

Lecture №15. Production of petroleum bitumen

The production of petroleum bitumen, commonly referred to as asphalt or bitumen, is a complex process that involves refining crude oil to obtain the desired quality and properties. Bitumen is a sticky, highly viscous, black or dark brown substance that is primarily used in road construction and maintenance. It provides durability and weather resistance to road surfaces, making it an essential material in the construction industry.

Here is an overview of the production process of petroleum bitumen:

- *Crude Oil Selection:* The first step in producing bitumen is to select the appropriate type of crude oil. Not all crude oils are suitable for bitumen production, and the quality of the crude oil plays a significant role in determining the final bitumen properties. Crude oils rich in heavy hydrocarbons are typically preferred for bitumen production.
- *Distillation:* The selected crude oil is subjected to a refining process known as distillation. In this process, the crude oil is heated in a distillation tower, and different fractions with varying boiling points are separated. Bitumen is obtained from the heaviest, most viscous fractions, often referred to as the "bottom of the barrel." These fractions contain high molecular weight hydrocarbons.

Vacuum Distillation: After the initial distillation, the heavy fractions are further processed through vacuum distillation. This step is carried out under reduced pressure to minimize thermal cracking and prevent the decomposition of bitumen. Vacuum distillation helps separate bitumen from other components in the heavy fraction.

Air Blowing: To achieve the desired consistency and properties, the bitumen obtained from vacuum distillation may be further processed through a method called air blowing. In this process, air is blown through the bitumen at high temperatures. This results in the oxidation of bitumen and changes its physical and chemical properties, making it more suitable for specific applications, such as road construction.

- *Addition of Polymers (Modified Bitumen)*: In some cases, bitumen can be modified by adding polymers to enhance its performance characteristics. This modified bitumen is often referred to as polymer-modified bitumen (PMB). Common polymers used for modification include styrene-butadiene-styrene (SBS) and ethylene-vinyl acetate (EVA). PMB exhibits improved elasticity, tensile strength, and resistance to cracking, making it suitable for various applications, including high-traffic roadways.
- *Quality Control*: Throughout the production process, rigorous quality control measures are in place to ensure that the bitumen meets specified standards and performance criteria. This includes testing for penetration, softening point, ductility, and other properties that determine the suitability of the bitumen for different applications.
- *Storage and Packaging*: The finished bitumen is typically stored in tanks and may be transported to construction sites in bulk or packaged in drums or other containers for distribution.

Petroleum bitumen is a crucial component in the construction industry, where it serves as a binder in asphalt mixtures for road surfaces. Its properties can be adjusted to meet specific requirements, making it a versatile material for various applications. The production of bitumen requires careful control and modification to ensure that it meets the demands of modern infrastructure construction and maintenance.