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COLLEGE OF ENGINEERING
NAAC Accredited Autonomous Institution
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Thalavapalayam, Karur – 639 113.

A Minor Project Report
on

FUEL TANK MONITORING AND THEFT DETECTION SYSTEM

Submitted by

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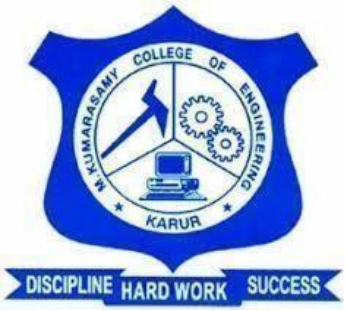

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

M. KUMARASAMY COLLEGE OF ENGINEERING

(An Autonomous Institution Affiliated to Anna University, Chennai)

THALAVAPALAYAM, KARUR-6369113.

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M.KUMARASAMY COLLEGE OF ENGINEERING

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BONAFIDE CERTIFICATE

Certified that this Report titled **"FUEL TANK MONITORING AND THEFT DETECTION SYSTEM"** is the bonafide work of **MADHUMITHA K (927622BEE066), SANTHOSH S (927622BEE097**), **SHOBIYA D (927622BEE108), SURENDAR M (927622BEE120)** who carried out the work during the academic year (2024-2025) under my supervision. Certifiedfurther that to the best of my knowledge the work reported herein does not form part of anyother project report.

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DECLARATION

We affirm that the Minor Project IV report title **"FUEL TANK MONITORING AND THEFT DETECTION SYSTEM"** being submitted in partial fulfillment for the award of **Bachelor of Engineering in Electrical and Electronics** is the original work carriedout by us.

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VISION AND MISSION OF THE INSTITUTION

VISION

- ✓ To emerge as a leader among the top institutions in the field of technical education

MISSION

- ✓ Produce smart technocrats with empirical knowledge who can surmount the global Challenges.
- ✓ Create a diverse, fully-engaged, learner - centric campus environment to provide Quality education to the students.
- ✓ Maintain mutually beneficial partnerships with our alumni, industry, and Professional associations.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

VISION

To produce smart and dynamic professionals with profound theoretical and practical knowledge comparable with the best in the field.

MISSION

- ✓ Produce hi-tech professionals in the field of Electrical and Electronics Engineering by inculcating core knowledge.
- ✓ Produce highly competent professionals with thrust on research.
- ✓ Provide personalized training to the students for enriching their skills.

PROGRAMME EDUCATIONAL OBJECTIVES(PEOs)

- ✓ **PEO1:** Graduates will have flourishing career in the core areas of Electrical Engineering and also allied disciplines.
- ✓ **PEO2:** Graduates will pursue higher studies and succeed in academic/research careers
- ✓ **PEO3:** Graduates will be a successful entrepreneur in creating jobs related to Electrical and Electronics Engineering /allied disciplines.
- ✓ **PEO4:** Graduates will practice ethics and have habit of continuous learning for their success in the chosen career.

PROGRAMME OUTCOMES(POs)

After the successful completion of the B.E. Electrical and Electronics Engineering degree program, the students will be able to:

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/Development of solutions: Design solutions for Complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal and environmental considerations.

PO4: Conduct Investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6:The Engineer and Society: Apply reasoning in formed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7:Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and Team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multi-disciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES(PSOs)

The following are the Program Specific Outcomes of Engineering Students:

- **PSO1:** Apply the basic concepts of mathematics and science to analyse and design circuits,controls, Electrical machines and drives to solve complex problems.
- **PSO2:** Apply relevant models, resources and emerging tools and techniques to providesolutions to power and energy related issues & challenges.
- **PSO3:** Design, Develop and implement methods and concepts to facilitate solutionsfor electrical and electronics engineering related real-world problems.

Abstract (Key Words)	**Mapping of POs and PSOs**
Fuel level sensing, SMS/app alerts, vehicle tracking, fuel invoice generation	PO1, PO2, PO3, PO4, PO5, PO6, PO7,PO8, PO9, PO10, PO11, PO12 PSO1, PSO2, PSO3.

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ABSTRACT

This project focuses on developing a Fuel Theft Detection and Monitoring System aimed at preventing unauthorized fuel usage in vehicles, particularly in commercial transport. The system continuously monitors the fuel level using a sensor installed in the fuel tank. If a sudden drop in fuel is detected while the vehicle is turned off or parked, the system identifies it as a possible theft and immediately sends an alert to the owner's mobile phone via SMS or a connected app. A GPS module is used to track the real-time location of the vehicle, enhancing security and enabling efficient fleet management. Additionally, the system records fuel refilling events, capturing data such as the amount of fuel added, time, and location. This data is used to generate digital fuel invoices, which help in verifying fuel expenses and maintaining accurate records. The project integrates hardware components like a microcontroller (STM32), GSM module, GPS module, and fuel level sensor, along with a mobile or web-based application for user interaction. This smart solution improves fuel management, prevents theft, and adds transparency to fuel usage, making it highly useful for transport companies, logistics services, and individual vehicle owners.

CHAPTER 1
LITERATURE REVIEW

Paper 1: Smart Fuel Monitoring System for Vehicles Using IoT

Inference: This paper introduces an IoT-based smart fuel monitoring system that measures fuel levels using ultrasonic sensors and sends data to the cloud. It also detects fuel theft and allows remote monitoring. The system uses GSM and GPS modules for alerting and location tracking. This research supports the idea of integrating fuel sensors with communication modules, which is also a key feature in our project. It highlights the efficiency of real-time fuel monitoring through a mobile interface.

Paper 2: Vehicle Fuel Theft Detection and Vehicle Tracking System

Inference: This paper proposes a system that uses a float-based fuel sensor to detect theft and a GPS module to track the vehicle's location. The data is transmitted using a GSM module. The authors emphasize the importance of alert mechanisms via SMS. This paper closely aligns with our approach and validates the use of GPS and GSM technologies for theft detection and vehicle monitoring.

Paper 3: Design and Implementation of Vehicle Fuel Tracking System Using Arduino

Inference: This study describes a low-cost fuel tracking system using Arduino, ultrasonic sensors, and GSM modules. It focuses on preventing unauthorized fuel usage and provides real-time updates to the user. The research confirms that microcontroller-based fuel tracking systems are feasible and effective, similar to our use of STM32 in place of Arduino for improved performance.

Paper 4: IoT Based Vehicle Tracking and Fuel Monitoring System

Inference: This research integrates fuel level sensing, GPS tracking, and cloud data storage. The authors propose using a mobile app to view vehicle location and fuel data, along with push notifications in case of anomalies. This paper supports our goal of developing a user-friendly app that allows owners to monitor fuel usage and get alerts, further validating the use of mobile interfaces for user interaction. Power Management in Wearable Safety Devices

Paper 5: Real-Time Fuel Level Monitoring and Theft Detection Using GSM and GPS

Inference: This paper presents a system that continuously monitors fuel levels and uses a predefined threshold to detect theft. The system sends alerts through GSM and provides GPS location data. The paper's method of setting threshold values for detecting unusual drops in fuel level has been adapted in our project as part of the theft detection logic.

CHAPTER 2

PROPOSED METHODOLOGY

2.1 BLOCK DIAGRAM

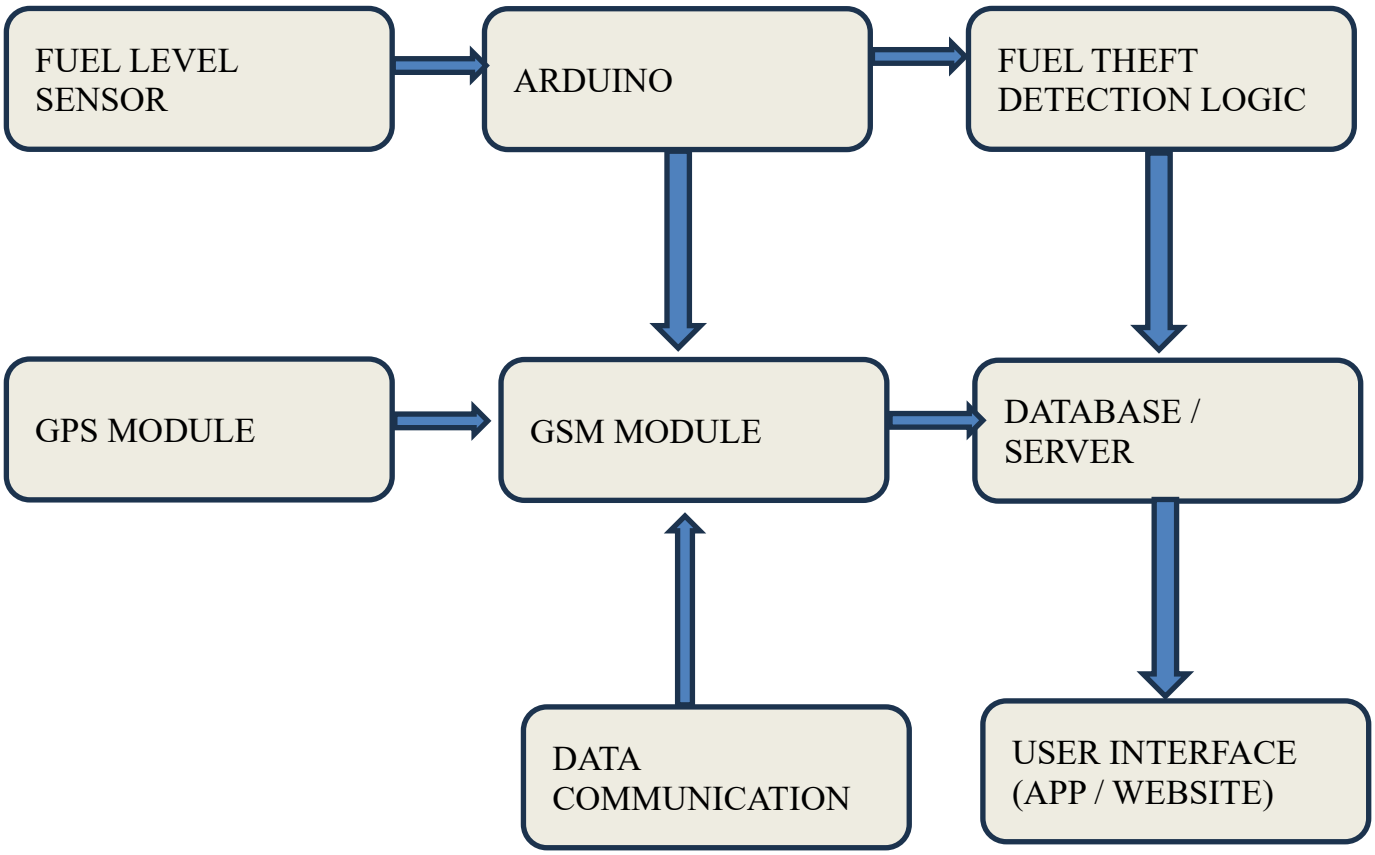

Fig no 2.1 Block Diagram

2.2 DESCRIPTION

The **Fuel Theft Detection and Monitoring System** is a smart solution aimed at preventing unauthorized fuel usage in vehicles. It uses a fuel level sensor to monitor the fuel tank in real-time. If a sudden drop in fuel level is detected while the vehicle is parked or off, it is identified as potential theft. An Arduino microcontroller processes this data and triggers a GSM module to send an SMS alert to the owner. A GPS module is also included to provide the exact location of the vehicle at the time of the incident. This helps in tracking where and when the theft occurred. The system is automatic and requires no manual checking. It is ideal for vehicles used in transport, logistics, and fleet operations.

Along with theft detection, the system also keeps records of every fuel refill. It logs the fuel amount, time, and GPS location, and this data is used to generate a digital invoice. All the data can be viewed through a mobile app or a web interface, allowing the owner to manage fuel usage easily. This helps reduce fuel wastage, ensures transparency, and increases accountability among drivers. The hardware used is simple and cost-effective, making the system suitable for both personal and commercial vehicles. With real-time alerts and location tracking, it enhances vehicle safety and operational control. The system is scalable and can be further improved by integrating cloud storage and advanced analytics. It is a reliable solution for modern fuel management challenges.

CHAPTER 3

RESULT AND DISCUSSION

3.1 HARDWARE COMPONENTS DESCRIPTION

FULE LEVEL SENSOR:

The fuel level sensor is an essential component in a vehicle's fuel system, designed to measure and transmit the amount of fuel in the tank to the dashboard gauge, ensuring accurate fuel monitoring. Typically, it uses a float-and-resistor mechanism, where a floating arm adjusts resistance as fuel levels change, though modern vehicles may employ capacitive, ultrasonic, or magnetic-resistive sensors for greater precision. Common issues include erratic gauge readings, incorrect fuel level indications, or complete sensor failure due to wear, corrosion, or electrical faults. Regular maintenance and timely replacement of a faulty sensor are crucial to prevent inaccurate readings, avoid unexpected fuel depletion, and maintain optimal vehicle performance.

Fig 3.1.1 FUEL LEVEL SENSOR

GSM MODULE:

GSM (Global System for Mobile Communications) is a widely used digital cellular technology that enables voice calls, text messaging (SMS), and data transmission over mobile networks. Developed as a 2G standard, GSM operates on multiple frequency bands (e.g., 900 MHz, 1800 MHz) and uses Time Division Multiple Access (TDMA) to allow multiple users to share the same frequency channel efficiently. Key features include SIM (Subscriber Identity Module) cards for user identification, encryption for secure communication, and roaming support across networks globally.

GPS:

GPS (Global Positioning System) is a satellite-based navigation system that provides precise location and time information anywhere on Earth. Operated by the U.S. government, it consists of a constellation of at least 24 satellites orbiting the planet. GPS receivers (like those in smartphones or car navigation systems) calculate their position by measuring signals from multiple satellites, using trilateration for accuracy within meters (or centimeters with advanced techniques).

Fig 3.1.2 GPS MODULE

ARDUINO:

Arduino is an open-source electronics platform widely used for prototyping and DIY projects, combining user-friendly hardware (like the Uno, Nano, or ESP32 boards) with a simple software IDE based on C++. It allows users to read inputs from sensors (e.g., temperature, motion) and control outputs (e.g., motors, LEDs, displays) through programmable logic, making it ideal for robotics, IoT devices, home automation, and educational purposes. With a vast library ecosystem, active community support, and cross-platform compatibility, Arduino simplifies embedded system development—though it lacks the computational power of single-board computers like the Raspberry Pi.

Fig 3.1.3 ARDUINO

RELAY MODULE:

A **relay module** is an electrically operated switch that enables low-power control signals (from devices like Arduino or Raspberry Pi) to safely manage high-power circuits, such as lights, motors, or household appliances. It acts as a bridge between delicate electronics and high-voltage/current loads, providing isolation to prevent damage from voltage spikes or surges. Common types include mechanical relays (with physical contacts for heavy-duty switching) and solid-state relays (SSR, which are silent and wear-free but generate heat). Relay modules often feature optocouplers for electrical isolation and come in various configurations (single or multi-channel) to control multiple devices. They are widely used in home automation, industrial systems, and IoT projects for secure power management.

Fig 3.1.4 RELAY MODULE

3.2 HARDWARE KIT

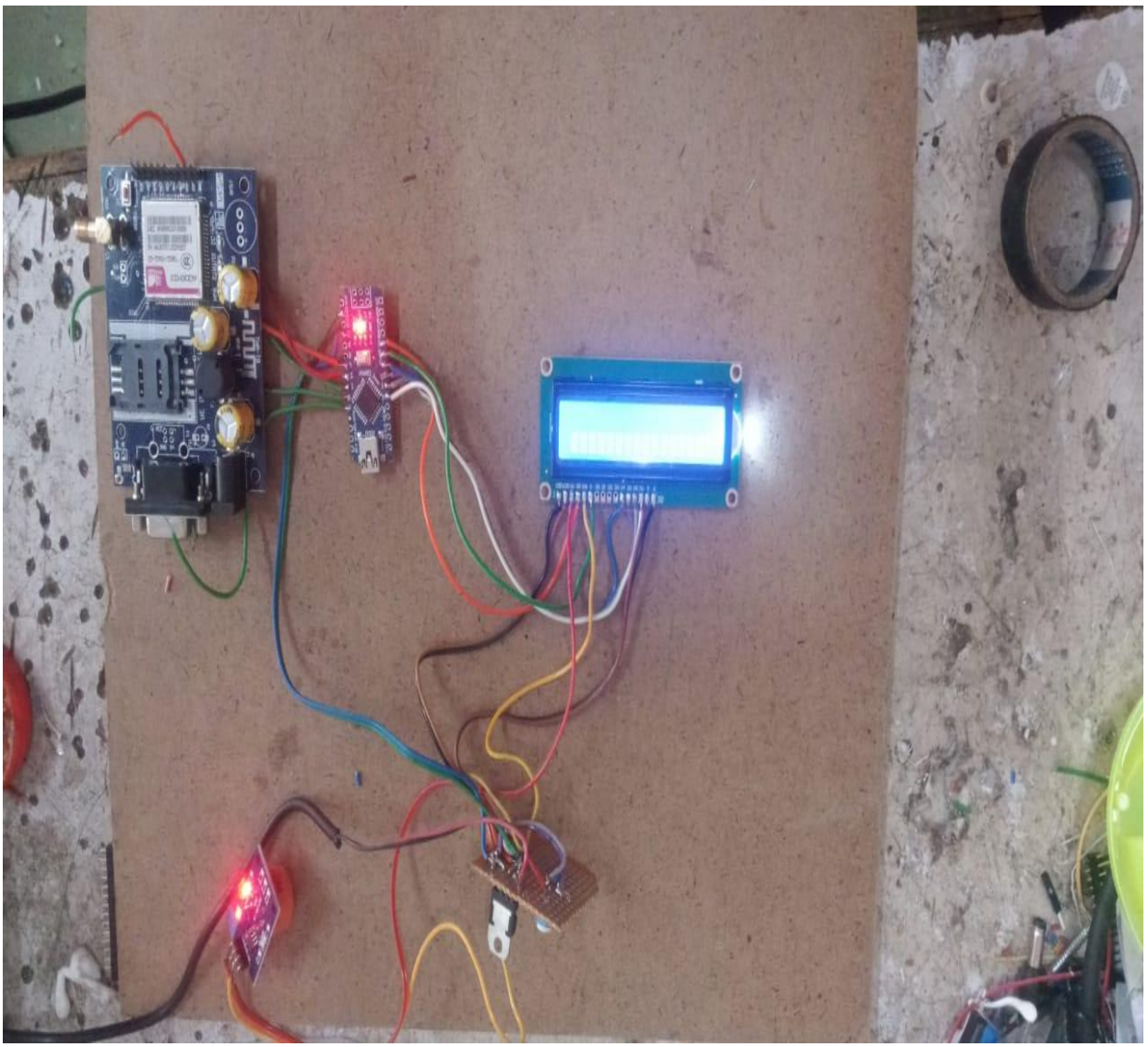

Fig 3.2 Hardware Kit

3.3 WORKING PRINCIPLE

The Fuel Theft Detection and Monitoring System functions on the principle of real-time fuel level sensing and vehicle location tracking using embedded electronics. It aims to detect unauthorized fuel removal and notify the vehicle owner or fleet manager immediately through a GSM-based alert system. The system is capable of monitoring fuel levels continuously and operates even when the vehicle is parked, helping prevent unnoticed fuel theft.At the heart of the system is a microcontroller (like Arduino or similar), which collects fuel level data from a sensor mounted in the fuel tank. Depending on the design, the sensor may be float-based, ultrasonic, or capacitive. These sensors provide real-time information about the fuel quantity. Under normal operation, the fuel level decreases gradually. If the system detects a sudden drop in fuel when the engine is off or the vehicle is stationary, it flags this as potential theft.

When abnormal fuel loss is detected, the microcontroller triggers a GSM module to send an SMS alert to the registered user. The alert includes theft details such as the time and amount of fuel lost. This allows the owner to take immediate action and investigate the situation.Simultaneously, the system employs a GPS module to log the vehicle's real-time location. This location data helps track where and when the fuel theft or refill occurred. During refueling, the system records the volume of fuel added, time, and location, and uses this information to automatically generate a digital invoice.All the system data—including fuel levels, alerts, and location history—is accessible through a mobile app or web dashboard. This platform enables users to monitor vehicles remotely, view theft events, check refueling records, and access digital fuel invoices easily.

CHAPTER 4

CONCLUSION

In conclusion, The Fuel Theft Detection and Monitoring System provides a smart, reliable, and cost-effective solution to one of the major challenges faced in the transportation and logistics sector—fuel theft. By integrating real-time fuel level monitoring with GPS tracking and GSM communication, the system ensures that any unauthorized fuel withdrawal is immediately detected and reported. The added functionality of automatic fuel invoice generation and vehicle location tracking improves overall transparency and efficiency in fuel management. This project not only helps in preventing fuel theft but also assists in keeping accurate fuel records, making it highly beneficial for individual vehicle owners as well as fleet operators. With its user-friendly interface and automated features, the system minimizes manual effort, enhances vehicle security, and contributes to better operational control. Overall, this project successfully demonstrates how embedded systems and communication technologies can be combined to solve real-world problems in a practical and efficient manner.

PROJECT – TOTAL COST

S.NO	COMPONENT DESCRIPTION	QUANTITY	COST
01	**FUEL LEVEL SENSOR**	1	150
02	**GSM MODULE**	1	150
03	**GPS MODULE**	1	340
04	**ARDUINO**	1	395
05	**RELAY MODULE**	1	165
		TOTAL	1200

Table1-Total cost

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