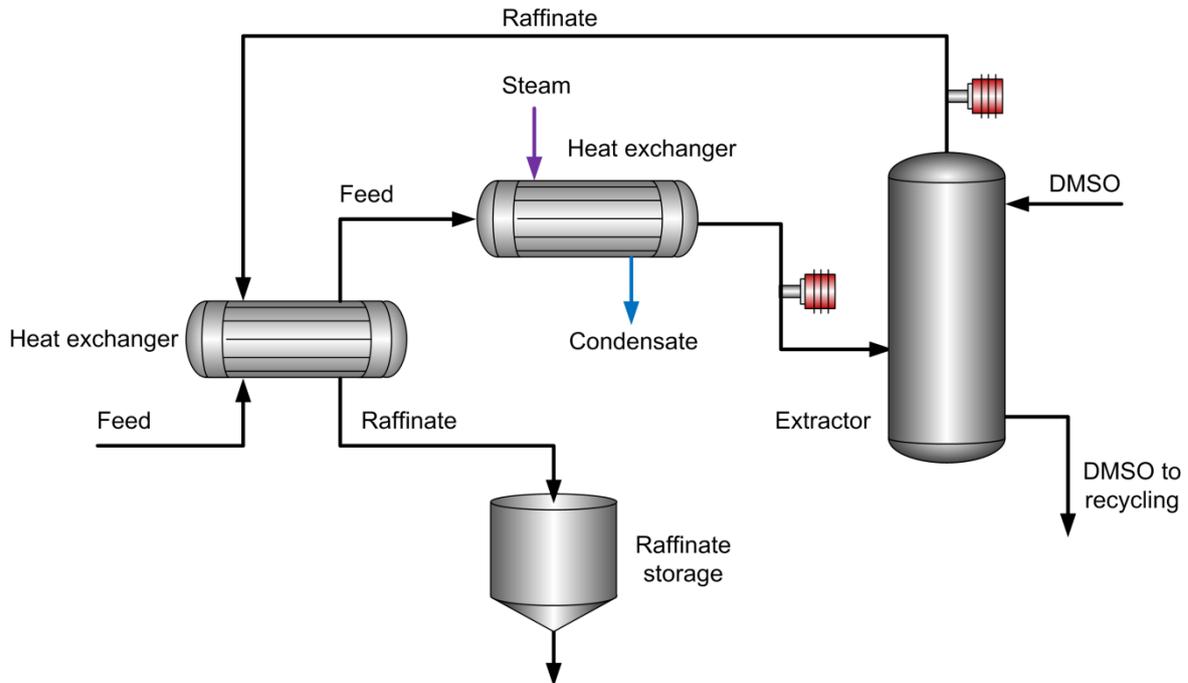


The Refining Unit



EXTENDER OIL

Typical end products

Extender oil, tires, synthetic rubbers, rubber products

Introduction

To improve mechanical and other important properties of natural and synthetic rubbers as well as in tires production extender oil must be used. The raw material are residual aromatic (RAE) and distillate aromatic (DAE) extracts of heavy oil fractions which are waste of lube oils refining (see APN 8.03.01). Extender oils have high level of polycyclic aromatic hydrocarbons (PAHs), which have carcinogenic effect on human health and can cause oncological diseases. Automotive tires release extender oil with PAHs to the environment.

REGULATION (EC) No 1907/2006 of the European Parliament has imposed the prohibition of the use of carcinogenic extender oils. Green automotive tires production uses carcinogens treatment technology aimed at production of a safer tire for the environment.

Application

The feed stock (RAE and DAE) enters the refining unit where the molecules of potentially dangerous carcinogens are removed through selective solvent treatment with dimethylsulfoxide (DMSO) in extraction column. PAHs are highly soluble in DMSO, so they are trapped from oil and discharged at the column bottom. Raffinate (purified oil) rises to the column top due to lower density compared to DMSO, and is further pumped to storage.

The relation between the Refractive Index at intake and outlet is essential to monitor extraction efficiency for process optimization. The K-Patents Process Refractometer PR-23-GP provides a real-time in-line indication of the aromatic content of the oil stream which strongly correlates with PAH concentration. The typical measurement range is between 1.500 and 1.5600 at 20°C (68°F).

In addition to the main process, DMSO recycling process could be monitored with K-Patents Process Refractometer PR-23-GP.

Installation

The K-Patents refractometer is most efficient when mounted in the feed stream right before the extraction column and in the outlet just after the column where the process temperatures are the highest (typically 90-110°C (194-230°F)). The output signal from the K-Patents refractometer is used to adjust either the extraction temperature, DMSO or oil feed to the column to achieve the best performance.

Appropriate equipment with hazardous and intrinsic safety approvals are available when required. For sensor wetted parts stainless steel 316L SS can be used. Non-standard prism material (YAG) should be used due to a specific measurement range. Automatic steam prism wash is necessary especially at the final product line which causes much higher prism contamination. The wash interval is typically up to 1 minute.

Instrumentation	Description
	<p>K-Patents Process Refractometer PR-23-GP is an industrial refractometer for large pipe sizes and tanks, cookers, crystallizers and kettles. Installation through a flange or clamp connection.</p>
Automatic prism wash:	<p>Prism wash with steam: The components of a steam wash system are a sensor with integral steam nozzle mounted at the sensor head, a shut-off valve for steam line and an indicating transmitter equipped with relays to drive the wash valves. The wash interval can typically be up to 1 minute.</p>
Area classification:	Intrinsic safety and hazardous area approvals are available
Measurement range:	Refractive Index (nD) 1.500 and 1.5600 at 20°C (68°F).