



UOP Linear Alkylbenzene (LAB) Complex

Petrochemical

Introduction

Linear alkylbenzene (LAB) is the most common raw material in the manufacture of biodegradable household detergents. LAB is produced using normal paraffins as a raw material. Normal paraffins are derived from straight run kerosene.

UOP offers processes, catalysts, adsorbents and equipment for the production of LAB from kerosene or normal paraffins. The processes can be utilized in combination in a new complex or retrofitted or revamped into existing complexes. The UOP LAB complex consists of a combination of several UOP processes, including the kerosene prefractionation, distillate Unionfining™ process, Molex™ process, Pacol™ process, DeFine™ process, PEP™ process, Detergent Alkylate process, and Detal™ process. The LAB technology is the most economical technology available today, and more than 70% of the world's LAB is produced using UOP technologies.

Until 1995, alkylation used hydrofluoric (HF) acid as the catalyst. In 1995, the first commercial Detal process unit using a solid bed catalyst alkylation process was commissioned. This revolutionary technology abolished the use of liquid acid in the plant, reducing capital investments, maintenance costs, and waste treatment.

Applications

The continued demand for LAB worldwide creates new growth and development of new technologies to improve the processes. Linear alkylbenzene sulfonate (LAS), is the most cost-effective surfactant available for use in detergent formulations. Environmentally proven LAS has the largest volume among existing surfactants.

Description

There are two major sections in a LAB complex: production of normal paraffins, and production of LAB from normal paraffins.

Production of normal paraffins:

- Kerosene prefractionation is often used to tailor the kerosene feed to the desired carbon range. Kerosene is stripped of light ends and heavier components so that the heart cut, containing the desired *n*-paraffins for the production of LAB of a certain range of molecular weight, is produced.



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- The distillate Unionfining™ process hydrotreats kerosene at sufficient severity to remove sulfur, nitrogen, olefins and oxygenate compounds which might otherwise poison the Molex adsorbent.
- The Molex process is a liquid state separation of normal paraffins from branched and cyclic components using Sorbex™ technology. The simulated moving bed adsorptive separation results from using a proprietary multi-port rotary valve. The extract stream is a high-purity normal paraffins stream. The raffinate stream, consisting mainly of *iso*- or *cyclic*-kerosene range compounds, is often blended into jet fuel.

Production of LAB from normal paraffins:

- In the Pacol process, the normal paraffins are dehydrogenated in a vapor phase reaction to corresponding mono-olefins over a highly selective and active catalyst.
- The DeFine process is a liquid phase, selective hydrogenation of diolefins in the Pacol reactor effluent to corresponding mono-olefins over a catalyst bed.
- The PEP process allows the selective removal of aromatics in the feed to the Detal or Detergent Alkylate unit.
- Detergent Alkylate is a process in which benzene is alkylated with mono-olefins produced in the Pacol unit to LAB using HF acid as a catalyst.

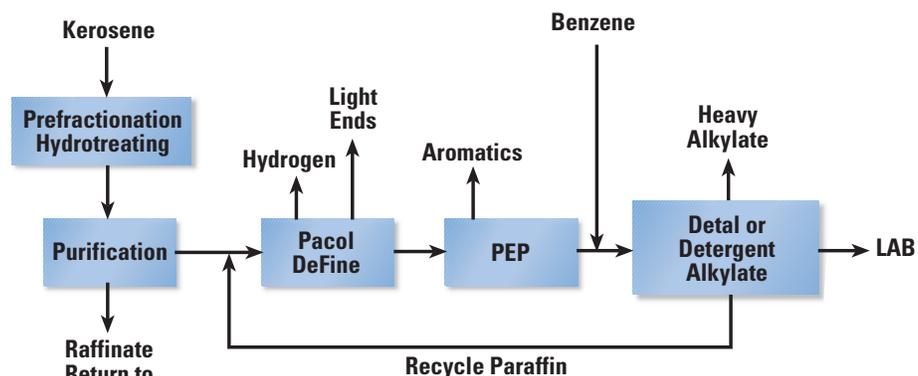
- The Detal process, jointly developed by CEPISA and UOP, is a solid catalyst, fixed-bed process in which benzene is alkylated with mono-olefins produced in the Pacol unit.

Feedstocks

Kerosene for the Unionfining process can be full boiling range, straight run kerosene, or a narrow cut for the production of LAB, usually C₁₀ to C₁₃, C₁₁ to C₁₄, or C₁₀ to C₁₄ *n*-paraffins.

Molex feed can be hydrotreated kerosene containing up to C₂₀ paraffin components. UOP's Molex unit can be designed to recover paraffins heavier than those used in LAB production. The Pacol feed is limited to four carbon numbers of *n*-paraffin due to fractionation limitations, typically either C₁₀ to C₁₃ paraffin or C₁₁ to C₁₄ normal paraffin produced directly from an upstream Molex unit or purchased as a raw material.

Integrated LAB Complex



Experience

UOP began offering alkylbenzene technology in the 1940s and continues to be the primary supplier of LAB technology to producers worldwide. Virtually all of the new LAB capacity in the past 15 years employs UOP technologies. Continued research and development improves upon the processes in the LAB complex, as well as the catalysts and adsorbents.

For more information

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