

GREEN NMP CO-SOLVENT EXTRACTION TECHNOLOGY

Introduction

Environment friendly Green NMP-Co-solvent Technology uses combination of a novel co-solvent for NMP and nitrogen stripping for solvent recovery. The process can be employed for all lube feedstocks. Water, injected as anti-solvent can be eliminated. Extensive laboratory and pilot plant studies have been conducted with various lube feed stocks. In order to make the process environment friendly, it is recommended to use nitrogen stripping instead of steam stripping.

Process Description

The Feed (Spindle oil (SO) to Deasphalted Oil (DAO)) is fed at the bottom of the extraction column, while the NMP-Cosolvent mixture is fed to the top of the extraction column. The process temperatures are in the range of 50–110°C. Addition of 20-30% co-solvent along with minimum or no water addition can result in 2-3 wt% raffinate yields without compromising the raffinate quality.

Benefits

- Can process wide range of feedstocks i.e. from SO to DAO.
- Cost effective co-solvent available commercially.
- Increases raffinate yield.
- No effluent generation.
- Energy saving by more than 40%
- Retrofits with existing NMP unit with minor hardware changes.
- Replacement of ~20 wt% co-solvent in NMP will reduce the inventory of costlier solvent and also reduce the cost incurred by refinery on account of solvent loss.

Commercialization

Commercial plant trial run is under implementation, after certain hardware modifications such as tank for storage of co-solvent, additional compressor and chiller for removal of traces of solvent from nitrogen from stripper, optional heat exchanger for cooling compressed nitrogen etc.



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LPG DEASPHALTING TECHNOLOGY

Introduction

LPG deasphalting process is a Dual mode deasphalting process, which can produce feedstock for both LOBS (LOBS mode) and secondary processes (cracker mode) with a single solvent in a single unit.

Benefits

- Easily implementable in existing propane deasphalting unit.
- Flexible DAO yield for feedstock to LOBS process as well as cracking process with same solvent with change in operating conditions.
- LPG is readily available in refineries.
- Eliminates separation of propane for use as solvent.

- Solvent can be recovered in supercritical mode.
- Improved GRM.

Commercialization

The process has been commercialized at Indian Oil's Haldia Refinery and ~7-8% increase in DAO yield has been achieved in the cracker mode without any hardware change. DAO yield in cracker mode can be further increased through hardware modifications. Cracker mode asphalt, being heavier than that of LOBS mode, can be used for production of bitumen meeting international specification (export grade), thereby maximizing HS crude processing capability of a refinery.



Introduction

Polymer Modified Bitumen is not just ideally suited for hot climates, but also satisfies the rising demands due to heavy vehicle and traffic volumes on today's roads and runways. Polymer Modified Bitumen is manufactured with a specially blended feed, making the binder homogenous and storage stable. It enhances the key properties of asphalt mixes i.e. deformation resistance and fatigue life. These improvements are the result of three vital physical changes which the polymer makes in the conventional binder structure: reduced temperature susceptibility, increased stiffness modulus and enhanced elasticity.

IndianOil R&D has developed reactive elastomeric polymer based Bitumen Formulation, comprising nitrogen rich additive meeting the referral specification IS: 15462 & IRC: SP53. Unlike conventional processes, the process for the production of Polymer Modified Bitumen has been designed to avoid the milling operation. Apart from the stated advantages the developed Polymer Modified Bitumen possesses excellent storage stability and anti-stripping properties.

Advantages

- Optimizes cost/ service life.
- Reduces maintenance frequency.
- Provides high skid resistance.
- Durable in extreme climatic conditions and high rainfall regions.
- Lower susceptibility to daily and seasonal temperature variations.
- Increases fatigue life.
- Delays cracking and reflective cracking.
- Overall improved performance in extreme climatic conditions and under heavy traffic conditions.
- Better water resistance.
- Resistance to creep failure.
- Higher indirect tensile strength.

Commercialization

The commercial production of Polymer Modified Bitumen is under implementation in IndianOil (M) CRMB Plant, Vadodara as well as at Panipat refinery.

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Introduction

Crumb Rubber Modified Bitumen is suitable for pavements subjected to varying weather conditions, heavy duty as well as heavy traffic and high traffic sea port roads etc. It is a durable and economical solution for new construction and maintenance of wearing courses. CRMB is manufactured using Crumb Rubber from heavy vehicle tyres, which is mechanically partial de-vulcanized and chemically treated. Additives like Natural Asphalt and polymers are added and come with enhanced properties.

IndianOil R&D has developed superior quality CRMB-50, CRMB-55 & CRMB-60 formulations meeting specifications laid down by Bureau of Indian Standard (BIS), IS: 15462 & IRC:SP:53. It is specially designed bituminous road binder for meeting the requirement of high traffic density areas, ever-increasing axle loads and significant variations in daily and seasonal temperatures of the flexible pavements.

IndianOil CRMB-Super is ideal, durable and economical solution for the concurrent problems of raveling, undulations, rutting, bleeding, shoving and potholes.

Advantages

- Better adhesion and bonding between aggregates and binder.
- Higher resistance to deformation at elevated pavement temperature.
- Improved resistance to stripping due to water repellent properties.
- Improved skid resistance during hot conditions.
- Improved Marshall Stability/ impact resistance.
- Improvement in ageing resistance- longer pavement life.
- Does not require any change in construction practices/ machinery.

Commercialization

IndianOil CRMB-Super is being manufactured at CRMB plants at Mathura, Panipat, Gujarat, Barauni, Haldia and Chennai.

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INDEMUL: A STATE-OF-THE-ART ROAD BINDER

Introduction

Bitumen in different forms is used as binder for road construction and maintenance work. One of its simple workable forms is bitumen emulsion. Bitumen emulsion does not require heating during application and can be used with cold and damp aggregates. It does not emit hydrocarbon fumes and is safe to animal, plant and human life.

Keeping in view of the various benefits associated with bitumen emulsion over conventional bitumen and to keep pace with the technology innovations in the field of binders abroad, IndianOil R&D has developed three grades of cationic bitumen emulsion namely Rapid, Medium and Slow setting designated as Indemul-R, Indemul-M and Indemul-S, respectively meeting the requirement of IS:8887 specification.

Properties

Indemul is flow-able at ambient temperature and is a ready to use material. It consists of very minute bitumen globules suspended in water with the help of emulsifier. The emulsifiers are generally long chain fatty amines and are commercially available. These emulsifiers also act as anti-stripping agents and thus reduce stripping of bitumen in presence of moisture from aggregates surface. The significant properties of the bitumen emulsions are viscosity, homogeneity, storage stability, adhesivity and particle charge.

Recommended use of Indemul-cationic bitumen emulsions

Type of Emulsion	Applications
RS-1	Rapid setting emulsion grade. Specially recommended for track coat applications
RS-2	Rapid setting emulsion grade. Specially recommended for surface dressing work.
MS	Medium setting emulsion used for plant or road mixes with coarse aggregates minimum 80%, all of which is retained on 2.36 mm IS sieve and practically none of which passes 180 micron IS sieve, and also for surface dressing and penetration macadam.
SS-1	Used for other applications such as fog seal, crack sealing, prime coat applications
SS-2	A slow setting emulsion used for plant or road mixes with graded and fine aggregates, a substantial quantity of which passes a 2.36 mm IS Sieve, and a portion of which may pass a 75 micron IS Sieve. Examples of its uses are cold mixed MSS, SDBC and slurry seal.

Field Trials & Commercialization

Field trials with Indemul were conducted to assess the actual performance on the road. Taking into considerations the effect of varying climatic conditions, traffic and axle loads, three test tracks were constructed using Indemul on NH-1A (J&K), NH-44 (Assam) and Hanumangarh-Sangaria road (Rajasthan). Directorate General Border Roads (DGBR) and Central Road Research Institute (CRRI) were associated in the field trials. The performance of test section laid with Indemul was

found to be better or comparable with the paving grade bitumen.

Bitumen emulsions are being commercially produced at IndianOil's state of the art bitumen emulsion plants at Panipat, Haldia & Chennai and marketed under the trade name "Indemul".

Licensing of technology

IndianOil R&D has transferred the bitumen emulsion technology to two private parties viz. M/s KCM Petrotech, Hyderabad & M/s SRPL, Indore.

