

GKN Automotive

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Overview Obiective:

Design and fabricate a modular machine data acquisition system to detect potential failures in Station 190 on the C1-PTU assembly line.

Specifications

Measurements

- Humidity
- Ambient temperature
- Vibration

Analysis

· Graphical plots of live measured data to spot unusual activity

Data Access

· Wi-Fi or Bluetooth access to microcomputer

Mountina

- · Modular system with easy install Sensors
 - Quick and easy installation
 - · Minimal interference to system if a sensor fails
 - As close as possible to point of action

Unit

- Able to run on electrical power or battery power
- Quick and easy to replace any failed parts
- Designed to withstand industrial environment

Description of Design

All sensors from NCD

- · Wall-Mounted or Magnet Mounted
- IP65 Rated Enclosure
- · Includes battery level with every transmission

Vibration & Temperature Sensor

- Sample rate up to 25,600 Hz
- Calculates RMS, MAX g Vibration, Velocity Vibration, Displacement, Peak Vibration Frequency
- · External probe option for vibration sensor
- Up to 500,000 transmissions from 6 AA batteries
- Measures temperature within 1°C

Humidity and Temperature Sensor (x2)

- · Sensor resolution of ±0.2°C and ±2%RH (relative humidity)
- Up to 500.000 transmissions from 4 AA batteries

USB Modem

- · Communicates wirelessly with all sensors
- · No power adapter, runs off USB
- Range of two miles
- Maximum load of 128 sensors

Microcomputer: Provided by GKN

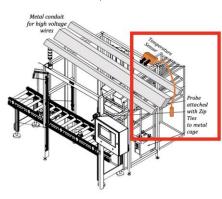
Implementation

- Connect Modem to Microcomputer to communicate to all sensors
- · Node-red process the data, displaying it visually and storing it in CSV files for later analysis
- Monitor data for abnormalities and set thresholds for temperature, humidity, and vibration
- Predict failures in both the station 190 and the product it is manufacturing

Placement of Sensors

Temperature Sensor





Station 190 Press View

Station 190 Birds Eye View

User Manual

- Installation and Setup
- Node-RED Operation
 - Full system setup for each sensor
 - · How each node works
- Sensor placement, battery replacement, setting limits
- Troubleshooting
 - Several online resources
- Bill of Materials
 - · Links to each component

User Interface Tabs

Current

 Shows data from the last 30 minutes as well as battery voltage

History

- Shows historic data for the last 24 hours Files
 - Shows all the files for each sensor for each day
 - · Data can be graphed or downloaded if needed



Data Analysis

After reviewing the provided data there were no distinct outliers to indicate any fault in the sensors' readings or a failure in Station 190

	A	D	C	D E		G	M		J	X	L
	Simestamp	temperature	humidity	Sirsestamp	temperature	humidity		Smestamp	a displacement mm	y displacement mm	I displacement mm
	1.646976+13	74.226	26.91	1.646545+12	72,644	40.91		1.6465+12			
	1.646976+13			1.646545+13				1.6465+12			
	1.646976+13	74.049	25.99	1.646545+13	72,663	40.90		1.6665+12			
	1.646995413	74.21	25.51	1,646545+13	72,644	40.97		1.6465+12			
	1.646980+13	74,226	40	1.646540+12	72,690	40.94		1.6465+12			
	1.646580+13	74.066	40.13	1.646540+13				3.6460+12			
	1.040550+13	74.066	40.07	1.646540+13	72,626	41.24		1.6465+12			
	1.646550+12	73.576	40.05	1.646540+12	72,644	40.88		1.6460+12			
o	1.646552+12	73.54	40.1	1.646545+12	72,663	40,77		1.6465+12			
	1.646585+13	79.522		1.646545+12				1.6465+12			
	1.646980+13	74.048	40.09	1.646546+12	72,734	40.99		1.6065+12			
	1.64699(+13	74.156	40.09	1.646540+12	72,644	40.8		1.6466+12			
4	1.646996+13			1.64654E+12	72.626	40.91		1.6466+12			
	1.606995+13	76.21	40.12	1,646545+13	72.56	41.21		1.6065+12			