RELEVANCE OF COLD ASPHALT IN ROAD MAINTENANCE

Engr. (Dr) Eyo, T.B; MNSE, MNIHTE, FIMC, MASCE.MARRA

National Technical Secretary, Nigerian Institution of Highways & Transportation Engineers (NIHTE)
President, National Asphalt Pavement Association (NAPA)
Managing Director/CEO; Besteng Nig Ltd, Suite 208, MKK Plaza, Gudu, Abuja
Director Emeritus, Federal Roads Maintenance Agency (ROAD PLUS)Abuja
e-mail: eyothom@yahoo.com; Website; www.eyotb.com:Mobile+2348033705986

SEPTEMBER 2020

ABSTRACT

Blemddan cold asphalt formally ROAD PLUS COLD Asphalt is the first ever indigenous government owned cold asphalt produced from 100 % locally available materials. The production process involves specially formulated concentrate which allows for a superior bonding strength that effectively 'binds' the aggregate tightly together to produce a strong, trafficable, long lasting and skid resistance waterproof surface. It is unique, in that it satisfies the engineering properties of binder and wearing course Marshal mix design FMW&H specification of the conventional hot mixed asphalt in addition to immersion index% test/boiling test. Cold Asphalt is a high-performance cold patch pavement material that is easily applied any time of the year under any weather condition. The advantage of cold asphalt is that it can be produced and used especially in the yuletide period (mid December – mid January) and also in the rainy seasons when most commercial asphalt plant are not operational. It has so far been used for direct labour works by ROAD PLUS in almost all states including highly trafficked Benin-Shagamu road and Third Mainland bridge in Lagos.

KEYWORD; cold asphalt, binder, wearing

INTRODUCTION

Effective road construction and maintenance cannot exclude the use of Cold Asphalt. The use of cold asphalt reduces fatality rate on the nation's highways as prompt attention is paid to patching of potholes. Presently, if pothole of a square meter ($1m^2$) is to be patched, hot asphalt would not readily be available for such a small square meter patch since no asphalt plant will batch asphalt for a one square meter patch. As a result, potholes are opened and left for days for accidents to occur.

With Cold Asphalt, one can place a few bags in the booth of the car, depending on the number and size of potholes, patch the potholes no matter how small, and then roll with vehicle tires. In effect, one man can patch a pothole with ease. It requires less equipment and is less labor intensive as only one man can patch and roll with vehicle tires. Cold asphalt could either be produced at ambient temperature and laid at cold or produced at elevated temperature and laid at ambient temperature. ROAD PLUS COLD asphalt is produced at elevated temperature and laid at ambient temperature.

ROAD PLUS COLD Asphalt now known as Blemddan Cold asphalt is the first ever indigenous government owned cold asphalt produced from 100 % locally available materials. The production process involves specially formulated concentrate which allows for a superior bonding strength that effectively 'binds' the aggregate tightly together to produce a strong, trafficable, long lasting and skid resistance waterproof surface. It is unique, in that it satisfies the engineering properties of binder and wearing course Marshal mix design FMW&H specification of the conventional hot mixed asphalt in addition to immersion index% test/boiling test. ROAD PLUS Cold Asphalt is a high-performance cold patch pavement material that is easily applied any time of the year under any weather condition. The advantage of cold asphalt is that it can be produced and used especially in the yuletide period (mid December – mid January) and also in the rainy seasons when most commercial asphalt plant are not operational.

ROAD PLUS cold asphalt has so far been used for direct labour works by ROAD PLUS in almost all states including highly trafficked Benin-Shagamu road and Third Mainland bridge in Lagos. The report has been very promising.

Until recently Cold Asphalt has not been popular in the nation's road maintenance program. A lot of road product vendors have introduced different kinds of cold asphalt from within and outside the country to the Federal Roads

Maintenance Agency (ROAD PLUS) yet cold asphalt has not been fully introduced into the nations highway program. In 2011, ROAD PLUS decided to award /pilot study (research contract) projects to the underlisted contractors with the purpose of studying the efficacy in terms of service performance and also availability of the product for use as additional or complementary to the use the of hot mix asphalt for road works. The pilot study involved four different types of cold asphalt including in-house cold asphalt produced in-house by ROAD PLUS Research and Development Division (See table enclosed). The terms of reference of this report is on the performance and efficacy of the cold asphalt pilot study which would indirectly be used as a criterion for payment of claims in the interim certificates among other objectives

DESIGN OF COLD ASPHALT

Cold asphalt is designed in two (2) ways depending on the whether you are using emulsion or straight run bitumen. Cold asphalt with emulsion is designed cold and laid cold, while the one with straight run bitumen is produced hot and laid cold. Cold asphalt referred to here is designed with 60/70 and modified with a (patented)proprietary anti tripping agent. All relevant unaged or tank bitumen tests are carried out the same way it is done on Marshal mix design. Individual aggregate property test and gradation are carried out the same way the conventional HMA asphalt is designed.

PRODUCTION OF ROAD PLUS COLD ASPHALT

Initially, the ROAD PLUS 2/5TPH mini asphalt in all the 36 states were procured to produce hot mix asphalt only. This was labour intensive and uneconomical. The mini asphalt plant was later enabled to produce cold asphalt. The benefit of using mini asphalt plant for production of cold asphalt is that it allows one to plan production and stockpile vis a vis maintenance works than hot asphalt. Unlike the hot asphalt which cakes after a day and the surplus after a days work is always discarded, cold asphalt can always be reused in future date as it has a shelve life of about one year. With zero wastage one can return unused cold asphalt back to bag or stockpile for future use.

INNOVATIVE PRODUCTION OF COLD ASPHALT FROM ROAD PLUS70/80TPH HOT MIX PLANT AT KUJE.

Hitherto, ROAD PLUS Cold asphalt was produced from 2/5TPH ROAD PLUS mini asphalt plant. An innovation in the production of Cold asphalt was made late in 2017. ROAD PLUS 70/80 TPH conventional hot asphalt plant has now been enabled to produce Cold asphalt. Cold asphalt used on Keffi-Gitata Road maintenance was produced from this innovation.

It therefore means the remaining 6no. 70/80 tph ROAD PLUS asphalt plant and any other conventional hot asphalt plant in the country can be enabled to produce both Hot and Cold asphalt. **Like the Cold asphalt itself, this is the first of its kind in the country.** With this, asphalt can be hauled to any distance without fear of being caked.

USAGE

It can effectively be used for pothole patching and asphalt works on;

i. Highways
ii. Car parks
iii. Estate roads
iv. Filling Stations etc.

ADVANTAGES

i. Unlike conventional one, it can be produced for the smallest size of pothole,
ii. No wastage, left over can be returned into the bag or stockpile and used within six months
iii. No more cutting and leaving of potholes opened on the road for accident to occur.
iv. Production of and laying of asphalt can be planned out on different days.
v. The antistripping properties used allows it to be used for overlay at even lower thickness than the conventional hot mix asphalt.
vi. The antistripping agent increases the bonding between aggregates and bitumen.
vii. No specialized equipment is required in laying the cold asphalt
viii. The concentrate can also be used to produce recycled cold asphalt from scarified pavement materials.

COLD ASPHALT is available in loose stockpile, 25kg bag ready for application on a prepared surface. Product can be stored for up to 12 months if stored in bags. It could also last for same period if stockpiled and covered with tarpaulin**.**

1st PILOT STUDY ON THE USE OF COLD ASPHALT

A pilot study is the place where mistakes can (and often should) be made. No research project is perfect, pilot study is where those imperfections will be

discovered. Pilot study report on the use of cold asphalt has confirmed that the use of cold asphalt is technically feasible, despite the imperfections and challenges faced by some product vendors. **Above all, the study has made the Agency to discover its own in-house cold asphalt.** The committee hereby recommends more pilot study projects on other new road maintenance product/techniques as a way of transferring other global road maintenance best practice to the Agency.

SUMMARY OF SERVICE PERFORMANCE OF PILOT STUDY PROJECTS ON COLD ASPHALTS.

S/N.	COMPANY	NAME OF PROJECTS	STATE/ZONE	EXCERPTS FROM FIELD REPORTS	COMMITTEE'S REMARKS
1.	Portland Paints and Products Nig. Ltd.	Pilot Study on the use of cold Asphalt for Special Maintenance of Gbogan – Oshogbo- Ilesha Road in Osun State	Osun State/South -West II	I. Failure observed on patched potholes and scarified sections.	Unsatisfactory service Performance
2.	Messrs Zenith Energy Road Limited	Pilot Study on the use of cold Asphalt for Special Maintenance of Ajase – Offa – Osun State Border Road in Kwara State Border	Kwara State North Central II	I. However, some potholes patched with it failed after a very short period of time. II. This makes efficiency to be low in performance III. The process of manufacturing this cold asphalt is cumbersome and ability to accomplish the production with a minimum – expenditure of time and effort is not there.	Unsatisfactory service performance

3.	Messrs Zenith Energy Road Limited	Pilot Study on the use of Cold Asphalt for Special Maintenance of Enugu-Abakaliki - Ebonyi State Border Road in Enugu State.	Enugu State/South East I	I. Few potholes patched are still in good shape while some have been scarified by ongoing rehabilitation projects by FMW. II. Contractor seemed not too familiar with the use of cold asphalt for maintenance works. III. The contract is not a success IV. The production & availability is another concern.	Unsatisfactory service performance
4.	Tafra Multitech Limited	Pilot Study on the use of cold Asphalt for Special Maintenance of Benin -Asaba Road in Edo State	Edo State/South South II	I. Could not use cold asphalt specified because of lack of Technical partner to transfer the technology. II. Work done was mostly desilting and laying of hot rolled asphaltic concrete binder course.	Unsatisfactory service performance

5.	Messrs Carboncor Technology Nig. Ltd	Pilot Study on the use of cold Asphalt for Special Maintenance of Shendam-Namu-Nassarawa State Border Road,Plateau State	Plateau State/ North Central (1)	I. The workmanship with the use of cold asphalt as performed by the contractor was very okay II. The cold asphalt by the contractor is very effective, as the area covered in September/October,2011 are in a very stable state till today. III. The output of the work is quite okay as the area patched and overlaid are still very stable.	Satisfactory service performance. Recommended to be used for Agency's maintenance program
6.	Carboncor Technology Nig. Ltd	Pilot Study on the use of cold Asphalt for Special Maintenance of Kariyana road in Bauchi State	Bauchi State/North East I	1. Performance okay because the pothole patched is still good.	Satisfactory service performance. Recommended to be used for Agency's maintenance program
7.	Research and Development Division, ROAD PLUS, (by Direct Labour)	Pilot Study on the use of cold asphalt on Kajiji– Dakki Takwas - Anka Road in Zamfara State	Zamfara State/ North West (2)	I. The product was found to be economical and reliable. II. All potholes patched with the product are still in good	Satisfactory service performance. Recommended to be used for Agency's maintenance

				condition III. Patching with ROAD PLUS cold asphalt is verysimple and speedy compared to other method of patching as no time is wasted and no wastage in material IV. The product can be kept up to 6months in storage V. It also possesses no hazard to workman. VI. The production was simple as 100% local labour and material were used. VII. It is all weather friendly and more efficient than other form of pothole patching.	program

OBJECTIVE OF THE STUDY:

The initial aims and objectives of the study would have been as follows:

i. To carry out a channelized or focused study on each type of cold asphalt as the proprietary concentrate of each cold asphalt differs with each trade mark.
ii. To investigate its constituents, physical and chemical characteristics, method of application of cold asphalt
iii. To study the short- and long-term economic consideration on the use of cold asphalt.
iv. To advise on the quality of work on the use of different types vis-à-vis the payment in the interim.
v. To recommend or discontinue further use of any failed cold asphalt.
vi. To study post project service performance for a year.
vii. To issue Certificate of Performance to well performed product after a period of one year.

METHODOLOGY:

The methodology listed below should have been followed in the initial supervision of the pilot study. However, the present collation of the report from Field Headquarters at this level is only a subjective approach. It is suggested that subsequent pilot study on any new road product or technique should be done by a quality circle which should have involved quality control QC and quality assurance QA in order to have an objective report of the quality, the process and the challenges of the study.

The following initial tasks should have been taken to reach the objectives of the pilot study:

i. Progress report from Field Headquarters staff should be used as a guide for daily supervision of works in each of the pilot study projects.
ii. Daily records of activities including the tonnage/bag of cold asphalt laid, area covered, average thickness, personnel cost, equipment used etc.
iii. Laying procedure could equally be documented.
iv. The following information may also be obtained; emulsion/bitumen content, anti-strip test result stability and flow, gradation, etc. R&D would also perform post project service life performance on each of the cold asphalt.
v. The study author would further advise on the product/work done for payment.
vi. R&D would then coordinate and submit a final report that documents the entire effort.

CHALLENGES

The result of the study revealed unique challenges due to ;

I. the procurement or importation of the unclassified proprietary concentrates which caused seizure or delay by Nigerian customs.
II. There was also complexity in undertaking product tests
III. lack of agreed protocol for assessing if the products met the performance intention as claimed.
IV. Some contractors had corporate issues with their foreign partners.
V. Above all the above were identified as being challenges when vendors propose innovative road products

RECOMMENDATION

From the field report based on visual judgment obtained from the FRMEs from the respective states where the pilot study took place, the Agency may wish to adopt the following recommendations

i.) Patronize for further observation the use of Carboncor cold asphalt produced by Messrs Carboncor Road Technology Nig. Ltd
ii.) Encourage extensive use of ROAD PLUS cold asphalt produced in-house by ROAD PLUS Research & Development Division.
iii.) Embark on more pilot study projects and treat them as such so as to derive the benefits of transferring more global technology on road maintenance to the Agency.
iv.) The committee also noted that other 'pilot study' projects namely Full Depth Reclamation (FDR) asphalt Recycling project on Mokwa – Tegina road and Mill and Fill recycling project on Kaduna-Zaria roads were ongoing at the same time with the pilot study on cold asphalt projects respectively. However, the Agency would have derived a lot of benefits from these costs saving road maintenance techniques if they were supervised as pilot study project instead of as traditional projects.
v.) Be it as it may, the pilot study result has shown that clearly an entry point exists for cold asphalt in ROAD PLUS and by Extension, Nigeria. Wetherefore recommend that it is a business worth investing.

CONCLUSION

The outcome of the study has been positive. Pilot study report has confirmed that the use of cold asphalt is technically feasible, despite the challenges faced by some of the vendors. The committee hereby recommends the use extensive use of **ROAD PLUS cold asphalt produced by ROAD PLUS and further trial ofCarboncor cold asphalt produced by Messrs Carboncor Technology Nig.Ltd** for road surfacing works and encourages more pilot study projects on othernew road maintenance products/techniques as a way of transferring global road maintenance best practices to the Agency.

PHOTOGRAPHS OF PRODUCTION, LAYING AND STOCKPILE OF ROAD PLUS (BLEMDDAN) COLD ASPHALT USING 2/5TPH MINI ASPHALT PLANT ACROSS THE COUNTRY

FORMER WORKS MINISTER AND SENATORS MARVEL AT COLD ASPHALT STOCKPILE




2ND PILOT STUDY: INNOVATIVE PRODUCTION OF COLD ASPHALT FROM ROAD PLUS 70/80TPH HOT MIX PLANT

70/80TPH

The second pilot study was not specifically on the cold asphalt but was on the feat of using a conventional 70/80tph hot asphalt plant to produce Cold asphalt. Hitherto, ROAD PLUS Cold asphalt is produced from 2/5TPH ROAD PLUS mini asphalt plant. An innovation in the production of Cold asphalt was made late last year. This involved fabricating external features comprising of a separate bitumen tanks, etc. to the ROAD PLUS 70/80 TPH conventional hot asphalt plant to produce Cold asphalt. I have through this innovation demonstrated the capacity to convert any conventional hot asphalt plant in the country to produce both Hot and Cold asphalt. Like the Cold asphalt itself, **this is the first of its kind in the country**. With this asphalt can be hauled to any distance without fear of being caked. The photographs of production, stockpiling and laying are asshown below;

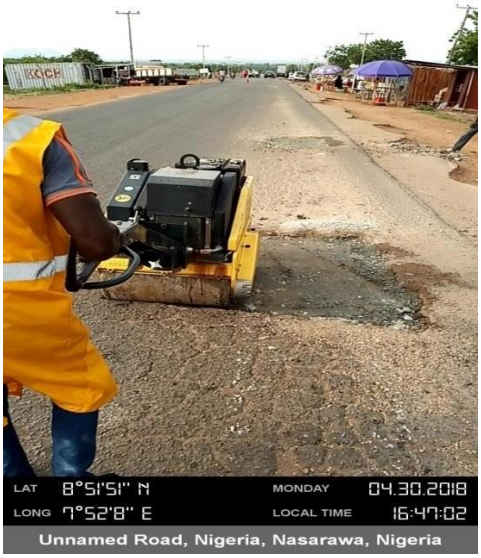
70/80 TPH ASPHALT PLANT WITH HOT AND COLD FACILITY

STOCKPILE OF BLEMDDAN BAGGED COLD ASPHALT

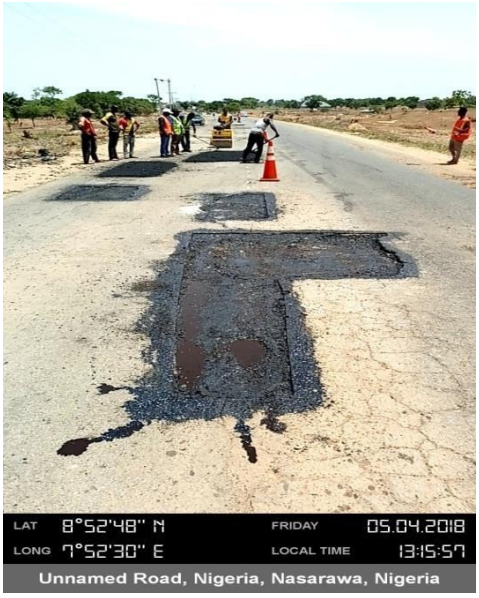
BLEMIDAN®
COLD MIX ASPHALT FOR ROAD MAINTENANCE AND POTHOLE REPAIR
COLD ASPHALT
QUICK. SIMPLE. CONVENIENT.
25kg

KEFFI – GITATA ROAD, NASSARAWA STATE, 2018

KEFFI – GITATA ROAD PICTURES

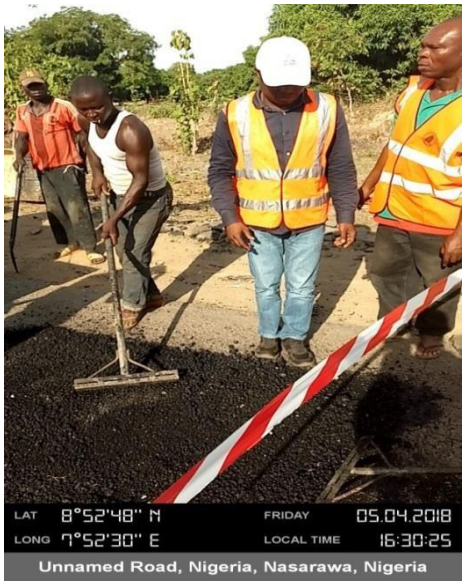


KEFFI – GITATA ROAD

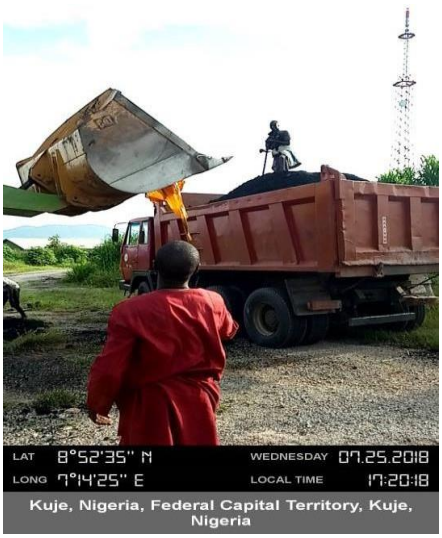


KEFFI – GITATA ROAD

KEFFI – GITATA ROAD



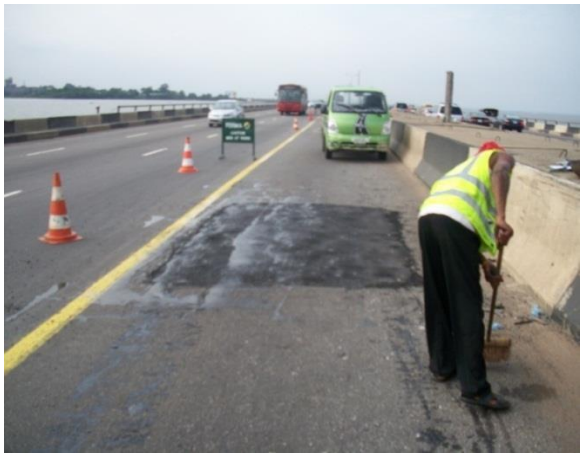
PRODUCTION IN KUJE



SOKOTO-GUSUA ROAD, ZAMFARA STATE

JEGA-KOKO-YAURI ROAD, KEBBI STATE

PATCHING OF POTHOLE WITH ASPHALT ON THIRD MAINLAND BRIDGE, LAGOS

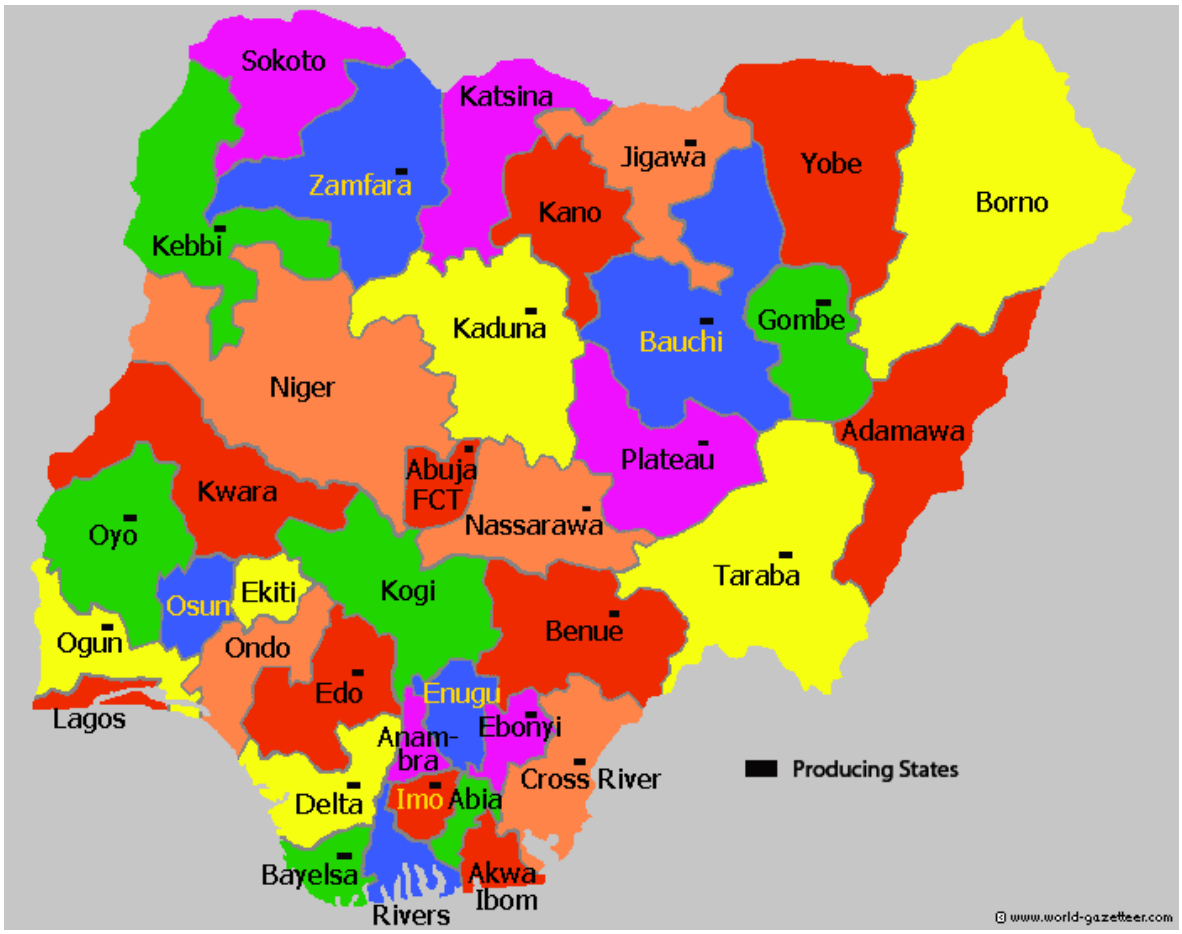


LAYING OF COLD ASPHALT ON JOS-BAUCHI ROAD, BAUCHI STATE

KADUNA COLD ASPHALT PRODUCTION BASE

NATIONWIDE USE OF COLD ASPHALT

STATES WHERE COLD ASPHALT HAS BEEN USED



COLD ASPHALT PRODUCING AND NON COLD ASPHPALT STATES PHASE 1

S/No.	ZONE	PRODUCING STATES	NON PRODUCING STATES	REMARKS
1.0	NORTH CENTRAL	NASSARAWA	KOGI	
		PLATEAU	NIGER	
		BENUE	FCT	
			KWARA	
2.0	NORTH WEST	KEBBI	SOKOTO	
		ZAMFARA	KANO	
		KADUNA	KATSINA	
		JIGAWA		
3.0	SOUTH EAST	EBONYI	ENUGU	
		OWERRI	IMO	
			ABIA	
			ANAMBRA	
4.0	SOUTH SOUTH	EDO	RIVERS	
		DELTA	AKWA IBOM	
		BAYELSA		
		CROSS RIVER		
5.0	SOUTH WEST	OYO	OSUN	
		OGUN	LAGOS	
			ONDO	
6.0	NORTH EAST	TARABA	BORNO	
		GOMBE	YOBE	
		BAUCHI	ADAMAWA	
		18	**19**	

FEDERAL REPUBLIC OF NIGERIA

Patents and Designs Act,

(CAP 344 Laws of the Federation of Nigeria 1990)

CERT. No. 000001

RP: NG/P/2013/043

Date of Patent: 21-01-2013

Date of Sealing: 28-01-2013

of the Federal Republic of Nigeria and Commander-in-Chief of the Armed Forces

DEUCK EBELE JONATHAN

request for the grant of a patent has been made by: ENGR. THOMAS EYO

OF BLOCK 39, FLAT 6, GAMES VILLAGE GUDU ABUJA

C/O PHILIP WHITE & ALL PUST 413 NIGRO CRESCENT WUSE 2 ABUJA

use and advantage of an Invention, for:

FERMA COLD ASPHALT

AND the Federal Government being willing to encourage all invention which may be for
ord, to please to accede to the request:
NOW THEREFORE, that I do by this instrument give and grant unto the person(s) above named
owner(s), executor(s), administrator(s) and assign(s) (each and any of whom are
referred to in the patentee) by special licence, full power, sole privilege and authority,
other or any agent or licensee of the patentee may subject to the conditions and provisions
to any statute or order for the time being force at all times hereafter during the term of
mentioned make, use, exercise, and vend the said invention throughout the Federal Republic
of that the patentee shall have and enjoy the whole profit and advantage from time to time
ues of the said invention during the term of twenty years from the date first above
(hereinafter) AND to the end that the patentee may have and enjoy the sole use and
all benefit of the said invention, I do by this instrument strictly command all citizens of
public of Nigeria that they do not at any time during the continuance of the said term
or indirectly make use of or put in practice the said invention, nor in anywise imitate
nor the written consent, licence or agreement of the patentee, on pain of incurring such
may be justly inflicted on such offenders, and of being answerable to the patentee
or for damages thereby occasioned.

AND that this patent shall be revocable on any of the grounds from time to time by the
or grounds for revoking patents by me, and the same may be revoked and made void

that nothing herein contained shall prevent the granting of licence to such manner
alterations as they may by law be granted.

MADE this 12th day of Feb

20 13

Registrar of Patents & Designs

CAC/IT/NO 127761

CAC

CORPORATE AFFAIRS COMMISSION

FEDERAL REPUBLIC OF NIGERIA

Certificate of Incorporation

of the Incorporated Trustees of

NATIONAL ASPHALT PAVEMENT ASSOCIATION

I hereby certify that

EYO THOMAS BASSEY, ESENWA MICHAEL NDUBUISI, MUAZU ISMAILA , ARUSUKABIE SUNNY A., AYONGS KABOSHIYO DAVID, OMEJE ULVIS O.

the duly appointed trustees of NATIONAL ASPHALT PAVEMENT ASSOCIATION *have this day been registered as a corporate body, subject to the below mentioned conditions and directions.*

Given under my hand and the Common Seal of the Corporate Affairs Commission at Abuja this 12th day of April, 2019

CONDITIONS AND DIRECTIONS

This certificate is liable to cancellation should the objects or the rules of the body be changed without the previous consent in writing of the Registrar General or should the body at any time permit or condone any divergence from or breach of such objects and rules

Note:
This certificate does not bestow upon the Organization the right to establish any institution, engage in any business and the like without permission from the appropriate authority

1228106

AZUKA OBIAGELI AZINGE

Registrar General

END NOTE

Cold asphalt is one of the numerous achievements I contributed to the much-needed innovations in the nation's highway sector. Nigeria has witnessed reforms in telecommunication and banking sectors etc. The time has come for a much-needed reform in the road sector by adopting current global best practices in the design, construction and maintenance of our roads.

We import cars from Europe, Asia and America, the time has come for us to **import their roads.**