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VISCOSITY GRADE PAVING BITUMEN
&
CRUMB RUBBER MODIFIED BITUMEN

For Road Construction and Maintenance

मंगलूर रिफाइनरी एण्ड पेट्रोकेमिकल्स लिमिटेड

(ऑयल एण्ड नेचुरल गैस कॉरपोरेशन लिमिटेड की सहायक कंपनी)

Mangalore Refinery & Petrochemicals Ltd.

(A Subsidiary of Oil and Natural Gas Corporation Ltd.)

MRPL - A PROFILE

Mangalore Refinery & Petrochemicals Ltd. (MRPL), a Government of India undertaking, operates a grass root refinery with a capacity of 11.82 MMTPA, which is being upgraded to 15 MMTPA. The refinery is located at Mangalore, on the West Coast in the ever green Dakshina Kannada District, about 350 kms, from Bangalore. MRPL started as a Joint Venture refinery, by Hindustan Petroleum Corporation Ltd. (HPCL) and Aditya Birla Group. With acquisition of share holding of AV Birla Group by Oil and Natural Gas Corporation Ltd., a Government of India Company; MRPL became a subsidiary of ONGC in March 2003.

MRPL has a versatile design with high flexibility to process crude oils of different API with high degree of automation. It is the only refinery in India with two Hydrocrackers and two CCRs. MRPL has also ventured in to production of Mixed Xylenes, Poly-propylene, and Petroleum Coke in addition to its ongoing production of the whole range of petroleum products such as LPG, MS, Naphtha, Kerosene oil, ATF, HSD, FO, Bitumen, Sulphur etc. MRPL products meet all international specifications are also exported to more than 40 countries all over the world.

INTRODUCTION

India has embarked on an ambitious roads construction and maintenance programme involving huge investment. Presently, Indian road network is about 33 lakh km and carries 65% of freight and 80% of the passenger traffic. Number of vehicles has been growing at an average pace of 10.16% per annum over the last five years. The roads in India are under huge pressure and need expansion, widening and modernization to handle the increasing traffic. The durability of the road surface depends on numerous factors, one of which is, quality and source of bitumen used.

The road quality and durability is also dependent upon the quality control exercised in the design of road, preparation and transportation of hot mix, laying and compaction.

Bureau of Indian Standards issued revised specifications in 2006 for paving grade Bitumen which are known as Viscosity grade (VG) Bitumen. MRPL is manufacturing and marketing VG Bitumen conforming to BIS 73:2006. In order to offer choice to the customer, MRPL also markets CRMB (Crumb Rubber Modified Bitumen) conforming to BIS 15462:2004. In view of the importance of bitumen in road construction and maintenance, it is necessary that appropriate grade of Binder most suited for the application is used and adequate quality control in its application is exercised at each stage.

BITUMEN CLASSIFICATION, SPECIFICATION, QUALITY ASSURANCE AND APPLICATIONS

Viscosity Grade Paving Bitumen is categorized as per its absolute viscosity (degree of Fluidity). Higher the grade, the stiffer the Bitumen. In Viscosity Grade, viscosity test are conducted at 60^{0} Celsius and 135^{0} Celsius, which represent the temperature of the road surface during summer (hot climate, similar to northern part of India) and mixing temperature respectively. The penetration at 25^{0} celcius, which is the annual average pavement temperature, is also retained.

As per IS 73:2006 specification, Bitumen is classified into following four types, based on absolute viscosity.

VG-10 BITUMEN

VG-10 is widely used in spraying application such as surface dressing and paving in very cold climate in lieu of old 80/100 penetration grade. It is also used to make Bitumen emulsion and modified Bitumen Products.

VG-20 BITUMEN

VG-20 can be used for paving in cold climate and high altitude regions, for eg northern region.

VG-30 BITUMEN

VG-30 is primarily used for to construct extra heavy duty Bitumen pavement that need to endure substantial traffic loads. It can be used in most parts of India in lieu of oil 60/70 penetration grade.

VG-40 BITUMEN

VG-40 is used in highly stressed areas such as those in intersections, near toll booths and truck parking lots in lieu of old 30/40 penetration grade. Due to its higher viscosity, stiffer bitumen mixes can be produced to improve resistance to shoving and other problems associated with higher temperature and heavy traffic loads.

VG-10 AND VG-30 GRADE OF PAVING BITUMEN MANUFACTURED BY MRPL COMPLY WITH THE REQUIREMENTS OF IS 73:2006 SPECIFICATION FOR VISCOSITY GRADE PAVING BITUMEN.

MRPL is recognized for its proven track record of consistently delivering high quality binders for paving applications. Our products perform under the most diverse and demanding road conditions in India. This is attributable to state-of-the-art manufacturing technology, comprehensive quality assurance programs and operational efficiency – all supported by our highly skilled and experienced staff.

We have excellent in house research center which focuses on R&D as well as providing technical expertise.

Our team of technical specialists is dedicated to ensure our products are tested thoroughly at every stage from selection of crude oil at the start of the production process, right through delivery.

MRPL has as a state-of-the-art independent Quality Laboratory accredited by **NABL (National Accreditation Board for Testing & Calibration Laboratories)** for ensuring product quality at every stage of production. NABL guarantees that MRPL can market finished products in the national and international market without the need for customers testing the product at their end.

MRPL is a registered supplier as per the approval granted by **DGS&Ds (Director General of Supplies and Disposals)**, Ministry of Commerce and Industry for Paving Bitumen.

MRPL has been upholding **Quality Management System** since 1999 and is certified with latest standard (ISO 9001:2008).

VISCOSITY GRADE (VG) BITUMEN SPECIFICATION AS PER IS 73:2006

Sl.No	Characteristics	VG-10	VG-30
1	Absolute Viscosity at 60° C, Poises (min)	800	2400
2	Kinematic Viscosity at 135° C, cSt (min)	250	350
3	Flash Point (COC) °C (min)	220	220
4	Solubility in trichloroethylene, percent (min)	99	99
5	Penetration at 25° C, 100 g, 5 s, 0.1 mm	80-100	50-70
6	Softening Point (R&B) °C (min)	40	47
7	Tests on Residue from thin film oven tests / RTFOT		
	Viscosity ratio at 60° C (max)	4.0	4.0
	Ductility at 25° C, cm, after thin film oven test (min)	75	40

MRPL VISCOSITY GRADE IS AVAILABLE IN:

Product	Form
MRPL VG-10	Bulk
MRPL VG-30	Bulk
MRPL VG-10	Packed (in drums of 156 kgs)
MRPL VG-30	Packed (in drums of 156 kgs)

HEALTH & SAFETY

Bitumen is delivered hot (as high as 160° Celsius) therefore exercising extreme caution and correct handling of bitumen help to minimize the risks of burns or other injury to those associated with deliveries as well as damage to the environment or equipment. Some of the common hazards associated with hot bitumen are:

- **Thermal Burns:** resulting from bitumen hose bursts, spillages and exposure to solar radiation.
- **Heat Stress and Burns:** resulting from overexposure to hot bitumen and working environment.
- **Fire and Explosion:** resulting from over heated Bitumen and released fumes.
- **Boil-over:** of bitumen tanks due to water contamination.
- **Spills:** from faulty containment or incorrect handling.
- **Fumes:** respiratory problems or nausea may be induced by high concentration of fumes from hot bitumen.
- **Hydrogen Sulphide:** in confined spaces H_2S may accumulate.
- **Pyrophoric Deposits:** may develop in bitumen tanks which could self ignite.

To ensure hot bitumen is used in safe and efficient manner the following safety precautions shall be followed:

- **Wear suitable personal protective equipment (PPE) at all times:** Full skin protection is required to avoid accidental burns when transferring or handling hot bitumen.
- **Always prevent contact between water and hot Bitumen** by checking the contents of the previous load before loading bituminous products into tanker and by following procedures to avoid violent boil-over of tanks.
- **Minimize Bitumen fumes** by heating Bitumen and Bituminous mixes to the recommended temperatures.
- **Minimize the use of Diesel** when cleaning equipments as this contributes to the Bitumen fumes.
- For complete description of hazards with the use of Bitumen, kindly refer the appropriate **Material Safety Data Sheet (MSDS).**

CRUMB RUBBER MODIFIED BITUMEN (CRMB)

Description

CRMB is a special type of Bitumen whose properties have been improved by the addition of crumb rubber thus altering the physical properties of Bitumen making it more resistant to temperature variations, weather and high traffic loads, reduced maintenance costs and excellent driving comfort. This product, in certain applications, may offer following advantages over Viscosity grade Bitumen.

Advantages

1. Lower susceptibility to daily and seasonal temperature variations.
2. Higher resistance to deformation at elevated pavement temperature.
3. Better edge resistance properties.
4. Better adhesion between the aggregate and binder ensures longer life strength and stability.
5. Higher fatigue life of mixing due to high elastic recovery.
6. Delay of cracking and reflective cracking.
7. Overall improved performance in extreme climatic conditions and under heavy traffic conditions.
8. Better water resistance.
9. Prevents rutting.
10. High Skid resistance.

Application

CRMB can be used for wearing courses and base courses at high traffic roads, busy intersections, bridge decks and roundabouts for increased life of the surfacing. It has already been used in applications such as

1. Bus lane.
2. Heavy Trafficked lane.
3. Slopes, roundabouts and junctions.
4. Industrial and multimodal platforms.
5. Providing high skid resistance
6. Reducing traffic noise.
7. For high rainfall regions.
8. In stress absorbing membrane interlayer (SAMI).

SPECIFICATION FOR CRUMB RUBBER MODIFIED BITUMEN AS PER IS 15462-2004

Sl.No.	Characteristics	CRMB-55	CRMB-60
1	Penetration @ 25° C, 0.1 mm, 100 g, 5 sec	<60	<50
2	Softening Point, °C (min)	55	60
3	Elastic Recovery of half thread in Ductilometer at 15° C (% min)	50	50
4	Flash Point, PMO, °C (min)	220	220
5	Viscosity @ 150° C, sec	2-6	3-9
6	Separation, Difference in softening point, °C (max)	4	4
7	Test on Residue		
	Penetration @ 25° C, 0.1 mm, 100 g, 5 sec (max % of Original)	40	40
	Increase in Softening Point, °C, (max)	6	5
	Elastic recovery of half thread in Ductilometer at 25° C (% min)	35	35

TO ENSURE BEST RESULTS

Recommended Temperature for Application

Sl.No.	Process	Temperature Range
1	Mixing with Aggregates	170 – 185° C
2	Laying	150 – 170° C
3	Compaction	Over 140° C
4	End of Compaction	110 – 120° C

MRPL CRMB IS AVAILABLE IN

Product	Form
MRPL CRMB-55	Bulk
MRPL CRMB-60	Bulk

PRESTIGIOUS PROJECTS

MRPL has supplied Bitumen and Value Added Bitumen (CRMB) in many prestigious projects like:

- Golden Quadrilateral Projects of NHAI
- Port Connectivity Projects of NHAI
- North – South corridor project of NHAI
- National Highways Development Programmes (NHDP) of NHAI
- Karnataka State Highways Improvement Programmes (KSHIP)
- Karnataka Road Development Corporation Ltd. (KRDC) programs
- Pradhan Mantri Gram Sadak Yojana (PMGSY)
- Airport Authority of India (Airport projects) etc.

SOME OF OUR PRESTIGIOUS CLIENTS

- Larsen &Toubro Ltd.
- Gammon India Ltd.
- Navyuga Engineering Company Ltd.
- Punj Llyod Ltd.
- IRCON international Ltd.
- IVRCL Infrastructure & Projects Ltd.
- Roman Tarmat Ltd.
- Madhucon Projects Ltd.
- Sadbhav Engineering Ltd.
- Abcon Engineering
- PSK Infrastructure & Projects Ltd.
- Gannon Dunkerly & Co. Ltd.
- Oriental Structural Engineers Pvt. Ltd.
- KMC Constructions Ltd.
- MAY TAS Infrastructure Pvt. Ltd.
- Lanco Group Ltd.
- Tikitar Industries Ltd.
- Vishal Infrastructure Ltd.
- Concord Constructions
- VDB projects Pvt. Ltd.
- Nandi Economic Corridors Enterprises Ltd.
- KNR Constructions Ltd.
- State PWDs

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