

# NBRRI WORKSHOP

## COLD RECYCLING TECHNOLOGY

### AS AN INNOVATIVE AND SUSTAINABLE METHOD FOR REHABILITATING

Collaborative Partnership of Julius Berger Nigeria PLC & Ahmadu Bello University

Representative: Dr. A. Ahmed Shuaibu, ABU

Date: 24-28 November 2025



# AKR Abuja-Kano Road

## JULIUS BERGER NIGERIA PLC

- ❑ The main northern artery of Nigeria's A2 highway
- ❑ The A2 highway is one of Nigeria's most important highways
- ❑ Running from North to South, it unites the Nigerian economy - enabling main agricultural zones in the north access to markets and ports in southern and coastal states and facilitating flow of goods from the southern regions
- ❑ Abuja-Kaduna-Zaria-Kano Road makes up ~380km of Nigeria's A2 highway, from the heart of Nigeria's capital, North to Kano





# Process Engineering @ AKR

## Cold Recycling Technology – Bitumen-Stabilized Material (BSM)

- The existing asphalt and base course is milled at full depth and transported to a nearby site yard for processing at a mobile cold mixing plant after crushing
- The granulated material is mixed with an active filler (Cement) and Foamed Bitumen to produce a homogenous mix of Bitumen-Stabilized Material (BSM) for paving the base layer of the road

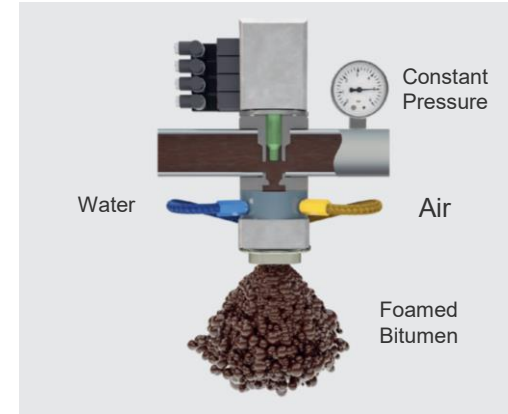
# Cold Recycling Technology – Bitumen-Stabilized Material (BSM)

## What is BSM?

- Material (RAP, GBC, Blend)
- Active Filler (Cement)
- Foamed Bitumen



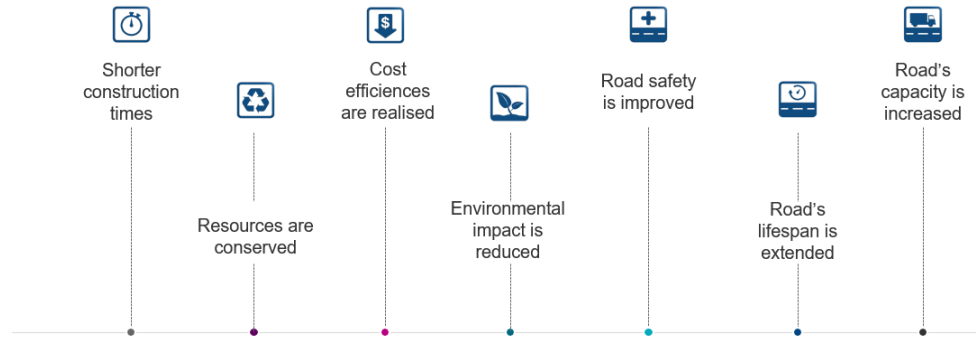
A mix of Foamed Bitumen (Viscosity Reduction) with cold moist material, so that tiny Bitumen Splinters stick to Aggregate Particles



Video Clip

## Why using BSM @ AKR?

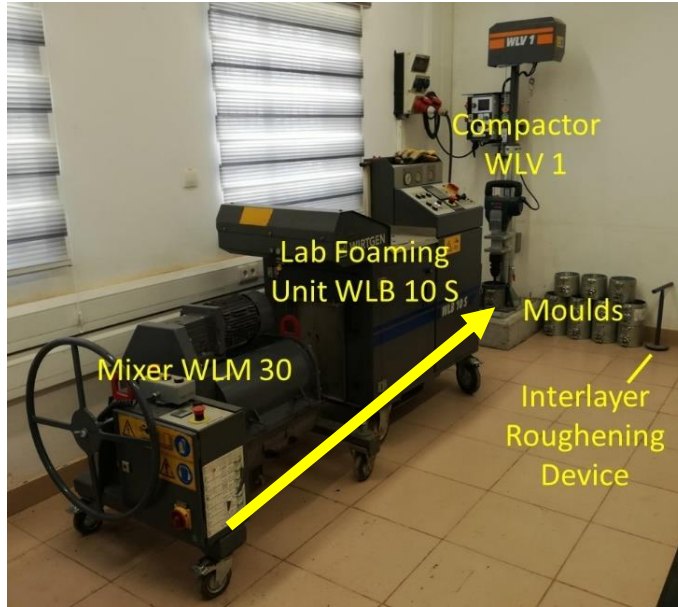
Numerous benefits for all-around value



# BSM – Bitumen-Stabilized Material

## □ Preliminary Tests – Laboratory Works:

- Investigation of Existing Pavement & Structure
- BSM Mix Design



# BSM – Bitumen-Stabilized Material

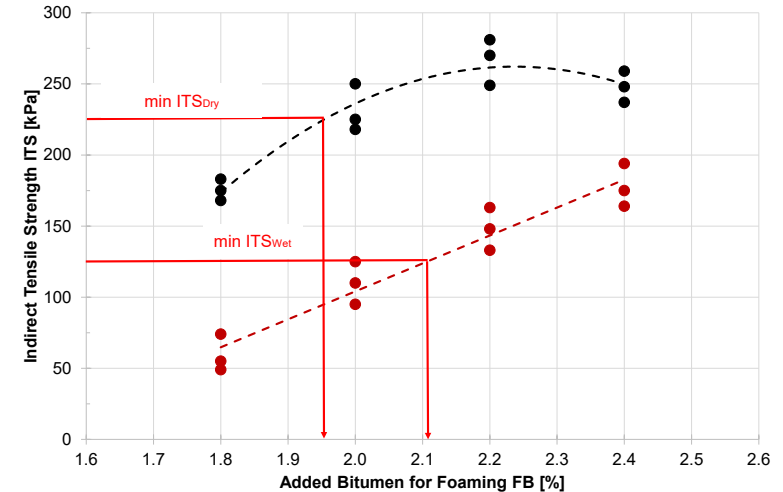
## □ Preliminary Tests – Laboratory Works:

- Investigation of Existing Pavement & Structure
- BSM Mix Design



## Optimization of Bitumen Addition – Key Parameters (Indirect Tensile Strengths):

- ITS<sub>dry</sub> (min. 225 kPa)
- ITS<sub>wet</sub> (min. 125 kPa)



# BSM – Bitumen-Stabilized Material

## □ Preliminary Tests – Laboratory Works:

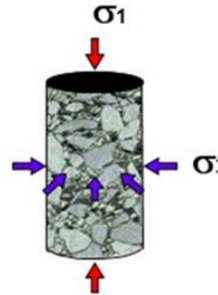
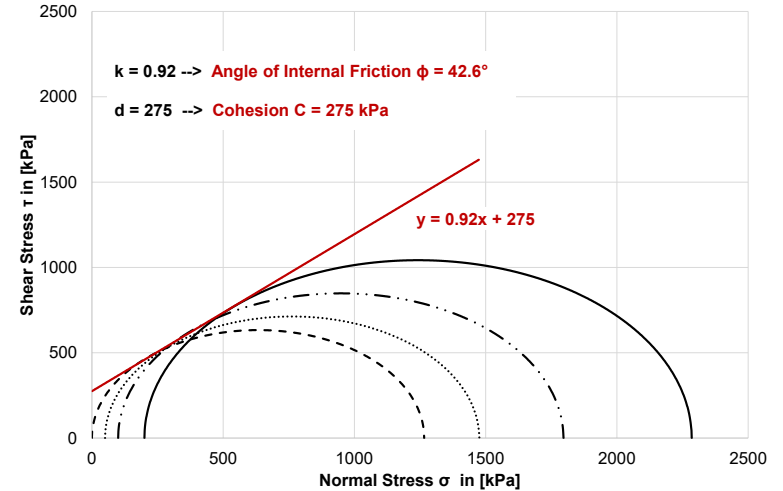
- Investigation of Existing Pavement & Structure
- BSM Mix Design



Determination of theoretical, structural Life – Pavement Design:

Triaxial Testing:

- Cohesion  $C$
- Angle of Intern. Friction  $\phi$



# BSM – Bitumen-Stabilized Material

## ❑ Site Operation – **IN-PLANT**:

- Investigation of Existing Pavement & Structure
- BSM Mix Design
- Construction Site:
  - In-Plant



**Milling** of existing road structure  
(RAP and GBC material)

Preparation (**Crushing**)  
of milled material



**In-Plant Mixing** (BSM production)

# BSM – Bitumen-Stabilized Material

## ❑ Site Operation – **IN-PLANT**:

- Investigation of Existing Pavement & Structure
- BSM Mix Design
- Construction Site:
  - In-Plant



**Paving** of BSM



**Compacting** of BSM



**Curing** of BSM

# BSM – Bitumen-Stabilized Material

## ❑ Site Operation – **IN-SITU**:

- Investigation of Existing Pavement & Structure
- BSM Mix Design
- Construction Site:
  - In-Situ



**In-Situ:** Milling and Stabilizing



## Pre-Compaction and Leveling



## Compaction



# Summary

- **Cold Recycling Technology** – An Innovative Sustainable Construction Method with environmental and economic benefits

- **Cooperative Partnership** between Industry (JBN) and Science (University ABU, Zaria)

## □ RILEM Paper and RILEM Workshop 2024

Réunion Internationale des Laboratoires et Experts des Matériaux  
78th RILEM Conference on Sustainable Materials & Structures,  
August 25-30, 2024, Toulouse (France)

## □ NIS (Nigerian Industrial Standards) in progress

- **West Africa Innovation Award 2025**

BUSINESS & ECONOMY

### Julius Berger wins big!

April 14, 2025 / Wole

- Clinches best Construction and Infrastructure Company of the Decade Award

Leading engineering construction company, Julius Berger Nigeria PLC, Thursday night in Lagos, emerged the Best Construction and Infrastructure Company of the Decade. At an award ceremony organised by West Africa Innovation Awards designed to promote excellence, creativity and innovation among brands and brands professionals in the West African subregion, the company came tops ahead of two others from the sector.

According to the Chairman of the Award Organising Committee, Cammil Chineme, Julius Berger is worth celebrating for its core values, professionalism and solid testimony of its doggedness in pursuing its endeavours.

### Julius Berger named best construction company at West Africa Innovation Awards

By Rahmattullah Laseel April 14, 2025 2:54 pm

Julius Berger Rated Best Construction Firm Of Decade



Julius Berger  
By Peter Mwanza, Lagos  
Tue, 18 Apr 2025 6:04:25 AM

Leading engineering construction company, Julius Berger Nigeria PLC, has emerged the Best Construction and Infrastructure Company of the Decade.

### SUSTAINABLE PAVEMENT STRUCTURE BY USING COLD RECYCLING TECHNOLOGY (BSM METHODOLOGY) IN COMPARISON TO TRADITIONAL PAVEMENT DESIGN

Jibrin M. Kaura<sup>1</sup>, Abdulfatai. A. Murana<sup>1</sup>, Shuaibu, A. Ahmed<sup>1</sup>, Amartey. H. S Bilikisu<sup>1</sup>, E. Hauser<sup>2</sup>, Mohammed. I. Amodu<sup>2</sup>, B. Bott<sup>2</sup>, E. Frasca<sup>2</sup>, F. Drosowski<sup>1</sup>, and Y. Ibrahim<sup>2</sup>,

<sup>1</sup>Department of Civil Engineering, Ahmadu Bello University, Zaria, Nigeria

<sup>2</sup>Julius Berger Nigeria PLC, Abuja, Nigeria

Presenter of the paper during the Conference : J. M. Kaura

#### Abstract

In 2018, Cold Recycling technology by means of using BSM methodology (Bitumen-Stabilised Material) was implemented in West Africa for the first time in order to rehabilitate and dualize a 380 highway road (AKR - Abuja-Kano Road), which is considered to be one of Nigeria's most important highway connecting key northern states. Thereby, the sustainable base layer through cold cycling with foamed bitumen (Bitumen Stabilised Material) is substituting the traditional Macadam asphaltic layer. The first part of the paper describes the performance optimization of the Bitumen stabilised Material. Thus, some key mechanical and performance indicators; Indirect Tensile strength, Unconfined Compressive Strength tests, and Shear Strength Parameters, have been considered in order to minimise the BSM additives and optimise the performance using Response Surface Method (RSM). The second part reviewed what is reported in the literature on the environmental and economic impact of road rehabilitation using Bitumen Stabilised Materials compared to the traditional use of Hot Mix Asphalt. Thereby, Life Cycle Assessments have been conducted in order to demonstrate the CO<sub>2</sub> and energy savings from the Nigeria, Abuja-Kano Road (AKR) project. The inputs (energy, raw materials, etc.) and the potential environmental and economic impacts have been evaluated throughout its life cycle and compared with traditional pavement structures.

**Keywords:** Cold Recycling Technology, Bitumen Stabilised Materials, CO<sub>2</sub> Savings, Life Cycle Assessments.

# THANK YOU!

