The Big Oil Movements Bonanza (The BOMB)

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URL: https://master--steady-llama-819e23.netlify.app/   Please test with Chrome browser.

Source code for the project is in the following files:
- Website
  - Front end: BOMB-UI hosted on Netlify set up for automatic deploys from github.
  - Back end: BOMB-REST hosted on Heroku with a ClearDB add-on deployed through Heroku github.
- Database
  - Tables and sample data: DDL.sql
  - Example CRUD operations, stored procedures: DML.sql

Table of Contents

Executive Summary

- ERD, Schema, and Normalization
  - The ERD and schema evolved throughout the project including the addition of 2 tables (Tests and Specifications) which created a second M:M relationship. Thus we have 7 tables, two of which are M:M (Lineups and Specifications). Transient dependencies were removed from these tables. For example, the specDescription column was removed from Specifications because the description could be built from the column values in the Materials and Tests tables as well as other columns within the Specifications table. Names of tables and columns as well as data types were changed for consistency and accuracy.
- M:M Table names
  - Originally M:M tables were named via the default naming scheme such as Tanks_Tasks this was then changed to something more descriptive like TanksInTasks and then finally to Lineups which we feel truly represents the purpose of the table which is to keep track of which source tanks are routed to which destination tank.
- Document updates
  - We described more completely how our project can meet the 3 objectives of Big Oil and backed that up with "virtual columns" built on stored procedures and temporary tables that demonstrate this functionality such as identifying the tasks that have lineup conflicts (those tasks that have one or more tank in common).
- Data validation
  - This was accomplished in 4 different ways. The first was using the SQL constraint specification such as setting the tank to either be a "source" or "destination" tank. The second was using data validation in the rest controller such as before running a stored procedure. The third way was using data validation in the UI such as ensuring that the tank naming convention T#[#[#...[A]] was followed (T3254, for example). Finally we ensured that a Task consists of one or more source tanks and one and only one destination by a combination of drop down selections on the UI and by completing all required steps via a transaction on the database side.
- Stored procedures
  - We used 14 stored procedures to combine and present the needed information to the end user. We have stored procedures which generate the human readable form (without foreign keys) of each of our database tables as well as various dropdowns and special items that prove the project can meet all of the objectives.

Project Outline

The Big Oil refinery processes 500,000 barrels of crude oil per day at a cost of $50 million ($18.25 bn annually) and 86 to 89% of the output from the refinery is transportation fuels including motor gasoline (mogas), diesel, and jet fuel with the remainder being propylene, asphalt, etc. Big Oil makes its money on the margin between the products it sells and the crude oil it buys. Management of the tank farm and fuel blending operation is critical to the refinery's success . Big Oil has three primary objectives related to the production of transportation fuels which is handled by 100 people within the Oil Movements division:

1. Achieve zero safety incidents. An example of a safety event would be overfilling a tank which could cause a release of gasoline like material to the dike around the tank and a subsequent fire that causes

loss of life, property, and potentially the license to operate resulting in monetary losses of at least several million dollars. The database will be able to run a query against all **Tanks** for levels (**pumpableVol** / **capacity** * 100%) outside of a specified range (for example, less than 20% or more than 80%).

2. Make on-spec fuels. Fuels could be contaminated because of the improper lineup or routing of a tank containing one material into a tank with an incompatible material, for example, putting ultra low sulfur diesel into a naphtha tank. Contaminated product requires remediation or reprocessing with costs exceeding several million dollars. The database will be able to run a query against all **Tasks** which will enable the blend operator to better plan their production runs because they will see what **Tanks** are in use via the **Lineups** entity and avoid tank conflicts (where 1 source tank would be needed to supply 2 destination tanks via separate tasks).

3. Optimize the blending process. Intermediate materials such as naphtha, reformate, and alkylate made during the refining process are blended together into a destination tank to make finished transportation fuel such as mogas. Blending too much of one high value material such as alkylate can lead to mogas that has a higher octane than required and results in product giveaway costing the refinery millions of dollars. The database can query the **Materials** and their **Specifications**, along with a **Task's taskVolume**. This information will be used by a blend optimizer to ensure optimum production of finished fuels.

Our database will be the single source of information for meeting all of Big Oil's objectives for fuel production.

1. The database will record the capacities and levels (via pumpable volume) of the more than 300 **Tanks** used to store over 50 different **Materials**, such as crude oil, intermediate products, and finished products in over 10 different **TankTypes**. An alarm system (not in scope) will use this information to alert operators to potential safety incidents and provide the response time necessary to take corrective action.

2. The **Tasks** track the current **Materials** being blended together and how that is being done which allows the Oil Movements division to identify which tanks are currently in use for a particular purpose and provides a means to prevent contamination of **Materials**. Although the Oil Movements division is responsible for thousands of pieces of equipment including tanks, pumps, valves, and the complex piping network of lines that tie (and cross tie) everything together, for the purpose of this project we are only focusing on the tanks.

3. The specifications of **Materials**, the **Tasks** for making finished products, and the known volumes within the **Tanks** may be used to enable fuel blending optimization via a program called an optimizer (not in scope).

The **Tanks** have various **TankTypes**. For example, spherical tanks are used to hold material with a low vapor pressure such as butane and isomerate, while floating, fixed, or cone roof tanks store material with a higher vapor pressure such as alkylate, reformate, and low sulfur diesel. The material in the destination tanks is finished product and will eventually be sold to customers, but that is not in the scope of this project.
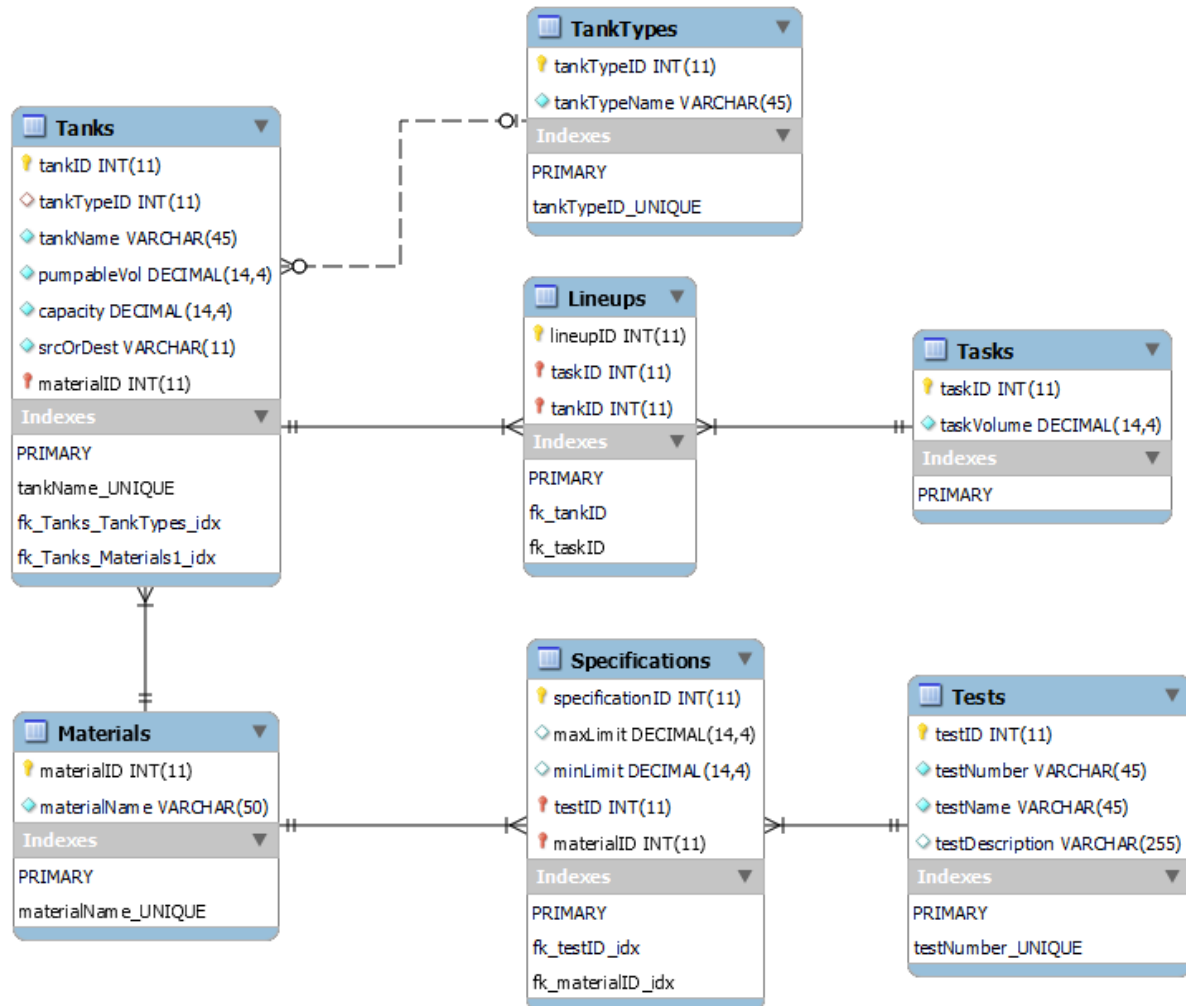
Database Outline - Entities, Attributes, and Relationships

- **Tanks**: **Tanks** are used to hold different **Materials**. A tank can be either a source (src) or destination (dest), which is identified using the boolean attribute **srcOrDest**.   **Materials** from source tanks are blended together into a destination tank. **Tasks** are used to indicate which **Tanks** are being used in a blend. **Tasks** and **Tanks** is a M:N relationship and so a bridging table, **Lineups**, is used.
    a. Attributes:
        i. tankID: int, unique, not NULL, Auto Increment, PK

        ii.   tankName: varchar(45), unique, not NULL (for example T301)
        iii.   tankTypeID: int, default NULL, FK
        iv.   materialID: int, not NULL, FK
        v.   pumpableVol: decimal(14,4), not NULL (amount of barrels available to pump out)
        vi.   capacity: int, not NULL (volume of the tank in barrels)
        vii.   srcOrDest: varchar(11), not NULL, default 'source' (Constrained to either "source" or "destination")

   b. Relationships:
        i.   A M:1 relationship between **Tanks** and **TankTypes** is implemented with **tankTypeID** as a FK inside of **Tanks**. A tank can only have 1 tank type, but a tank type can be assigned to many tanks.
        ii.   A M:1 relationship between **Tanks** and **Materials** is implemented with **materialID** as a FK inside of **Tanks**. A tank can hold only 1 type of material, but a material could be held in several tanks.
        iii.   A 1:M relationship between **Tanks** and **Lineups** is implemented with **tankID** as a FK in a bridging table, **Lineups.**

- **TankTypes**: There are several types of **Tanks**, such as floating roof, cone roof, fixed and spherical.
  - a. Attributes:
    - i. tankTypeID: int, unique, not NULL, Auto Increment, PK
    - ii. tankTypeName: varchar(45), not NULL
  - b. Relationships:
    - i. A 1:M relationship between **TankTypes** and **Tanks** is implemented with **tankTypeID** as a FK inside of **Tanks**. A tank will have one tank type, but many tanks can be the same type.

- **Tasks**: Tasks are used to create a finished blend of transportation fuel in a destination tank by blending material from one or more source tanks.
  - a. Attributes:
    - i. taskID: int, unique, not NULL, Auto Increment, PK
    - ii. taskVolume: decimal(14,4), not NULL (target volume in barrels)
  - b. Relationships:
    - i. A 1:M relationship between **Tasks** and **Lineups** is implemented with **taskID** as a FK in a bridging table, **Lineups**.

- **Lineups**: A bridging entity is used to show the M:N relationship between **Tanks** and **Tasks.**
  - a. Attributes:
    - i. lineupID: int, unique, not NULL, Auto Increment, PK
    - ii. tankID: int, not NULL, FK
    - iii. taskID: int, not NULL, FK
  - b. Relationships:
    - i. A M:1 relationship between **Lineups** and **Tanks** is implemented with **tankID** as a FK in a bridging table, **Lineups**.
    - ii. A M:1 relationship between **Lineups** and **Tasks** is implemented with **taskID** as a FK in a bridging table, **Lineups.**

- **Materials**: A chemical with specifications. **Materials** are those things that can be stored in the **Tanks**.
  - a. Attributes:
    - i. materialID: int, unique, not NULL, Auto Increment, PK
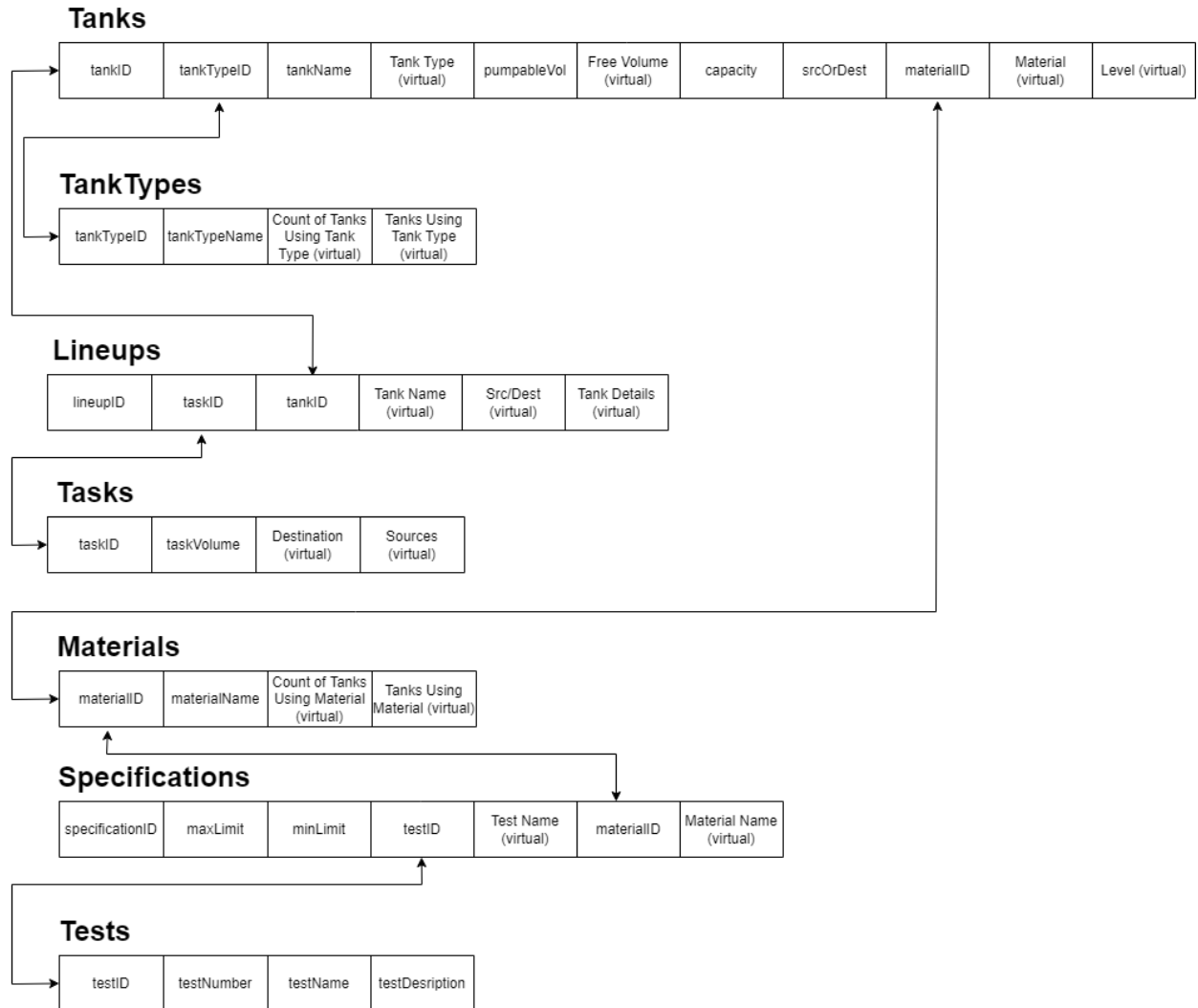   - ii. materialName: varchar(50), unique, not NULL

1. Examples: Alkylate, Isomerate, Premium MOGAS
   b. Relationships:
      i. A 1:M relationship between **Materials** and **Tanks** is implemented with **materialID** as a FK inside of **Tanks.**
      ii. A 1:M relationship between **Materials** and **Tasks** is implemented with **materialID** as a FK in **Tasks.**
      iii. A 1:M relationship between **Materials** and **Specifications** is implemented with **materialID** as a FK in a bridging table, **Specifications.**

- **Tests:** The various tests that can be run on different materials.
   a. Attributes:
      i. testID: int, unique, not NULL, Auto Increment, PK
      ii. testNumber: varchar(45), not NULL, unique
      iii. testName: varchar(45), not NULL
      iv. testDescription: varchar(255), default NULL
   b. Relationships:
      i. A 1:M relationship between **Tests** and **Specifications** is implemented with a **testID** as a FK inside of a bridging table, **Specifications**.

- **Specifications:** A bridging entity is used to show the M:N relationship between **Materials** and the **Tests**. The Specifications are a list of properties that a material must have to be given a particular name.
   a. Attributes:
      i. specificationID: int, unique, not NULL, Auto Increment, PK
      ii. maxLimit: decimal(14,4)
      iii. minLimit: decimal(14,4)
      iv. testID: int, not NULL, FK
      v. materialID: int, not NULL, FK
   b. Relationships:
      i. A M:1 relationship between **Specifications** and **Tests** is implemented with a **testID** as a FK inside of a bridging table, **Specifications**.
      ii. A M:1 relationship between **Specifications** and **Materials** is implemented with **materialID** as a FK in a bridging table, **Specifications.**

Entity-Relationship Diagram

TankTypes
- tankTypeID INT(11)
- tankTypeName VARCHAR(45)

Indexes
- PRIMARY
- tankTypeID_UNIQUE

Tanks
- tankID INT(11)
- tankTypeID INT(11)
- tankName VARCHAR(45)
- pumpableVol DECIMAL(14,4)
- capacity DECIMAL(14,4)
- srcOrDest VARCHAR(11)
- materialID INT(11)

Indexes
- PRIMARY
- tankName_UNIQUE
- fk_Tanks_TankTypes_idx
- fk_Tanks_Materials1_idx

Lineups
- lineupID INT(11)
- taskID INT(11)
- tankID INT(11)

Indexes
- PRIMARY
- fk_tankID
- fk_taskID

Tasks
- taskID INT(11)
- taskVolume DECIMAL(14,4)

Indexes
- PRIMARY

Materials
- materialID INT(11)
- materialName VARCHAR(50)

Indexes
- PRIMARY
- materialName_UNIQUE

Specifications
- specificationID INT(11)
- maxLimit DECIMAL(14,4)
- minLimit DECIMAL(14,4)
- testID INT(11)
- materialID INT(11)

Indexes
- PRIMARY
- fk_testID_idx
- fk_materialID_idx

Tests
- testID INT(11)
- testNumber VARCHAR(45)
- testName VARCHAR(45)
- testDescription VARCHAR(255)

Indexes
- PRIMARY
- testNumber_UNIQUE

Schema

Big Oil Movements Bonanza (BOMB) Schema

Tanks

tankID	tankTypeID	tankName	Tank Type (virtual)	pumpableVol	Free Volume (virtual)	capacity	srcOrDest	materialID	Material (virtual)	Level (virtual)

TankTypes

tankTypeID	tankTypeName	Count of Tanks Using Tank Type (virtual)	Tanks Using Tank Type (virtual)

Lineups

lineupID	taskID	tankID	Tank Name (virtual)	Src/Dest (virtual)	Tank Details (virtual)

Tasks

taskID	taskVolume	Destination (virtual)	Sources (virtual)

Materials

materialID	materialName	Count of Tanks Using Material (virtual)	Tanks Using Material (virtual)

Specifications

specificationID	maxLimit	minLimit	testID	Test Name (virtual)	materialID	Material Name (virtual)

Tests

testID	testNumber	testName	testDesription

* **virtual** means that the column is visible on the UI and the values are determined from a SQL Stored Procedure, or using React methods.

- Schema Information
    a. Each table has its own primary key to identify records. There are no composite keys.
    b. The **Lineups** entity has the ON DELETE CASCADE option set for its foreign keys. This allows the complete removal of a tank for a task if the tank or task are deleted.
    c. The **Lineups** entity has the ON UPDATE CASCADE option set for its foreign keys. If **taskID** in **Tasks** or **tankID** in **Tanks** is modified then the change will be propagated to the **Lineups** entity.

d. The **Specifications** entity has the ON DELETE CASCADE option set for its foreign keys. This allows the complete removal of a specification if a material or a test is deleted that is referenced in the **Specifications** entity.

e. The **Specifications** entity has the ON UPDATE CASCADE option set for its foreign keys. If **testID** in **Tests** or **materialID** in **Materials** is modified then the change will be propagated to the **Specifications** entity.

f. The **Tanks** entity has the ON DELETE RESTRICT option set for its foreign keys. This prevents the deletion of a material or tank type if it exists in the Tanks entity.

g. The **Tanks** entity also has the ON UPDATE CASCADE option set for its foreign keys. If **materialID** in **Materials**, or **tankTypeID** in **TankTypes** is modified then the change will be propagated to the **Tanks** entity.

Sample Data

Tanks

tankID	tankTypeID	tankName	pumpableVol	capacity	srcOrDest	materialID
11	14	T27	60000.0000	80000.0000	source	11
12	12	T168	45000.0000	68000.0000	source	12
13	15	T321	15000.0000	25000.0000	source	15
14	15	T90	5000.0000	82000.0000	destination	17
15	13	T82	35000.0000	75000.0000	destination	18
16	15	T74	5000.0000	60000.0000	source	14
17	NULL	T322	37000.0000	70000.0000	source	16
18	16	T1212	20000.0000	45000.0000	source	13
19	15	T105	40000.0000	71000.0000	destination	17
NULL	NULL	NULL	NULL	NULL	NULL	NULL

TankTypes

tankTypeID	tankTypeName
11	Bullet
12	Cone Roof
13	External Floating Roof
14	Fixed Roof
15	Internal Floating Roof
16	Sphere
NULL	NULL

Tasks

Result Grid

	taskID	taskVolume
▶	11	60000.0000
	182	20000.0000
	205	30000.0000
	NULL	NULL

Lineups

Result Grid Filter

	lineupID	taskID	tankID
▶	684	182	14
	694	182	11
	704	182	12
	714	205	11
	724	205	13
	734	205	15
	744	11	17
	754	11	13
	764	11	16
	774	11	19
	NULL	NULL	NULL

Materials

Result Grid Filter Rows:

	materialID	materialName
▶	11	Alkylate
	17	Conventional MOGAS
	14	Heavy Light Ultraformate
	13	Isomerate
	12	Light Hydrotreated Naphtha
	18	Premium MOGAS
	16	Stabilized Heavy Naphtha
	15	Ultraformate
	NULL	NULL

Specifications

specification...	maxLimit	minLimit	testID	materialID
11	3.0000	0.0000	13	11
12	2.0000	0.0000	18	11
13	72.0000	68.0000	19	11
14	5.6000	0.0000	12	11
15	270.0000	187.0000	20	11
16	54.0000	50.0000	19	12
17	9.5000	0.0000	12	12
18	255.0000	110.0000	20	12
19	1.5000	0.0000	14	12
20	2.0000	0.0000	16	12
21	87.0000	83.0000	11	12
22	10.0000	0.0000	13	12
23	13.0000	10.0000	12	13
24	87.0000	82.0000	11	13
25	3.0000	0.0000	12	14
26	86.2000	85.8000	11	14
27	5.0000	0.0000	13	15
28	104.0000	98.0000	11	15
29	10.0000	0.0000	13	16
30	92.0000	87.0000	11	16
31	10.0000	0.0000	13	17
32	9.4000	8.4000	12	17
33	87.0000	85.0000	11	17
34	5.0000	0.0000	13	18
35	8.9000	8.1000	12	18
36	92.0000	90.0000	11	18
NULL	NULL	NULL	NULL	NULL

Tests

testID	testNumber	testName	testDescription
11	D2699	RON	Standard Test Method for Research Octane Nu...
12	D323	RVP	Test for Vapor Pressure of Petroleum Products
13	D5623	Sulfur	Standard Test Method for Sulfur Compounds in...
14	D130	Cu Strip	Copper Strip Corrosion Test
15	D3606	Benzene	Standard Test Method for Determination of Ben...
16	D7667	Ag Strip	Silver Strip Corrosion Test
17	D2700	MON	Standard Test Method for Motor Octane Numbe...
18	D5762	Nitrogen	Standard Test Method for Nitrogen in Liquid Hyd...
19	D6822	Gravity	Standard Test Method for Density, Relative Den...
20	D7213	Sim Dist	Standard Test Method for Boiling Range Distrib...
21	D4952	Mercapt...	Standard Test Method for Qualitative Analysis fo...
NULL	NULL	NULL	NULL

Screen Captures

HomePage - Contains the links to the other pages which each represent a table in the database.

TankPage - Allows READ and DELETE (MdDeleteForever icon). If the delete is successful then the TankPage is reloaded. Contains links to CREATE (Add Tank) and UPDATE (MdEdit icon).

Manage Details of the Tanks

Each tank contains one material and may be involved in one or more tasks.

Filter by Tank Names

Add Tank

Tank Name	Tank Type	Pumpable Volume (bbls)	Free Volume (bbls)	Capacity (bbls)	Material	Src/Dest	Level (%)	Edit	Delete
T27	Fixed Roof	60,000	20,000	80,000	Alkylate	source	75.00	✏	⌫
T74	Internal Floating Roof	5,000	55,000	60,000	Heavy Light Ultraformate	source	8.30	✏	⌫
T82	External Floating Roof	35,000	40,000	75,000	Premium MOGAS	destination	46.70	✏	⌫
T90	Internal Floating Roof	5,000	77,000	82,000	Conventional MOGAS	destination	6.10	✏	⌫
T105	Internal Floating Roof	40,000	31,000	71,000	Conventional MOGAS	destination	56.30	✏	⌫
T168	Cone Roof	45,000	23,000	68,000	Light Hydrotreated Naphtha	source	66.20	✏	⌫
T321	Internal Floating Roof	15,000	10,000	25,000	Ultraformate	source	60.00	✏	⌫
T322		37,000	33,000	70,000	Stabilized Heavy Naphtha	source	52.90	✏	⌫
T1212	Sphere	20,000	25,000	45,000	Isomerate	source	44.40	✏	⌫

Clicking on the hyperlink brings up the tasks that use a particular tank (T27, for example).

Tasks Using Tank

Task ID	Description
182	20,000 bbls of Conventional MOGAS in T90 from: T27 (Alkylate), T168 (Light Hydrotreated Naphtha)
205	30,000 bbls of Premium MOGAS in T82 from: T27 (Alkylate), T321 (Ultraformate)

CreateTankPage - Allows CREATE. If creation is successful then the user is returned to the TankPage.

Add a Tank

Tank Number	Tank Type	Pumpable Volume	Capacity	Material Name	Src/Dest
(i.e. 123)	Bullet	pumpable volume	capacity	Alkylate	source

Cancel   Create

EditTankPage - Allows UPDATE. If the edit is successful then the user is returned to the TankPage.

Edit the Tank

Tank Number	Tank Type	Pumpable Volume	Capacity	Material	Src/Dest
82	External Floating Roof	35000	75000	Premium MOGAS	source

Cancel   Save

Data validation is present on both CreateTankPage and EditTankPage.

TankTypesPage - Allows READ and DELETE (MdDeleteForever icon). If the delete is successful then the TankTypesPage is reloaded. Contains links to CREATE (Add Tank Type) and UPDATE (MdEdit icon).

Manage Tank Types

There are many varities of tanks with the best choice determined by the properties of the material stored inside the tank.

Add Tank Type

Tank Type Name	Count of Tanks Using Tank Type	Tanks Using Tank Type	Edit	Delete
Bullet	0		✏	🗑
Cone Roof	1	T168	✏	🗑
External Floating Roof	1	T82	✏	🗑
Fixed Roof	1	T27	✏	🗑
Internal Floating Roof	4	T321, T90, T74, T105	✏	🗑
Sphere	1	T1212	✏	🗑

CreateTankTypesPage - Allows CREATE. If creation is successful then the user is returned to the TankTypesPage.

Add a Type of Tank

Tank Type Name

name of tankType

Cancel   Create

EditTankTypesPage - Allows UPDATE. If the edit is successful then the user is returned to the TankTypesPage.

Edit the TankType

Tank Type Name

Dome

Cancel   Save

TaskPage - Allows READ and DELETE (MdDeleteForever icon). If the delete is successful then the TaskPage is reloaded. Contains links to CREATE (Add Task) and UPDATE (MdEdit icon).

Manage Tasks and Associated Lineups

Each task specifies a certain volume of finished product and, together with lineups, specifies which tanks are used.

Add Task

Task ID	Task Volume	Destination	Sources	Edit	Delete
11	60,000	Conventional MOGAS in T105	T322 (Stabilized Heavy Naphtha), T321 (Ultraformate), T74 (Heavy Light Ultraformate)	✏	☒
182	20,000	Conventional MOGAS in T90	T27 (Alkylate), T168 (Light Hydrotreated Naphtha)	✏	☒
205	30,000	Premium MOGAS in T82	T27 (Alkylate), T321 (Ultraformate)	✏	☒

Clicking on the hyperlink for a task brings up the conflicting tasks (those tasks using one or more of the tanks in the selected task). Task 205 has conflicts with both Task 11 (via T322) and Task 182 (via T27).

Conflicting Tasks

Task ID	Description
11	60,000 bbls of Conventional MOGAS in T105 from T322 (Stabilized Heavy Naphtha), T321 (Ultraformate), T74 (Heavy Light Ultraformate)
182	20,000 bbls of Conventional MOGAS in T90 from T27 (Alkylate), T168 (Light Hydrotreated Naphtha)

CreateTaskPage - Allows CREATE. If creation is successful then the user is returned to the TaskPage.

Add a Task

This page adds a task and executes a transaction which ensures 1 destination tank and 1 or more source tanks.

Task Volume (bbls)	Destination Tank	Source Tanks
Number > 0	Select a destination tank.	T27: Has 60,000 bbls of Alkylate T55: Has 111 bbls of Alkylate T123: Has 10,000 bbls of Alkylate T168: Has 45,000 bbls of Light Hydrotreated Naphtha

Cancel   Create

EditTaskPage - Allows UPDATE. If the edit is successful then the user is returned to the TaskPage.

Edit the Task

Task Volume	Destination Tank	Source Tanks
20001	Select a destination tank.	T27: Has 60,000 bbls of Alkylate T55: Has 111 bbls of Alkylate T123: Has 10,000 bbls of Alkylate T168: Has 45,000 bbls of Light Hydrotreated Naphtha

Cancel   Save

Data validation is present on both CreateTaskPage and EditTaskPage.

LineupPage - Allows READ and DELETE (MdDeleteForever icon). If the delete is successful then the LineupPage is reloaded. Contains links to CREATE (Add Lineup) and UPDATE (MdEdit icon).

Manage the M:M Lineups Table - Associations between Tasks and Tanks

Note: It is NOT recommended to use this page to add Lineups. Use the Tasks page instead.

Add Lineup

Lineup ID	Task ID	Tank ID	Tank Name	Src/Dest	Tank Details	Edit	Delete
774	11	19	T105	destination	T105 (Conventional MOGAS) Remaining: 31,000	✏	⊠
754	11	13	T321	source	T321 (Ultraformate) Available: 15,000	✏	⊠
744	11	17	T322	source	T322 (Stabilized Heavy Naphtha) Available: 37,000	✏	⊠
764	11	16	T74	source	T74 (Heavy Light Ultraformate) Available: 5,000	✏	⊠
684	182	14	T90	destination	T90 (Conventional MOGAS) Remaining: 77,000	✏	⊠
704	182	12	T168	source	T168 (Light Hydrotreated Naphtha) Available: 45,000	✏	⊠
694	182	11	T27	source	T27 (Alkylate) Available: 60,000	✏	⊠
734	205	15	T82	destination	T82 (Premium MOGAS) Remaining: 40,000	✏	⊠
714	205	11	T27	source	T27 (Alkylate) Available: 60,000	✏	⊠
724	205	13	T321	source	T321 (Ultraformate) Available: 15,000	✏	⊠

CreateLineupPage - Allows CREATE. If creation is successful then the user is returned to the LineupPage.

Add a Lineup

Note: It is NOT recommended to use this page to add Lineups. Use the Tasks page instead.

Task	Tank
Task 205: Volume: 30,000 ⌄	T27 (source) contains Alkylate Available: 60,000 ⌄

Cancel   Create

EditLineupPage - Allows UPDATE. If the edit is successful then the user is returned to the LineupPage.

Edit the Lineup

Lineup ID	Task	Tank
714	Task 205: Volume: 30,000 ⌄	T27 (source) contains Alkylate Available: 60,000 ⌄

Cancel   Save

MaterialPage - Allows READ and DELETE (MdDeleteForever icon). If the delete is successful then the MaterialPage is reloaded. Contains links to CREATE (Add Material) and UPDATE (MdEdit icon).

Manage the Names of Materials

Different materials can be stored in tanks. Material names and which tanks use the materials can be found below. A material can also have one of more tests. Selecting a material name will show the associated test and limits, if any. Certain materials can't be deleted due to constraints.

Add Material

Material ID	Material Name	Count of Tanks Using Material	Tanks Using Material	Edit	Delete
11	Alkylate	1	T27	✏	🗑
17	Conventional MOGAS	2	T90, T105	✏	🗑
14	Heavy Light Ultraformate	1	T74	✏	🗑
13	Isomerate	1	T1212	✏	🗑
12	Light Hydrotreated Naphtha	1	T168	✏	🗑
18	Premium MOGAS	1	T82	✏	🗑
16	Stabilized Heavy Naphtha	1	T322	✏	🗑
15	Ultraformate	1	T321	✏	🗑

Clicking on the hyperlink for a material name brings up the specifications for that material.

Associated Specifications

Material and Test Name	Test Number	Max Limit	Min Limit
Ultraformate RON	D2699	104	98
Ultraformate Sulfur	D5623	5	0

CreateMaterialPage - Allows CREATE. If creation is successful then the user is returned to the MaterialPage.

Add a Material

Material Name

name of material

Cancel   Create

EditMaterialPage - Allows UPDATE. If the edit is successful then the user is returned to the MaterialPage.

Edit the Material

Material Name

Conventional MOGAS

Cancel   Save

SpecificationPage - Allows READ and DELETE (MdDeleteForever icon). If the delete is successful then the SpecificationPage is reloaded. Contains links to CREATE (Add Specification) and UPDATE (MdEdit icon).

CreateSpecificationPage - Allows CREATE. If creation is successful then the user is returned to the SpecificationPage.

EditSpecificationPage - Allows UPDATE. If the edit is successful then the user is returned to the SpecificationPage.

TestPage - Allows READ and DELETE (MdDeleteForever icon). If the delete is successful then the TestPage is reloaded. Contains links to CREATE (Add Test) and UPDATE (MdEdit icon).

Manage Laboratory Tests for Materials

A material can have one or more tests. Selecting a test number will show the associated materials and limits, if any.

Add Test

Test ID	Test Number	Test Name	Test Description	Edit	Delete
11	D2699	RON	Standard Test Method for Research Octane Number of Spark Ignition Fuels	✏	🗑
12	D323	RVP	Test for Vapor Pressure of Petroleum Products	✏	🗑
13	D5623	Sulfur	Standard Test Method for Sulfur Compounds in Light Petroleum Liquids by Gas Chromatography and Sulfur Selective Detection	✏	🗑
14	D130	Cu Strip	Copper Strip Corrosion Test	✏	🗑
15	D3606	Benzene	Standard Test Method for Determination of Benzene and Toluene in Spark Ignition Fuels by Gas Chromatography	✏	🗑
16	D7667	Ag Strip	Silver Strip Corrosion Test	✏	🗑

Clicking on the hyperlink for a test number brings up the materials that have specifications based on that test.

Associated Specifications

Test and Material Name	Test Number	Max Limit	Min Limit
RON Light Hydrotreated Naphtha	D2699	87	83
RON Isomerate	D2699	87	82
RON Heavy Light Ultraformate	D2699	86.2	85.8
RON Ultraformate	D2699	104	98
RON Stabilized Heavy Naphtha	D2699	92	87
RON Conventional MOGAS	D2699	87	85
RON Premium MOGAS	D2699	92	90

CreateTestPage - Allows CREATE. If creation is successful then the user is returned to the TestPage.

Add a Test

Test Number	Test Name	Test Description
i.e. 123	name of test	description of test

Cancel   Create

EditTestPage - Allows UPDATE. If the edit is successful then the user is returned to the TestPage.

Edit a Test

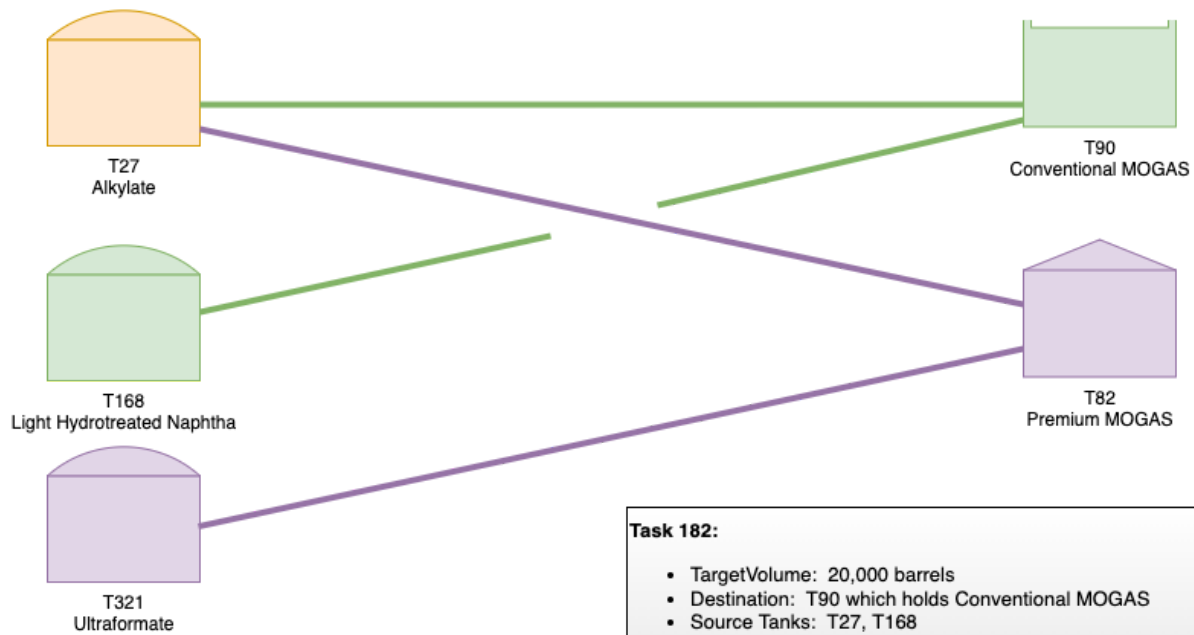| Test Number	Test Name	Test Description
5623	Sulfur	Sulfur

Cancel   Save

Appendix

Big Oil Process Flow Diagram

Source Tanks

T27
Alkylate

T168
Light Hydrotreated Naphtha

T321
Ultraformate

Destination Tanks

T90
Conventional MOGAS

T82
Premium MOGAS

Tanks shown in green are in use by Task 182 only.
Tanks shown in purple are in use by Task 205 only.
Tanks shown in orange are used by multiple Tasks.

*Note: In this simplified refinery's oil movements division, each Tank can only be a part of a single Task at any one moment in time.

Task 182:

- TargetVolume: 20,000 barrels
- Destination: T90 which holds Conventional MOGAS
- Source Tanks: T27, T168

Task 205:

- TargetVolume: 30,000 barrels
- Destination: T82 which holds Premium MOGAS
- Sources: T27, T321

Tasks 182 and 205 *conflict* because they both use T27.