Environmental Products & Accessories

Product Inventory Database

Abstract

This project focuses on the development of a comprehensive product inventory management database system for Environmental Products & Accessories, LLC, or EPA. EPA is a manufacturer and reseller of vacuum truck parts and related products. They sell to municipalities, OEMs, resellers, general contractors, and plumbers. The company is currently facing integration issues and has no way to notify when inventory needs to be purchased or created with its current databases. For the purpose of this project, rather than cleaning and integrating their very complex systems, I will create a database that consists of multiple departments from scratch. The project will consolidate inventory, supplier, category, and sales data into a cohesive structure.

The system will also provide critical functionalities, such as tracking inventory levels, managing supplier relationships, recording sales transactions, and analyzing sales trends. Using five primary entities—Product, Supplier, Inventory, Category, and Sales—the database ensures data integrity and supports scalable growth for EPA Sales. The primary outcomes of the project include a significant reduction in operational inefficiencies and improved customer service through better data accuracy and accessibility.

Introduction

A comprehensive product inventory management system will be developed to track inventory levels, costs, supplier information, and sales. This system aims to enhance operational efficiency across various departments. The primary users will include Executives, Operations Managers, the Purchasing Department, the Sales Department, and Warehouse Managers. The project focuses on Environmental Products & Accessories, LLC.(EPA Sales), a retail company that specializes in original equipment manufacturer (OEM) and aftermarket parts for vacuum trucks, hydro vacs, and jetting equipment. Employing fewer than 20 people, EPA Sales operates nationwide and offers a diverse range of over a thousand products, serving plumbers, general contractors, Original Equipment Manufacturers (OEMs), and municipalities. For this project, a sample from their inventory will be utilized.

As a wholesaler and reseller, EPA Sales manufactures many products in-house while also carrying renowned brands in the industry. Currently, the company faces operational challenges due to three disparate and poorly integrated databases: Shopify, Sage, and Hubspot. Shopify manages e-commerce and sales data but also contains product inventory and information that often conflict with the other systems. Sage, their accounting software, tracks costs and vendor data, while Hubspot, their customer relationship management (CRM) platform, monitors the buyer's journey, purchases, returns, and more. The lack of integration among these systems has resulted in messy, inconsistent data that complicates operations and customer service.

For the sake of this project, rather than attempting to fix or integrate the current databases, we will start fresh by designing and creating a completely new database from scratch. This approach will ensure the database is clean, cohesive, and designed to meet the company's operational needs without inheriting errors or inconsistencies from the existing systems. The new system will consolidate key elements such as inventory, supplier, and sales data into a unified structure,

allowing for greater efficiency, reduced redundancy, and improved accuracy. The primary goal is to provide real-time visibility into inventory levels and to consolidate the current 3 databases into one unified system, which enables better tracking, sales trends, customer demands, and much more.

By creating this new database, the project will resolve data mismatches, streamline operations, and enhance customer service while providing a strong foundation for future scalability and integration. Two main results include streamlined operations for most departments to reduce to a singular database instead of multiple and real-time inventory visibility.

Data Information

The key functionalities are described by departments that will likely be utilizing the database:

Operation and Executives

Operation managers and executives will be able to access records of all products and use organized product data for performance and profitability reports.

Purchasing Department

Manage supplier relationships with accurate records and facilitate timely procurement to maintain adequate inventory levels. This is to ensure strong supplier partnerships to support consistent stock availability.

Sales Department

Record detailed sales transactions and analyze sales trends to identify high-performing products. They can collaborate with warehouse managers to confirm sufficient stock levels for customer orders and ensure popular products remain in stock for better customer satisfaction.

Warehouse Management

Monitor inventory levels in real-time to ensure efficient warehouse operations are met for customer demands.

Entity Relationship (ER) Diagram

Entities & Attributes

Product: Information on each product.

- ProductID - Unique identifier for each product
- ProductName - Name of the product
- CategoryID - Reference to the product's category
- SupplierID - Reference to the supplier providing the product
- Price - The selling price of the product
- StockLevel - Current quantity of the product available in stock
- ReorderLevel - Minimum stock level at which resticking is required
- ProductDescription - Additional details or specifications about the product

Supplier: Details of suppliers.

- SupplierID - Unique identifier for each supplier
- SupplierName - Name of the supplier

- ContactName - Name of the supplier's contact person
- PhoneNumber - Contact phone number for the supplier
- Email - Contact email address for the supplier
- Address - Supplier’s physical or mailing address
- City - Supplier’s city
- State - Supplier’s state
- Zip - Supplier’s zip code

Inventory: Tracks products stocked.

- InventoryID - Unique identifier for inventory records
- ProductID - Reference to the product being tracked
- StockLevel - Current quantity of the product in stock
- ReorderLevel - Minimum quantity before restocking is required
- LastUpdated - Date and time when the stock level was last updated

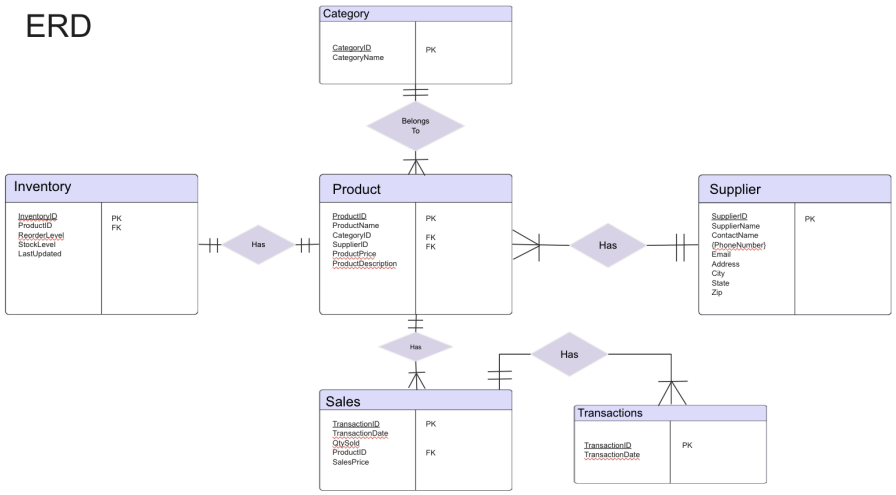
Sales: Records of each sale transaction.

- TransactionID - Unique identifier for each sales transaction
- ProductID - Reference to the product being sold
- QuantitySold- Number of units sold in the transaction
- SalePrice - The price at which the product was sold
- TransactionDate - Date and time when the transaction occurred
- TotalAmount - Total cost of the transaction (QuantitySold * SalePrice)

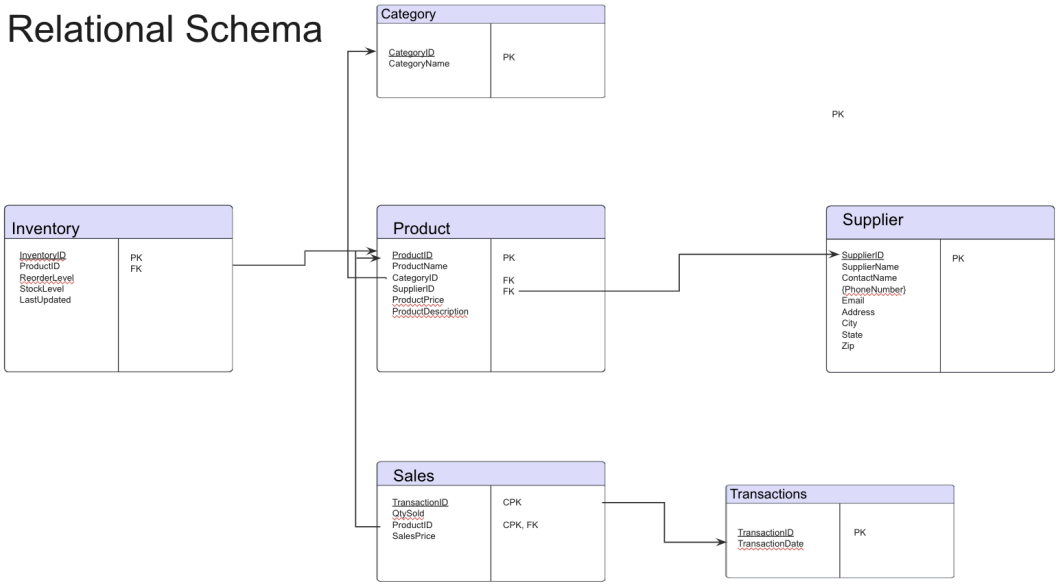
Category: References to the product's category (Hydro excavation, Air Movers, Confined Spaces, etc).

- CategoryID - Unique identifier for each category
- CategoryName - Name of the category
- CategoryDescription - Additional details about the category (optional)

ERD



Relational Schema



Relationships

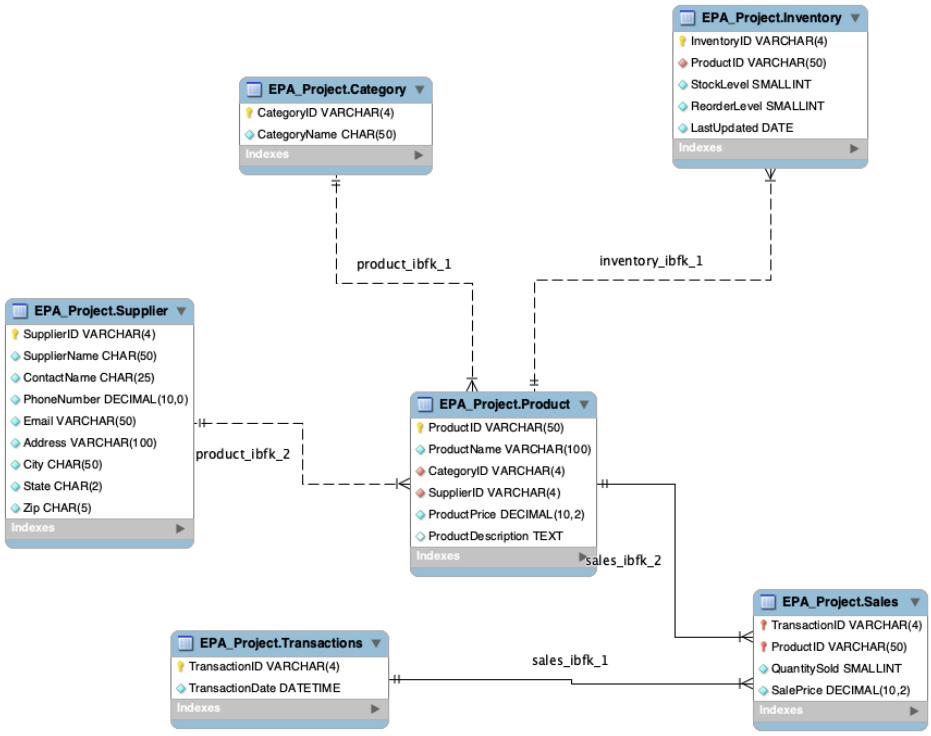
Product → Supplier: M:1 (Each product has one supplier).

Supplier → Product: 1:M (A supplier can supply multiple products).

Category → Product: 1:M (A category can contain multiple products).

Inventory → Product: 1:1 (Each product has one inventory record).

Product → Sales: 1:M (Each product can appear in multiple sales transactions).



Inventory Table

InventoryID	ProductID	StockLevel	ReorderLevel	LastUpdated
I001	PW 300680050	500	100	2023-12-01
I002	P AFU0824HD	50000	20000	2023-10-25
I003	MHRSN	2500	500	2024-01-03
I004	JHP1225400	100	20	2023-12-10
I005	JHP1225500	80	15	2023-12-11
I006	H RG0832	50	10	2023-12-12
I007	HR-SMK18LS	25	5	2023-12-13
I008	HR-SMK24-LS	3	5	2023-12-14
NULL	NULL	NULL	NULL	NULL

Supplier Table

SupplierID	SupplierName	ContactName	PhoneNumber	Email	Address	City	State	Zip
S001	North American Pressure Washer Outlet	Alice Smith	1234567890	alice@northamericanpressurewasheroutlet.com	123 Main St	Atlanta	GA	30033
S002	Hydrovac Store	Bob Brown	2345678901	bob@hyrdovacstore.com	456 Broad St	Boston	MA	02118
S003	Jetter Depot	Clara Jones	3456789012	claraj@jetterdepot.com	789 Elm Ave	Seattle	WA	98039
S004	Piranha Vendor	Derek Lee	5678901234	derek@piranhavendor.com	101 Industrial Pkwy	Nashville	TN	37214
S005	Hurco Equipment Co.	Elaine Carter	6789012345	elaine@hurcoequipment.com	222 Equipment St	Denver	CO	80202
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

Product Table

ProductID	ProductName	CategoryID	SupplierID	ProductPrice	ProductDescription
HR-SMK24-LS	Hurco Ripcord Smoker 24	C003	S005	3074.14	Super Smoker, Ripcord24 (Briggs-Motor) uses Liquid Smoke
HR-SMK18LS	Hurco Ripcord Smoker 18	C003	S005	2154.14	Power Smoker, Ripcord Smoker18 (Briggs-Motor) uses Liquid Smoke
JHP1225500	3/4" * 500' Orange Piranha 2500 PSI Vendor	C001	S004	1199.84	3/4" Piranha 2500PSI, Male * Male NPT
JHP1225400	3/4" * 400' Orange Piranha 2500 PSI Vendor	C001	S004	960.84	3/4" Piranha 2500PSI, Male * Male NPT
H RG0832	8" * 32" Red Gum Vacuum Truck Hose	C002	S002	221.94	8" I.D, 9" O.D. 36" Bend radius. 9.26# per foot
P AFU0824HD	8" Flange * 8" HydroVac Crown Tube	C002	S002	150.00	8" Flange Heavy Duty Tube (0.125") W/ Hydrovac Crown * 24"
PW 300680050	1/2" Black Linear Hydroexcavation Gun	C001	S001	100.00	High Flow 32 GPM Straight Rear Entry Spray Gun for Hydro Excavation
MHRSN	Manhole Roller	C003	S003	99.00	Standard Duty (Angle Iron) with Nylon Roller
NULL	NULL	NULL	NULL	NULL	NULL

Transaction Table

TransactionID	TransactionDate
T001	2024-12-01 14:00:00
T002	2024-12-02 09:15:00
T003	2024-12-02 14:23:06
T004	2024-12-05 10:30:00
T005	2024-12-06 14:15:00
T006	2024-12-07 16:45:00
NULL	NULL

Category Table

CategoryID	CategoryName
C001	Hydroexcavation
C002	Air Movers
C003	Confined Spaces
NULL	NULL

Sales Table

TransactionID	ProductID	QuantitySold	SalePrice
T001	PW 300680050	2	249.84
T002	MHRSN	5	224.94
T002	P AFU0824HD	1	349.50
T003	MHRSN	1	224.94
T004	H RG0832	2	221.94
T004	JHP1225400	3	960.84
T005	HR-SMK18LS	1	2154.14
T005	JHP1225500	1	1199.84
T006	HR-SMK24-LS	1	3074.14
NULL	NULL	NULL	NULL

```
/* Create a database */
CREATE DATABASE EPA_Project;

USE EPA_Project;

/* Create Tables: Category, Supplier, Product, Sales, Inventory,
Transactions */
CREATE TABLE Category(
    CategoryID VARCHAR(4) NOT NULL,
    CategoryName CHAR(50) NOT NULL,
    PRIMARY KEY (CategoryID)
);

CREATE TABLE Supplier(
    SupplierID VARCHAR(4) NOT NULL,
    SupplierName CHAR(50) NOT NULL,
    ContactName CHAR(25) NOT NULL,
    PhoneNumber NUMERIC(10) NOT NULL,
    Email VARCHAR(50) NOT NULL,
    Address VARCHAR(100) NOT NULL,
    City CHAR(50) NOT NULL,
    State CHAR(2) NOT NULL,
    Zip CHAR(5) NOT NULL,
    PRIMARY KEY (SupplierID)
);

CREATE TABLE Product(
    ProductID VARCHAR(50) NOT NULL,
    ProductName VARCHAR(100) NOT NULL,
    CategoryID VARCHAR(4) NOT NULL,
    SupplierID VARCHAR(4) NOT NULL,
    ProductPrice DECIMAL(10,2) NOT NULL,
    ProductDescription TEXT,
    PRIMARY KEY (ProductID),
    FOREIGN KEY (CategoryID) REFERENCES Category(CategoryID),
    FOREIGN KEY (SupplierID) REFERENCES Supplier(SupplierID)
);

CREATE TABLE Transactions (
    TransactionID VARCHAR(4) NOT NULL PRIMARY KEY,
    TransactionDate DATETIME NOT NULL
);

CREATE TABLE Sales(
    TransactionID VARCHAR(4) NOT NULL,
    ProductID VARCHAR(50) NOT NULL,
    QuantitySold SMALLINT NOT NULL,
    SalePrice DECIMAL(10,2) NOT NULL,
    PRIMARY KEY (TransactionID, ProductID), -- Composite primary key
    FOREIGN KEY (TransactionID) REFERENCES Transactions(TransactionID),
    FOREIGN KEY (ProductID) REFERENCES Product(ProductID)
);

CREATE TABLE Inventory(
```

```
    InventoryID VARCHAR(4) NOT NULL,
    ProductID VARCHAR(50) NOT NULL,
    StockLevel SMALLINT NOT NULL,
    ReorderLevel SMALLINT NOT NULL,
    LastUpdated DATE NOT NULL,
    PRIMARY KEY (InventoryID),
    FOREIGN KEY (ProductID) REFERENCES Product(ProductID)
);

/* Insert Data */
INSERT INTO Category (CategoryID, CategoryName)
VALUES
    ('C001', 'Hydroexcavation'),
    ('C002', 'Air Movers'),
    ('C003', 'Confined Spaces');
Select * from Category;

INSERT INTO Supplier (SupplierID, SupplierName, ContactName, PhoneNumber,
Email, Address, City, State, Zip)
VALUES
    ('S001', 'North American Pressure Washer Outlet', 'Alice Smith',
1234567890, 'alice@northamericanpressurewasheroutlet.com', '123 Main St',
'Atlanta', 'GA', '30033'),
    ('S002', 'Hydrovac Store', 'Bob Brown', 2345678901,
'bob@hyrdovacstore.com', '456 Broad St', 'Boston', 'MA', '02118'),
    ('S003', 'Jetter Depot', 'Clara Jones', 3456789012,
'claraj@jetterdepot.com', '789 Elm Ave', 'Seattle', 'WA', '98039');
Select * from Supplier;

INSERT INTO Product (ProductID, ProductName, CategoryID, SupplierID,
ProductPrice, ProductDescription)
VALUES
    ('PW 300680050', '1/2" Black Linear Hydroexcavation Gun', 'C001',
'S001', 100.00, 'High Flow 32 GPM Straight Rear Entry Spray Gun for Hydro
Excavation'),
    ('P AFU0824HD', '8" Flange * 8" HydroVac Crown Tube', 'C002', 'S002',
150.00, '8" Flange Heavy Duty Tube  (0.125") W/ Hydrovac Crown * 24"'),
    ('MHRSN', 'Manhole Roller', 'C003', 'S003', 99.00, 'Standard Duty
(Angle Iron) with Nylon Roller');
Select * from Product;

INSERT INTO Transactions (TransactionID, TransactionDate)
VALUES
    ('T001', '2024-12-01 14:00:00'),
    ('T002', '2024-12-02 09:15:00'),
    ('T003', '2024-12-02 14:23:06');
Select * from Transactions;

INSERT INTO Sales (TransactionID, ProductID, QuantitySold, SalePrice)
VALUES
    ('T001', 'PW 300680050', 2, 249.84),
    ('T002', 'P AFU0824HD', 1, 349.50),
    ('T002', 'MHRSN', 5, 224.94),
    ('T003', 'MHRSN', 1, 224.94);
```

```
Select * from Sales;

Describe Inventory;
/*Update the StockLevel column to UNSIGNED SMALLINT*/
ALTER TABLE Inventory
MODIFY StockLevel SMALLINT UNSIGNED NOT NULL;
ALTER TABLE Inventory
MODIFY ReorderLevel SMALLINT UNSIGNED NOT NULL;
/*------------*/
INSERT INTO Inventory (InventoryID, ProductID, StockLevel, ReorderLevel,
LastUpdated)
VALUES
      ('I001','PW 300680050', 500, 100, '2023-12-01'),
    ('I002','P AFU0824HD', 50000,20000,'2023-10-25'),
    ('I003','MHRSN',2500,500,'2024-01-03');
Select * from Inventory;

/*Adding additoinal data*/
INSERT INTO Supplier (SupplierID, SupplierName, ContactName, PhoneNumber,
Email, Address, City, State, Zip)
VALUES
    ('S004', 'Piranha Vendor', 'Derek Lee', 5678901234,
'derek@piranhavendor.com', '101 Industrial Pkwy', 'Nashville', 'TN',
'37214'),
    ('S005', 'Hurco Equipment Co.', 'Elaine Carter', 6789012345,
'elaine@hurcoequipment.com', '222 Equipment St', 'Denver', 'CO', '80202');

INSERT INTO Product (ProductID, ProductName, CategoryID, SupplierID,
ProductPrice, ProductDescription)
VALUES
    ('JHP1225400', '3/4" * 400\' Orange Piranha 2500 PSI Vendor', 'C001',
'S004', 960.84, '3/4" Piranha 2500PSI, Male * Male NPT'),
    ('JHP1225500', '3/4" * 500\' Orange Piranha 2500 PSI Vendor', 'C001',
'S004', 1199.84, '3/4" Piranha 2500PSI, Male * Male NPT'),
    ('H RG0832', '8" * 32" Red Gum Vacuum Truck Hose', 'C002', 'S002',
221.94, '8" I.D, 9" O.D. 36" Bend radius. 9.26# per foot'),
    ('HR-SMK18LS', 'Hurco Ripcord Smoker 18', 'C003', 'S005', 2154.14,
'Power Smoker, Ripcord Smoker18 (Briggs-Motor) uses Liquid Smoke'),
    ('HR-SMK24-LS', 'Hurco Ripcord Smoker 24', 'C003', 'S005', 3074.14,
'Super Smoker, Ripcord24 (Briggs-Motor) uses Liquid Smoke');

INSERT INTO Transactions (TransactionID, TransactionDate)
VALUES
    ('T004', '2024-12-05 10:30:00'),
    ('T005', '2024-12-06 14:15:00'),
    ('T006', '2024-12-07 16:45:00');

INSERT INTO Sales (TransactionID, ProductID, QuantitySold, SalePrice)
VALUES
    ('T004', 'JHP1225400', 3, 960.84),
    ('T004', 'H RG0832', 2, 221.94),
    ('T005', 'JHP1225500', 1, 1199.84),
    ('T005', 'HR-SMK18LS', 1, 2154.14),
    ('T006', 'HR-SMK24-LS', 1, 3074.14);
```

```
INSERT INTO Inventory (InventoryID, ProductID, StockLevel, ReorderLevel,
LastUpdated)
VALUES
    ('I004', 'JHP1225400', 100, 20, '2023-12-10'),
    ('I005', 'JHP1225500', 80, 15, '2023-12-11'),
    ('I006', 'H RG0832', 50, 10, '2023-12-12'),
    ('I007', 'HR-SMK18LS', 25, 5, '2023-12-13'),
    ('I008', 'HR-SMK24-LS', 20, 5, '2023-12-14');

UPDATE Inventory
SET StockLevel = 3
WHERE ProductID = 'HR-SMK24-LS';

SELECT * FROM Category;
SELECT * FROM Supplier;
SELECT * FROM Product;
SELECT * FROM Transactions;
SELECT * FROM Sales;
SELECT * FROM Inventory;


/*SQL STATEMENTS*/

/*Which products were sold in transactions that occurred after 2024-12-02
in order?*/
Select T.TransactionDate as TransactionDate, T.TransactionID as
TransactionID, P.ProductID as ProductID, P.ProductName as ProductName
From Transactions as T
Join Sales as S on T.TransactionID = S.TransactionID
Join Product as P on S.ProductID = P.ProductID
Where T.TransactionDate > '2024-12-03 00:00:00'
Order by T.TransactionDate Desc;


/*Which top 3 products have generated the highest revenue?*/
Select P.ProductID, P.ProductName, S.SalePrice
From Product as P
Join Sales as S on P.ProductID = S.ProductID
Order by S.SalePrice Desc
Limit 3;

/*Which products are below their reorder level?*/
Select P.ProductID, P.ProductName, I.StockLevel, I.ReorderLevel
From Product as P
Join Inventory as I on P.ProductID = I.ProductID
Where I.StockLevel < I.ReorderLevel;


/*What is the total revenue generated by products in categories containing
"Space" or "Hydro," supplied by suppliers located in 'GA', 'MA', or
'WA'?*/
Select P.ProductID, P.ProductName, C.CategoryName, SU.SupplierName,
SU.State, Sum(S.QuantitySold * S.SalePrice) as TotalRevenue
```

```
From Category as C
Join Product as P on C.CategoryID = P.CategoryID
Join Supplier as SU on P.SupplierID = SU.SupplierID
Join Sales as S on P.ProductID = S.ProductID
Where (C.CategoryName like '%Space%' or C.CategoryName like '%Hydro%') and
SU.State in ('GA','MA','WA')
Group by P.ProductID, P.ProductName, C.CategoryName, SU.SupplierName,
SU.State;
```

Analysis

My SQL analysis questions exemplify what users would be asking for in reports to utilize to make better business decisions:

Which products were sold in transactions that occurred after 2024-12-02 in order?

```sql
/*Which products were sold in transactions that occurred after 2024-12-02 in order?*/
Select T.TransactionDate as TransactionDate, T.TransactionID as TransactionID, P.ProductID as ProductID, P.ProductName as ProductName
From Transactions as T
Join Sales as S on T.TransactionID = S.TransactionID
Join Product as P on S.ProductID = P.ProductID
Where T.TransactionDate > '2024-12-03 00:00:00'
Order by T.TransactionDate Desc;
```

TransactionDate	TransactionID	ProductID	ProductName
2024-12-07 16:45:00	T006	HR-SMK24-LS	Hurco Ripcord Smoker 24
2024-12-06 14:15:00	T005	HR-SMK18LS	Hurco Ripcord Smoker 18
2024-12-06 14:15:00	T005	JHP1225500	3/4" * 500' Orange Piranha 2500 PSI Vendor
2024-12-05 10:30:00	T004	H RG0832	8" * 32" Red Gum Vacuum Truck Hose
2024-12-05 10:30:00	T004	JHP1225400	3/4" * 400' Orange Piranha 2500 PSI Vendor

Which top 3 products have generated the highest revenue?

```sql
/*Which top 3 products have generated the highest revenue?*/
Select P.ProductID, P.ProductName, S.SalePrice
From Product as P
Join Sales as S on P.ProductID = S.ProductID
Order by S.SalePrice Desc
Limit 3;
```

ProductID	ProductName	SalePrice
HR-SMK24-LS	Hurco Ripcord Smoker 24	3074.14
HR-SMK18LS	Hurco Ripcord Smoker 18	2154.14
JHP1225500	3/4" * 500' Orange Piranha 2500 PSI Vendor	1199.84

Which products are below their reorder level?

```
/*Which products are below their reorder level?*/
Select P.ProductID, P.ProductName, I.StockLevel, I.ReorderLevel
From Product as P
Join Inventory as I on P.ProductID = I.ProductID
Where I.StockLevel < I.ReorderLevel;
```

ProductID	ProductName	StockLevel	ReorderLevel
HR-SMK24-LS	Hurco Ripcord Smoker 24	3	5

What is the total revenue generated by products in categories containing "Space" or "Hydro," supplied by suppliers located in 'GA', 'MA', or 'WA'?

```
/*What is the total revenue generated by products in categories containing "Space" or "Hydro," supplied by suppliers located in 'GA', 'MA', or 'WA'?*/
Select P.ProductID, P.ProductName, C.CategoryName, SU.SupplierName, SU.State, Sum(S.QuantitySold * S.SalePrice) as TotalRevenue
From Category as C
Join Product as P on C.CategoryID = P.CategoryID
Join Supplier as SU on P.SupplierID = SU.SupplierID
Join Sales as S on P.ProductID = S.ProductID
Where (C.CategoryName like '%Space%' or C.CategoryName like '%Hydro%') and SU.State in ('GA','MA','WA')
Group by P.ProductID, P.ProductName, C.CategoryName, SU.SupplierName, SU.State;
```

ProductID	ProductName	CategoryName	SupplierName	State	TotalRevenue
PW 300680050	1/2" Black Linear Hydroexcavation Gun	Hydroexcavation	North American Pressure Washer Outlet	GA	499.68
MHRSN	Manhole Roller	Confined Spaces	Jetter Depot	WA	1349.64

Summary and Conclusion

Through this project, I learned the importance of being detail-oriented in database design and implementation. Each step required careful attention, as even small mistakes—such as typos, incorrect data types, or missing data—made my SQL script messy and led to errors. These challenges taught me the value of meticulous planning and validation. After encountering these issues, I decided to start over, which helped me refine my approach and ensure that my database was clean, accurate, and functional.

This process not only improved my technical skills but also reinforced the importance of patience and precision in managing complex data systems.

By planning ahead and ensuring accuracy early on, many issues can be prevented later in the process. This insight mirrors the challenges faced by EPA Sales. Their lack of proper planning and the rush to implement systems without adequate integration and research led to significant inefficiencies, requiring ongoing effort and overtime to fix their issues. This approach has cost them both time and money—resources that could have been saved if the systems were designed correctly from the start. This experience highlighted how a well-thought-out and methodical approach is not only valuable in database development but also crucial for long-term operational success.