

④ The Refinery

Paper Model
to print, cut and assemble



We, at the People's Ministry of Petroleum and Mining and PDVSA, have undertaken the task of educating Venezuelans, aware of the reasonable and sovereign use of oil, convinced of its strategic value to fight poverty and join peoples.

We are positive that getting on the activities carried out by PDVSA to turn oil and gas into gasoline, computer items, toys and a wide array of useful goods will make us more careful and watchful of whatever is said and done in our oil industry.

For such purposes, we are handing in you the Series "Learning about oil," composed of simple, ready-to-assemble models of oil operations.

This time, we are providing you with The Refinery. We are certain that as soon as you finish off, you will have discovered, along with us, one of the so many wonderful worlds of the oil industry.

How to use this material.

- **Print the cover, the text information and the instructions to assemble the model, on bond paper.**
- **On a printer that accepts cardboard, print the parts of the model and its base. Use letter-size bristol cardboard.**

The refinery is an industrial facility where crude oil turns into gasoline, kerosene, oils, greases, gas, gasoil and other useful products.



WHAT ARE THE CONSTITUENT ELEMENTS OF A REFINERY?

The refinery is composed of:

Furnace, where the crude oil arrives from oil wells.

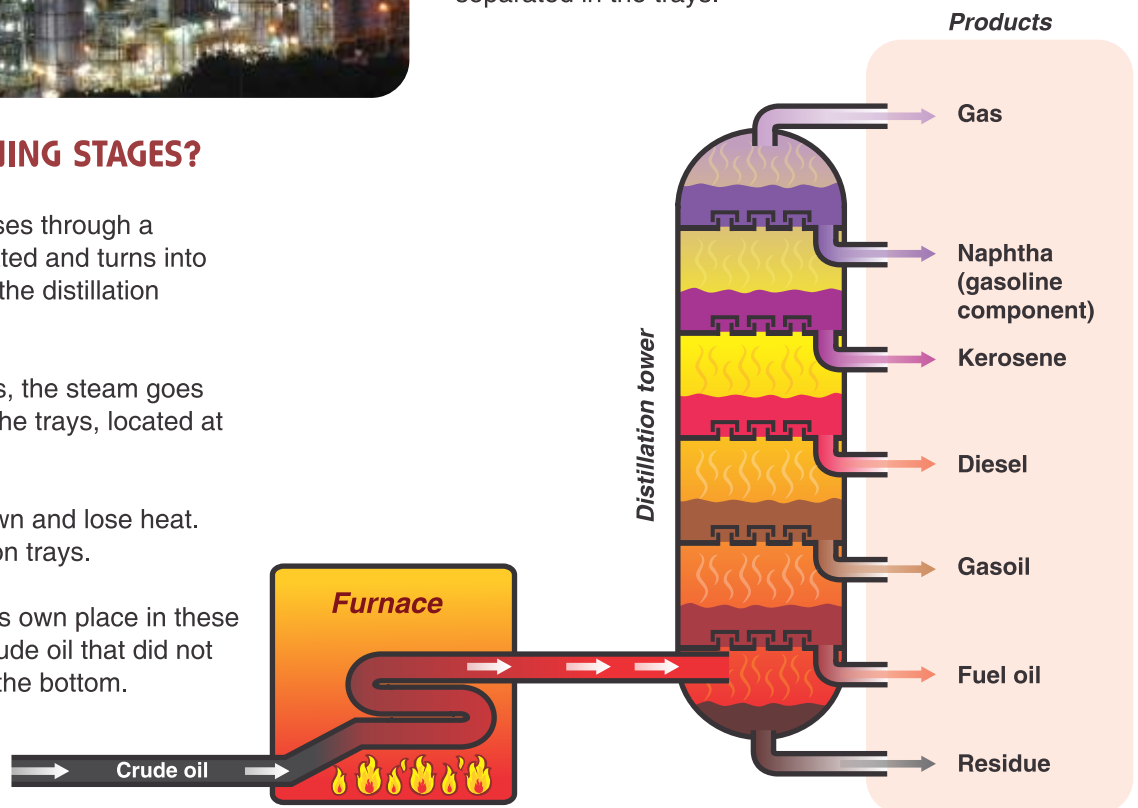
Distillation tower, where the steam of the processed crude oil is distributed.

Trays; they work at different temperatures and help to separate and process the oil components.

Ducts; they are used to collect several streams separated in the trays.

WHAT ARE THE REFINING STAGES?

- 1 First, the crude oil passes through a furnace; there, it is heated and turns into steam; next, it goes to the distillation towers.
- 2 In the distillation towers, the steam goes from the bottom up to the trays, located at different levels.
- 3 Rising steams cool down and lose heat. Next, they are placed on trays.
- 4 Every substance has its own place in these trays; the rest of the crude oil that did not evaporate remains on the bottom.



Location of refineries in Venezuela



REFINERY	ESTABLISHMENT
Bajo Grande	1917
Cardón	1947
Amuay	1950
Puerto La Cruz	1950
San Roque	1950
El Palito	1960
Paraguaná Refining Center (CRP)*	1997

*Paraguaná Refining Center, the largest in the world, was created by the merger of the refineries of Amuay, Cabo Cardón and Bajo Grande.



DOTTED LINES
Show the area that needs to be **folded**.



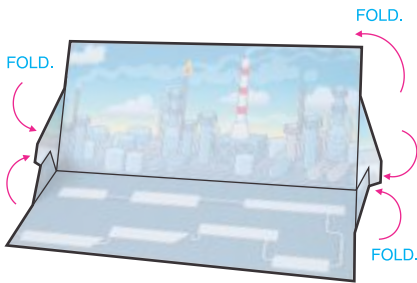
SOLID LINES
Show the area that needs to be **cut out**.

HOW TO ASSEMBLE THE REFINERY

- Before cutting the pieces out, go over all the fold lines with the tip of an exhausted ballpoint pen and a rule. This will help you fold the pieces.
- Cut out every piece; arrange them in your workplace in alphabetical order (each piece has an identity letter).
- Fold each piece.
- Carefully read the directions before starting.
- Take your time to assemble each piece, following the steps.
- Once the model is over, glue it on its base; the base is overleaf.
- You can glue the base on a piece of cardboard, polyethylene, or MDF, of 23 x 30 cm to make it steadier.

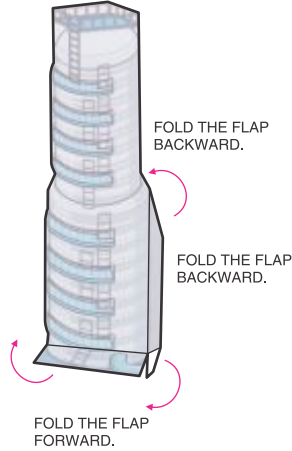
1 "A" Piece. BASE OF THE REFINERY.

FIRMLY FOLD THE EDGES ON THE SIDES AND THE BACKGROUND. IN THIS WAY, THE SIDES WILL BE EASILY GLUED. THE SIDES ARE TO BE GLUED AT THE END, AFTER GLUING ALL THE PIECES ON THE BASE.

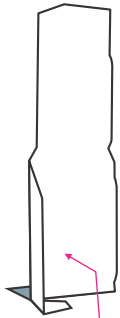


2 "B" Piece. VACUUM TOWER.

FOLD THE FLAPS OF THE PIECE AS SHOWN IN THE PICTURE.



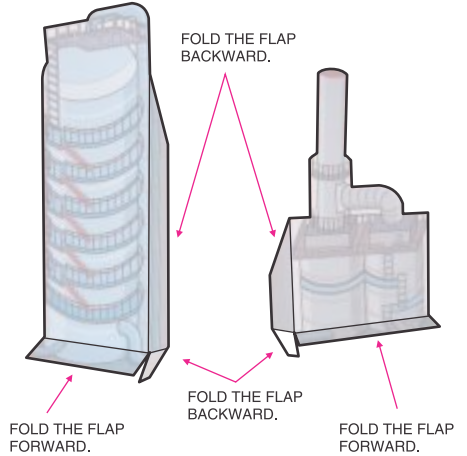
A VIEW OF THE PIECE FROM BEHIND.



THIS FLAP IS USED AS FOOT TO KEEP THE PIECE ERECTED.

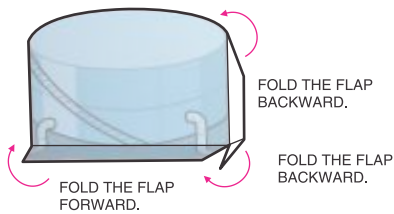
3 "C" Piece. ATMOSPHERIC COLUMN.

REPEAT THE SAME OPERATION WITH PIECES "C" AND "D."



4 "D" Piece. FURNACE.

5 "E" Piece. STORAGE TANK.

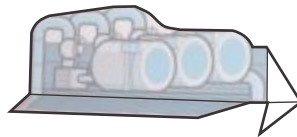


A VIEW OF THE PIECE FROM BEHIND.

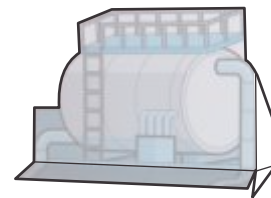


REPEAT THE SAME OPERATION WITH PIECES "F", "G" AND "H."

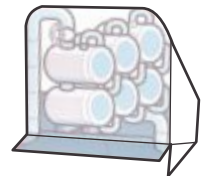
6 Pieza "F". MOTORES Y BOMBAS.



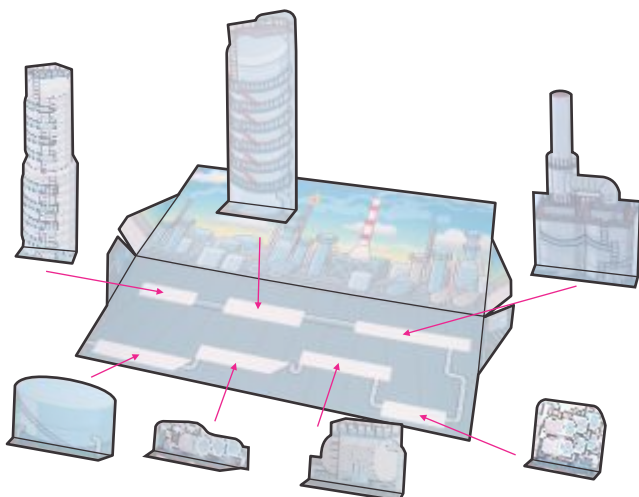
7 "G" Piece. DESALTER.



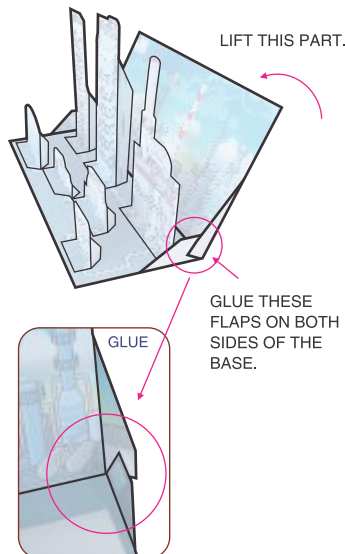
8 "H" Piece. HEAT EXCHANGER.



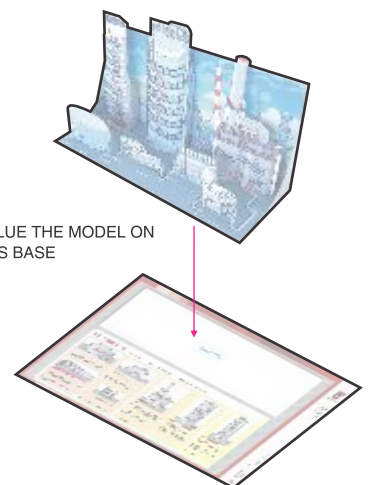
9 GLUE EACH PIECE ON THE BASE, ON ITS RESPECTIVE SPOT. GLUE FIRST THE THREE BACK PIECES; NEXT, THE FOUR FRONT PIECES.



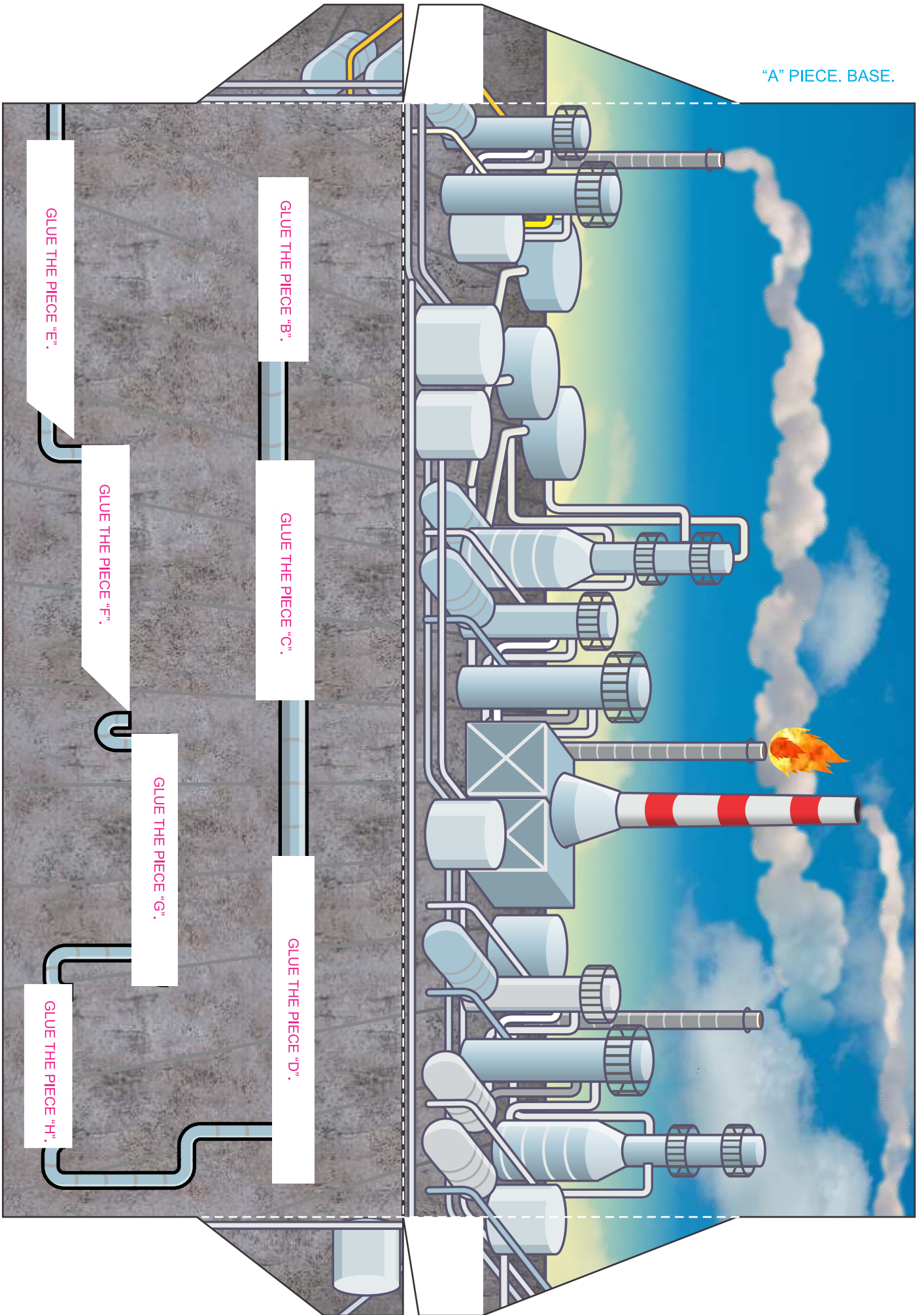
10 LIFT AND GLUE THE BACKGROUND OF THE MODEL AS SHOWN IN THE FIGURE.

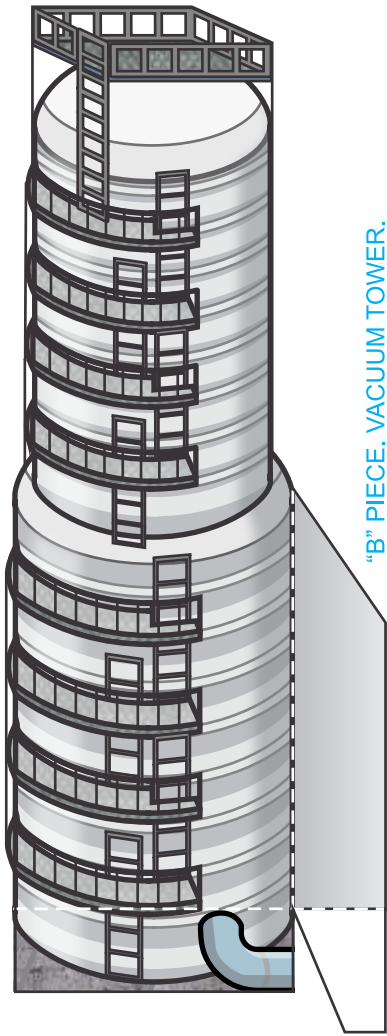


11 GLUE THE MODEL ON ITS BASE; THE BASE IS OVERLEAF.

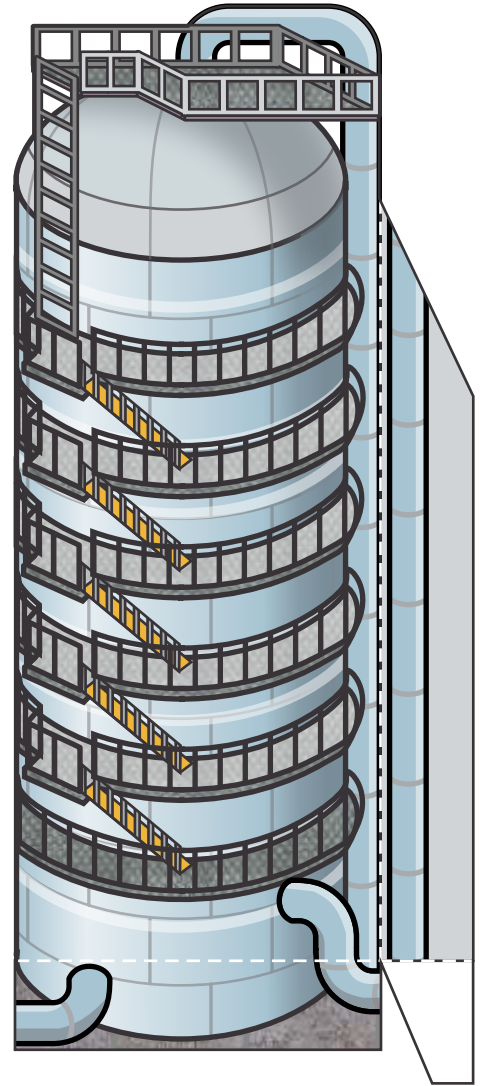


"A" PIECE. BASE.

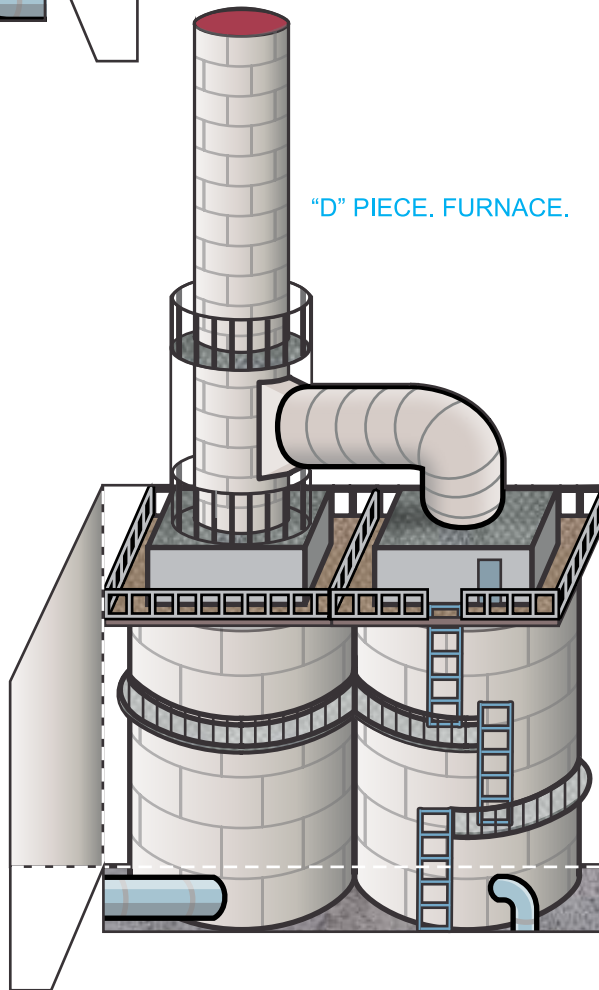




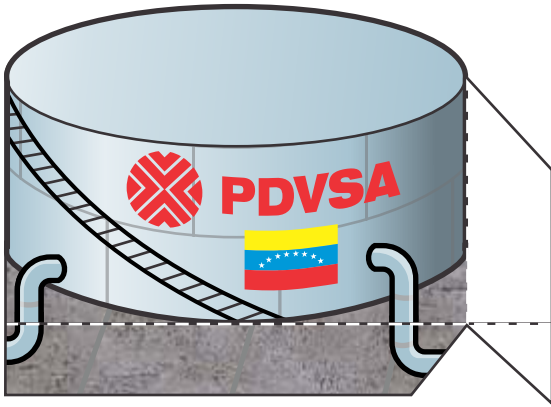
"B" PIECE. VACUUM TOWER.



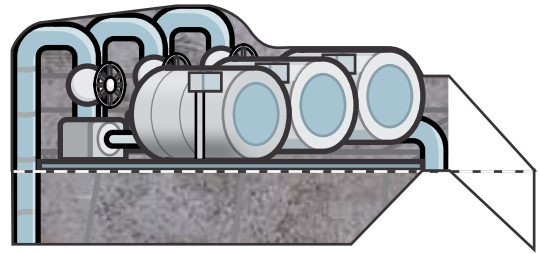
"C" PIECE. ATMOSPHERIC COLUMN.



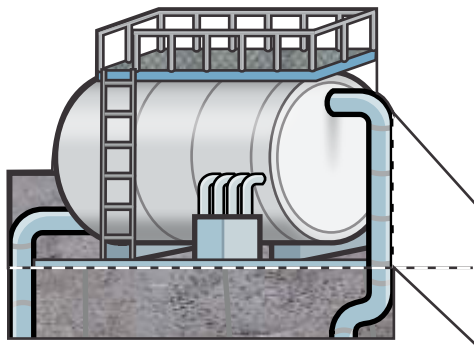
"D" PIECE. FURNACE.



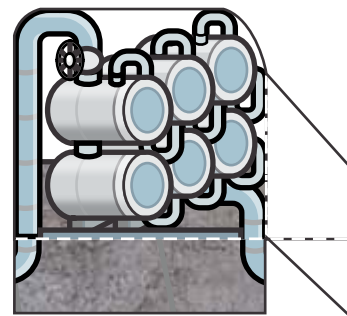
"E" PIECE. STORAGE TANK.



"F" PIECE. ENGINES AND PUMPS.



"G" PIECE. DESALTER.



"H" PIECE. HEAT EXCHANGERS.

AREA TO GLUE THE REFINERY

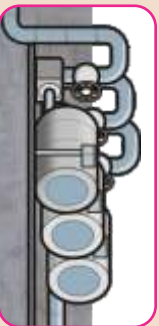
The Refinery

Some of the major constituent elements of a refinery are the following:



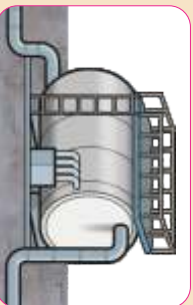
STORAGE TANKS

Huge tanks where the crude oil is stored.



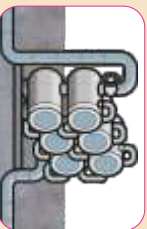
ENGINES AND PUMPS

Engines drive the plant. The pumps help to empty the storage tanks and carry the crude oil elsewhere in the plant.



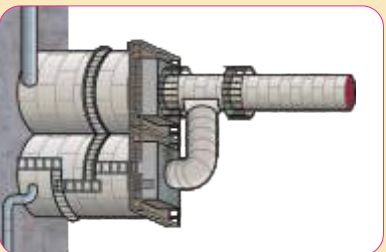
DESALTER

This unit, by means of an electric field, separates water residues and salt contents from oil.



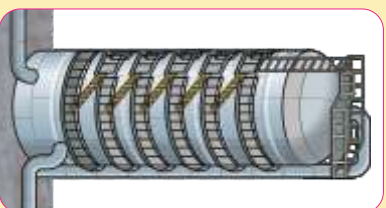
HEAT EXCHANGERS

Preheat the crude oil before going to the furnace.



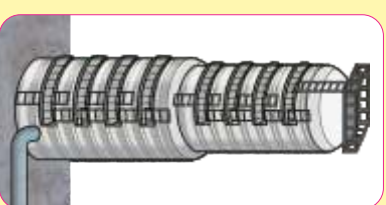
FURNACE

It heats the oil at 330°-370° C. This turns most hydrocarbons into gases. Resulting gases are pumped at the bottom of the atmospheric column.



ATMOSPHERIC COLUMN

It separates most of light products, such as gas, gasoline, naphtha, kerosene and gasoil.



VACUUM TOWER

This unit takes up the residue from the atmospheric tower and separates it into heavy products, namely: bitumen, fuel and lube oils.

