

INNOVATIVE WAYS TO HANDLE ASPHALT

by PEDRO BARRIOS, BSEE

ASPHALT SOURCES

NATURAL DEPOSITS

- LAKES
- SANDS



ASPHALT LAKE – TRINIDAD AND TOBAGO

ALSO AS BY PRODUCTS FROM REFINERY PROCESSES

ASPHALT SOURCES

LAKES

Asphalt lakes are the result of strange geological occurrences, in which bitumen from deep deposits within the Earth was forced to the surface. Pitch Lake is the world's largest natural source of asphalt. The world famous cluster of tar pits is located in Hancock Park, right in the heart of Los Angeles. Although it is the largest asphalt lake in the world, covering a surface of 445 hectares, Guanoco Lake is not as well known as the others we've covered. It is located in the Orinoco Basin, Venezuela, close to Macaraibo Lake.



ASPHALT SOURCES

SANDS

Oil sands or **tar sands**, are a type of unconventional petroleum deposit. The sands contain naturally occurring mixtures of sand, clay, water, and a dense and extremely viscous form of petroleum technically referred to as bitumen. Oil sands are found in large amounts in many countries throughout the world, but are found in extremely large quantities in Canada and Venezuela.



MAIN USES

- ROAD PAVING
 - ROOFING
- SEALING PURPOSES

MAIN USES

ROAD PAVING

Asphalt is a portion of the residual fraction that remains after primary distillation operations. It is further processed to impart characteristics required by its final use. In vacuum distillation, generally used to produce road-tar asphalt, the residual is heated to about 750° F and charged to a column where vacuum is applied to prevent cracking.

MAIN USES

ROOFING

Asphalt for roofing materials is produced by air blowing. Residual is heated in a pipe still almost to its flash point and charged to a blowing tower where hot air is injected for a predetermined time. The dehydrogenization of the asphalt forms hydrogen sulfide, and the oxidation creates sulfur dioxide. Steam, used to blanket the top of the tower to entrain the various contaminants, is then passed through a scrubber to condense the hydrocarbons.

MAIN USES

SEALING PURPOSES

Asphalt sealing coat treatments are mainly a preventive maintenance procedure applied to the asphalt pavement surface to prevent or delay costly corrective measures (figure 2). Asphalt seal coats are surface treatments designed to seal and protect the asphalt pavement from harmful environmental conditions such as sunlight, rain, and snow. Surface treatments are also applied to enhance the wearing properties and improve the traction between the pavement and vehicle tires.

MAYOR PRODUCERS

- BP
 - Exxon Mobil
- Petroleos de Venezuela SA
 - Royal Dutch Shell
 - CEMEX UK
 - VALERO
 - SINOPEC
 - PETROBRAS
 - OTHERS

CONDITIONS FOR STORING ASPHALT

ASPHALT IS STORED IN TANKS HEATED AT 300 DEGREES FARENTHEITH (120 C)





TEMPERATURES ARE CRITICAL IN ASPHALT PROCESSES AS OVERHEATING THE PRODUCT CAN ALTER ITS CHARACTERISTICS AND QUALITY.

ASPHALT IS GRADED IN RATIOS AS 40/50, 60/70, 85/100, 120/150, 200/300

40/50 IS RATED AS HARDEST GRADE

60/70, 85/100 ARE THE MOST TYPICAL USED IN USA

200/300 IS THE SOFTEST GRADE AND IS USED MOSTLY IN COLD CLIMATES SUCH AS NORTHERN CANADA

ASPHALT PENETRATION GRADING IS ESTABLISHED BY **PENETRATION TEST**

DUE TO SPECIFIC GRADES OF ASPHALT, STORING AND TRANSPORTATION REQUIRES DEDICATED VESSELS TO ENSURE QUALITY OF PRODUCT

NEWER MODIFICATION PROCESSES ARE MADE TO IMPROVE ASPHALT PERFORMANCE KNOWN AS **PMB** OR **PMA**

PENETRATION TEST PROCEDURE

- Melt and cool the asphalt binder sample under controlled conditions.
- Measure the penetration of a standard needle into the asphalt binder sample under the following conditions:
 - Load = 100 grams
 - Temperature = 25° C (77° F)
 - Time = 5 seconds
 - The depth of penetration is measured in units of 0.1 mm and reported in penetration units (e.g., if the needle penetrates 8 mm, the asphalt penetration number is 80). Penetration grading is based on the penetration test.
- The standard penetration test is:
AASHTO T 49 and ASTM D 5: Penetration of Bituminous Materials

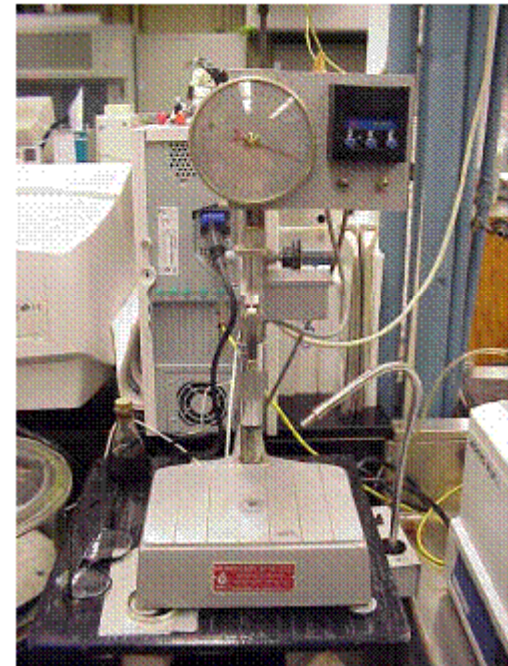


Figure 3.24: Penetration Test

MEANS OF TRANSPORTATION OF FINISHED GOODS TO END USERS



BARGE



INSULATED TRUCK



DRUMS



RAILROAD

BY BARGE

- ALLOWS HIGH QUANTITIES OF PRODUCT TO BE MOVED AT ONCE
- DEDICATED VESSELS ARE REQUIRED FOR SPECIFIC PRODUCT GRADING
- LIMITED TO PROPERLY EQUIPPED LOCATIONS
- AFFECTED BY WEATHER CONDITIONS
- TEMPERATURE CONTROL CONDITIONS REQUIRED



BY TRUCK

- DEDICATED VEHICLES DEPENDING ON PRODUCT GRADING
- LIMITED TO TRUCK CAPACITIES AND **DOT** RULING LOAD LIMITS
- USUALLY 24 TONS TRUCKS
- AFFECTED BY WEATHER CONDITIONS
- TEMPERATURE CONTROL CONDITIONS REQUIRED
- SUCEPTIBLE TO TRUCKS TIPOVERS AND PRODUCT SPILLS
- LIMITED DISTANCES



BY RAILROAD

- NON – INSULATED VESSELS
- LIMITED ROUTES
- LOCALLY – NATIONAL APPLICATIONS



BY DRUMS

- NON – INSULATED CONTAINERS
- DRUM HANDLING PROCESS REQUIRED
- CONTAINERS ARE TREATED AS HAZARDOUS MATERIAL
- PRODUCT LOSSES DUE TO RESIDUES IN CONTAINER



NEW OPTION

PE PACKET

INNOVATIVE PROCESS THAT TAKES ASPHALT AT **75 DEGREES C** AND DOWNLOADED IN A TRAY. TRAY IS PREVIOUSLY COVER WITH A **PE** LAYER BY A PLASTIC EXTRUSION PROCESS. ONCE ASPHALT IS PLACED IN TRAY A SECOND **PE** LAYER EXTRUSION PROCESS COVERS THE TRAY. FINALLY A HEAT SEAL PROCESS ENSURE ASPHALT PACKET SEAL WHICH IS THEN TAKEN TO A COOLING PROCESS BY WATER IMMERSION. THE PACKETS ARE THEN PLACED IN SUPER SACKS AND STORED IN CONTAINERS FOR SHIPMENT TO ITS DESTINATION.



ADVANTAGES TO ITS PREVIOUS MEANS OF TRANSPORTATION

- NO HEATING CONDITIONS REQUIRED AS PRODUCT IS TRANSPORTED AT AMBIENT TEMPERATURES
- EASY HANDLING AND NO RISK TO PERSONNEL DUE TO BURNS BY HOT PRODUCT
- EASE OF TRANSPORTATION AS SUPER SACKS ARE PLACED IN CONTAINERS WITHOUT THE NEED OF TEMPERATURE CONTROLS AND SHIPPED OUT ANYWHERE IN THE WORLD AS A COOL CARGO
- MARKET EXPANSION SINCE NO SPECIAL REQUIREMENTS TO SHIP OR RECEIVE LOADS BEYOND A TRUCK DOCK AND A MELTING TANK
- NO SHIPMENT DISPOSAL OF HAZARDOUS MATERIALS LIKE CONTAMINATED DRUMS SINCE PACKETS GET MELTDOWN WITH THE ASPHALT.
- **ECOFRIENDLY** AND A **GREEN SOLUTION** TO REDUCE CO2 EMISSIONS
- MAKES YOUR PRODUCT AVAILABLE TO DEMANDING MARKETS BEYOND NATIONAL BORDERS

A NEW AND DIFFERENT APPROACH

- PUT A TRAY IN A CONVEYOR
- BY PLASTIC EXTRUSION FROM FLAT HEAD PE EXTRUDER LAY PE FILM IN TRAY
- DOWNLOAD 25 KG OF HOT ASPHALT AT 75 DEGREE C
- BY PLASTIC EXTRUSION FROM FLAT HEAD PE EXTRUDER LAY SECOND PE FILM IN TRAY TO COVER PRODUCT
- BY HEAT SEAL PROCESS SEALED OFF PACKET
- COOLED DOWN PACKET BY WATER IMMERSION
- STACK IT UP IN SUPER SACKS
- STORE IT IN CONTAINERS
- SHIP IT OUT AROUND THE WORLD WHERE THE DEMAND IN GREATER



ESTIMATED CAPACITY OF ONE LINE

1 TRAY = 2 PACKETS OF 25 KG EA = 50 KG/ TRAY

3 TRAYS PER MINUTE = 180 TRAYS / HOUR

LINE IS ESTIMATED WITH ABOUT 60 TRAYS

MINIMUM BUILDING CAPACITY 200 FEET BY 100 FEET AND HIGH CEILINGS

PRODUCTION OF **ONE LINE** PER HOUR = 9 METRIC TONS

5000 TONS/ 9 = 555.5 HOURS / 24 = 23 DAYS

ONLY **ONE LINE** ALLOWS TO MOVE \$3.5 MILLION DOLLARS OF ASPHALT AVAILABLE FOR DISTRIBUTION WORLDWIDE IN 23 DAYS. DEPENDING ON AVAILABLE FACILITIES, UP TO 4 LINES CAN BE INSTALLED IN ONE BUILDING TO OPTIMIZE INVESTMENT AND OPERATIONS. HEAVY AUTOMATION IS REQUIRED TO MINIMIZE PERSONNEL AND 24 HOURS OPERATION IS RECOMMENDED DUE TO START UP PROCEDURES. SYSTEM RELIABILITY IS CRUCIAL AND PROCESS VALIDATION IS IMPERATIVE TO REDUCE DOWNTIME AND ENSURE QUALITY. PRECISION ENGINEERING IS VITAL FOR THIS SPECIFIC APPLICATION IN WHICH CENTRUM ELECTRIC CAN PROVIDE YOU WITH AMPLE EXPERIENCE IN THE PROCESS.

THE TIME IS NOW AND THE TECHNOLOGY IS AVAILABLE

HOW DOES THE GLOBAL ASPHALT MARKET LOOKS LIKE AS OF TODAY?

Asphalt market declined drastically during 2008 and 2009, as demand dropped in various end-use segments including paving and roofing. The harsh market conditions forced a noticeable number of suppliers either to close down or temporarily halt operations in their facilities. The impact was significantly higher on small-scale suppliers. Usually, a large portion of the asphalt produced is utilized for road paving and decline in road construction activity in various parts of the world dented the market prospects in a major way. The fall was significantly higher in matured markets such as the US and Europe, which collectively generate more than 55% of the world asphalt production.

Asia-Pacific stood as the only region that registered positive growth during the period. Growth in the region was primarily driven by the Chinese initiatives to lay new roads and repair the existing roads, covering vast areas. **A rebound in the construction sector and global GDP growth, in addition to the continued robust rise in emerging markets across the Asia-Pacific region, primarily India and China, is expected to enable the market to register growth in the near-term.** Factors that continue to govern the market landscape include world economy gradation, prices of crude oil and implementation of new infrastructure projects. Besides these, environmental concerns, especially with regard to asphalt recycling, shape the industry structure.

Europe represents the largest region for Asphalt worldwide, as stated by the new market research report on Asphalt.

Growth-wise, Asia-Pacific is projected to be the fastest growing regional market for asphalt. Rapid increase in population and steady economic growth are key factors driving growth in the paving and roofing end-use markets in Asia-Pacific, creating robust demand for asphalt. Infrastructure development is making rapid strides across the world, particularly in developing countries where huge investment has been flowing into infrastructure projects. Improving transportation infrastructure is one of the key strategies for enhanced standard of living in developing countries. This not only reduces the cost of imports but also improves the marketability of goods. Asia Pacific and Eastern Europe, which are taking up numerous paving projects including highways and shorter routes on a large scale, are expected to be the major growth markets. Paving represents the largest end-use segment for asphalt globally, while roofing constitutes the other major end-use segment of asphalt.