UNIVERSITY OF GHANA

COLLEGE OF BASIC AND APPLIED SCIENCES

SCHOOL OF ENGINEERING SCIENCES

Department of Computer Engineering

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CPEN 211: Database System Design

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DATABASE PROJECT :2

AIRPORT SHELL DATABASE REPORT

ABSTRACT

Airport Shell is a popular and expanding fuel filling station located close to the Kotoka International Airport. With the growth of business operations over time, the management of Airport Shell has decided to automate its activities to provide better service to its customers. This paper describes the process of automating the filling station's activities and the benefits it will bring to customers and the business as a whole.

INTRODUCTION

The Airport Shell filling station, located in proximity to Kotoka International Airport, has seen a significant rise in business operations due to its strategic location and high-quality services. However, as the business expanded, the manual processes used to serve customers began to pose challenges for both the staff and customers. To overcome these challenges and provide better service, the management of Airport Shell has decided to automate all its activities. This automation is expected to reduce waiting time, eliminate errors, and improve overall customer experience. This paper will outline the steps taken by Airport Shell to automate its activities and how it will improve its service to customers. Additionally, it will also discuss the potential benefits of automation for the business as a whole.

METHODOLOGY

As a database expect I took the following steps to arrive at the solution to the problem.

- Understand the current processes of the filling station, including the different activities, operations, and services offered and
- Conduct a comprehensive analysis of its current manual processes. This analysis will help identify the various tasks, workflows, and data flows involved in the filling station's activities, including customer details, transaction records, inventory, and supplier information.
- Analyze the relationships between the different data entities to create a comprehensive entity-relationship diagram (ERD) that shows the different entities and how they are related.
- Design and create the actual database by implementing the entity-relationship diagram. This involves creating tables for each entity, defining their attributes, and establishing relationships between them using foreign keys.
- Populate the database with relevant data and perform tests to ensure that the database is functioning correctly.

IMPLEMENTATION OF THE STEPS

After identifying and understanding the problem at hand, the following entities and relationships exist in the Airport Shell Filling Station database system:

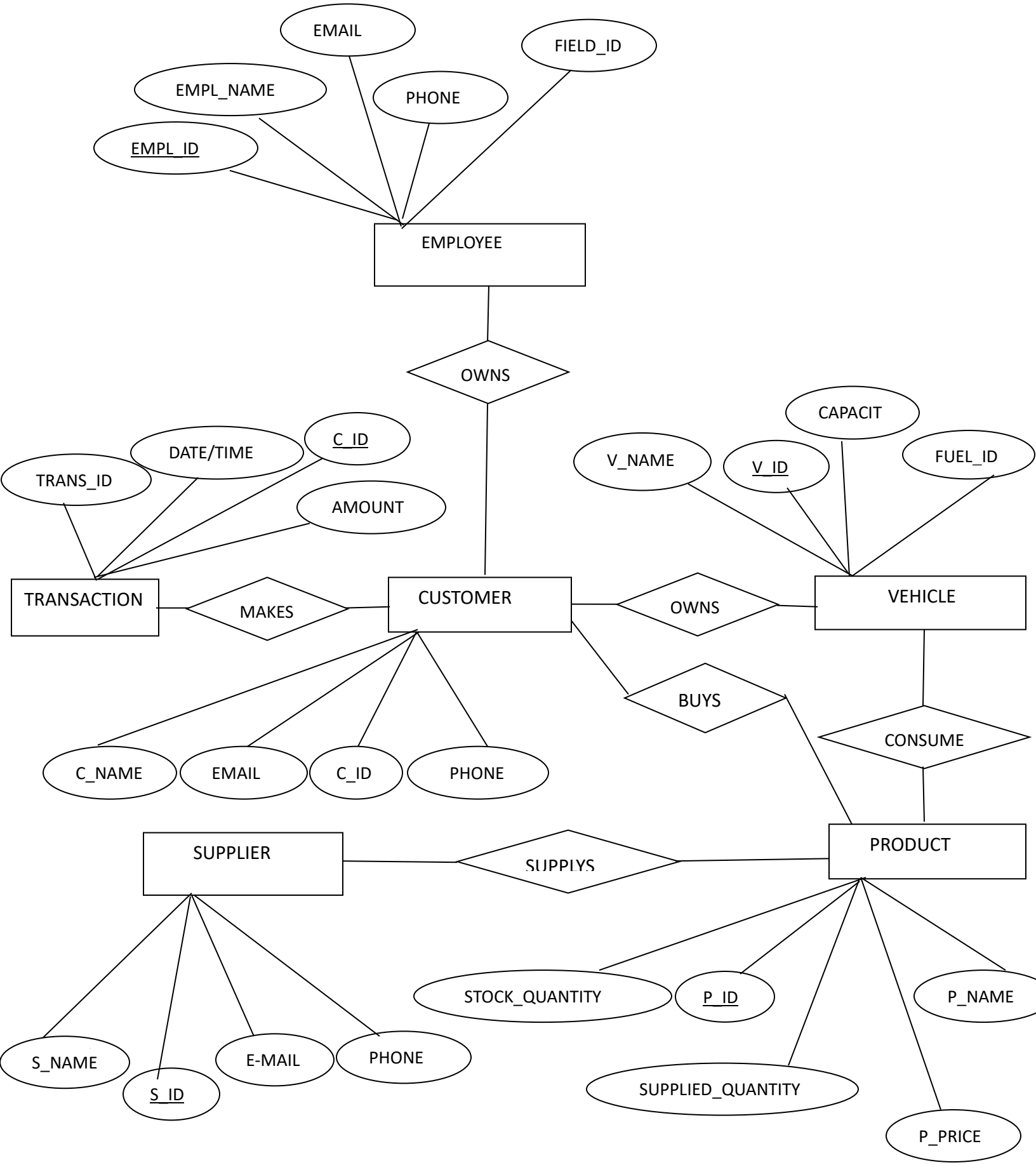
Customers: The customers of the filling station have a unique customer ID, name, license plate, phone number, and amounts paid for fuel and products. The Customer entity has a one-to-many relationship with the Fuel Transactions and Product Transactions entities.

Employees: The employees of the filling station have a unique employee ID, name, job title, shift, and salary. The Employees entity has a one-to-many relationship with the Customers and Product Transactions entities.

Fuel Suppliers: The fuel suppliers of the filling station have a unique supplier ID, name, phone number, email, and address. The Fuel Suppliers entity has a one-to-many relationship with the Fuel Tanks entity.

Fuel / Product: The fuel tanks of the filling station have a unique tank ID, capacity, fuel type, price per liter, supplier ID, and pump attendant ID.

ENTITY RELTIONSHIP DIAGRAM


EMAIL
FIELD_ID
EMPL_NAME
PHONE
EMPL_ID
EMPLOYEE
OWNS
CAPACIT
C_ID
DATE/TIME
V_NAME
FUEL_ID
TRANS_ID
V_ID
AMOUNT
TRANSACTION
MAKES
CUSTOMER
OWNS
VEHICLE
BUYS
CONSUME
C_NAME
EMAIL
C_ID
PHONE
SUPPLIER
SUPPLYS
PRODUCT
STOCK_QUANTITY
P_ID
P_NAME
S_NAME
E-MAIL
PHONE
S_ID
SUPPLIED_QUANTITY
P_PRICE

RELATIONS / TABLES WITH THEIR ATTRIBUTES

.

➢Customers: Customer_ID, Name, Phone, Email

➢Vehicles: Vehicle_ID, Type, Capacity

➢Products: Product ID, Name, Price, Quantity

➢Suppliers: Supplier_ID, Name, Phone, Email

➢Transactions: Transaction ID, Date, Time, Quantity, Amount, Customer_ID (FK), Product_ID, Employee_ID, Supplier_ID (FK), Vehicle_ID (FK)

IMPLEMENTING THE TABLES USING POSTRESQL

CUSTOMER TABLE

```
Customer( customer_id int primary key,
customer_name varchar(100) not null,
    phone varchar(20) not null,
    Email varchar(100) not null,
    product_id INT not null);
```

Data Output | Explain | Messages | Notifications

	customer_id [PK] integer	customer_name character varying (100)	phone character varying (20)	email character varying (100)	product_id integer
1	1	JONATHAN MENSAH	55476580	jmensah@gmail.com	1
2	2	JOHN DOE	23456789	johndoe@gmail.com	1
3	3	JANE DOE	54765432	janedoe@gmail.com	2
4	4	BOB SMITH	545555555	bobsmith@gmail.com	2
5	5	SARA LEE	547476311	saralee@gmail.com	2
6	6	MIKE JONES	2422222	mikejones@gmail.com	2
7	7	JIMMY SMITH	247333333	jimmysmith@gmail.com	3
8	8	AMY LEE	54440044	amylee@gmail.com	3
9	9	PETER PARKER	23665666	peterparker@gmail.com	2
10	10	MARY JANE	24777777	maryjane@gmail.com	4
11	11	TONY STARK	275388888	tonystark@gmail.com	1
12	12	NATASHA ROMANOFF	278612999	natasharomanoff@gmail.com	4
13	13	BRUCE BANNER	272121212	brucebanner@gmail.com	1
14	14	CLINT BARTON	24343434	clintbarton@gmail.com	1
15	15	WANDA MAXIMOFF	56565656	wandamaximoff@gmail.com	3

;

EMPLOYEE TABLE

```
CREATE TABLE Employee (
  Empl_id INT PRIMARY KEY,
  Empl_name VARCHAR(100) NOT NULL,
  field_id INT NOT NULL,
  Email VARCHAR(150)  NOT NULL,
  phone VARCHAR(20) not null
);
```

Data Output | Explain | Messages | Notifications

	empl_id [PK] integer	empl_name character varying (100)	field_id integer	email character varying (150)	phone character varying (20)
1	1093	DANIEL MANSO	1	dmanso@gmail.com	027078234
2	1094	JESSICA LEE	1	jlee@gmail.com	052345678
3	1095	ERIC WANG	2	ewang@gmail.com	028765432
4	1096	KATE WU	2	kwu@gmail.com	052345678
5	1097	JOHN SMITH	2	jsmith@gmail.com	058765432
6	1098	JANE DOE	2	jdoe@gmail.com	054345678
7	1099	DAVID KIM	2	dkim@gmail.com	058765432
8	1100	SARAH OKAI	6	sokai@gmail.com	02612345678
9	1101	RYAN LEE	3	rlee@gmail.com	058765432
10	1102	CHRIS KIM	3	ckim@gmail.com	052345678
11	1112	OSCAR DAZI	6	Odazi@gmail.com	054765432
12	1132	PATRICK KIM	6	pkim@gmail.com	05666678
13	1293	HANNAH DOE	3	hdoe@gmail.com	027077234

VEHICLES TABLE

CREATE TABLE vehicles(NUMBER_PLATE VARCHAR(50) NOT NULL,

Vehicle_name VARCHAR(100) NOT NULL,

Type VARCHAR(100) NOT NULL, Capacity INT NOT NULL,

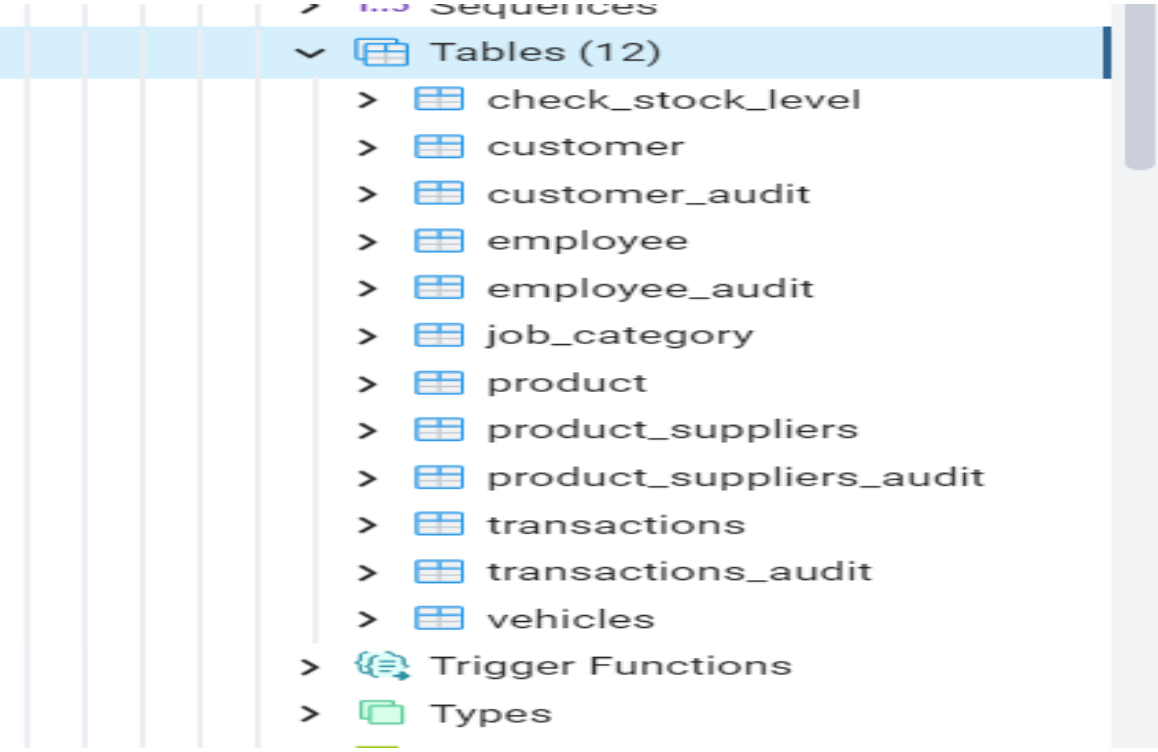
fuel_id INT NOT NULL,

Vehicle_id INT PRIMARY KEY)

Data Output | Explain | Messages | Notifications

	number_plate character varying (50)	vehicle_name character varying (100)	type character varying (100)	capacity integer	fuel_id integer	vehicle_id [PK] integer
1	GR-123-20	Honda Civic	private	5	1	1
2	GR-0201-19	Ford F-150	pickup	3	2	2
3	GW-151-20	Chevrolet Camaro	sports	2	3	3
4	Ge-124-22	KIA Bongo	pickup	3	1	4
5	WR-838-18	Toyota Sienna	van	8	1	5
6	BA-161-18	Jeep Wrangler	SUV	4	2	6
7	GA-123-23	BMW 3 Series	luxury	5	2	7
8	AS-002-22	Dodge Charger	sedan	5	1	8
9	WR-543-17	GMC Sierra	pickup	6	1	9
10	UE-997-08	Nissan Altima	sedan	5	3	10
11	BA-674-21	Subaru Outback	wagon	5	2	11
12	NR-A27-15	Honda Odyssey	van	7	1	12
13	GR-254-20	Ford Mustang	sports	2	2	13

The picture below shows how the database will be after creating the all the necessary tables



TESTING OF THE DATABASE CREATED

After all the tables are created , then i run some queries on the it to see if it truly works as expected.

TESTING THE DATABASE CREATED

- **TEST CASE1**

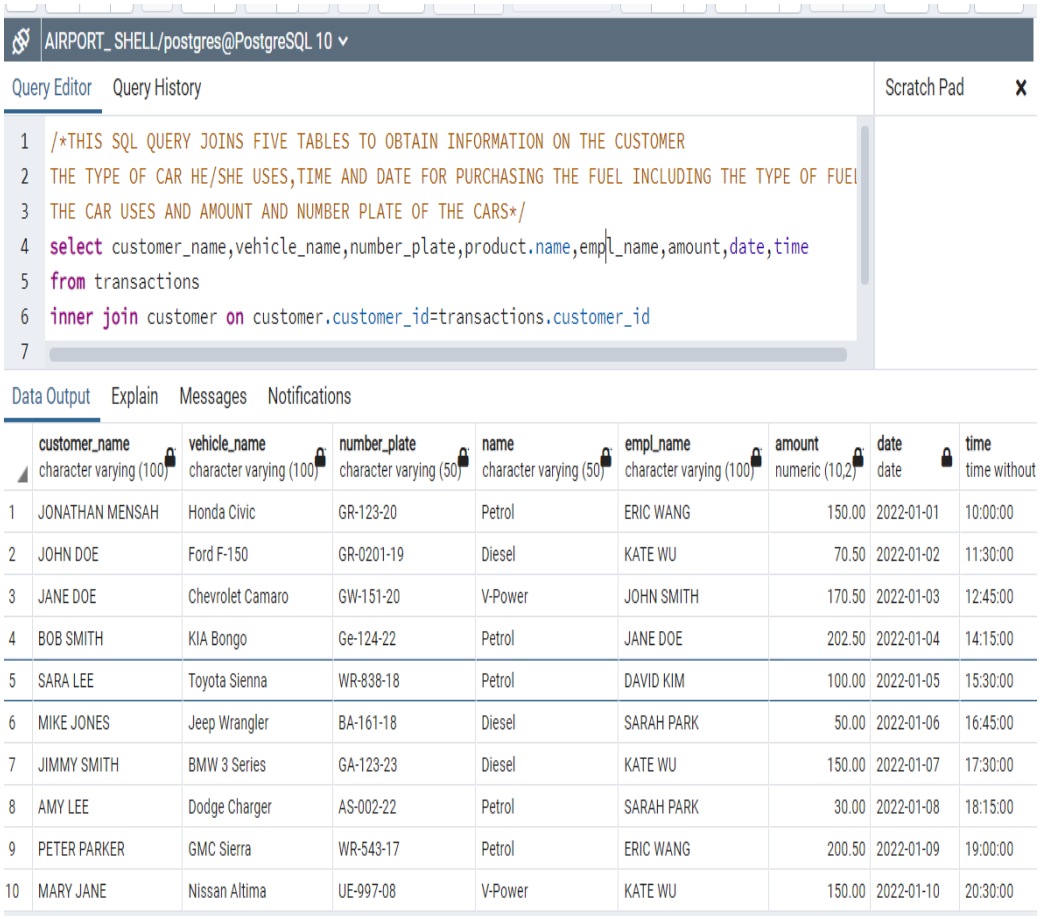
  Assuming the company(shell) wants to retrieve informantion on the name of customers, the type of cars they use, the name of the employee that sold the fuel to them, type of fuel the customer bought, the time and date of purchase of the fuel

  QUERY TO ACHIEVE THIS

```
select
customer_name,vehicle_name,number_plate,product.name,empl_name,amount,datetime
from transactions

inner join customer on customer.customer_id=transactions.customer_id
inner join employee
on employee.empl_id=transactions.empl_id
 inner join vehicles
on vehicles.vehicle_id=transactions.vehicle_id
inner join product on product.product_id=vehicles.fuel_id
```

QUERY OUTPUT



	customer_name character varying (100)	vehicle_name character varying (100)	number_plate character varying (50)	name character varying (50)	empl_name character varying (100)	amount numeric (10,2)	date date	time time without
1	JONATHAN MENSAH	Honda Civic	GR-123-20	Petrol	ERIC WANG	150.00	2022-01-01	10:00:00
2	JOHN DOE	Ford F-150	GR-0201-19	Diesel	KATE WU	70.50	2022-01-02	11:30:00
3	JANE DOE	Chevrolet Camaro	GW-151-20	V-Power	JOHN SMITH	170.50	2022-01-03	12:45:00
4	BOB SMITH	KIA Bongo	Ge-124-22	Petrol	JANE DOE	202.50	2022-01-04	14:15:00
5	SARA LEE	Toyota Sienna	WR-838-18	Petrol	DAVID KIM	100.00	2022-01-05	15:30:00
6	MIKE JONES	Jeep Wrangler	BA-161-18	Diesel	SARAH PARK	50.00	2022-01-06	16:45:00
7	JIMMY SMITH	BMW 3 Series	GA-123-23	Diesel	KATE WU	150.00	2022-01-07	17:30:00
8	AMY LEE	Dodge Charger	AS-002-22	Petrol	SARAH PARK	30.00	2022-01-08	18:15:00
9	PETER PARKER	GMC Sierra	WR-543-17	Petrol	ERIC WANG	200.50	2022-01-09	19:00:00
10	MARY JANE	Nissan Altima	UE-997-08	V-Power	KATE WU	150.00	2022-01-10	20:30:00

❖ TEST CASE 2

Assuming Mr. Kwabena is now the new manager at the shell filling station and he wants to get all the information on the employees and their various fields of work including their salaries.

QUERY TO ACHIEVE THIS

```
select empl_name,job_name,job_description,salary

from employee

inner join job_category

on employee.field_id=job_category.job_id
```

QUERY OUTPUT

```
1  select empl_name,job_name,job_description,salary
2  from employee
3  inner join job_category
4  on employee.field_id=job_category.job_id
```

Data Output | Explain | Messages | Notifications

	empl_name character varying (100)	job_name character varying (25)	job_description character varying (2000)	salary numeric (100,2)
1	DANIEL MANSO	Station Manager	Manages the day to day activities of the filling station	5000.00
2	JESSICA LEE	Station Manager	Manages the day to day activities of the filling station	5000.00
3	ERIC WANG	Pump Attendant	Responsible for dispensing fuel and providing other basic services to customers	2500.00
4	KATE WU	Pump Attendant	Responsible for dispensing fuel and providing other basic services to customers	2500.00
5	JOHN SMITH	Pump Attendant	Responsible for dispensing fuel and providing other basic services to customers	2500.00
6	JANE DOE	Pump Attendant	Responsible for dispensing fuel and providing other basic services to customers	2500.00
7	DAVID KIM	Pump Attendant	Responsible for dispensing fuel and providing other basic services to customers	2500.00
8	SARAH PARK	Pump Attendant	Responsible for dispensing fuel and providing other basic services to customers	2500.00
9	RYAN LEE	Cashier	Responsible for handling customer payments, maintaining accurate records of transactions, and reconciling cash at the end of the day	2000.00
10	CHRIS KIM	Cashier	Responsible for handling customer payments, maintaining accurate records of transactions, and reconciling cash at the end of the day	2000.00
11	HANNAH DOE	Cashier	Responsible for handling customer payments, maintaining accurate records of transactions, and reconciling cash at the end of the day	2000.00
12	JANET ASARE	Cashier	Responsible for handling customer payments, maintaining accurate records of transactions, and reconciling cash at the end of the day	2000.00
13	ERIC ANSAH	mechanics	Responsible for performing minor vehicle repairs and maintenance services such as oil changes, filter replacements, and brake repairs	1500.00
14	KOFI MANSO	mechanics	Responsible for performing minor vehicle repairs and maintenance services such as oil changes, filter replacements, and brake repairs	1500.00
15	JOANA DANSO	cleaning staff	Responsible for maintaining a clean and hygienic environment at the filling station, including cleaning the bathrooms, floors, and other public areas	900.00
16	JANET DUAH	cleaning staff	Responsible for maintaining a clean and hygienic environment at the filling station, including cleaning the bathrooms, floors, and other public areas	900.00
17	DAVID OFORI	cleaning staff	Responsible for maintaining a clean and hygienic environment at the filling station, including cleaning the bathrooms, floors, and other public areas	900.00
18	SARAH OKAI	Security personnel	Responsible for ensuring the safety of the filling station and its customers and responding to any incidents or emergencies that may arise	1000.00
19	OSCAR DAZI	Security personnel	Responsible for ensuring the safety of the filling station and its customers and responding to any incidents or emergencies that may arise	1000.00
20	PATRICK KIM	Security personnel	Responsible for ensuring the safety of the filling station and its customers and responding to any incidents or emergencies that may arise	1000.00

OBSERVATION

In both test cases, it was observed that the database designed was able to output the information need by shell company without any diffiucties. In test cases 1 for instance, the database provided exact information that the shell filling station needs at that point in time . This is shown in the output of test case 1 . The ouptut actually met the demand of the company indicating that the database created is actually working as expected

DISCUSSIONS AND CONCLUSION:

The benefits of automation in the fuel filling industry cannot be overstated. Automating processes such as payment, fuel dispensing, and record-keeping can significantly reduce the time it takes to serve customers and reduce errors associated with manual processes. Automation can also help to improve safety and security by reducing the risks associated with human error.

Furthermore, the benefits of automation extend beyond customer service and operational efficiency. It can also contribute to sustainability by reducing waste, conserving energy, and lowering the environmental impact of the filling station's operations.

Overall, Airport Shell's decision to automate its activities is a positive step towards enhancing its competitiveness in the fuel filling industry. By leveraging technology to improve customer

service, increase efficiency, and promote sustainability, Airport Shell is positioning itself as a leader in the industry and setting the standard for other filling stations to follow.

In conclusion, the decision made by the management of Airport Shell to automate its activities is a wise one, given the company's growth over time. Automating the filling station's activities will lead to a more efficient and streamlined process for both customers and the business. Customers will benefit from faster and more convenient service, and the business will be able to process more transactions in less time, ultimately leading to increased profitability.