OIL REFINERY

TEAM MEMBERS

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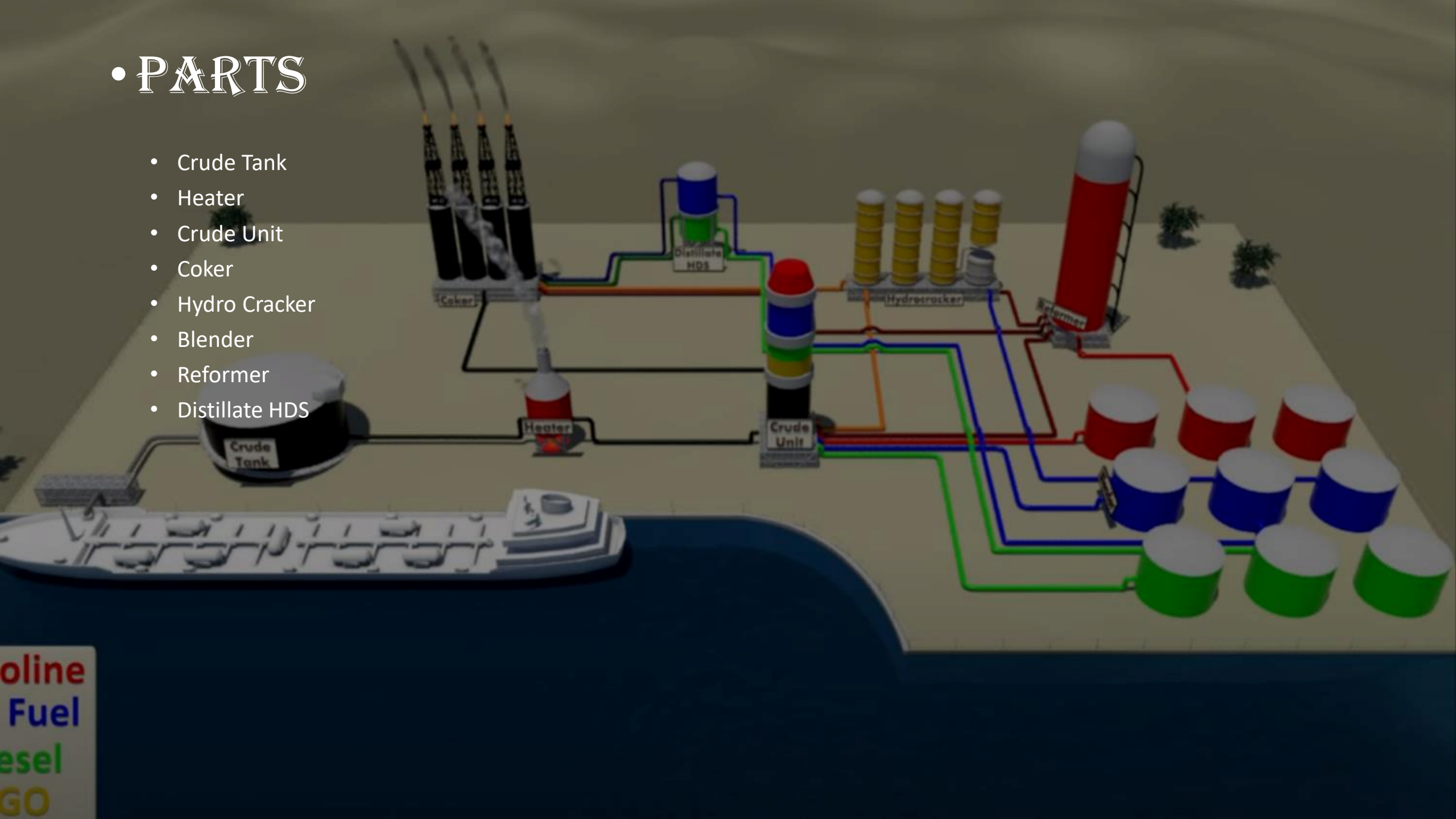
INTRODUCTION

- Oil refineries are industrial facilities designed to transform crude oil into various valuable products including gasoline (petrol), diesel fuel, fuel oils, heating oil, kerosene, liquefied petroleum gas (LPG), and petroleum naphtha.
- Oil refineries can turn crude oil into building blocks for plastics (ethylene and propylene) directly, using methods like cracking, instead of needing to make gasoline first.
- Oil refining is a capital-intensive industry with significant economic implications at both local and global scales.

• PARTS

- Crude Tank
- Heater
- Crude Unit
- Coker
- Hydro Cracker
- Blender
- Reformer
- Distillate HDS



CRUDE TANK

- Crude oil tanks serve as temporary storage facilities for incoming crude oil obtained from oil wells or tanker ships.
- Crude oil stored in tanks undergoes settling, allowing water and sediments to separate from the oil.
- Crude oil stored in tanks is the main raw material for refining. It's pumped from tanks to refining units for separation, conversion, and purification, yielding various petroleum products.

HEATER

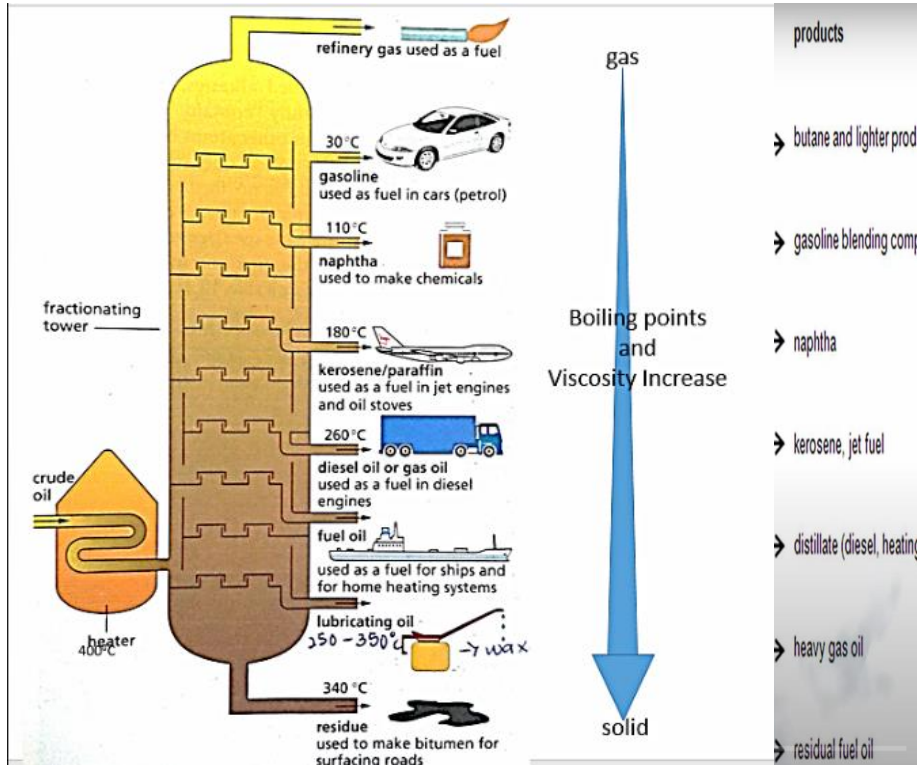
- Heaters elevate crude oil and feedstock temperatures, reducing viscosity for easier pumping and transportation.
- Provides heat energy for chemical reactions, enabling processes like hydrocarbon cracking and molecular reforming.
- Heating crude oil is instrumental in efficiently separating its various components in distillation towers and other separation units. This process enhancement leads to higher yields of desired products, improving overall refinery efficiency.

CRUDE UNIT

The crude unit separates crude oil into primary fractions based on boiling points, including gases, naphtha, kerosene, diesel, and atmospheric residue.

In the crude unit, the fractionation tower is central. Here, crude oil is heated, vaporized, and then condensed at various heights based on boiling points, separating it into distinct fractions.

The residual material left at the bottom of the crude unit, known as atmospheric residue or atmospheric bottoms, is typically sent to secondary processing units such as vacuum distillation units or delayed Cokers for further refining.



COKER

- The Coker unit processes residual oil from the vacuum distillation column, breaking down long-chain hydrocarbons into shorter chain molecules through thermal cracking.

- It yields low molecular weight hydrocarbon gases, naphtha, light and heavy gas oils, and petroleum coke. The process leaves behind excess carbon, forming petroleum coke, while producing valuable lighter hydrocarbon products.

HYDROCRACKER

A hydrocracking unit, or hydrocracker, takes gas oil, which is heavier and has a higher boiling range than distillate fuel oil, and cracks the heavy molecules into distillate and gasoline in the presence of hydrogen and a catalyst.

The hydrocracker upgrades low-quality heavy gas oils from the atmospheric or vacuum distillation tower, the fluid catalytic cracker, and the coking units into high-quality, clean-burning jet fuel, diesel, and gasoline.

BLENDER

- Oil refinery blenders mix different kinds of oil and additives to make the exact kinds of gasoline, diesel, and other fuels that people need.

- The main purposes of crude oil blending are to optimize commercial value, to upgrade or reduce oil consumption to meet specifications, and to facilitate oil movement.

- Products can be blended by different processes, such as:
    1) In-line through a manifold system
    2) Batch blending in tanks
    3) Onboard blending into marine vessels

REFORMER

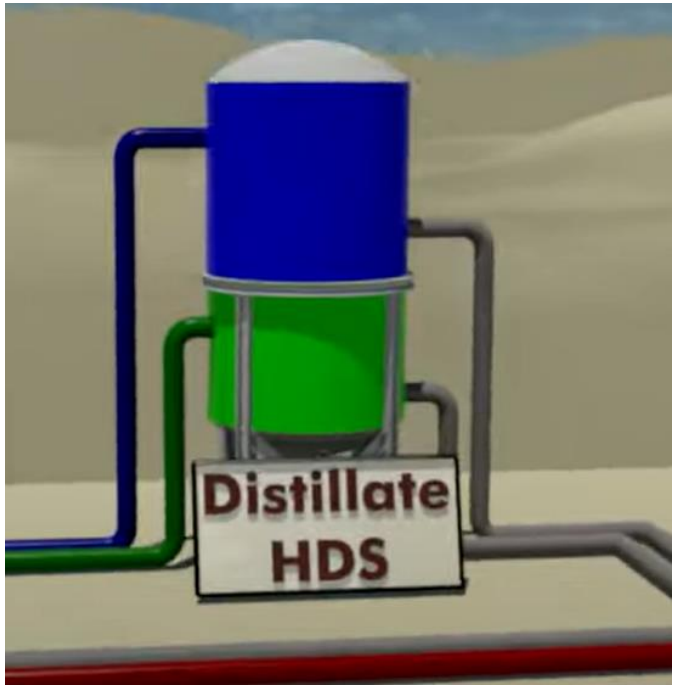
Catalytic reforming is a method to turn low-quality gasoline into high-quality gasoline. It takes gasoline made from crude oil, which usually isn't great, and turns it into a better, high-octane type of gasoline called reformate.

Reformate is the main source of aromatic bulk chemicals such as benzene, toluene, xylene and ethylbenzene which have diverse uses, most importantly as raw materials for conversion into plastics.

DISTILATE HDS

Hydrodesulfurization (HDS) is a common process to take sulfur out of natural gas and fuels like gasoline, jet fuel, diesel, and others. It helps make these fuels cleaner and less polluting when they're used.

Hydrodesulfurization happens in a fixed-bed reactor at high temperatures (300-400 °C) and pressures (30-130 atmospheres).he process uses a catalyst made of alumina base with cobalt and molybdenum (CoMo), sometimes supplemented with nickel and molybdenum (NiMo) for challenging feedstocks.The aim is to remove sulfur from fuels by reacting it with hydrogen under these conditions, making the fuels cleaner and less polluting.



LEARNING

- **Interdisciplinary Skills:**
  - Acquired hands-on experience in combining design, engineering, and manufacturing concepts through Autodesk Inventor and 3D printing.

- **Technical Proficiency:**
  - Gained advanced skills in CAD software, understanding the intricacies of designing complex structures.
  - Learned the technical aspects of 3D printing, including material selection and printer calibration.

- **Team Dynamics:**
  - Developed effective communication strategies to work efficiently as a team.
  - Experienced the value of diverse perspectives and collaborative problem-solving.

- **Critical Thinking:**
  - Engaged in critical analysis of design choices and their impact on the functionality of the model.
  - Enhanced ability to anticipate and address potential design flaws.

- **Project Planning:**
  - Understood the importance of meticulous planning in executing a complex project from concept to physical model.
  - Improved ability to estimate time and resources needed for project completion.

- **Adaptability:**
  - Adapted to new challenges and unexpected obstacles throughout the design and printing process.
  - Cultivated a flexible mindset to embrace new technologies and methods.

ACKNOWLEDGMENT

ROBOTIC CLUB HELPED US BY PROVIDING 3-D PRINTER

MAKER SPACE AND CNC LABS THAT ALSO HELPS US TOO MUCH

AUTODESK INVENTOR WHICH WE USED TO DESIGN OUR MODEL

REFERENCES

https://www.google.com/imgres?imgurl=http%3A%2F%2Fwww.ansonindustry.com%2Fuploads%2Fallimg%2Fcrude_oil_storage_tanks.jpg&tbnid=5-3egZHzPQaUmM&vet=1&imgrefurl=http%3A%2F%2Fwww.ansonindustry.com%2Fstorage-tanks%2Fcrude-oil-storage-tanks.html&docid=4o3cLlRz5pyNTM&w=800&h=450&hl=en-IN&source=sh%2Fx%2Fim%2Fm1%2F4&kgs=5d9ff28c2124878f&shem=abme%2Ctrie

https://youtu.be/H7RXJuQosWw?si=k48cndsXgJS9sM1E

Oil storage - PetroWiki (spe.org), Fired Heaters: Working, Components, Types, Function, Sections, Maintenance – What Is Piping , crude unit in oil refinery - Search Images (bing.com)

Hydrocracker | McKinsey Energy Insights