



Maintenance Log Reporting App

Stack

- **Frontend** - React + Vite + Tailwind CSS
- **Backend** - Express.js + Node.js
- **Database** - PostgreSQL + Supabase
- **Deployment** - Vercel + Render

Purpose of the project

The main goal of this project is to

- Log and manage all maintenance activities happening inside a factory - routine, preventive, predictive, breakdown, implementation across machines and departments.
- Track worker attendance and shifts - across three shift timings along with a general shift
- Evaluate the workforce performance based on the hours of work done by each user.
- Real time monitoring of what all machines are being worked under at a particular time.
- Generate insights on machine maintenance frequency and workplace productivity for better decision making

▼ Role Based Access

This app will be used by a hierarchy of 4 levels

- Maintenance Head
- HOD of all departments where the different machines come under
- Shift workers (work in specific shifts)
- General shift workers (work in the main general shift)
- **Maintenance Head** → Has full access to all departments, machines, attendance, and performance reports; oversees overall maintenance operations.
- **Department HOD** → Manages machines and workers within their department, reviews maintenance logs, and monitors department-specific performance.
- **Shift Workers** → Work in assigned shifts, log routine readings, report breakdowns, and perform preventive/predictive maintenance tasks.
- **General Shift Workers** → Work in the main shift (8:30–5:00) handling general maintenance, implementation tasks, and supporting other maintenance activities.
- Shift and general workers are either mechanical or electrical workers.

▼ Shifts

Shift	Timing	Break Duration	Description
Shift 1	06:00 – 14:30	45 min (tea + breakfast)	Early morning shift
Shift 2	14:30 – 23:00	45 min (tea + dinner)	Afternoon to late evening shift
Shift 3	23:00 – 06:00	15 min (tea)	Night shift with minimal break
General Shift	08:30 – 17:00	1 hr (15+30+15) - 2 tea break + lunch break	Standard daytime shift for general workers

Expected Working Hours = Total shift duration – Break duration

- Shift 1 & 2 → **8 hrs 30 min – 45 min = 7 hrs 45 min expected**
- Shift 3 → **7 hrs – 15 min = 6 hrs 45 min expected**
- General Shift → **8 hrs 30 min – 1 hr = 7 hrs 30 min expected**

▼ Work Types

Work Type	Description
Routine	Daily logging of machine readings (weight, temperature, pressure calibrations.)
Preventive	Scheduled maintenance to avoid potential failures
Breakdown	Emergency repair of sudden machine failures
Predictive	Calibration & adjustments based on sensor data trends (weight, temperature, pressure)
Implementation	New installations, upgrades, or infrastructure work around machines

▼ Worker performance evaluation

At the **end of each month**, the system calculates:

$$\text{Monthly Performance (\%)} = \left(\frac{\text{Total Effective Hours Worked in Month}}{\text{Expected Working Hours in Month}} \right) \times 100$$

Grade	Monthly Performance (%)	Meaning
A	≥ 95%	Excellent – eligible for increment consideration
B	85% – 94%	Very Good – meets expectations
C	75% – 84%	Satisfactory – acceptable performance
D	60% – 74%	Below Average – needs improvement
E	< 60%	Poor – subject to review/warning

Expected Working Hours (per month) = Sum of all assigned shifts' durations (excluding breaks).

Based on the grades he gets, he will be getting his increment.

▼ Machine Monitoring

Machine Parameter	What it Tracks	Why It's Important
Machine Status	Running, Under Maintenance, Idle	Shows current operational state
Usage Frequency	How many times the machine was worked on (attendance logs linked to it)	Helps identify overused or underutilized machines
Maintenance Frequency	Number of maintenance logs (routine, preventive, breakdown)	Helps analyze reliability and schedule preventive work
Breakdown Count	How often the machine failed in a given period	Identifies problematic machines needing replacement/upgrades
Downtime Hours	Total hours machine was unavailable due to breakdowns	Helps calculate production loss
Department	Which department the machine belongs to	Allows department-wise machine analytics

This way, **Maintenance Head or HOD** can see:

- Which machines are **currently active**
- Which machines need **frequent maintenance**
- Which departments have **high downtime**

▼ Analytics

Analytics Type	What It Shows	Who Uses It
Worker Attendance Report	Total shifts worked, effective vs expected hours	Maintenance Head, HOD
Performance Grading	Monthly performance rating (A–E) based on hours worked	Maintenance Head, HOD
Real-Time Workforce View	Who is currently working, on which machine, and what task	Maintenance Head
Machine Usage Analytics	How often each machine is used, by which workers	HOD, Maintenance Head
Maintenance Frequency Report	How many routine, preventive, breakdown, predictive tasks logged for each machine	Maintenance Head
Downtime & Breakdown Analysis	Total downtime hours and failure frequency for machines	Maintenance Head
Department Productivity	Attendance & maintenance workload stats per department	HOD, Maintenance Head

Database schemas

▼ users

Column	Type	Notes
id (PK)	uuid	Unique user ID

Column	Type	Notes
name	varchar	Full name
email	varchar	For login (Supabase Auth)
role	enum(head , hod , shift_worker , general_worker)	Defines access level
department_id	uuid FK → departments.id	Null for Head
created_at	timestamp	Auto timestamp

▼ departments

Column	Type	Notes
id (PK)	uuid	Dept ID
name	varchar	Dept name (e.g., Electrical, Assembly)

▼ machines

Column	Type	Notes
id (PK)	uuid	Machine ID
name	varchar	Machine name
department_id	uuid FK → departments.id	Machine belongs to dept
status	enum(running , under_maintenance , idle)	Current state

▼ Shifts

Column	Type	Notes
id (PK)	uuid	Shift ID
name	varchar	Shift 1, 2, 3, General
start_time	time	Start time
end_time	time	End time
break_minutes	int	Break duration in minutes

▼ worker attendance

Column	Type	Notes
id (PK)	uuid	
worker_id	uuid FK → users.id	Who worked
shift_id	uuid FK → shifts.id	Which shift
machine_id	uuid FK → machines.id	Which machine
check_in	timestamp	Start time
check_out	timestamp	End time
effective_hours	numeric	(check_out - check_in - break)
expected_hours	numeric	Based on shift
performance_rating	char(1)	A–E (optional, can be computed via view)

▼ maintenance logs

Column	Type	Notes
id (PK)	uuid	
machine_id	uuid FK → machines.id	Which machine
reported_by	uuid FK → users.id	Who reported
assigned_to	uuid FK → users.id	Who is fixing
work_type	enum(routine , preventive , breakdown , predictive , implementation)	Type of work
reading_value	jsonb	Sensor readings (for routine/predictive)
downtime_hours	numeric	For breakdown
status	enum(pending , in_progress , completed , verified)	
reported_at	timestamp	
completed_at	timestamp	
verified_by	uuid FK → users.id	
verified_at	timestamp	

▼ performance reports

Column	Type	Notes
worker_id	uuid	
total_worked	numeric	Sum of effective_hours
total_expected	numeric	Sum of expected_hours
monthly_perf	numeric	Percentage worked
grade	char(1)	A–E