




IRF GLOBAL

2023 IRF GLOBAL ROAD ACHIEVEMENT AWARDS











www.IRF.global/graa

TABLE OF CONTENTS

MORE THAN AN INDUSTRY ACCOLADE

H.E. Abdullah A. AlMogbel
Chairman Emeritus for Life
International Road Federation

The IRF Global Road Achievement Awards (GRAA) Program was founded to publicize to the world the innovative, practical, creative, cost-saving and sustainable solutions the road industry provides to societies and economies.

Instituted in 2000, the GRAA Program has distinguished more than 250 projects, products and technologies from around the world. Today, the Awards are recognized as a prestigious industry accolade in their own right, but they also serve to remind a much wider audience that the mobility everyone takes for granted would not be possible without the talent and commitment of our industry. Lastly, the IRF Awards are an accelerator of progress and ideas: by showcasing our achievements, we are able to learn from each other, and build on our successes.

On behalf of IRF Global and our international panel of independent judges, I would like to congratulate the winners of the 2023 IRF Global Road Achievement Awards. They are an asset to an industry that is constantly investing in new solutions to deliver gains and sustainability advances that benefit everyone.

The diversity and quality of this year's winning projects are also a great testament to IRF Global's status as the international marketplace for best practices and industry solutions.

I invite you to examine them in detail and to submit your own exemplary projects to the 2024 GRAA Competition.

ASSET PRESERVATION AND MAINTENANCE MANAGEMENT

INNOVATIVE PAVEMENT MANAGEMENT SYSTEM & SUSTAINABLE ROADS IN THE CITY OF DUBAI

ROADS & TRANSPORT AUTHORITY (RTA) OF DUBAI

The Roads & Transport Authority (RTA) of Dubai executed a groundbreaking project from 2021 to 2023 aimed at revolutionizing road management and sustainability. This project had several integral components that leveraged modern technology and innovative materials for more efficient and safe roads.

Smart Pavement Survey and Asset Condition
The cornerstone of this initiative was the deployment of Smart Pavement Survey Technology. The system, known as Laser Crack Measurement System-2 (LCMS-2), uses a blend of Artificial Intelligence, Internet of Things (IoT), Digital Photogrammetry, and 3D high-resolution imaging. It can accurately identify and quantify 14 types of pavement distresses such as Alligator Cracking, Rutting, and Potholes, among others, with varying degrees of severity.

The LCMS-2 technology is not confined to just evaluating the surface of the road but also assesses road markings, signs, and even street furniture. Its ability to measure road rutting and the International Roughness Index (IRI) enables authorities to judge the road's comfort and safety levels. Overall, the technology could survey 18,762 km of Dubai's road network in two years, compared to a mere 2,400 km if inspected manually. It offers 95% time efficiency and 97% accuracy compared to traditional methods.

Big Data and Pavement Management
The data harvested by LCMS-2 are analyzed through AgileAssets Software, a Big Data platform. This software is instrumental in the inventory of results, maintenance planning, budget allocation, and Key Performance Indicator (KPI) monitoring. It also calculates the Pavement Quality Index (PQI), which stood at an impressive 95.48% for Dubai's roads in 2022.

Intelligent Maintenance Plans
Based on the AgileAssets Software's analysis, several intelligent maintenance scenarios are created. These help in predicting future road conditions, and required maintenance budgets, and allow for flexible budget allocation depending on PQI levels.

Sustainable Materials
The project championed the use of sustainable and recycled materials like White Paint, Shredded Waste Plastic, Polymer Modified Bitumen (PMB), and Reclaimed Asphalt Pavement (RAP). These materials have shown to significantly enhance pavement durability, reduce ecological impact, and extend service life.

Safety Measures
Safety evaluations are carried out, particularly Skid Resistance tests, to ensure road safety. The tests aim to achieve a minimum friction value of 0.35 as per RTA specifications. Special attention is also given to rehabilitation measures for rutting and potholes, which are leading causes of road accidents.

Energy Efficiency
In 2022, traditional road lighting was replaced with LED fixtures, leading to significant energy savings. This transition resulted in a 57% reduction in electricity consumption, a reduction of 3,046 tons in CO_2 emissions, and annual cost savings of 4,001,906 AED. Furthermore, the total energy saved was 5,268,230 kWh annually.

In sum, the RTA's multi-pronged project has set a benchmark in road management. It combines technology, data analytics, and sustainable practices to not only enhance road quality but also user comfort and safety, making Dubai's roads a global model for the future.

Dr. Mohamed Darwish Saeed
Manager of Pavement and Materials Quality, Roads and Transport Authority-Dubai

" Securing victory in the Asset Preservation & Maintenance Management Category of the IRF Awards is a testament to RTA's commitment to upholding the highest standards in road and transport management in the city of Dubai. It reaffirms our dedication to preserving infrastructure, ensuring safe journeys, and optimizing resources for a better future."

CONSTRUCTION METHODOLOGY

ZIGANA TUNNEL

REPUBLIC OF TÜRKİYE, MINISTRY OF TRANSPORT AND INFRASTRUCTURE

The Zigana Tunnel, having the rank of longest double tube highway tunnel in Europe, is located on one of the North-South axes of Turkey, which is of high importance, within the boundaries of Trabzon and Gumushane provinces. The project covers the range of 15,1 kilometers with 2x14,5 km double tube tunnels crossing the Zigana mountain and its connection roads. The tunnel length of the left tube is L=14.448 m. and the right tube is L=14.477 m. The Zigana Tunnel starts from the elevation of 1.015 m., climbing up to the maximum peak of 1.264 m. with a slope of 3.30% and then descending with a down slope of 0.85% and breaks through at elevation of 1.212 m.

Zigana Tunnel ventilation system is composed of deep vertical shaft structures and air exchange stations which was designed and executed for the first time in Turkey in highway tunnels. Within the scope of the project, there are total of 4 ventilation shaft structures at 2 stations, one for exhaust and one for fresh air at each station. With the execution of Ventilation Shaft No. 1 (Height=272 x 2 = 544 m - Diameter=3.60 m) and Ventilation Shaft No. 2 (Height=241 x 2 = 482 m - Diameter=3.60 m), totally 1.026 meters of vertical shaft have been completed within the scope of the project. The excavation operation of shaft structures has been executed by using rising and drilling excavation methodology with the help of drilling machine known as RBM (Raise Boring Machine). The lining and supporting operations of the vertical shaft wells have been performed with Glass Fiber-Reinforced Polyester (GRP) pipes.

AIM AND BENEFITS OF THE PROJECT

Trabzon - Gumushane road which is located on an important artery within the international road network that connects the Black Sea Coastal Road to the south through Trabzon-Macka-Torul-Gumushane districts, carries a very high traffic load.

With the Zigana Tunnel Project, the standarts of the former existing state road which is 12 meters wide and which is in a very important position in terms of economy, culture and social aspects of the country have been improved with a new geometry of dual carriage way (2x2 lanes). Former existing road is shortened by 8 km and the travel time is decreased approximately 15 minutes for cars and 60 minutes for heavy tonnage vehicles. It is ensured that people using the new highway can carry out all their commercial and social activities more safely and quickly. Especially during the winter months, the problems and troubles experienced on the former existing road are eliminated and more comfortable, safe and economical transportation opportunity is provided to road users. Sharp horizontal curves and steep ramps on the former existing route have been improved in compliance with the standards and problems such as rock falls and landslides due to steep slopes are eliminated.

Zigana Tunnel Project has been implemented by Turkish engineers and workers and one hundred percent domestic and national resources were used in the construction, design and operation stages of the project.

Abdulkadir URALOĞLU
Minister of Transport and Infrastructure of the Republic of Türkiye

“ We are very proud that IRF Global Road Achievement Award was given to this project this year, which is inspiring in terms of contracting, engineering and R&D. We sincerely thank the international panel of jury for this valuable and meaningful award in the ‘Construction Methodology’ category.”

DESIGN

NANJING JIANGXINZHOU YANGTZE RIVER BRIDGE

NANJING PUBLIC PROJECT CONSTRUCTION CENTER

Nanjing Jiangxinzhou Yangtze River Bridge is located in the core area of Nanjing city, an important traffic corridor between Jiangbei New Area and Jiangnan main city. The total length is about 10.33 km and is combined with bridge and tunnel, with six two-way lanes. The main bridge across the Yangtze River is a 2×600m three-tower cable-stayed bridge, officially completed and opened to traffic in December 2020.

(1) Technological innovation, the project has developed and adopted an intensive, efficient, safe, durable, green and low-carbon lightweight high-performance structure suitable for industrial construction to create the world's first all-steel composite beam cable-stayed bridge. The first steel shell-concrete composite cable tower with vertical and horizontal bidirectional reinforced concrete tenon (PBL) as shear joint is developed. The bearing capacity of steel shell-concrete composite cable tower is 49% higher than that of reinforced concrete structure with the same section size and steel content, and the cracking load of concrete is 150% higher, which can effectively reduce the engineering quantity of cable tower. Moreover, it has the advantages of easy construction, good appearance quality and excellent durability.

Coarse aggregate reactive powder concrete (CA-RPC) with high elastic modulus (> 54GPa), high initial cracking strength (≥13MPa) and low total shrinkage (< 300με) was developed.

The CA-RPC plate is used as the bridge panel of steel-concrete composite beams, which can reduce the dead weight of the structure by 35% and systematically reduce the input of raw materials in the whole bridge.

The application of high-performance composite structure saves the engineering cost of about 32 million dollars. The excellent structural performance enables the steel-mixed composite structure to have the capability of spanning kilometers, which makes outstanding contribution to the development of modern cable-stayed bridge.

(2) Practicing the concept of environmental protection and sustainable development, the project approaches Greenwater Bay wetland and Yangtze finless porpoise Reserve, which requires high environmental protection. The concept of green, low-carbon and sustainable development, and implements industrial construction technology is created. 80% of the work on the bridge was completed at the factory, which significantly shortened the construction period and enabled the project to be completed five months ahead of schedule. After the completion of the project, the bridge is integrated with the surrounding environment, and the common finless porpoises play in the water, becoming a beautiful scenery beside the bank of the river.

(3) Economic and social benefits, combination of lightweight and high-performance steel and concrete structure and the aesthetics of bridge architecture give birth to the tall, elegant and simple bridge structure, which integrates with the surrounding environment and becomes the most iconic building in the local area. The total cost of the main bridge is 168 million dollars, and the comprehensive unit price is 2,628 dollars /m2, which is the classic project with the best unit price of the Bridges, built in the middle and lower reaches of the Yangtze River in recent ten years.

In the past year, the average daily traffic volume reached about 80,000 vehicles. The spatial and temporal distance between the two banks of the Yangtze River shortened from 40 minutes to 10 minutes. This has effectively promoted the smooth and accelerated flow of various innovative factors between regions, and greatly reflects the social benefits.

Wu Huanling

Director, Nanjing Public Project Construction Center

" We are very honored to be recognized with the Design award of the GRAA, which is widely respected in the world. This aWinning the Awards holds profound significance for our center as it reaffirms our relentless efforts and outstanding performance. This recognition is a testament to teamwork, innovation, and the pursuit of excellence, encouraging us to continue surpassing ourselves and achieving even greater accomplishments in the future. Moreover, the International Road Federation established the Global Road Achievement Award (GRAA) in the year 2000, a visionary initiative that signifies the pivotal role of the transportation sector in driving global societal and economic advancement. Through the GRAA, IRF underscores the significance of road innovation, reminding the world that the services we often take for granted actually stem from the dedication and expertise of the transportation industry."

XINGYI RING EXPRESSWAY IN GUIZHOU

GUIZHOU HIGHWAY ENGINEERING GROUP CO., LTD.

Xingyi Ring Expressway in Guizhou is known as the world's most sublime expressway in karst peak forests. The expressway is 62.5 kilometers long. It surrounds the south side of Xingyi City, an international mountainous tourism city, and passes through typical karst peak forest areas. It connects famous geological landscapes, including Maling River Canyon, Forest of Ten Thousand Peaks (Wanfenglin) and Xingyi National Geological Park, and Louna Village, which is a traditional Bouyei ethnic minority residence.

Adhering to the principles of utmost protection of the environment and living traditions of local minorities, the expressway applied over 20 advanced technologies during the design, construction and operation stages to build a demonstration project of environmental and cultural protection. The route is carefully selected during the design stage with ecological, humanistic, geological, and environmental considerations. Using BIM+GIS simulation design and life-cycle multi-factor and multi-plan comparison technologies, the tunnel route with a higher construction cost of 7.70 million USD was selected to avoid fragmentation of Louna Village and occupation of the farmland where Bouyi ethnic minorities have lived for generations. 91.2% of the whole line has achieved zero earthwork disposal, saving a land occupation of 612,000m2. Prefabricated and standardized structures were used in the superstructures of bridges, and high pile caps were used in the substructures of bridges to reduce excavation by 54,000m3. The tunnels were designed with zero-elevation slope entrances, reducing the damage to vegetation by 47,000m2 and excavation by 89,000 m3.

During the construction stage, 310,000m3 of excavated topsoil was reused as greening substrates; 1.77 million m3 of tunnel spoils were utilized as concrete raw materials and roadbed fillers. 70 pipelines were built to transport bridge-construction waste to minimize ecological impact. Artificial intelligence was applied to accelerate the determination of the surrounding rock support parameters of tunnels. After the completion of the site work, 61 kilometers of construction access roads were hardened and retrofitted for the use of local residents.

During the operation stage, local plants are used for greening, and a drip irrigation automatic control system is used to reduce water consumption by 80% annually and solve the shortage of expressway greening water in karst areas. Besides, 85 culverts and 6 bridge deck runoff collection ponds were built to protect the surface water. Distributed smart solar energy systems were installed in tunnels, service areas, parking areas, and toll stations, supplying 15.2 million kWh of clean electricity annually. 69 sections of sound barriers are used at sound-sensitive points. The Project mitigated the negative environmental impact, reduced carbon emissions by 124,300 tons, and achieved direct ecological and environmental benefits.

After project completion, the traffic congestion in Xingyi urban area has been alleviated by 50%, and the number of tourists has increased by 65.5%, helping approximately 301,500 local people along the expressway to alleviate poverty and achieve well-being. The expressway has achieved remarkable socio-economic benefits by facilitating transit traffic, connecting urban areas, and promoting tourism and rural revitalization, therefore perfectly integrates engineering into the natural and cultural environment.

Dejiang Dai

General Manager, Guizhou Highway Engineering Group Co., Ltd.

"Founded in 1958, Guizhou Highway Engineering Group Co., Ltd. has constructed more than 7,000 kilometers of roads and over 1,200 bridges and tunnels in Guizhou Province and other areas with complex geological structures. Our group has always regarded Environmental and Ecological Protection as a high priority and accumulates multiple green technologies through practical projects. As a pioneering contractor globally to practice ESG principles over the whole lifecycle of project management, we are very honored to receive the GRAA environmental mitigation award, which approved our prior achievements. In the future, we will continue to explore more sustainable and low-carbon technology advances and strengthen sectoral communications to jointly build a bright future." "

THE MILFORD ROAD ALLIANCE

DOWNER NEW ZEALAND & WAKA KOTAHI NZ TRANSPORT AGENCY

The Milford Road Alliance (the Alliance) is responsible for maintaining the gateway to New Zealand's tourism crown jewel – the only road into and out of the majestic Milford Sound. An innovative partnership sees Waka Kotahi NZ Transport Agency and Downer manage a significant programme of work within a protected national park and UNESCO World Heritage Area, ensuring the one road into and out of Milford Sounds is safe, resilient and accessible for the almost 1,000,000 tourists the area welcomes annually.

Vanessa Browne, the Project Alliance Board chair, aptly captures the essence of the programme, "Waka Kotahi and Downer New Zealand are true programme partners. When we step onto the Milford Road, we leave our organisation at the door so we can wholeheartedly form the Alliance." This statement summarises the spirit of the Alliance's remarkable journey.

Dedication to the safety and wellbeing of those who traverse the Milford Road is unwavering at the Alliance. Nestled within an alpine environment which is prone to avalanches and rock fall, the Milford Road must be managed to the highest standard to prevent harm to unsuspecting travellers. Through harnessing high performance and effective programme management, the Alliance boasts an outstanding safety record with a low Total Recordable Injury Frequency Rate of zero for the past 12 months.

Milford Road Alliance is a significant infrastructure programme. In addition to avalanche and rock fall prevention, the Alliance manages numerous complexities including the historic, one-lane Homer Tunnel which provides the only vehicle access to the Milford Sounds, the requirement to keep the road open as much as possible while maintaining consistent standards, environmental considerations, and the need for Alliance staff to act as first responders to emergency situations. Evidence demonstrates that Milford Alliance manages these numerous complexities well and delivers an excellent program.

To achieve true high performance, the Alliance is committed to a long-term program model. Called an 'evergreen alliance', the unique model requires long-term notice for either party to end the partnership and recognises the high-value, specialist nature of the Alliance team. The evergreen model enables the program with certainty, fostering confidence and investment.

Programme investment helps to ensure the Alliance's ability to share knowledge widely across the industry, particularly for road agencies operating in alpine environments. With a dedicated in-house workshop and innovative solutions aplenty, the Alliance provides excellent opportunities for replication. This is particularly evident in the Alliance's development and use of avalanche detection technology and the in-house development of bespoke and innovative tools.

The Alliance is not a simple infrastructure programme. It is world class and a testament to human ingenuity, team resilience, and high-performing collaboration. The Milford Road Alliance continues to deliver a programme to maintain one of the world's most sought-after natural attractions and ensure explorers for generations to come can safely undertake the epic journey.

Kevin Thompson
Milford Alliance Manager

" The Milford Road Alliance is not just a partnership; it is a symbol of what can be achieved when passion and expertise converge on a grand scale. Being recognised at the Global Road Achievement Awards is incredible for us as a team – it recognises the hard work, passion, and specialist skills of our exemplary team."

PROJECT FINANCE

CONSTRUCTION OF 2ND NIGER BRIDGE LINKING ANAMBRA & DELTA STATES & ACCESS ROAD FROM EXISTING BENIN-ASABA EXPRESSWAY TO APPROACH LINK ROAD TO 2ND NIGER BRIDGE IN DELTA STATE

FEDERAL MINISTRY OF WORKS AND HOUSING, NIGERIA

The Federal Government of Nigeria has drafted public/private sectors participation in the provision and maintenance of key infrastructures across the country. As such, the need for alternative sources of project finance which was established through the Road Infrastructure Development and Refurbishment Investment Tax Credit Scheme (RIDRITCS) Scheme, signed into law through a Presidential Executive Order 007 in 2019. This aims at:

- enabling the Federal government of Nigeria to leverage on private sector funding for the construction or refurbishment of Eligible Road Infrastructure projects in Nigeria;
- focusing on the development of Eligible Road Infrastructure projects in an efficient and effective manner that creates value for money through private sector discipline;
- guaranteeing Participants in the Scheme timely and full recovery of funds provided for the construction or refurbishment of Eligible Road Infrastructure projects in the manner prescribed in the Executive Order; and
- the Scheme will be in force for a period of Ten (10) years from the date of commencement of the Executive Order (2019).

As part of the main sources of project financing which includes equity, debt and government grants, five critical projects across all geopolitical zones (totaling about 545km length) in Nigeria, are benefiting from the special funding under equity from various Government Agencies such as National Sovereign Investment Authority (NSIA), in which the Construction of Second Niger Bridge project in Anambra State, South Eastern Nigeria is major amidst others. The construction of Bodo-Bonny Road with a Bridge across the Opobo Channel in Rivers State – South Southern Nigeria is being funded by Nigeria Liquefied Natural Gas Limited (NLNG) and other numerous projects. Around 350m road length is being sponsored by Nigerian National Petroleum Company Limited (NNPC) wherein the Rehabilitation of Zaria - Funtua - Gusau - Sokoto – Birnin Kebbi Road: Addendum of Contract for the Zaria - Funtua Section, (79.4km) – North-Western Nigeria is being financed.

Prominent private companies indicated interest and currently funding projects under the RIDRITCS as grants has been approved for some or full percentages of the project financing. Some of them include Dangote Industries Limited funding about 385km of roads across all zones of the country, GZ Industries Limited funding the Construction Of The 3.7km Umuchichi – Osusu – Umueme – GZ Industries Road in Aba, Abia State (3.7km)- South Eastern Nigeria, MTN Nigeria Communications Plc funding the Construction of the Enugu – Onitsha Expressway Road in Anambra and Enugu States (110km) - South Eastern Nigeria, Mainstream Energy solutions Ltd. funding around 205km roads in Niger State – North Central Nigeria and BUA International Limited funding around 280km of roads in Kwara State – North Central Nigeria.

The benefits to participants of the scheme, Government and the public presents an opportunity to channel funds towards the construction, repair and maintenance of key infrastructures which are most critical to the movement of products and services, it takes some burden off the Government in providing necessary Infrastructure across her nation and reduces the bureaucracy of road selection for rehabilitation or construction. Upon completion of these roads, travel time reduces and greater job opportunities are created.

Engr. Musa Saidu

Deputy Director Highways (Works and Housing)

" Receiving the IRF Global Road Achievement Award in the Project Finance & Economic category, on behalf of the Honourable Minister and the entire staff of Federal Ministry of Works & Housing, it is important to note that, the achievement of this project under the alternative funding source and receiving this award will boost the confidence of the Federal Government of Nigeria, other African countries and interested nations of the world to create more sources to fund their infrastructural projects. In this respect, we are sincerely grateful for this inestimable recognition. "

EĞİSTE HADİMİ VIADUCT

REPUBLIC OF TÜRKİYE, MINISTRY OF TRANSPORT AND INFRASTRUCTURE

Eğiste Hadimi Viaduct project was designed on Konya-Alanya Road, which is one of the important arteries of the North-South axis of our country, with a length of 1372 meters using the Balanced Cantilever Construction Method. The viaduct was designed as a double prestressed box girder bridge supported by 8 piers with heights ranging between 42 m. and 166 m. The total length of the bridge is 1372 meters with seven center spans of 170 meters and two side spans of 91 meters.

With these features, Eğiste Hadimi Viaduct has become the tallest and longest balanced cantilever bridge in Türkiye.

The middle spans were completed using cantilever formwork travelers, while the last 7.5 meters of the side spans were completed by casting concrete on the scaffolding. The structure was designed as two separate bridges resting on the same foundation with a double carriageway platform of 12.50-meter-width: serving 2 lanes in each direction.

The existing route has been cut by 4.4 km with the completion of the Eğiste Hadimi Viaduct, and ride comfort and traffic safety have both been attained by improved road standards. The Konya-Alanya Road's former use of the existing road at the Eğiste Creek Valley crossing had a longitudinal slope of 8.00%. By lowering the longitudinal slope of the new viaduct to 2.30%, time and fuel savings on the road were made possible, and the environmental impact of the vehicles was decreased by lowering carbon emission.

Eğiste Hadimi Viaduct has become the most critical part of the connection between Central Anatolian Cultural Tourism (Mevlana, Cappadocia) and Mediterranean Coastal Tourism (Alanya, Antalya) by saving time (20 minutes) on Konya-Alanya Road, one of the major tourism destinations of Türkiye. It will also contribute significantly to the development of the tourism industry by increasing ride comfort and road safety in tourism transportation.

For the construction of the Eğiste Hadimi Viaduct, 2.090.000.000 Turkish Liras (247.033.237 USD) was spent, all of which was from the own resources of the Republic of Türkiye.

Eğiste Hadimi Viaduct was opened to traffic on November 26, 2022.

A project quality management system that complies with ISO 9001 has been established and put into practice in full cover to guarantee quality from design to construction and prevent rework on a project this size and complexity that involves so many repeated high-risk tasks.

This framework demonstrated its effectiveness in a difficult project like the record-breaking structure which calls for state-of-the-art construction techniques as it enabled to safely connect massive superstructure cantilevers at record heights within tolerances.

Project quality goals are achieved through systematic execution of quality policies for design, construction engineering, materials selection, and construction methods, as well as the appropriate management of documentation which promotes cooperation among all project parties. Hold points are defined at critical construction stages where the implementation on site is checked against bridge design and superstructure camber requirements.

Abdulkadir URALOĞLU
Minister of Transport and Infrastructure of the Republic of Türkiye

" We are proud to win the International Road Federation (IRF) Global Road Achievement Award for our Eğiste Hadimi Viaduct Project, which opens the door to important transportation networks in the region, on the 100th anniversary of the Republic of Türkiye. The award we received in the "Quality Management" category not only certifies the success of our project, but also demonstrates the care and sensitivity we have shown while implementing the quality management system in all processes from design to construction. We are pleased with the success of our project, which has taken its place among the world's most important projects in its field by always prioritizing quality with engineering solutions in accordance with international standards. We sincerely thank the jury committee for this honorable and meaningful award. "

Aerogel Modified Bituminous Materials

RESEARCH

aerogel Modified Bituminous Materials (aMBx)

ARIZONA STATE UNIVERSITY

Globally, about 90% of roads are made of asphalt mixtures. Asphalt binders typically used in paving mixtures have properties that are influenced by environmental and temperature conditions. Thermal susceptibility of asphalt causes a softening behavior at high temperatures and stiffening at lower temperatures, leading to a brittle behavior. These conditions will lead to cracks due to the accumulated thermal stresses within the pavement. Several modifiers have been introduced into asphalt materials to improve their performance. Many have poor heat storage stability, high thermal susceptibility, and low resistance to aging.

Researchers at the Advanced Pavement Laboratory (APL), School of Sustainable Engineering and the Built Environment (SSEBE) at Arizona State University developed an aerogel composite to provide a solution to these challenges. Aerogel is encapsulated with co-products of the petroleum-refinery system (e.g., heavy oil products, asphalt binders) or compatible materials (e.g., synthetic polymers or organic polymers such as bio-derived compounds). The aerogel and encapsulator are blended to produce the composite. Examples of aerogel composites include aerogel Modified Bituminous Materials (aMBx). The aMBx product showed great potential in the modification of asphalt materials to perform as a material with unique thermal resistance properties, and potentially providing an urban cooling mechanism for the Urban Heat Island (UHI).

Advantages include:

1) Increases the resistance to temperature susceptibility

2) Energy efficient material that increases durability and reduces CO2 emissions.

3) Reduces heat conduction and optimizes heat storage, contributing to urban cooling.

4) Provides opportunities to cater for larger markets in the paving and roofing industry.

Continued research and implementation of this product is being advanced through the National Center for Infrastructure Transformation, led by Prairie View A&M University, and Arizona Science and Technology Center - New Economy Incentive at ASU.

The research group was recently funded as a startup company, Aerogel Coating Technologies (aCT), with a goal to advance this technology and introduce it to market.

Kamil Kaloush
ASU FORTA Professor and Strategic Business Officer, aCT

"We are pleased to add this prestigious award to our innovative pavement engineering program at ASU. This recognition will significantly support our technology transfer efforts, accelerate field implementation, and connect us with industry partners to distribute the product worldwide. We are grateful and sincerely appreciative to the IRF for all the support they provided over the past decade. "

ASCENDI'S ROAD SAFETY ACTION PLAN 2020-2023

ASCENDI

ASCENDI is a motorway operator responsible for 627 km of network in Portugal that is divided in 6 concessions.

The company's vision is to become an industry efficiency benchmark by providing an exceptional service to its clients and the community.

Traffic safety plays a decisive role in this context and lowering the number of accident casualties is one of the organization's top priorities.

Since the 2015´s economic crisis, Portugal has been slowly recovering its performance and that was reflected in the general increase of traffic demand throughout the road network under the company's management.

Even though highways only represent about 7% of injury accidents in the country, ASCENDI reached a total of 587 casualties within its network in 2019.

Taking these numbers as the starting point and being aware that solutions to the problem would only be successful by applying a transversal, integrated and medium-term approach, ASCENDI decided to develop its Road Safety Action Plan 2020-2023 (RSAP).

The Plan was divided in 3 sections:

- Characterization of the road safety scenario;
- Target setting for 5% annual casualties' reduction in the network;
- Definition of the Action Plan that included:
  - Measure description;
  - Tasks and implementation schedule;
  - Internal and external responsibilities;
  - Budget and Kpi's.

The following RSAP's measure list addressed the 'before' (A), 'during' (B), and 'after' (C) stages of road accidents: :

A1 – Characterization of speeds and expansion of the SINCRO network;
A2 – Studies and mitigation measures in higher road accidents risk areas;
A3 – Telematics in the Norte concession;
A4 – Automatic incident detection system;
A5 – Ascendi's Safety Barriers Upgrading Plan;
A6 – Predictive model of road accidents;
A7 – Automatic alert system of vehicles driving in the wrong way;
B1 – Automatization of the emergency notifications reported to the National Emergency Line "112";
B2 – Automatic vehicle alert system in emergency stopping zones;
B3 – Centralization of Ascendi network traffic & operational control;
C1 – Production of internal road safety information;
C2 – Accident analysis reports with fatalities and seriously injured.

Additionally, the RSAP included two transversal measures to assure its monitoring and dissemination. An internal Steering Committee meets every trimester to analyze the status and help with the measure implementation. In the communication plan, Ascendi developed specific campaigns targeting the audience attention for the need of behavioral change towards safer driving that involved the main institutional stakeholders in the field of traffic safety.

With about six months to final implementation date and after a 22M euros investment, the preliminary results are already very positive once the reduction targets have been achieved for every year of the project. Moreover, despite having +4% traffic demand, 2022 registered a reduction by 23% in casualties (-135) when compared against 20194. So far, the RSAP has contributed to prevent 390 casualties in the Ascendi' s network.

ASCENDI believes that the RSAP is a good practice in road safety and is deeply committed to make it successful for its users. The company hopes that it may inspire the rest of the road community to act on road casualties' prevention.

José Revés
Chief Operations Officer, Ascendi

" The Ascendi's Road Safety Action 2020-2023 sets the targets and the roadmap of actions to achieve an ambitious reduction in road casualties. We are delighted with this GRAA and hope that this project may inspire the road community to join us in our commitment towards safer roads."

DEVELOPMENT, DEPLOYMENT, AND TESTING OF A MOTORCYCLE COLLISION ALERT SYSTEM (MCAS) TO IMPROVE SAFETY FOR RIDERS IN MALAYSIA

MALAYSIAN INSTITUTE OF ROAD SAFETY RESEARCH (MIROS)

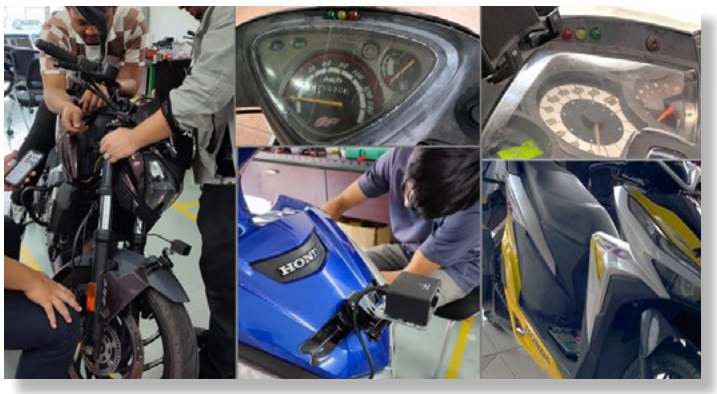
In an effort to reduce motorcycle crashes, the Malaysian Institute of Road Safety Research (MIROS) has developed a LIDAR-based automated collision alert system for small displacement motorcycles. The MIROS Motorcycle Forward Collision Alert System (MCAS) uses a LIDAR sensor to detect objects and obstacles in the rider's path and activates an audible and visual alert to warn the rider of the hazard. Undetected obstacles, within the path of a motorcycle, can have tragic consequences if evasive action is not taken. To this end the MCAS's LIDAR sensor can "see" obstacles that riders may not see. The alerts are designed to direct the rider's attention to the forward path and help them take evasive action to avoid a collision. MCAS has been tested in a variety of real-world conditions, including on highways, city streets, work zones, and traffic jams throughout Malaysia. The system has shown to be effective in detecting a wide range of hazards, including cars, trucks, other motorcycles, and objects.

MIROS is collaborating with PLUS Malaysia Berhad to conduct a naturalistic motorcycle riding study which aimed to install the MCAS onto motorcycles used by selected commuting workers in Malaysia. The main objectives of the project were to determine the functionality, usability, safety benefits, retrofittability and acceptance of MCAS among the motorcyclists. The MYR 200,000.00 project is also joined by the Virginia Tech Transportation Institute (VTTI), USA as a research collaborator. This research project is also supported by Honda through its partner in Malaysia to provide technical expertise and resources to support testing.

Forty-five motorcycles will be retrofitted with MCAS system. The motorcycles are being used by participants to commute to work for 3 to 6 months. The selection of participants was prioritized based on self-reported crash risk along their commuting route. As a naturalistic study, the project is using a variety of data collection methods, including cameras (video footage), GPS data, and surveys. The findings will be reported to the government for policy making related to pre-collision warning technologies for motorcycles sold in Malaysia.

Currently, the MCAS has been retrofitted on 32 motorcycles comprising 18 different models with engine size ranges from 115 - 600 cc. There are 483 motorcyclists still waiting to be selected to fill in another 13 available slots as a participant, showing the high interest among commuting workers in Malaysia. The preliminary findings of the project are promising. Since the first installation in October 2022, MCAS has clocked 7,400 activation hours across 78,000 kilometers distances with no major technical or operational issues. Feedback from the participants indicated that MCAS has been effective in preventing collisions and reducing the risk of a crash. The system has also been shown to improve risky behaviors among riders, such as speeding, lane splitting, and riding while distracted.

Overall, this pioneering project has directly improved the safety of commuting workers in Malaysia while demonstrating MCAS as a promising innovative technology for motorcyclists.



Mohd Khairul Alhapiz Ibrahim

Senior Research Officer and MCAS Project Leader, Malaysian Institute of Road Safety Research (MIROS)

"We are honored to receive the 2023 IRF Global Road Achievement Award for our innovation in motorcycle safety. This award is a testament to our strong dedication and commitment to making the roads safer for all, especially for vulnerable road users. This recognition motivates us to work even harder to find high-impact and sustainable solutions for road safety in Malaysia and beyond."

EXPANSION AND RECONSTRUCTION PROJECT OF THE TAIAN-ZAOZHUANG SECTION OF THE BEIJING-TAIWAN EXPRESSWAY

SHANDONG HI-SPEED CONSTRUCTION MANAGEMENT GROUP CO., LTD.

The total length of the project is 189.5 kilometers, with a design speed of 120 kilometers per hour. The original four-lane road is expanded to eight-lane road, which is invested and constructed by Shandong High-speed Group. As the first " Expansion and reconstruction + smart expressway" pilot project of "A Country with Strong Transportation Network" of China, and the first smart expressway in Shandong Province of China.

Based on the actual engineering needs of intelligent operation and maintenance of long-distance expressways, this project aims to ensure the road safety of the expressway reconstruction and expansion, provide efficient and convenient traffic services, and improve the level of road management. It adopts theoretical analysis, indoor and outdoor tests, numerical simulation, system development, field testing and other technical means. It has built the technical system of green, low carbon, intelligent renovation and expansion and security for long-distance national trunk highway. The innovative achievements of the project are as follows:

1. The technology of long-distance green intelligent reconstruction and expansion

In view of problems of abandoning a large number of in-service structures of long-distance reconstruction and expansion expressway and difficulties of reusing them, intelligent prediction of load data, intelligent verification of bridge resistance and intelligent analysis of bridge performance are proposed. The existing research ideas of hierarchical utilization of structures solve the problems of poor accuracy of detection and evaluation, low efficiency and low recycling rate, and break through the key technologies of green carbon reduction. It expands the way of resource utilization of existing structures and increases the added value of recycling.

2. The technology of life-cycle holographic sensing and intelligent control

In order to solve the difficulties of reusing a large number of existing structures in service of long-distance reconstruction and expansion expressways, a full life-cycle traffic holographic perception and intelligent control technology has been developed, achieving remote diversion of vehicles with information services and intelligent guidance of parking in service areas, etc., which also ensures the further improvement of service level during the renovation and expansion period. An integrated platform for the full life-cycle of construction, management, and operation has been created, realizing the integration of traffic data during the construction and operation periods.

3. The high-precision trajectory tracking and vehicle-road collaborative support technology

In order to solve the problem of accurate control of traffic flow during the period of reconstruction, expansion and operation, the high precision vehicle trajectory tracking technology has been developed to realize real-time and accurate information services. In order to reduce safety accidents caused by human factors, the automatic driving control model construction technology based on the safety potential field was developed to realize the following, lane change and control of truck formation, creating a 20-kilometer open vehicle-road coordination test section with the longest mileage in China.

Lv Xinjian

Deputy General Manager, Shandong Hi-Speed Construction Management Group Co., Ltd. and Director, Construction Management Office for Reconstruction and Expansion Project of Tai'an-Zaozhuang Section of Beijing-Taiwan Expressway

" This award is a successful example of innovation in transportation infrastructure concepts, technology, and management in Shandong Province, China in recent years. This award fully demonstrates the brand strength of Shandong Hi-Speed Group in the field of international transportation construction, which is of great significance for Chinese infrastructure to go global. This award represents an important opportunity for Chinese infrastructure sector to voice "Chinese voice", and showcase the "Chinese power" that benefits and cares for the people. "

URBAN PLANNING AND MOBILITY

SAADIYAT LAGOONS PROJECT

ALDAR

The Saadiyat Lagoons Development is a totally unique sustainable community - designed, developed and delivered to meet higher ecological standards in Saadiyat Island.

Living in harmony with nature is a core principle of the Saadiyat Lagoons community. By prioritising the preservation and restoration of the surrounding environment, these homes seamlessly integrate with their natural setting. The result is a thriving ecosystem that benefits both residents and the local flora and fauna.

Covering an area of 618.5 hectares, this one-of-a-kind development not only provides breathtaking views and a serene ambiance, but also fosters a deep connection with nature.

A robust mobility planning approach was followed to achieve a '5-minute' community', putting various travel destinations within a five minute walk of your home, encouraging a car-free environment, lowering carbon emissions and energy consumption. Three-pillar planning approach was implemented through providing an appropriate infrastructure, including shaded walkways and covered trails to increase the share of sustainable transportation, managing the travel demand through vigorous planning for public realm functions and activities, and applying design principles that leverage data and technology in order to provide a green and safe infrastructure to achieve sustainability goals.

In line with UAE leadership vision in sustainability, Saadiyat Lagoons' sustainable design prioritises energy efficiency through diverse approaches and measures. The development targets a 40% emissions reduction over its lifecycle which includes 33% embodied carbon reduction, and 42% operational carbon reduction which factors 30% reduction in anticipated operational energy consumption and 49% in water use reduction, making it a sustainable development that advances Aldar's interim target to reach net zero by 2050.

From reducing our ecological footprint and preserving natural resources to enjoying a closer connection with nature, these residences provide a truly unique and enriching experience.

Saadiyat Lagoons: embracing nature and a sustainable lifestyle in the heart of Abu Dhabi.

Adel Albreiki
Chief Executive Officer, Aldar

"We are proud to receive the prestigious International Road Federation Award for the second consecutive year. This recognition in the Urban Planning & Mobility Category highlights Aldar's strong dedication to sustainability in all our projects. As the UAE leadership has declared 2023 as the Year of Sustainability, Saadiyat Lagoons exemplifies our commitment to aligning with this visionary goal."

GLOBAL

KNOWLEDGE • ADVOCACY • EDUCATION
BEST PRACTICES • BUSINESS OPPORTUNITIES

Better Roads. Better World.

IRF GLOBAL

International Road Federation

GLOBAL HEADQUARTERS & SECRETARIAT
500 Montgomery Street, Fifth Floor, Alexandria, VA 22314 USA
Telephone: +1 703 535 1001 Facsimile: +1 703 535 1007

REGIONAL OPERATIONS
Santiago, Chile | Accra, Ghana | Nairobi, Kenya | Kuala Lumpur, Malaysia

TRAINING INSTITUTES
Alexandria, VA USA | Dubai, UAE | Zagreb, Croatia

2024 GRAA Application Information

APPLICATION DEADLINE: MAY 8, 2024

The application package must include:

1. A completed application form
2. A project summary (<500 words)
3. An explanation of how the project meets the criteria of the category in which it has been submitted (~100 words)
4. Microsoft PowerPoint® presentation (.ppt or .pptx) including but not limited to slides, photographs, drawings, diagrams, videos, or additional explanatory materials. (Presentations should be limited to 30 slides or less).

OR

- Complete our online application, which includes built in file uploading **(https://irf.wufoo.com/forms/2024-graa-application)**

For further information, please contact: graa@IRF.global | Tel: +1 703 535 1001

www.IRF.global