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Fabrication and process of Atmospheric Distillation Unit

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Abstract - This review paper studies the Fabrication and process of Atmospheric Distillation Unit. Distillation is an ancient unit operation, and has been widely practiced for thousands of years. Early applications used crude vaporization and condensation equipment, often for concentrating the alcoholic content of beverages. This expansion accelerated once distillation was recognized as an effective means of separating crude oil into various products. From there, the application of distillation spread into the majority of chemical processes . Refining of crude oils or petroleum essentially consists of primary separation processes and secondary conversion processes

1. Introduction

The petroleum refining process is the separation of the different hydrocarbons present in the crude oil into useful fractions and the conversion of some of the hydrocarbons into products having higher quality performance. These products, particularly the light and middle distillates, i.e., kerosene and diesel are more in demand all over the world. Crude distillation unit (CDU) is at the front end of the refinery, also known as topping unit, or atmospheric distillation unit. It receives high flow rates hence its size and operating cost are the largest in the refinery. The unit should run satisfactorily at about 60% of the design feed rate. Seasonal temperature variation should be incorporated in the design because changes in the cut point of gasoline can vary by 20 C (36F) between summer and winter . The petroleum refining process is the separation of the different hydrocarbons present in the crude oil into useful fractions and the conversion of some of the hydrocarbons into products having higher quality performance. Atmospheric and vacuum distillation of crude oils is the main primary separation processes producing various straight run products, e.g., gasoline to lube oils.

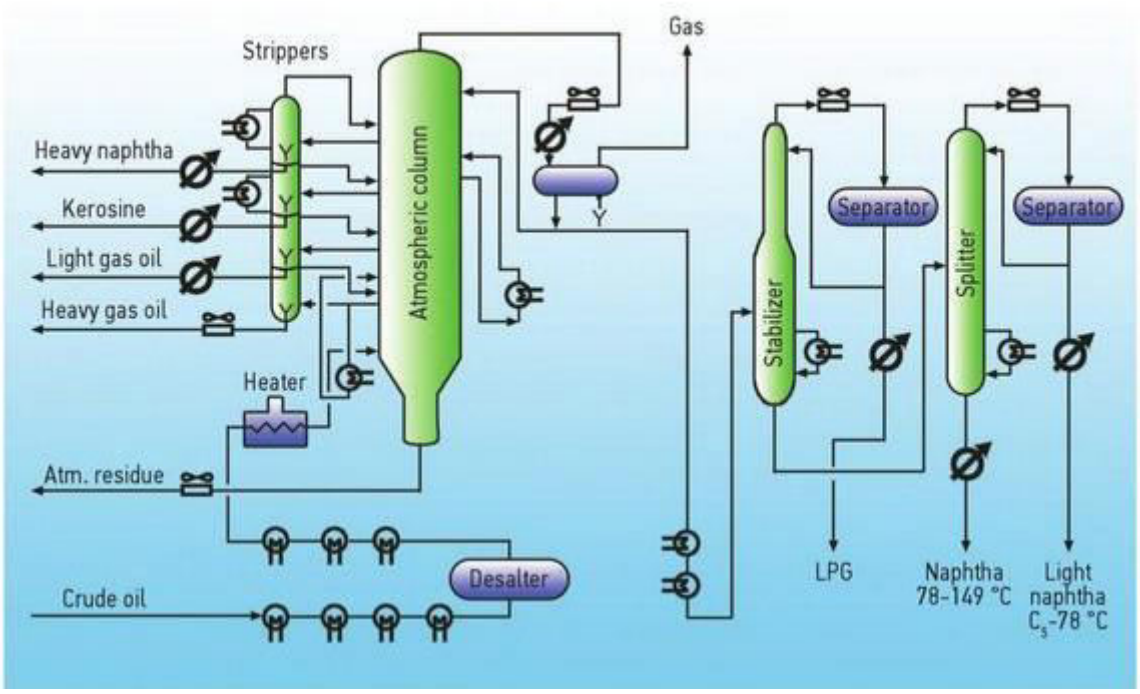
In this dissertation we present an accumulated theoretical study of the Fabrication and process of Atmospheric Distillation Unit

2. Atmospheric Distillation

Distillation unit under atmospheric pressure, or professionally called "topping", is primary refinery unit. Crude oil delivered to refinery needs to be refined in this unit, and then by capacity of atmospheric distillation unit, processing capacity of the whole refinery is estimated. This unit has the task, under atmospheric pressure and temperature of approximately 355 °C, and depending on crude oil type, to fractionate crude oil into particular products, i.e. distillates that are later refined in other units or processed in order to get higher value products, i.e. products of required quality.It is obvious that today all modern facilities in crude oil industry are controlled by digital control system (computers). Each distillation column consist of stripping section (bottom section of the column where steam is introduced in order to

remove components that have lower boiling points from the bottom of the column, i.e. residue) and rectification section that is located above section of the column where crude oil enters the column.

Recuperation of heat is brought to almost perfection in the modern distillation facilities, which enables optimal fuel consumption in a furnace in which crude oil is heated before it is sent to distillation column. Temperature to which crude oil is heated depends on the type of crude oil, and It falls within an interval 345 °C to 375 °C. If heat recuperation is good, then crude oil is heated to minimum of 260 °C before it enters the furnace. This means that it needs to be heated from 260 °C to 345 °C (or to 375 °C) in the furnace. If temperature of crude is about 200 °C before It enters the furnace, due to poor recuperation of heat, far more fuel will be needed to heat crude oil to desired temperature, than in the case in which crude oil temperature is 260 °C at the furnace entrance.
Second advantage of circulatory reflux is reduced steam volume at the top of the column, since conversion of liquid phase to vapor phase is decreased, so smaller area of condenser (cooler) is needed for cooling of the top product, which decreases investment value as well as water consumption for cooling in the coolers or electrical energy consumption for start up of electric motor for air coolers.



Atmospheric distillation without flash Column

Crude oil that arrives in a refinery contains water, sediments, and salts that, despite efforts, were not removed in oil field. Water, sediments, and salts have to be removed from crude oil before distillation because Gas

- Water in processing, due to instant evaporation (350 °C) and high volume generation, can cause turnover of distillation column trays which disables good quality of fractional distillation, and the work of the unit must be stopped;

- Sediments deposit on the heat exchangers and cause signifi-cant reduction of heat transfer efficiency; they also cause lo-calized generation of coke, and pressure increase which caus es breaking of heat exchanger gaskets and mixing of fluids that pass through heat exchanger, which lead to elimination of heat exchanger from the process, if this is possible, or shut-ting down of a unit;

- Salts are usually dissolved in water which is present in crude oil. Salts, predominantly sodium chloride (NaCl), dissociate and hydrolyze to generate strong acids (hydrochloric HCl) that cause corrosion on the unit's equipment

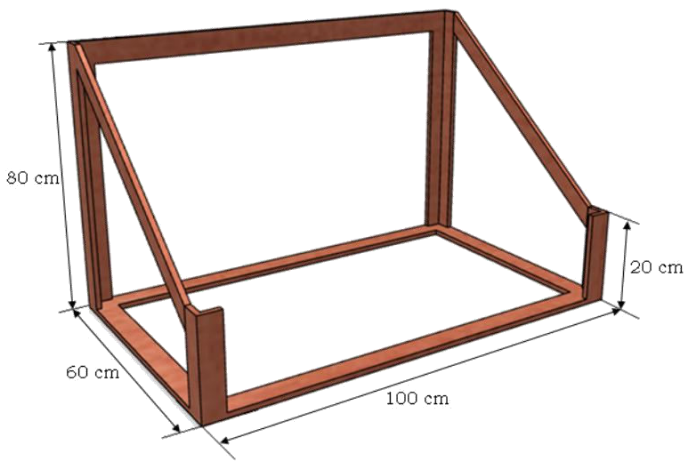
(heat exchangers, columns, vessels). Besides the mentioned substances, crude oil, depending on its quality, contains naphthenic acids and sulphur compounds, which also cause corrosion and put the unit in danger.

3. Fabrication of Model

The main Objective of Our project is to create a model of Atmospheric Distillation Unit. Process and Method and Material Used in the Project are Described Following in brief. It shows the Distillation through Column from Feed Insertion to Product Separation.

3.1 Frame

In the following figure a Iron Frame is shown.ON which the ADU unites Components is to be Mounted. Frame is Have 4 Legs in Which A pair is 80 cm Long and the other pair is 20 cm Long. Both Lets and Joined with other Iron strip .



3.2 Distillation Column

In this Drawing Distillation Coulmn(Tower) is represented. As Shown in The Figure Column have an Opening of 13.5 cm long to show sieves inside the Column. This Column is 70 cm long having 16.5 cm Diameter.

(a) (b) (c)

Column Drawing (a) Orthogonal View(b) Front View (c) Side View

This column is main processing eqipmment of the unit this column ditillation take place. Feed Is seprated in to different productrs like Napthas,Gasoline, Desiel within it.

3.3 Material

Distillation Column - Galvanized Iron and Steel Alloy
Pipes - Poly Vinyl Chloride ,Iron
Frame - Iron
Tank, Furnace - Sheet Metal

3.4 Contraction

Arc and Gas welding is used to Joint Fabricated this Model. Column is mounted on the Frame with help of Support. Feed Tank and Furnace is welded on frame and pipes are welded to Column and Side Strippers and labeling is done with the stickers. Sieves placed inside the Column is Welded. Two handle are placed inside each Side to Lift the Model for Mobility.

4. CONCLUSION

In Order Create a Representative Model of Atmospheric Distillation Column Flow sheets and CAD model and Drawings are Considered. In below Picture the Actual Model is Shown after Fabrication. This model's Objective is to Serve a Good medium to Understand Atmospheric Distillation Process. Via this Model Sieves Inside the Column can Observed. In this model feed tank and Furnace is placed and to Understand the Process from Feed to Product.

Actual Picture Of Atmospheric Distillation

As per usage and application are mentioned in above section. This Distillation unit can be used at Various Areas. Distillation is being used form Every ages. Nowadays huge heavy Distillation Unit are being used in Chemical plants, Refinery, Petrochemical plants. With the Help of Emerging Technology Distillation is being Improved For better Efficiency.

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