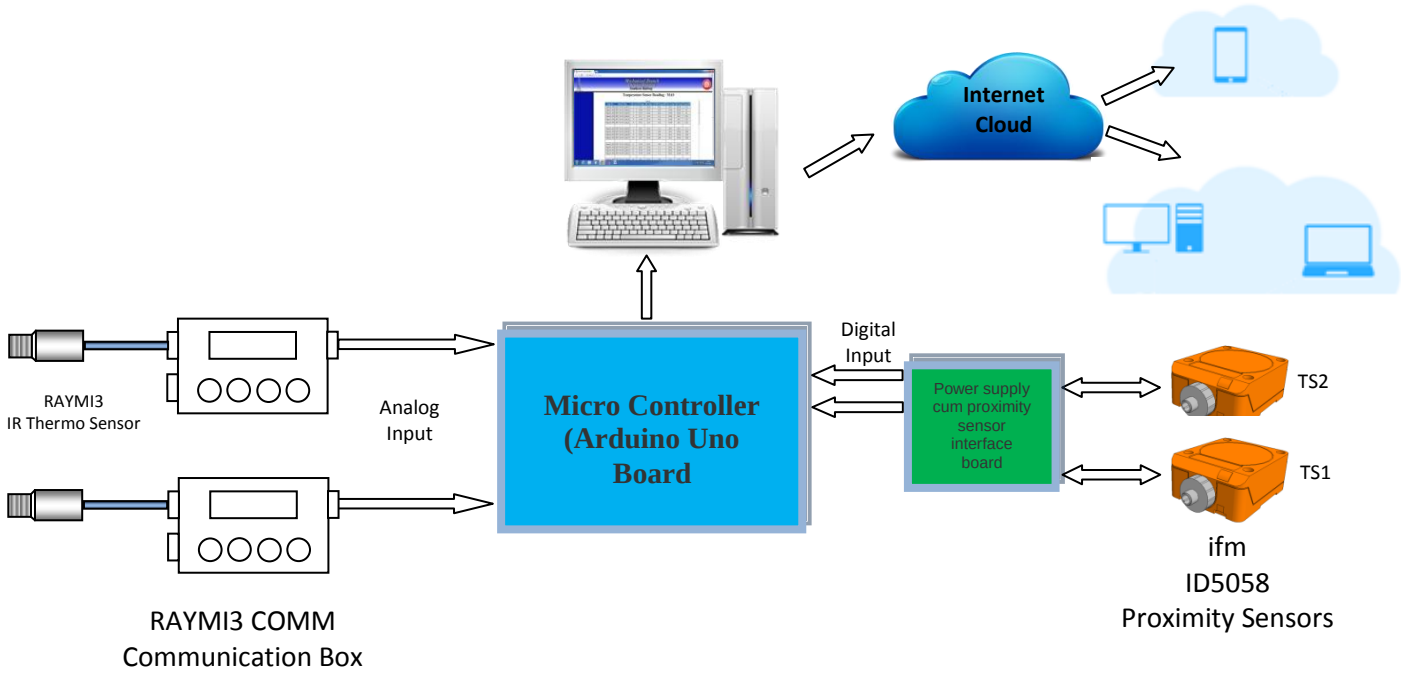


The application page gives colour indication and buzzer sound when the temperature of Axle Box is more than 60^{0}C or the difference in temperature between two axles in a rolling stock exceeds 20^{0}C.

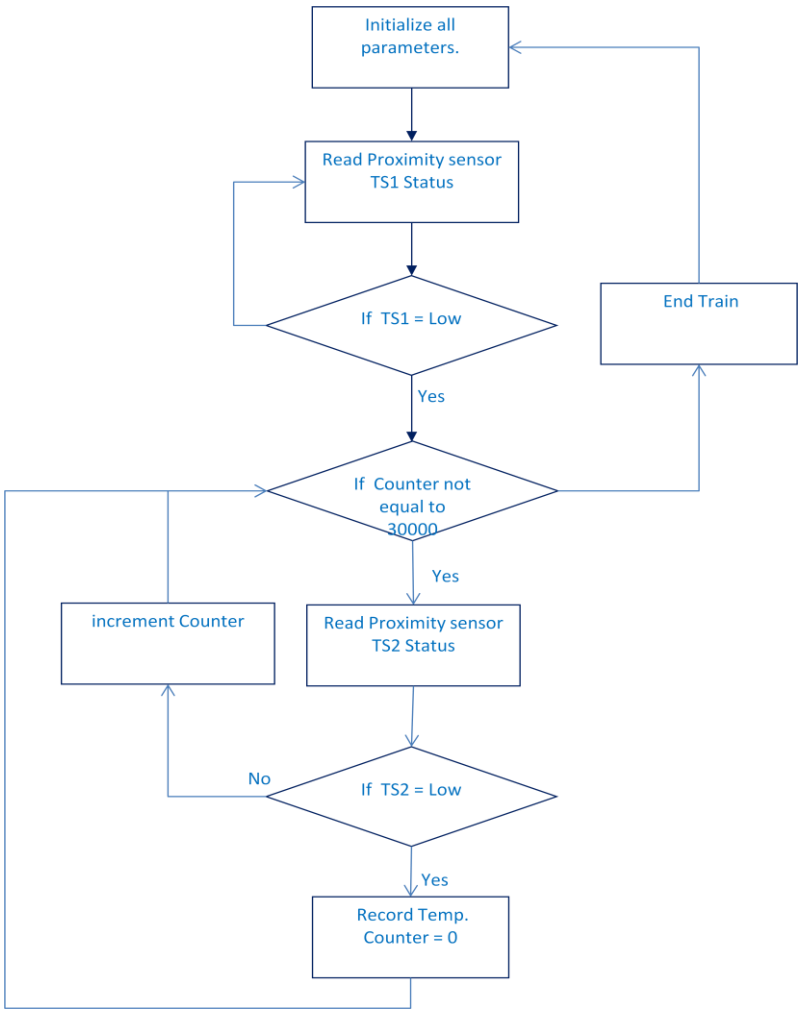


Method of working:

In this system Analog output of LH & RH - IR Temperature sensors and digital output of proximity sensors are connected to a Micro Controller Board(Arduino Uno) and the microcontroller acts as brain of the system. The USB port of Micro controller is connected to a mini computer available in the field unit.



ALGORITHM OF WORK FLOW



The Micro controller continuously monitors the status of proximity sensors TS1 & TS2. In normal condition, Proximity Sensor TS 1 and TS 2 remain high (5 V). When the first axle of the vehicle touches TS1, it becomes low (0 V) and starts counting the Axle numbers when the wheel moved over TS2. The Micro controller starts capturing LH & RH temperature of the Axle Box with the axles passing over TS2 and transfer the data to mini compute through Serial port. The Visual Basic program running on the computer captures the readings and stores them on the MySQL database with timestamp (Date and Time of Recording) and Axle Box number. After the passes of all axles the system will wait for 45seconds, if there is no more axle to count, the microcontroller will put “End train”. This will be sensed by VB program running on mini PC and assign a dummy train number to the saved data and transfer the data to centralised web server.

The application page gives colour indication and buzzer sound when the temperature of Axle Box is more than 60^0C or the difference in temperature between two axles in a rolling stock exceeds 20^0C.

Materials Specification:

S.No	DESCRIPTION	QTY	TECHNICAL SPECIFICATION
1	AXLE BOX TEMPERATURE MEASUARING SENSOR (Non-contact IR sensor for high speed measurements)	2 Nos.	• Temperature range: -50 to 975 °C • Optical resolution: 25:1 • Spectral range: 8 - 14 µm • System accuracy (at ambient temperature 23 ±5 °C) : ±1 % or ±2 °C • **Response time:** Analog output(90%) : 6 ms or better sensitive sensor less than 6ms Digital output(50%) : 3ms or better sensitive sensor less than 3ms • **Environmental rating** Sensing head : IP65 (NEMA-4) Electronic box : IP65 (NEMA-4) • Cable length : 15m • Power Supply : 8–36 VDC
2	PROXIMITY SENSOR	2 No	Electronic rectangular inductive proximity sensor with 50 mm sensing range (flush mountable) with normally open/closed output function, evcoie connector and cable of 15 meter length, operating voltage: 10 to 30 v DC, make: IFM NO. 5058 or equivalent
3	METAL BOX	1 No	4*3 feet box. Drawing enclosed
4	Control unit	1 unit	ATMEL Based microcontroller board
5	Modem	1 No.	Integrated GPRS/GSM modem including SIM with 2 years internet & SMS package.
6	Embedded PC (Industrial)	2 Nos.	DUAL CORE CORE 2 DUO CELERON PROCESSOR OR HIGHER HAVING HDMI/VGA/LVDS WITH • 8GB OF DDR3L 1333 RAM, • MINIMUM 1 COM PORT 3.5 OR 25: • 64 GB SATA HDD • ONE MINIPCI WHICH SUPPORTS WIFI, • MINIMUM 2 USB. • OS WINDOWS 7 OR HIGHER MODEL 101 1900 OR EQUIVALENT
7.	ELECTRICAL and Earth pit		Up to 30mtrs electrical connection including earth work if needed. Earth pit to be provided by the firm near field unit.
8.	Commercial LED TV 24*7	1 no.	32” COMMERCIAL 24*7 LED DISPLAY
9.	Fixing Brackets for proximity & IR Temperature sensor	Each 2 Nos.	As per requirement.
10.	Base for fixing IR temp. sensor bracket.	2 Nos.	1’ X 1’ concrete base to a height of rail level on either side of the track with Anchor bolt

DETAILS OF HOT BOX DETECTOR AT MAS DIVISION

Location	No. of Hot Box detectors installed	Date of installation	Make	No. Of Axles Recorded	No. of Cases detected	No. of Cases of Hot Axel	Other cases detected	Other cases found > 65^0 C detected
LC53/KPD DN Main Line	01	19-06-2018	INDIGENEOUS	5,50,556	4	1	3(3 WARM BOX)	152
UP MAINLINE AT TPT END/JTJ	01	18-01-2019	INDIGENEOUS	1,67,958	-	-	-	46
LC76/NYP/UP MAINLINE	01	09-02-2019	INDIGENEOUS	37,850	-	-	-	2

NUMBER OF CASES DETECTED: 3

DATE	TRAIN / WAGON NO	AXLE BOX TEMP	DETACHED AT
13-02-2019	FCOP/PLMD/BCN-SE BCNAM1 30079373613 (LD)KGPW:09.05.18 RD:06/19	R4-**98^{0}C**	JTJ
14-02-2019	WFD/CONT/CN BLCB 62250425279 (LD) RYPS:28.10.15 MNGT:22.12.18 RD:06/20	R4-**92^{0}C**	JTJ
18-02-2019	WFD/CONT/CN BLCB 62250004634 (LD) KTTW:04.08.15 MNGT:23.10.18 RD:03/20.	**L4-70^{0}C**	JTJ