USINA
DE NOTÍCIAS

DIFFERENT DEMANDS, INNOVATIVE SOLUTIONS

DOMINICAN REPUBLIC:
investment in infrastructure and urban mobility

BRAZIL, ANÁPOLIS AIRBASE:
precision for runaway leveling

OSCILLATION:
compaction efficiency and quality

SOUTH AFRICA:
Much Asphalt starts the production of rubberized asphalt

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Number 30

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Tel: +55 (51) 3364-9200 - **Fax:** +55 (51) 3364-9228 - E-mail: ciber@ciber.com.br | www.ciber.com.br

Daniel Siebrecht, Ciber Industrial President

Picture: Fabiano Panizzi

MEETING DEMANDS IN DIFFERENT COUNTRIES AND CONTINENTS

Talking about "meeting the customer's needs" has become sort of a mantra in the business world. And this is not different at Ciber or from Wirtgen Group motto: "Close to Our Customers". In practice, it demands a lot of investment, dedication and commitment to most companies. It also demands time, because it is necessary to listen to what the customer needs and talk to identify future demands or technologies and specific applications. It demands investment in knowledge, in the development of solutions which are appropriate to project needs of each customer.

Fortunately, at Ciber, a subsidiary of the Wirtgen Group, we have managed to apply all of that in our day to day activities. This positioning has been fundamental to our growth, especially to our customers' satisfaction, because working this way will lead us to overcome the number of over 1,700 Ciber asphalt plants spread over four continents, which are built and appropriate to each customer demand in each country. On the cover spread of the current issue of Usina de Notícias, there are a few stories that report the means to serve with the most varied solutions which are appropriate to different customers' demands in different countries and continents, from technical issues coming from usage singularities up to legal demands of each region.

In addition to this cover spread, this issue brings the case of Rio de Janeiro plant, which produces different types of asphalt mixes to important works in the city, and talks about mobile plants used in Dominican Republic, which were chosen by the dynamic of works that demand equipment transport to several places. Rubberized asphalt, storable HMA (Hot Mix Asphalt), advantages of oscillation in compaction, and much more. Also, many more cases with technologies and several applications that we always enjoy sharing with you.

This is what we believe – to be close to our customers, offer and spread knowledge about application practices and new technologies and, above all, to make the most advanced products and service solutions available. ■

EDITORIAL STAFF

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Address: Rua Senhor do Bom Fim, 177
CEP (Zip Code) 91140-380
Porto Alegre – RS – Brazil
Phone: (51) 3364-9200 / Fax: (51) 3364-9228
ciber@ciber.com.br / www.ciber.com.br

General coordination:
Luiz Marcelo Tegon (President)
Jandrei Goldschmidt (Marketing Manager)
Barbara Rossi

Production and execution:
Phone: (11) 3253-4542
www.timbro.com.br
timbro comunicação

Executive Publisher: Rodrigo Garcia Aguiar
Editorial Director: Celina M. M. Lopes
Editor: Laiza Carneiro
Journalist: Helvânia Ferreira (Mtb/DRT/RS: 8166)
Reportage: Laiza Carneiro, Márcio Jardim, Sandra Coutinho, Carina Rossi Morpurgo, Mariana Menezes, Angelo Augusto Santi

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BETWEEN BEACHES AND JOBS

The country seeks excellence to improve its road network

DEALERS IN AFRICA

WIRTGEN SOUTH AFRICA PTY LTD.
Phone: 27 11 452 18 38 / *Fax:* 27 11 452 48 86
E-mail: heinrichs@wirtgen.co.za
Website: www.wirtgen.co.za
Operating region: South Africa, Botswana, Mozambique, Lesotho, Swaziland, Zimbabwe, Malawi, Zambia, Tanzania, Namibia, Burundi, Rwanda, Uganda, Kenya

SARL TRACTOR PARTS SERVICES TPS
Phone: 213 21 44 54 89/31 / *Fax:* 213 21 44 81 72
E-mail: tps-algeria@tps-algeria.com
Website: www.tps-algerie.com
Operating region: Algeria

SMDM – SOCIÉTÉ MAROCAINE DE DISTRIBUTION MATÉRIEL
Phone: 212 5 23 31 88 00 / *Fax:* 212 5 23 32 63 96
E-mail: contact@smdm.ma
Operating region: Morocco

SOTRADIES
Phone: 216 71 771366 / *Fax:* 216 71 798966
E-mail: slim.bairam@utic.com.tn
Operating region: Republic of Tunisia

SCOA TRAC
Phone: 234 1 2802072 / 234 8034087262 / *Fax:* 234 1 4521683
E-mail: scoatrac@scoaplc.com
Operating region: Nigeria.

DEM MAURITANIA
Phone: +221 77 136 40 77
E-mail: bs@demimpex-equipment.com
Website: http://www.dem-group.com/en/dem-mauritania
Operation region: Mauritania

DEM SENEGAL SARL
Phone: +221 33 859 50 00
E-mail: info@dem-senegal.sn
Website: http://www.dem-group.com/en/dem-senegal
Operation Region: Senegal

DEM GHANA - DEMIMPEX EQUIPMENT MINING & SERVICES LIMITED
Phone: +233 302 934 406
E-mail: info@dem-ghana.com
Website: http://www.dem-group.com/en/dem-ghana
Operation region: Ghana

DEM DRC SPRL
Phone: +243 970 041 745
E-mail: info@dem-drc.com
Website: http://www.dem-group.com/en/dem-drc
Operation region: Democratic Republic of the Congo

MOVICORTES
Phone: +244 222 014 892 / *Fax:* +244 222 014 872
E-mail: moviter@movicortes.es
Website: http://www.moviter.pt
Operation region: Angola Nigeria

DEALERS IN ASIA AND OCEANIA

WIRTGEN SINGAPORE PTE. LTD.
Phone: +65 6863 2533 / *Fax:* +65 6863 1533
E-mail: wirtgen@wirtgen.com.sg
Website: http://www.wirtgen.com.sg
Operation region: Myanmar, Laos, Thailand, Cambodia, Vietnam, Brunei, Philipines, Singapore, Indonesia

WIRTGEN (M) SDN BHD
Phone: +60 3 6274 8662 / *Fax:* +60 3 6274 6443
E-mail: wirtgen@wirtgen.com.my
Website: http://www.wirtgen.com.my
Operation region: Malaysia

Picture: Filipe Vasconcelos

BR-116: RECOVERY GETS TO BAHIA

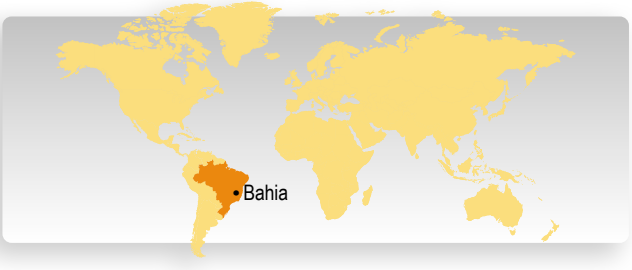
DIFFERENT TECHNIQUES AND MACHINES HAVE BEEN USED TO MEET THE NEEDS OF RECONSTRUCTION OF THE ROAD IN THE STATE OF BAHIA

Aiming at the improvement of road conditions and traffic, BR-116, a federal highway that crosses the country from North to South, has another ongoing large project. The works on the road network were done in Bahia this time, starting in Salvador and getting to the border of the state and Minas Gerais.

Under the responsibility of the Via Bahia Concession Company and the ANTT (Agência Nacional de Transportes Terrestres – National Agency of Road Transportation), the work is divided in seven stretches. Stretch 5, from km 632.50 to 735.40 of the road, was done by Pavia Brasil, Pavimentos e Vias S.A and received an investment of approximately 50 million reais.

THE TECHNIQUE

The reconstruction of the BR pavement started with the milling of the old pavement, with variable thickness due to deflection (a study carried out in the beginning of the work that measures the structure's elastic displacement). Part of the milled material was used as a base material, and this increased the flexibility of the structuring layer of the pavement. Cement was also added (3%) to increase hardness. The result was a base with higher flexibility and hardness capacity, which is appropriate for roads with high traffic load. The parameter for quality evaluation of the base course was the Resilience Module, which evaluates both the hardness capacity (related to resistance to permanent deformation) and the layer's flexibility (related to resistance to the formation of cracks due to fatigue). The module trial was done in the laboratory starting with the application



of a vertical cyclic load and a horizontal confining tension, simulating the load conditions of the structure.

An asphalt layer called Open-Graded Hot Mix Asphalt was layered on the base course and binding painting, a similar method to the Hot Pre Mixed, but since it has lower Petroleum Asphalt Cement (PAC) content, it presents a larger void volume.

With maximum production of 150 tons per hour, the Ciber Plant UACF 19 P2 has produced, in this specific job, over 120 thousand tons of the Open-Graded Hot Mix Asphalt. Since the mix presented a very low amount of fines, the temperature of exhaustion gases was high, being necessary to control the temperature of the bag filter through the cold air damper opening. The cold air damper made it possible to process any type of asphalt mix, from dense mixes to discontinuous ones with a low fines percentage. Thus, the bag filter temperature is always close to the ideal one", explained Marcelo Zubaran, Specialist at Ciber Equipamentos Rodoviários.

EQUIPMENT

To meet the needs of the project, such as agility in the execution and restrictions in the working hours on the road, more than ten machines of the Wirtgen Group were used in all services and stages of the work, such as: Wirtgen milling machines to remove the damaged asphalt layer, Ciber UACF 19 P2 asphalt plant to produce the asphalt mix, Hamm tandem rollers and tire rollers. Vögele and Ciber pavers were used in the application of asphalt on the road; Hamm padfoot rollers 3411 and a Wirtgen recycler WR 2000 were used for earthwork and stabilization services.

According to Conrado Almeida, Production Director at Pavia Brasil, the choice to use Wirtgen Group equipment was because they bring quality and low operational cost, in addition to the environmental preservation concern.

Complete stretch of the work on BR-116

Picture: Filipe Vasconcelos

Picture: Thiago Rozek

Conrado Almeida, Production Director at Pavia Brasil

"The equipment is the most modern in the national market, with an excellent final quality of the service delivered, with cutting-edge technology and low operational costs. Many machines have lower fuel consumption than similar machines from other brands, generating financial and environmental benefits, with reduced emissions of pollutants", Almeida explains.

The UACF 19 P2 Ciber Asphalt Plant was installed at the medium point of the stretch, in the city of Jaquié, and has produced over 120 tons of asphalt mix, facilitating the operation and the development of the work within the deadline.

"We've had great production results, reaching all production targets, providing the assurance that we would have, at any time, the amount and the quality of Hot Mix Asphalt that we needed, he asserts.

Conrado also mentions the performance of another machine in the recycling technique. "The Wirtgen WR 2000 cold recycler offers a service of excellence, with higher quality and safe results, aiming at reusing the material and generating less environmental impact".

A Ciber Paver AF 5000 Plus was also used. This paver is broadly used in medium and large size projects, with a capacity of up to 450 tons per paving hour. According to Conrado, the machine was chosen due to the quality and the assurance and due to the high volume to be produced in a short time, because it was necessary to increase the capacity of asphalt application throughout the whole job.

"We count on Wirtgen Group Equipment in all services and stages and we see them as important resources to meet our target and deadlines with the customer. Since this is a road with an intense truck traffic, it demanded a joint effort between planning and engineering, and it led us to be more productive in a shorter time frame, due to the fact that we could not intervene on lanes and shoulders in days and times of high flow", Conrado adds.

It is estimated that ten thousand vehicles cross this stretch of BR-116 every day, and 70% of that are trucks. The construction work started in July 2013 and was completed in August 2014. ■

TECHNICAL INFORMATION

Job: BR-116 Recovery

Place: Between the cities of Milagres and Boa Nova (BA).

Length: from km 632.50 to 735.40 – Stretch 5

Investment: R$ 50 million

Technique: Milling of the previous pavement, with variable thickness due to deflection. Part of the milled material was used as base material. Cement was also added (3%) to increase hardness. An asphalt layer called Open-Graded Hot Mix Asphalt was layered on the base course and binding painting, a similar method to the Hot Pre Mixed, but since it has lower Petroleum Asphalt Cement (PAC) content, it presents a larger empty volume.

Start: July 2013 | **Completion:** August 2014

Pictures: Filipe Vasconcelos

SOUTH AFRICA WILL PRODUCE RUBBERIZED ASPHALT

Picture: Anderson Bastos

THE UACF 17 PLANT WAS BOUGHT BY MUCH ASPHALT, ONE OF THE LARGEST ASPHALT PRODUCERS IN THE WORLD

Economy in South Africa grows, on average, 5% a year, and the South African leaders know that a good road structure is necessary in order to transform economic growth into real socio-economic development. Having that in mind, the country has created the Program for Infrastructure Development in Africa (PIDA). The initiative comes from the African Development Bank, the New Partnership for African Development, and from the African Union: an ambitious joint effort to improve the infrastructure in the country and in the continent, including rails and roads.

Most of roads in the countries are in a poor state and need large investments, according to the African Development Bank (AFDB). Proof of that is that transportation costs in South Africa are 63% higher than in developed countries, which raises the cost burden of products at local markets and hinders its competitiveness on international markets.

Since 1965, Much Asphalt, located in Cape Town, has been one of the main companies responsible for road construction in the country. And, to reinforce their production, they have acquired a Ciber UACF 17 asphalt plant, which had already been used for over five years by another construction company in South Africa. The machine, which was not working due to the long time out, underwent a renovation project to be fully recovered.

"We created a complete project for the electric part and for the machine's electronics, as well as for the whole weighting, electric, and software systems, among others. Wirtgen South Africa and Ciber worked together in gathering and supplying all necessary parts for the plant's recovery, explains Daniel Correa da Silva, Senior Technician at Wirtgen South Africa. Even before putting the plant into operation, Much was very happy with the equipment's technology and the technical/ parts support provided by Ciber.

One of the main demands of the company is the production of asphalt mixes with rubber modified binding agent. This technology has become a growing trend in the country, because this technique is related to economic

aspects since it offers a better cost-benefit relationship, as well as environmental benefits with the reutilization of disposed tires. "This asphalt technique used in South Africa is a specification of the regulatory agency in the country, but it also depends of the resolution of each contract", Daniel explains.

The modification of the asphalt cement by the addition of rubber causes an increase of the binding agent's viscosity, thus it improves the adhesive capacity with aggregates due to a larger pellicle thickness around aggregates edges. As a consequence, the rubberized bitumen remains more stable in the mixture voids, acting as a Mastic. Such factors make this binding agent more stable, with better elastic features, which results in a pavement less likely to present cracks and permanent deformations.

The rubberized bitumen also presents higher resistance to aging by oxidation, keeping its elastic characteristics for a longer time and increasing the pavement's service life. Disposed tires are used as additive to modify this binding agent. In general, 15% to 20% of rubber is added to the binding agent and this means a consumption of approximately one thousand tires per kilometer of pavement with rubberized asphalt.

ONE OF THE LARGEST ASPHALT PRODUCERS IN SOUTH AFRICA

The company supplies asphalt mixtures for construction of airports, for municipal jobs, and even for domestic services. Located in Cape Town since 1965, it became a subsidiary of Murray & Roberts Group in 1986.

Most of Much's production premises are located within or near South Africa's main cities. The company success is based on its understanding and developments of the real needs of the customer, with support of a team committed to the service and quality excellence.

According to Anderson Bastos, Exports Manager at Ciber Equipamentos Rodoviários, 95% of the renovation project has been completed; the only parts left are technical revision and testing. "After being tested, this plant goes to the South of Botswana, where it will carry out a project to the construction of a road, planned for the next few months", Anderson explains. ■

The plant acquired by Much Asphalt before the renovation

Pictures: Anderson Bastos

Picture: Luciano Sackis

DIFFERENT DEMANDS, INNOVATIVE SOLUTIONS

Delivering equipment such as asphalt plants in different continents with such different demands, culture, languages, and legislation would not be possible without thinking about the best way to fit the equipment to the customer's needs. It is necessary to study very attentively the characteristics of each market, to translate it into projects which meet the customer's needs, meeting or going beyond the requirements of the project and delivering technology and robustness to systems concerning the quality of the end product.

As part of this process, from solutions development up to the service culture, Ciber Equipamentos Rodoviários has acquired a significant know how in the markets where it acts throughout its 56 years of activities, with different plant options and configurations ready to deliver with the same precision, either in dry regions, such as Northern Africa, or places with heavy rain, such as the North of Brazil. Furthermore, these machines can be adjusted to the specifications and legislations that vary across different countries.

Plants prepared for each market make it possible to enable special projects and applications which before were only under the academic domain of engineering; nowadays, however, they are a reality.

SMA asphalt mix production in Mexico (customer: Grupo Cadena)

MEXICO

The North of Latin America, Mexico, more specifically, is going through an evolution in paving techniques, thus the equipment has been replaced in order to keep up with this new reality. Ciber plants that were sent to this country have been specially configured to fully meet the new local requirements. The task to deliver the right machine to the desired application demands knowledge about the road engineering culture and materials available, in addition to the geographic and climatic conditions. Mexico has different climates, from tropical, as in the tourist state of Quintana Roo, to the dry weather in the North of the country, such as the state of Sonora. These factors have an important influence on asphalt plants performance. In addition to the climate, the predominant type of aggregate in each region is also an important factor to be taken into account to ensure the quality of the asphalt mix. Mexico presents coastal plains composed by aggregates of limestone origin, with high water absorption, and low mechanical resistance. On the other hand, there are mountains in the middle of the country formed by granite rock, basically, which is very hard and has low water absorption. It is essential to know these characteristics in order to configure the plants so then they have the maximum output under the different conditions they are subject to.

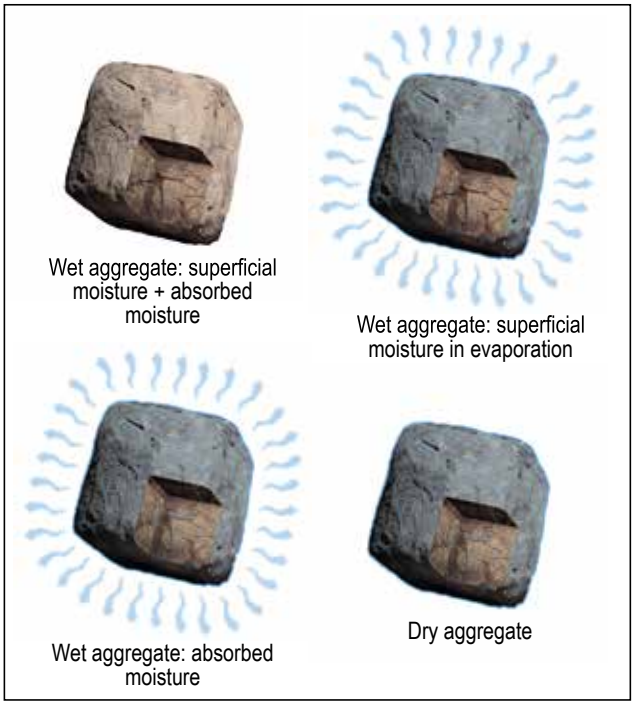
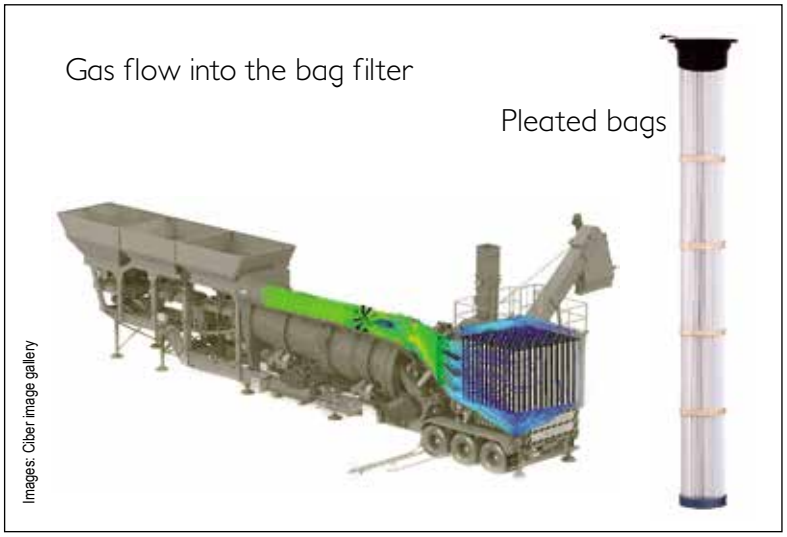


Image: Ciber image gallery

Regarding the type of mix that is produced, an important characteristic of the Mexican market is the production of black bases, a mix of aggregates with up to 2" with bitumen, for the application on an intermediate layer between the base course and the wearing course. The mixer of Ciber plants can be configured to perfectly meet this demand, with lower wear of components and maximum power applied to the mix, ensuring a homogeneous final product. Many times, the binding agent pellicle around aggregates faces of the black bases is the thinnest, which requires a longer mixing time, a characteristic that can be adjusted in the field. In addition, the mixer is adjusted according to the maximum size of the aggregate, minimizing the wear and maximizing the mixing capacity.

Environmental requirements from regulatory bodies in Mexico are in continuous evolution, thus the latest technology plants with bag filter are already the favorite among construction companies. There are several reasons for that: the modern bag filters minimize the environmental impact of the production process because they render unnecessary the construction of pools, and as a consequence, the use of water. They also prevent particulate materials from getting to the atmosphere which is important, in addition to the environmental benefit, to avoid the waste of fine aggregates. Plants with bag filters speed up the process of obtaining environmental license for operation and avoid the fines and interdictions that are very common in plants with lower technology, without bag filters.



Images: Ciber image gallery

Other systems of Ciber plants are specially configured according to the Mexican conditions of operation, resulting in higher robustness of compressed air systems, with several steps of condensed water separation, a requirement which is especially important for operations in tropical regions, where the relative humidity is extremely high.

Among the construction companies that stand out for their focus on quality through investments in technology, is the Cadena Group, which is producing SMA (Stone Matrix Asphalt) asphalt mix in the city of Tijuana, in the North of the country, alongside the USA border. The Ciber plant model iNOVA1200P1 used in this work has a special mixer, in which the first step of the process is carried out dry, ensuring homogeneity of aggregates with fiber and filler before the injection of the modified binding agent. This type of asphalt mix tends to present a longer service life as compared to the conventional asphalt concrete types and the success depends, in addition to the excellent quality of aggregates and asphalt cement, on the process used by the plant. For that, the aggregates have granite origin with a very high abrasiveness and low water absorption. PAC is modified with polymers.

Picture: Luciano Sackis

At another job site, Cadena Construction Company has done interventions using the iNova asphalt plant on State Highway Number 2, between the towns of Guanajuato and Michoacán de Ocampo. During one of the inspections done at the time of the works, the head of the Mexicali Center of Infrastructure and Development of Popular and Rural Communities (Mexicali CID), Francisco Javier Paredes Rodriguez, shared his impressions with local newspapers.

Picture: Marcelo Zubaran

SMA mix pavement

Introduction of fiber in the SMA mix

"We were interested in seeing the quality of the processes of preparation of the asphalt mix and the quality of the works of laying asphalt on that stretch, and we were able to verify that Cadena Construction Company has a highly modern piece of equipment, both for the preparation of the asphalt batch and in asphalt laying for paving. That guarantees that we are going to have a good quality in the work of road maintenance", Rodriguez says.

The head of the Infrastructure Center complements by saying that "in addition, it was noticed that the plant also meets the requirements regarding good control of air pollutant emissions, which is also important for all in the industry and in construction, in the sense that all processes carried out by the construction companies have the premise of respect to the environment as a concept", he adds.

Another example is the UACF17P-1 plant, used by TYP Group in the city of Celaya, 260 km away from the capital. This company was responsible for the infrastructure works of the newest Honda manufacturing plant, specially a 2 km test runaway. After three months of works, the interventions done reached a high excellence standard, to the point that Honda awarded the TYP Group a prize of good service delivered due to the quality of the asphalt applied on the runaway.

"On the West part of Mexico, the companies are used to use older plants from the North American market, most of them second hand and with technology from the 80's and 90's, which have a low mixing quality and present emissions. Ciber has brought equipment aligned to the most modern references in the sector, which adds high efficiency in the external mix, drying drum adjustable to the climate variation in the region, in addition to portability, which eases driving from one job site to another", says Rafael Maganã, Engineer of the TYP Group in charge of the Celaya works.

The high execution performance achieved at the works done by Ciber customers in Mexico can also be credited to the presence of Construmac, a dealer in the country. The company worked in the mediation between the construction companies and Ciber, always with the goal of ensuring the best equipment performance according to the demand of each work, in addition to mitigating and minimizing any eventual machine shutdown with agility in technical service responses. For that, Construmac counts with a network created by the headquarter, located in City of Mexico, and other nine branch offices spread all over the Mexican territory.

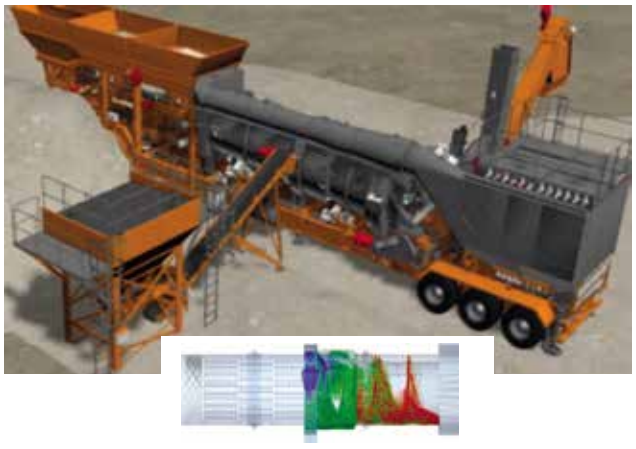
Mexico, one of the largest Latin American countries, is characterized by the high activity in the construction market: there are many projects distributed in its territory, which demands plants with maximum mobility and installation easiness. Other features of the company's plants also grab the attention of the construction companies of the region, such as compact equipment and with a better performance when compared to others in the market. The mobility factor favors getting around the job, as well as assembling and disassembling. This is a very important advantage. For Latin America, a continent where the road infrastructure still has a lot to develop, the portability feature is fundamental to transport the equipment to remote regions where projects might be located. The plants get to remote areas, in most cases, before pavement does. Asphalt plants are the core machine in the construction of the first paved connections, fundamental to the development of any region.

SURINAME

In Suriname, just like in other ten countries in Central America, Ciber has the partnership and presence of Resansil, which is a dealer in the region and is responsible for customer service support and coverage. Alongside with Ciber, Resansil has been working actively to make the machines appropriate to the needs of the construction companies in the country. This efficiency and structure ensure the buyers about agility and quality in equipment assistance service. A country in the Northern part of South America which shares borders with French Guiana, Brazil, and Guyana, Suriname is in a favorable moment of investments and modernization of its road structure.

There are two main regions that demand projects: the coastal area in the North, formed by plains, where there largest plantation areas are located and where most of the population lives, and the Southern part, composed by tropical forests and savanna, sparsely inhabited.

The plants were appropriate to work in the geodemographic situation in Suriname, such as the 80 t/h mobile Ciber plant, with easy assembling and driving around the job site. As well as the 140 t/h stationary batch plants, which are very well equipped, including with a system to incorporate RAP and for dosing the fines recovered from the bag filter, the thinnest fraction of granular size passing through the screen is #200 (0.075 mm). This plant is also equipped with a special system for filler dosing, whose participation in the mix is around 0.5% to 1.5%. In summary, all input materials are dosed through weighting, that is, mass control, the most precise means of aggregate dosing.



Images: Ciber image gallery

Above, an additional silo to receive the milled material (RAP), intake to the drying drum through a special ring.

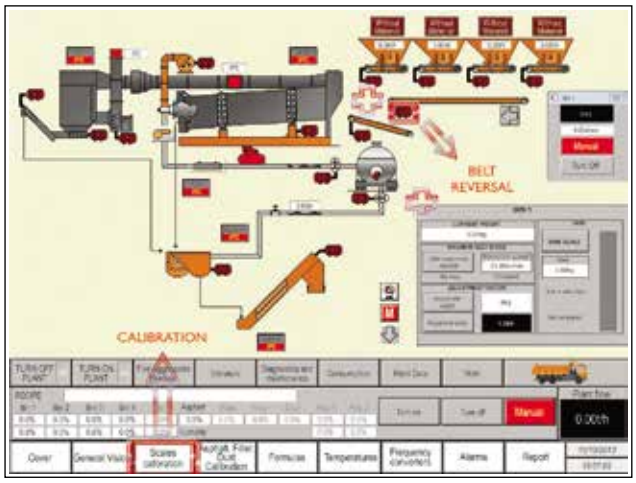
If the batch plants are recognized by its care and precision in input dosing, Ciber UA- B18E takes this care to an extreme level: the special dosing processes exceed all current precision standards.

In addition to the precision to ensure quality of the asphalt mix, the environmental concern is equally important. Since this plant is prepared to process RAP, it is equipped with an exhaustion system along the mixer to extract any fumes that might result from RAP processing, which means practically zero unburned hydrocarbon emissions, an important factor to preserve the quality of life around the plant.

The UAB18E equipped with a ready mix storage silo ensures that logistic difficulties external to the plant will not affect its production pace. The installation also has two liquid asphalt storage tanks, and one of them is equipped with agitators, ready to process modified asphalt.

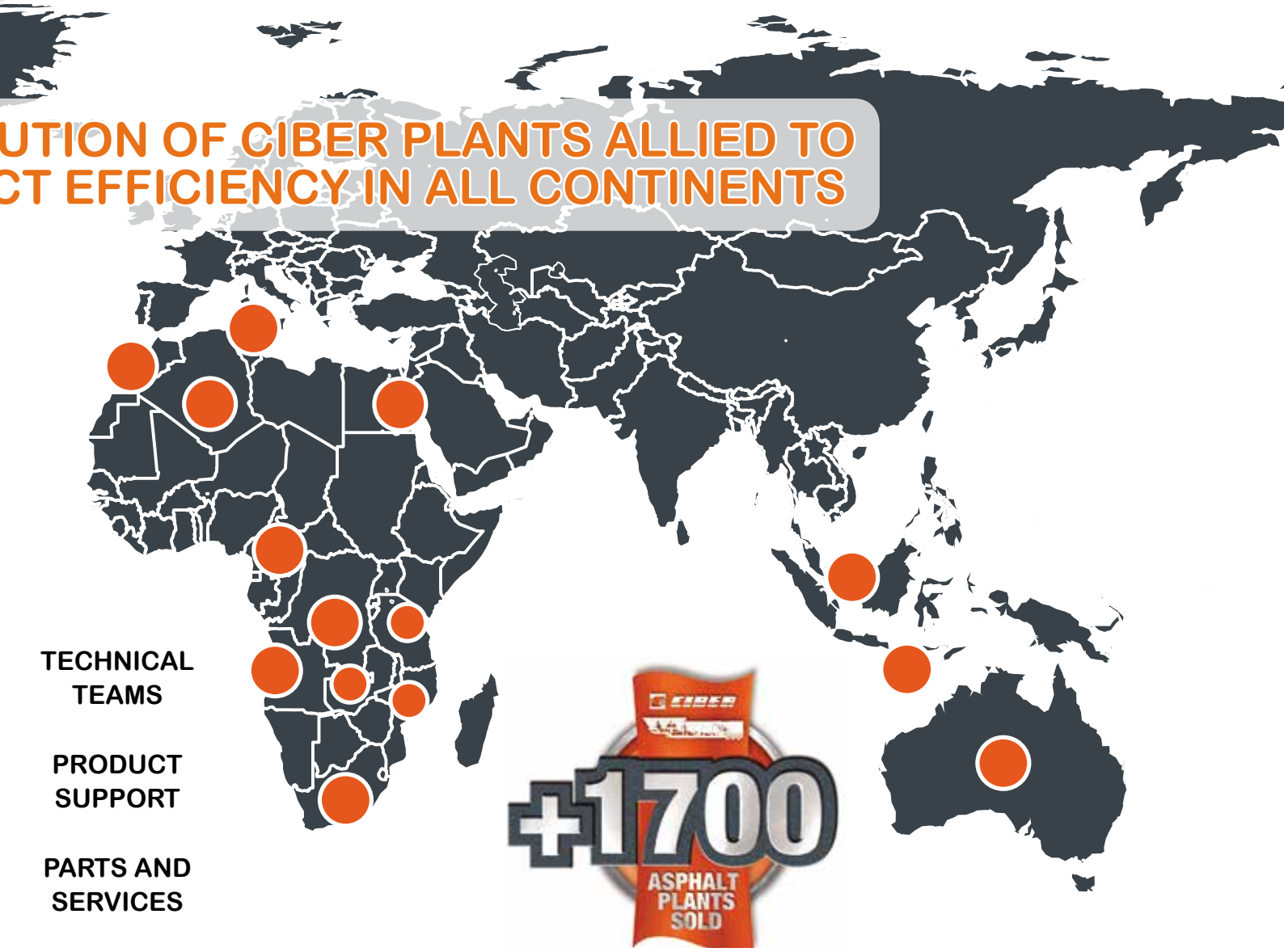
URUGUAY

Thanks to the good results in the economy, with a growth rate above the average of Latin American countries, Uruguay has invested in the recovery of its road structure. Ciber plants have supported asphalt concrete production in the country, especially in Maldonado region, which includes cities as San Carlos and Punta Del Este. This region is characterized by foliated granite rocks and one of the relevant features to characterize the rock mass is through Cerchar abrasiveness trial. Still new in Brazil, especially in the paving environment, the Cerchar index of aggregates evaluates the hardness and abrasiveness of aggregates from the wear of a standard tip, used in rock compression in the trial. Thus, the higher the Cerchar of a rock is, the lower its wear will be and its hardness



Images: Ciber image gallery

Display for operation and plant functions monitoring



will be higher. Results up to 4 represent rocks that have average abrasiveness, and between 4 and 6 are the rocks of very high abrasiveness. Granite in the Maldonado region presents a Cerchar index of 5.8. The aggregates located in the central area of Uruguay, around Durazno, present a value around 5.4.

ARGENTINA AND COLOMBIA

Argentina presents basalt aggregates, with a Cerchar abrasiveness index of 2.5 (mild) up to granites with a 5.4 value in this index (highly abrasive). This regional study guides the wear expectation of a few items of the plant in a customized way. In Colombia, it is common to use round pebble stones, fractured or not, as aggregates in asphalt mixes. The typical Cerchar abrasiveness of these Colombian aggregates varies between 3.3 and 5.6, depending on their origin. On the other hand, the round shape of the pebble causes a lower wear on metal structures, but it might reduce the shearing resistance of the asphalt mix. Also depending on the constituting minerals of these aggregates, such as clay minerals 2:1, water contained in the clay particles, due to the present elements, is more viscous than the normal standard. This fact, associated with the high water absorption, requires a higher permanence time of aggregates in the drying system to ensure maximum elimination of humidity and, consequently, the correct adherence of liquid asphalt on aggregates surface. Thus, the versatility achieved by the different possible configurations of the dryers in Ciber plants, in terms of variability of the drying time, is a decisive factor for asphalt mixes quality in Colombia.

AUSTRALIA

Ciber plants were adapted to the region and have operated in Australian lands since 2010 with several models. These plants are keeping Australia as one of the countries with the highest rate of paved roads in the world (3 to 4 times more roads per capita than Europe and 7 to 9 times more than Asia). Spread from East to West in the Australian territory, these plants are configured with special operation tension - 415V, something specific in Oceania countries. The plants were configured according to each specific demand, as for example, a unit located in the vicinity of Sydney, which has systems to produce foamed warm asphalt and capacity for RAP incorporation into the asphalt mix. These systems were required because Australia is one of the countries that most consumes fuel in the world, and the warm asphalt reduces the plant's fuel consumption in approximately 15%. Also due to the great amount of roads, hot recycling is a sustainable idea, with high economic advantages and environmental appeal. The UACF 19 P2 plant uses 15% of RAP in the asphalt mix, separating this recyclable material into two particle size fractions, a thin one and a thick one, being 50% of each fraction.

Environmental requirements for installation and operation of an asphalt plant in Australia are highly strict. And the filtering philosophy of Ciber plants is an important help for the environmental feasibility of the job site.

UACF 17 P2 with a system to produce soil mixes – USC 20

Picture: Ciber image gallery

Particle size separation in thick RAP and thin RAP

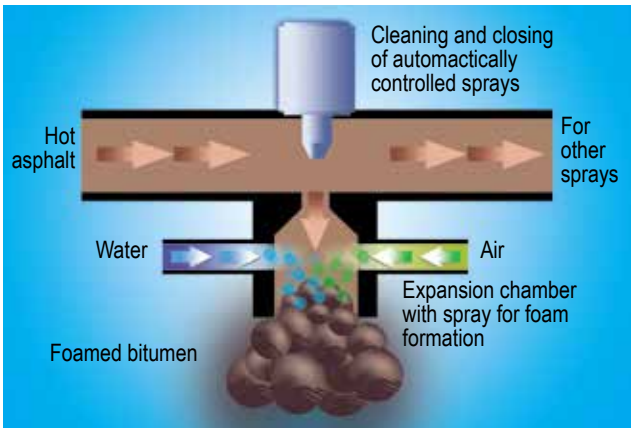


Image: Renato Gottinari

Air injection, water and asphalt binding agent cause the effect of foamed bitumen

Picture: Banco de imagens Ciber

MALAYSIA

Meeting the demands of customers in distant countries has not been a barrier, as in the case of Malaysia, a country that is, geographically, so far away from Brazil. Malaysia is one of the countries that has been challenging this paradigm and, along with Ciber, has been shortening distances. Before starting commercialization of plants in a new market, the local dealer requires its engineers and technicians to undergo intense training programs at the Ciber plant, in Porto Alegre, and he gets prepared with ideal parts storage to meet the demands since the first day of operation of the asphalt plant. The geographical distance addresses to different cultures and practices than the ones found in closer countries, reason why the previous understanding of these techniques and materials that make up the asphalt mixes is fundamental. The oil and the refinement means, for example, have an important influence in the characteristics of asphalt cement, which entail specific techniques to work with this product, as well as the particular weathering of the region determines the characteristics of rocks, which are unique to each place. Understanding and compiling all these characteristics is an important job and it makes commercialization sustainable.

In 2013 and 2014 Ciber plants were installed in Malayan lands, being used to manufacture base courses and wearing courses at the airport of Kota Kinabalu, a tourist city in Malaysia. This double function was only possible due to a soil system attached to the asphalt plant to produce both hot asphalt mix and soil mix – with or without agglomerating material – for application as pavement base. Also to meet a specific local demand, the plant's burner may work with light oils, heavy oils and LPG gas.

The local market demands equipment with specific technology. For this reason, the constant mapping of projects demands and customers' needs have been so important to deliver plants that are produced to effectively service specific markets.

NEW ZEALAND

On the same lines of preliminary studies and territory knowledge is the market on New Zealand. The plant operating in this country has a series of customizations demanded by the market and the customer, which makes it ideal for the types of mixes that will be produced.

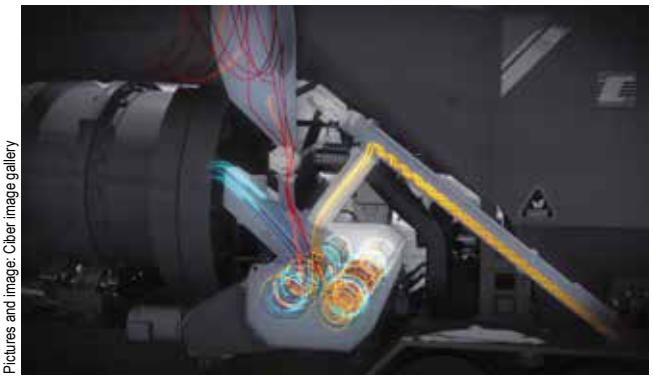
As a UACF 19 plant, it presents six aggregates dosing silos of 10m3 each, which is indispensable in New Zealand. In this country, the construction companies have easy availability of different aggregates, and it facilitates the particle size composition of the asphalt mixes. Another specialty is the size of the chimney that releases the gases coming from combustion. It has approximately 25 meters, something demanded by the local environmental authorities. A Hauck burner and diesel oil will be used. It is also common the use of RAP in asphalt mix, with direct introduction into the mixer. For this type of application, the milled material gets in the mix as a "black rock", that is, as another aggregate, and its binding agent is disregarded.

NORTHERN AFRICA

In the North of Africa, for example, Algeria, Morocco, Tunis and Egypt, the plants installed have special, but common, configurations in these countries. Due to the

UACF 15 P1 operating in Tunisia

large amount of fines, something common to the rocks used in the region, the plant should have full control over the fine materials that will be incorporated to the mix, especially the ones that pass in the screen 200. For that, those plants have a system to re-dose the fines of the bag filter in order to eliminate the excess of fines in the mix. Another trend in the region is the incorporation of RAP in the asphalt mix. One of the Ciber plants, in Morocco, has this system incorporated, even after its installation.



Pictures and image: Ciber image gallery

Fines recovered in the filtering process are transported into the mixer.

SUB-SAHARAN AFRICA

The Southern part of Africa, especially South Africa, is an example of good paving techniques. The forerunner of cold in situ recycling, the region always demands special plants, with configurations such as fines silo and filler, warm foamed bitumen, and recently, hot recycling systems.

Another country, Zambia, also has demands and specificities, for example, an Inova 1200 model which was equipped with a silo to re-dose bag filter's fines with a volume of 4.0 m3 and a filler silo with 2.0 m3. The same demand is common in Ivory Coast. ■

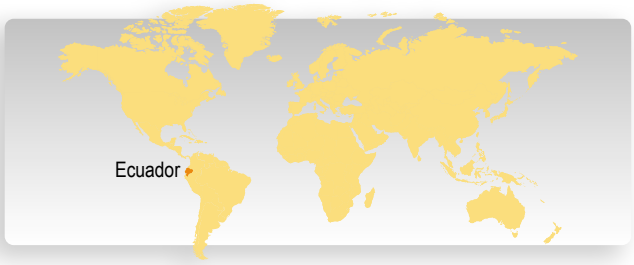
COLD RECYCLING BECOMES STRONGER IN ECUADOR

ANGOS E HIJOS CONSTRUCTION COMPANY PARTICIPATES IN CONSTRUCTION WORKS ALL OVER THE COUNTRY AND USES COLD TECHNOLOGY WITH A UACF 17 P2

Quando When we talk about cold recycling, it is noticeable that it was a technique that has changed and improved asphalt application from the use of existing pavement on the road and, for this reason, it is a more sustainable option. With less material brought to pave the road that uses cold recycling, the loads and weights during transportation are also lower. Thus, there are savings in fuel as well, as an example.

In Ecuador, the use of the cold recycling technique has been growing and becoming very common among the companies that offer road services in the country. This was the technique chosen by Angos e Hijos.

5 kilometers from the line that divides the world into North and South hemispheres, where latitude is 00°00'00'', it is possible to find a machine by Ciber Equipamentos Rodoviários, a Counterflow Asphalt Plant Advanced Series UACF 17 P2. Currently located close to the



Picture: Marcelo Zubaran

Middle of the World Monument, where the Equator Line is, this happy coincidence is a result of the partnership between Ciber and one of the most emergent Ecuadorian construction companies in the country: Angos e Hijos.

In the capital city, Quito, the UACF 17 P2 is working in 13.5 km of works on Manuel Cordova Galarza Avenue, one of the most important roads in the country which connects the Federal District to the Ecuadorian Coast Northwest. The region is one of the most visited tourist routes in Ecuador. According to data from the Middle of the World City, a tourist complex where the Equator Line monuments are located, the place receives 600 thousand visitors a year.

The soil of Manuel Cordova Galarza road, even though it has a lot of traffic, it has a history of suffering from heavy rains and climate variation in the region. The works that count with the participation of the UACF 17 P2 aim at reinforcing and modernizing the road's pavement with more robust asphalt layers, also offering increased safety to drivers.

Before the works, the asphalt layer of the road had variable thickness, which ranged between 15 and 22 centimeters, and it was common to see defects and cracks on the ground, in addition to a deficient drainage system. Even the parallel and transversal ditches between 60 and 120 cm wide were not enough to drain the water.

To work on a road where there are 40 thousand vehicles a day, it was necessary to think about quick and efficient application techniques. "We removed the old asphalt layer and put it back on a new structure with a higher thickness than the previous one. Then, we implemented the recycled technology with milled from the mix and we incorporated the asphalt emulsions and the renewing agents", says Daniel Angos, Angos e Hijos CEO.

From the removed material, Angos e Hijos started to make hot asphalt mix in the UACF 17 P2 with completely new aggregates.

"This has converted the materials from milling into a recycled asphalt basis, stabilized, and appropriate to receive the 7.5 centimeters of hot asphalt mix, according to project specification done by the Ministry of Transport and Public Works in Ecuador, the contracting party of the work", Daniel says.

At the same time they chose the UACF 17 P2 and procedures and techniques to apply the asphalt mix; Angos e Hijos have also broke paradigms in the country, provided that the experience of other construction companies in Ecuador with cold recycling had not been successful.

"I believe that the negative reaction to cold recycling techniques was due to the previous equipment, which consisted of machines with very basic technology that would not allow a good mix and use. Most of the works with recyclers that we saw in Ecuador presented problems. Another important cause for the experiences that were not successful in the past is the fact that we are a country with variable climate conditions, so the companies have to study this aspect really well, because each technique will present a different behavior according to the climate of the region approached". Daniel adds.

Another important aspect in the repair operation on the road was the total area of the pavement, around 240 thousand m2, in addition to the recycled volume of binding asphalt with 45 thousand m3, as well as 40 million liters of asphalt emulsion.

GROWING WITH ECUADOR

With the increase of the GDP (Gross Domestic Product) of 4.5% in 2013, Ecuador has seen, for the past few years, a moment of government investment in infrastructure works, such as hydropower plants and roads to provide more support to economic sector that are in sharp expansion, which is the case of construction, oil, mining, agriculture and manufacturing. In this ascension phase, Angos e Hijos has been consolidated as one of the main construction companies in the country.

According to the Ministry of Transport and Public Works, in a report published considering the period between January 2007 and December 2013, the country invested over 9 billion dollars in works of urban mobility and other areas.

"Angos is a relatively new company which has eight years of history. However, it has already been part of several interventions that have been extremely important to Ecuador and they have the trust of the Ministry of Transport and Public Works", highlights Diego Lopez, General Manager at Fizamaq Cia Ltda., a Ciber dealer in Ecuador.

For the past three years, the Ministry of Transport and Public Works changed the bidding model to hire companies to do interventions throughout the country. With this change, the technical experience and the quality parameters of the works became more thorough, which brings benefits to construction companies of excellence, such as Angos e Hijos. "Through these bidding processes, the government has trusted us some investment. I believed we met all the parameters presented, in addition to having a very good project execution. This is important because the country is growing and with unprecedented investments in the sector in Ecuador", he says. ■

TECHNICAL FEATURES

Project: Renovation of Manuel Cordova Galarza Avenue

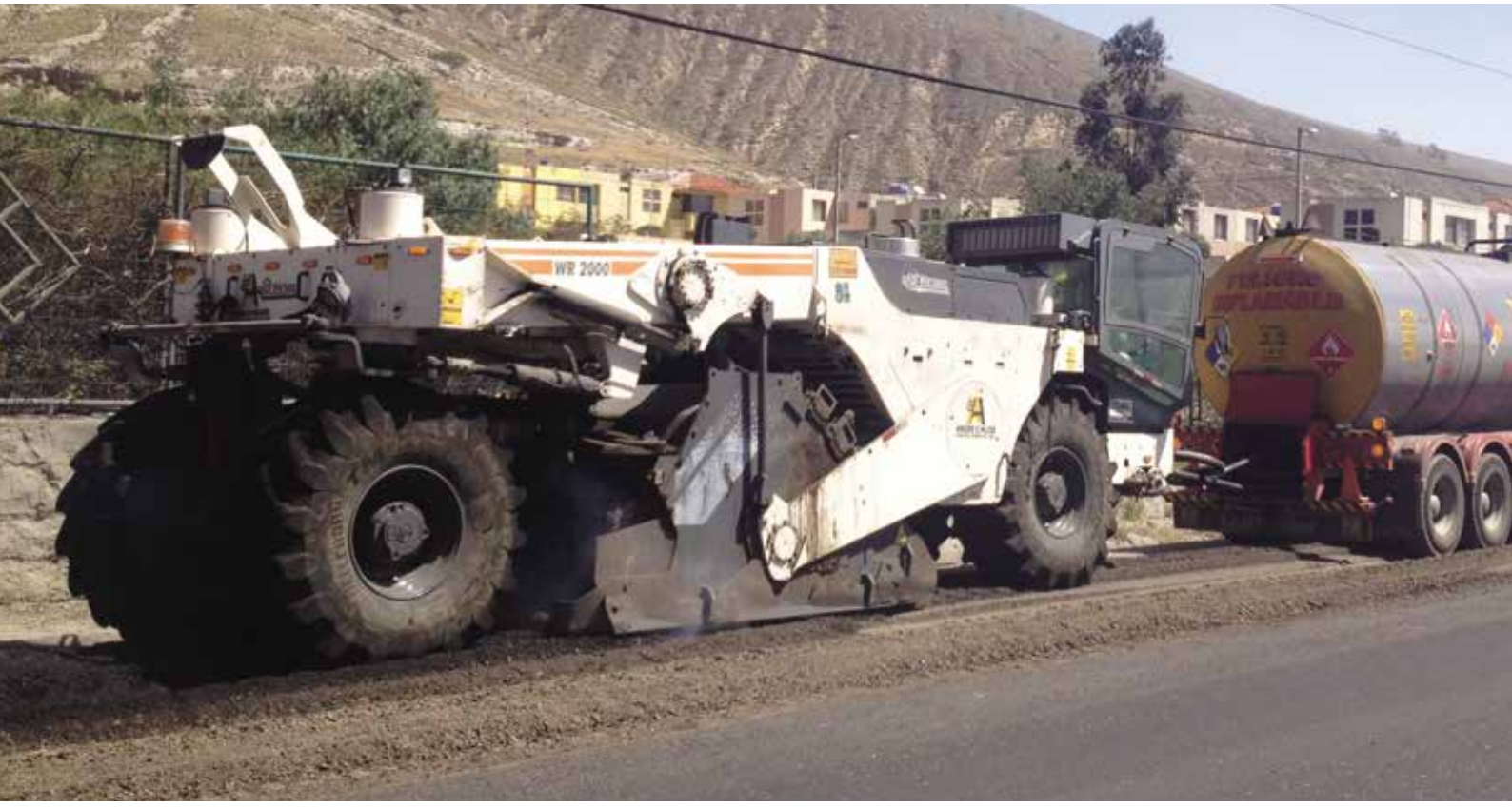
Place: Quito, Ecuador

Extension: 13.5 km

Technique: Removal of the old asphalt layer and replacement with a new structure with higher thickness as compared to the previous one.

Recycling with milling materials from the mass and incorporation of asphalt emulsions and renewing agents, as well as hot asphalt mix in the UACF 17 P2 with completely new aggregates, from the removed material, converting the material coming from milling into a recycled asphalt base, stabilized and appropriate to support 7.5 centimeters of hot mix asphalt concrete.

Picture: Marcelo Zubaran



ANÁPOLIS AIR BASE: HIGH TECHNOLOGY FOR RUNAWAY RENOVATION

Picture: BANN Crédito CÍVIL - Zuarez Cavalcante de Albuquerque

THE MOST MODERN EQUIPMENT HAS BEEN USED TO ENSURE EXCELLENCE IN LEVELING THE RUNAWAY AND TO EXECUTE THE JOB

EPC Construções always demands excellence and work optimization at the construction site. For that, it counts with Wirtgen Group equipment to operate in several construction sites. Among those, the renovation of Anápolis Air Base, in Goiás, also used such equipment.

Asphalt milling at the job was carried out by the models W200 and W100. For compaction, a GRW18 Hamm Roller and a tandem roller HD 90 were used. A Vögele Super 1800-2 was used in paving.

The W100 is the only milling machine to be produced in the country and, with German technology and quality; it stands out by the easiness of operation and maintenance, ideal for the air base demand.

"There is a lot of concern in terms of leveling, which has to be highly precise to contribute to the adherence of the tires on the runaway, both for landing and taking off", explains Pedro Araújo, Operation Director at EPC.

The specialty of EPC is the execution of works on airport runaways and air bases. For this reason, it needs the best equipment available in the market. According to Alexandre Liage, Engineering Director at EPC, all machinery from Wirtgen Group had excellent performance, such as the Vögele Super 1800-2, which has cutting-edge technology and easy handling, as well as an electronic control system.

"The result was excellent and the final pavement was great. This is the best paver we have ever worked with", he asserts.

"This machine has the highest quality. One point to highlight is its screed, which is electronically heated, ensuring speed and temperature homogeneity throughout the whole paving width", explains Juliano Gewehr, Ciber Product Specialist.

The works at Anápolis Air Base were carried out smoothly and were completed exceeding the expectations.

"We have no complaints. We finished the works ahead of time and the machines operated really well the whole time", Liage says.

ANÁPOLIS AIR BASE

Strategically installed in the heart of Brazil, Anápolis Air Base has 42 years of operations and offers space for support, defense and training for the Brazilian Air Force, with a high level of demand for works in their runaways areas. Currently, BAAN hosts the First Air Defense Group (1st GDA), which has defense missions in the Federal Capital and the Second Squad of the Sixth Aviation Group (2nd/6th GAV), which helps in the SIPAM project (Protection System of the Amazon).

BAAN will soon become the new house of the Sweden Fighter Aircrafts Gripen NG, an acquisition of the government to improve the Brazilian air defense. The renovations of the Basis serve to adapt the runaways to receive the new fighter aircrafts in an appropriate way and to improve the exercises and planned missions involving other aircrafts. Besides, in the next few years, the Basis is going to receive the 3rd Self-Defense Antiaircraft Artillery Group (3rd GAAD), which will enable the infantry militaries to provide support in soil to air missions, both in times of piece and conflict.

Picture: Agência Força Aérea / © SGT Johnson

Night soil signaling during landing procedure

TECHNICAL FEATURES

Project: Recovery of the Anápolis Air Base runaway
Place: Anápolis Air Base (GO)
Technique: Continuous milling and micro-milling. Standard HMA paving with alteration in asphalt features (polymer).
Start date: February 2014
End date: May 2014

Picture: Rogerio Gentile Lima

EQUIPMENT

Considering that the runaway safety is fundamental for the perfect landing and taking off, the equipment used for the job were chosen based on the highest demand standards. Wirtgen milling machines are among the machines used. The W100, since it moves on tires and has easy and fast mobility, which ensures agility and versatility, primary requirements of the work. The Wirtgen W200, on the other hand, due to its large size, has a high production and ensures excellence in levelling the cut required, thanks to the electronic system Level-Pro. Besides, it has an automatic alignment system in parallel to the surface.

For compaction, two Hamm rollers were used: the GRW 18 which ensures static roller stability through its double steering, as well as uniform weight distribution on each tire. In addition to the simple operation and practical maintenance, driving is easy and continuously variable thanks to the hydrostatic gearbox. The Hamm tandem roller HD 90, with a driver seat which allows panoramic view, facilitates and optimized the driver work, an important feature for this specific work which was done, for most of its part, at night.

Paving was done with the Vögele Super 1800-2 which, besides the very high production, with a paving width of up to 9 meters with mechanical extensions, has the Ergo-Plus® system for machine operation and control. It minimizes application mistakes and contributes for the good final quality of execution, which is essential on a road for landing and taking off, which is the case of Anápolis Air Base. ■

Picture: Rogerio Gentile Lima

RIGHT BY THE QUARRY, THE IMPACT CRUSHER BRINGS IN INNOVATION

Picture: Guilherme Ratkiewicz Rodrigues

EQUIPMENT OPERATES ON TWO FRONTS: STONE CRUSHING FOR AGGREGATES INDUSTRY (DUST, GRAVEL 0 AND GRAVEL 1), MINING, AND CONSTRUCTION AND DEMOLITION WASTE (CDW) RECYCLING

In infrastructure works, in the paving operation, the preparation of the sub base and base course with the use of crushed stones is an important phase in the process, because it ensures pavement stability and quality. In this scenario, the most common is the use of crushed granite.

To crush the material, making it ready to use, the company Córrego Rico uses the impact crusher Kleemann MR 110 Z S EVO, which is already operating at full force by a quarry in São Pedro da Aldeia, Região dos Lagos (Lakes Region), Rio de Janeiro. Besides working with natural stones, such as granite, the impact crusher can also be used in construction and demolition waste (CDW) recycling and also milled asphalt, which shows the equipment's versatility. Today, 85% of the production is granite (dust, gravel 0 and gravel 1), 10% CDW and 5% milled asphalt.

According to Dionattan Veloso Medeiros, Córrego Rico director, the company is the only one in the region that does this type of work. "In this region there is not any other equipment of this type. We have done some research before acquiring it and, among all machines available

Picture: Guilherme Ratkiewicz Rodrigues

in the market, the MR 110 Z S EVO was the one that best suited our needs, because it is the most versatile one and has an external screen (secondary screening system)", he explains.

Córrego Rico operates in urban works segments and uses part of the crushed material in service provision, and in roads maintenance and paving. The other part is sold to paving companies which work on asphalt recovery, road extension, road duplication, setbacks, highways, wheelwork, and shoulders. In addition, it is also suited for collecting waste from civil construction and demolition which are recycled in the impact crusher and reutilized. The main customers are from nearby cities, such as Cabo Frio, Araruama, Arraial do Cabo and Rio das Ostras.

To recycle construction waste, it is necessary to make only one adaptation on the crusher, which is to use the magnetic separator, the other adjustments are made on the control system on the touchscreen. The MR 110 Z S EVO has a self-protection mechanism which avoids damages to the rotor and the crushing chamber, preventing non-crushable material to go through, such as steel bars, rebars, and wood logs. Except for these materials, the CDW recycling capacity is extremely high.

HIGHLIGHTED FEATURES

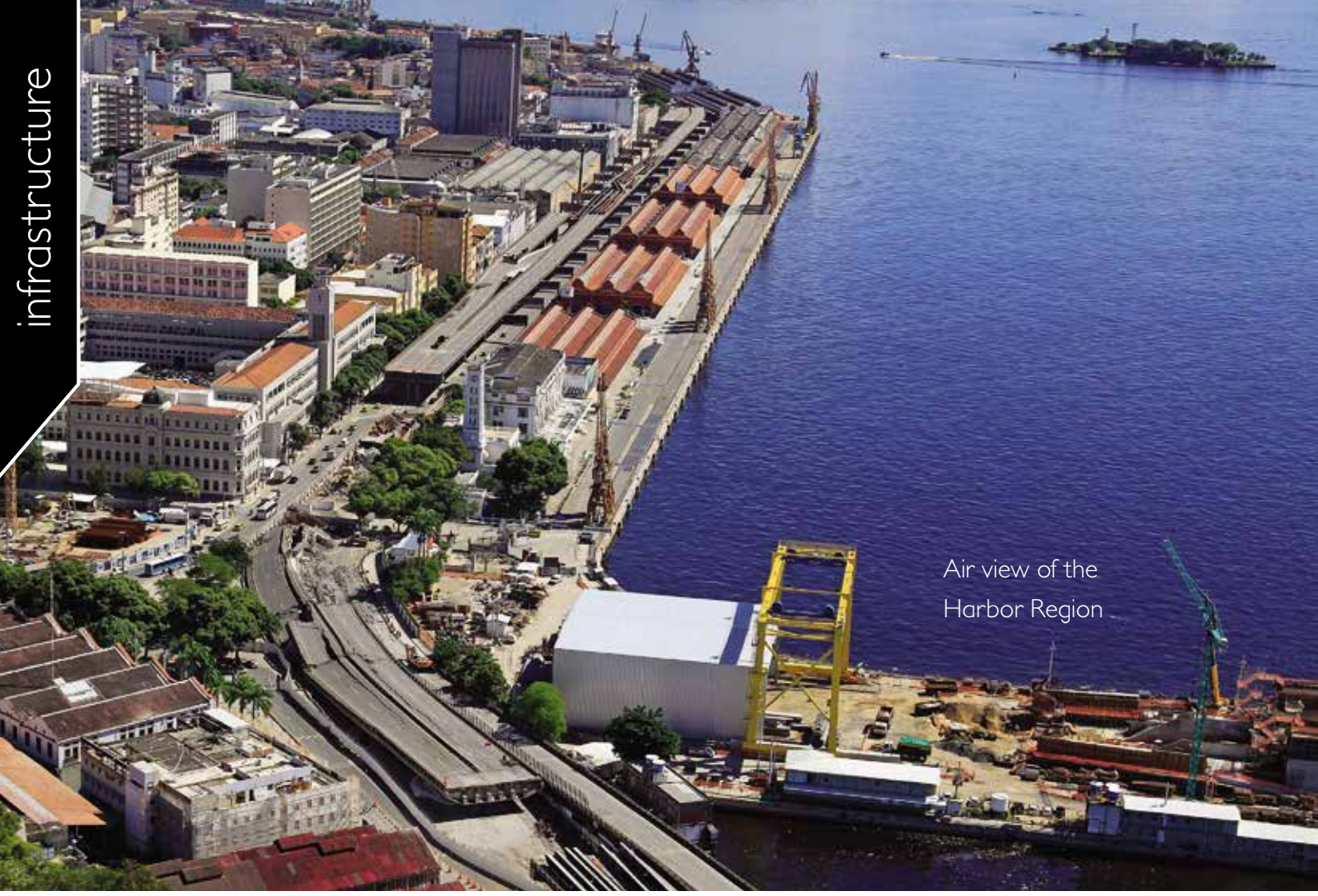
The Kleemann MR 110 Z S EVO offers several advantages. Its pre-screening system with double deck and bypass eliminates all fines before they reach the crushing chamber, reducing the wear of the impact crusher bars. Another unique advantage of this piece of equipment is the presence of sensors installed in the feeling, which adjust the flow of material in a continuous manner, optimizing the comminution process. In addition, the crusher has a vibrating chute after the crushing system, which reduces operational risks and wear of the conveyor belt.

Until now, the crusher has been working with 180 t/h granite crushing feeding and 280 t/h when it operates with CDW (Construction and Demolition Waste). To operate in two distinct markets, Córrego Rico has chosen the Kleemann crusher model S, which means secondary screening after crushing and return conveyor belt. Therefore, depending on the application, it is possible to work or not in "closed circuit".

Economic feasibility was also a fundamental factor in the choice of Kleemann MR 110 ZS EVO. Granite is already a challenge for impact crushers due to the high abrasiveness and material resistance. However, trials and tests done in laboratory have shown the usage feasibility of the Kleemann impact crusher and also showed excellent results in the quality of the end product. For example, the high production, the efficiency in the crushing process and mainly, the quality of the crushed material in terms of its cubicity, proved to be key-elements for the success of operation.

The impact crusher MR 110 ZS EVO still counts with a diesel-electric driving system, in which the diesel engine powers a generator which drives the MR 110 ZS EVO electrical motors, reducing fuel consumption in up to 25%. ■

Dionattan Veloso Medeiros,
Córrego Rico Director



Air view of the Harbor Region

Picture: Pawel Loj

REVITALIZATION IN RIO DE JANEIRO: PORTO MARAVILHA

PROJECT AIMS AT REQUALIFYING THE HARBOR REGION OF THE CITY

Currently considered the most important revitalization work in the country, Porto Maravilha project, in Rio de Janeiro, has 5 million square meters undergoing improvements. Among the improvements are streets, squares and avenues restructuring, such as the demolition of Elevado da Perimetral, the transformation of Rodrigues Alves Avenue into an expressway, and the construction of Binário do Porto road, which will cross the whole region from Praça Mauá (Mauá Square) up to Novo Rio Bus Terminal, among others.

According to Porto Maravilha portal, by Rio de Janeiro City Hall, among other actions, there will be reurbanization of over 70 km of roads, 17 km of bike lanes will be implemented and 15 thousand trees will be planted throughout the whole extension of the works. The repairs concern the infrastructure of the port region, precarious for being old and due to the lack of public investment, such as electric, gas and sewage, drinkable water, and telecommunications systems; in addition to commercial and residential buildings that are being built.

A Hamm compacting roller HD 90 was acquired by Odebrecht Construction Company, the leading company

in the consortium in charge of the works, and it is being used to pave the streets of downtown Rio, an important part of the project that will enable the revitalization of the port area in Rio.

According to Antônio João de Souza Júnior, Transportation Leader at Odebrecht, the main advantage of the Hamm roller HD 90 as compared to others available in the market is its finishing function, whereas other rollers tend to be more focused on the base.

> "In the comparison, the Hamm HD 90 is very good. There were similar ones, but those were not so appropriate. There is also the fact that the HD 90 is more modern and, therefore, ideal for the works", João Antônio explains.

The HD line of Hamm compacting rollers is characterized by full view of front and rear drums, always keeping the operator's visual contact to avoid accumulation of asphalt material on the drum. Access to water spray nozzles is easy and without obstructions. The double frequency and vibration amplitude ensure compaction efficiency both in thin and thicker layers.

> "The HD 90 performance has been excellent. It is working well, without any problems so far. On a scale from 0 to 10, I would say 10", Júnior says.

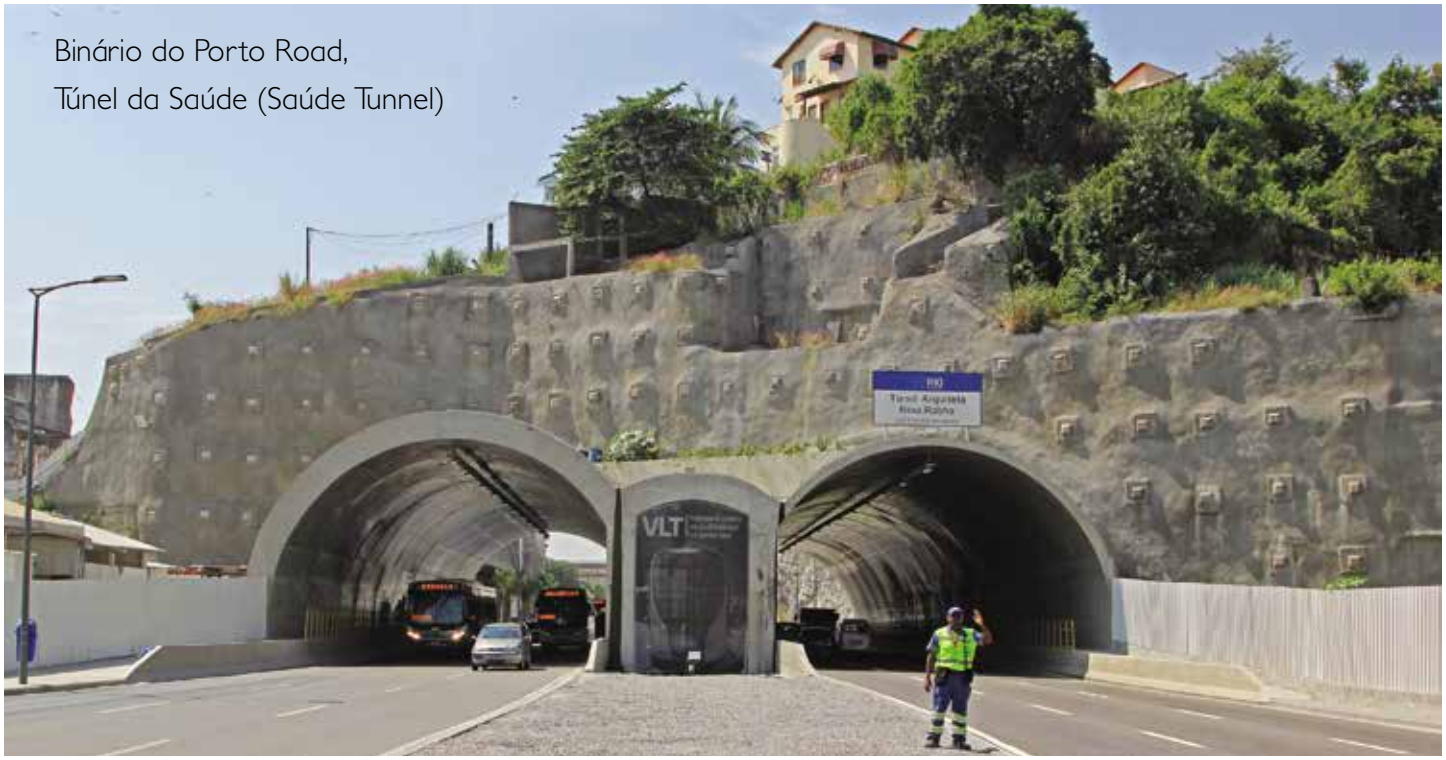
According to Odebrecht, the construction presents 78% of completion of its secondary road; the expressway is 51% complete. Besides, the surrounding urban infrastructure is 20% complete. Project completion is estimated for 2016.

According to Guilherme Rodrigues, regional sales manager at Wirtgen Brazil Southeast, most part of the asphalt used in this work is being produced at Usina do Caju (Caju Plant), made by Ciber. "The plant is installed in Caju neighborhood and distributes asphalt mixes throughout the whole city. Among the mixes produced there, are the colored asphalt (red) for bike lane applications, and asphalt concrete with the use of RAP, applied in the port", he adds.

PORTO MARAVILHA

Porto Maravilha consists of several works done by Rio de Janeiro City Hall aiming at requalifying the Port Region of the city, which has suffered degradation with time. Based on the principles of sustainability, the project estimates that there will be development in the region, with the restructuring of streets, squares, avenues, and tunnels.

The high point of the requalification of the area is the construction of The Museum of Tomorrow, opening expected for the second semester of 2014. Also at Praça Mauá (Mauá Square) there will be the Art Museum of Rio de Janeiro, which along with Escola do Olhar will become a reference for art and entertainment. ■



Binário do Porto Road,
Túnel da Saúde (Saúde Tunnel)

Picture: Pawel Loj

Picture: O Asfalto

STORABLE HMA: TECHNIQUE FOR ROADS REHABILITATION

WITH EASY APPLICATION, THE STORABLE ASPHALT TECHNIQUE ALLOWS TO FILL UP POTHOLES EVEN IN RAINY DAYS.

On Brazilian roads and streets there are way too many potholes. When preventive maintenance is not done, pathologies start to happen. They start with small crazing and cracks which evolve and turn into large potholes. When there is not a total intervention in the paving structure through milling or recycling, the bagged asphalt application technique becomes an alternative to the conventional technique using hot mixed asphalt or cold pre-mixed in order to solve this problem.

Also known as storable HMA, bagged asphalt allows companies to store the product for up to 24 months, which does not get hard, remaining in good conditions during this period. For the application, the mix of asphalt with additives is not necessary, which increases the convenience of operation.

Sold in bulk or in bags with pre-determined weight (generally 25 kg), in addition to allowing a long storing time, it is a great option for City Halls and works that demand low volume. This technique increases the reaction capacity in the recovery of potholes, because usually there is some difficulty in acquiring small amounts of the conventional product (hot mix asphalt), being necessary to wait for the accumulation of ditches and potholes to enable the acquisition. It also avoids disposal of the hot mixed product, which would generate expenses acquiring material that may not be used.

Another advantage of the storable HMA is the possibi-

lity of application in wet places and even in rainy days. It avoids that the team and the equipment will have to wait to start working and makes it possible for places with rainy weather to fill up the potholes on the pavement anytime, it is not necessary to wait for the dry season.

PRODUCTION

According to the product specialist at Ciber Equipamentos Rodoviários, Marcelo Zubaran, "to store the asphalt material, an additive is used. It is inserted directly into the bitumen tank; this additive does not alter the operation conditions of the plant. The asphalt mix is warmed to approximately 160º and presents the aspect of conventional concrete. The only difference is the storage capacity because it presents workability even at low temperatures. After machining, it is necessary to wait for the product to cool down and later it is put into bags for commercialization", he explains.

THE MANUFACTURER

Producer of this technique for about two years, the group – composed by the company from Campinas O Asfalto and two from Goiânia Ultrapav and Pedreira Britec, which have their own Ciber plants – has been manufacturing the mix with high quality.

"The technique has existed for a few years, but Britec made it commercially feasible for the Brazilian market. This happened due to the availability of bags with a lower amount of product", explains Helder Henrique Valin Barbosa, Administrative Manager at Britec quarry.

Picture: Robert Cazarini

Helder Henrique Valin Barbosa, Administrative Manager at Britec Quarry

The technique developed by Jorge Coelho, director at O Asfalto, allows for the extension of bitumen's agglutinating power, which makes it possible for the asphalt mix to be stored, bagged and applied at ambient temperature.

According to Hebert Vallim Barbosa, Ultrapav Director, the Ciber asphalt plant iNova 1200 is able to produce the storable HMA technique with higher quality than other plants available in the market "because it has an external mixer with dry mix, so we can follow up the mixing process and application of the chemicals, ensuring the excellence of the mix", he explains.

"We got where we are thanks to Ciber asphalt plants, which has allowed us to reach the maximum quality with this technique", Jorge Coelho adds.

Picture: Robert Cazarini

Jorge Coelho (Director, O Asfalto) and Hebert Vallim Barbosa (Director, Ultrapav)

According to Fábio Xavier de Souza, Wirtgen Brazil Midwest Sales Specialist, "those customers have a high opinion of our products. They really take into account our ability to provide support, both in parts and services. In addition to the quality of equipment, they acknowledge our assistance as a differential, and they talk about the benefits our plants afford them at the time of operation".

APPLICATIONS

An alternative technique to the cold pre-mixed with the use of asphalt emulsion, the storable HMA is applied at ambient temperature even in wet places or during rains. This is due to the fact that the material has a lower temperature than the traditional HMA. The mix has a higher workability at ambient temperature without using solvents in the composition.

In addition to pothole filling, it can be used on sand, gravel, and concrete - as long as they are stable, always keeping the necessary care with in the construction of the base. It is only necessary to clean, apply the mix, compact it and the area is immediately ready to be used. Since the product is applied at ambient temperature, it is not cooling that will harden it, but compaction.

"Considering all those factors, when the storable asphalt is used, there is approximately a 50% gain in productivity in pothole filling application", explains Jorge Coelho.

POTHOLE FORMATION

The potholes on the road are a consequence of the evolution of cracks on an old pavement or even in new asphalt pavements. As heavy vehicles go by, the asphalt pavement is flexed. If the volume of mixture voids on the pavement is higher than what was planned due to the low percentage of bitumen, during the flexion, the pavement will not have the elastic capacity to return to the initial position (without flexion) and will generate cracks on the lower part of the asphalt wearing course.

If the resistance to the traction of the mix is lower than the traction request that happens in the lower fibers of the asphalt wearing course, with loading, there will be formation of cracks. During rainy periods, a pavement with

Images: Ciber image gallery

1

The pavement is a system in layers, in which each one fulfills its functions in order to avoid permanent deformation and cracks.

2

Considering that the structuring layers of the pavement are fulfilling traffic demands, we analyze the main cause for pothole formation on the asphalt wearing course due to lack of resistance or flexibility of this layer.

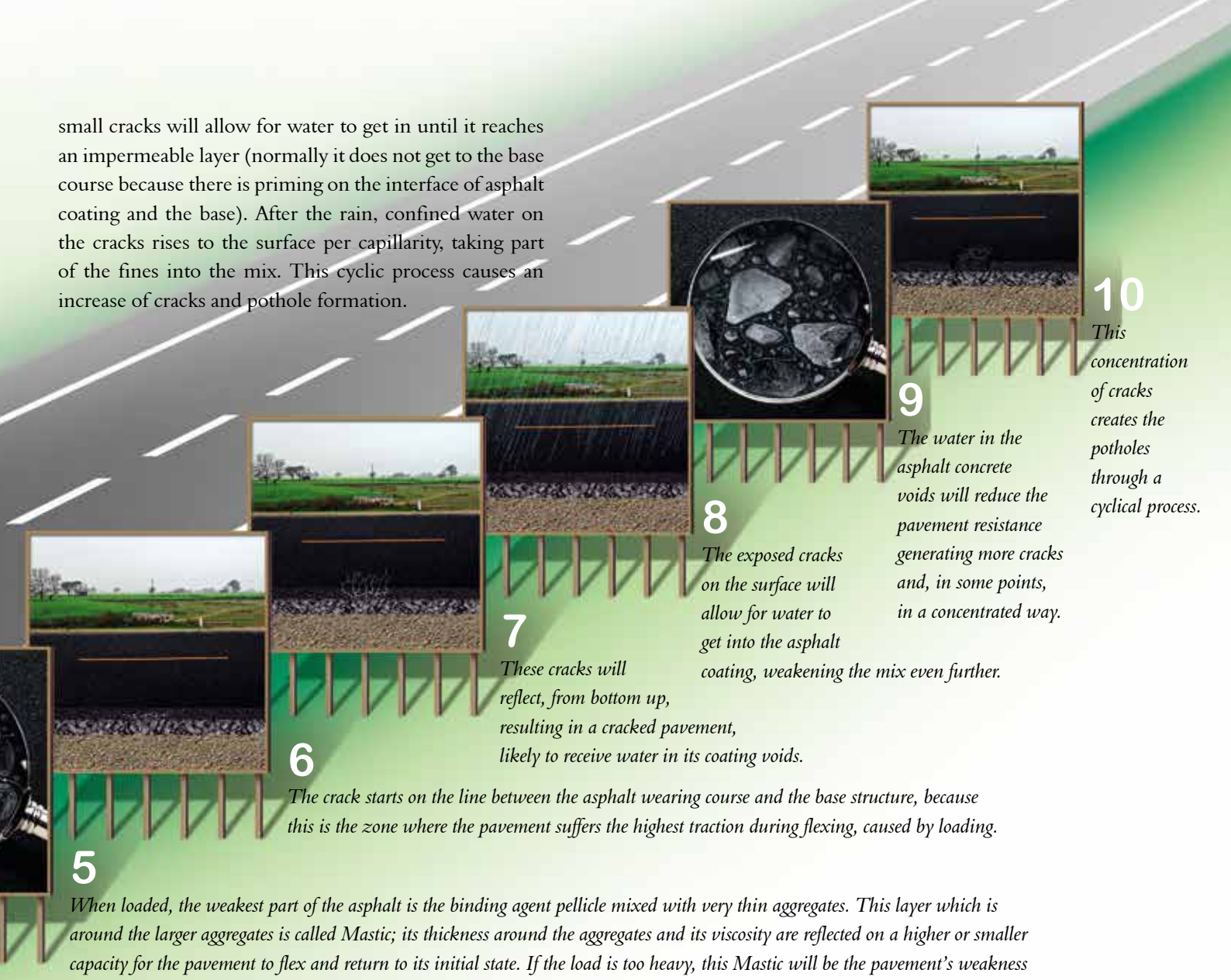
3

Asphalt concrete é composed basically by aggregates of different sizes, bitumen, and air voids, this last element makes the pavement flexible.

4

With traffic, mainly it should go back to the characteristics of the which guarantees fle

small cracks will allow for water to get in until it reaches an impermeable layer (normally it does not get to the base course because there is priming on the interface of asphalt coating and the base). After the rain, confined water on the cracks rises to the surface per capillarity, taking part of the fines into the mix. This cyclic process causes an increase of cracks and pothole formation.



10
This concentration of cracks creates the potholes through a cyclical process.

9
The water in the asphalt concrete voids will reduce the pavement resistance generating more cracks and, in some points, in a concentrated way.

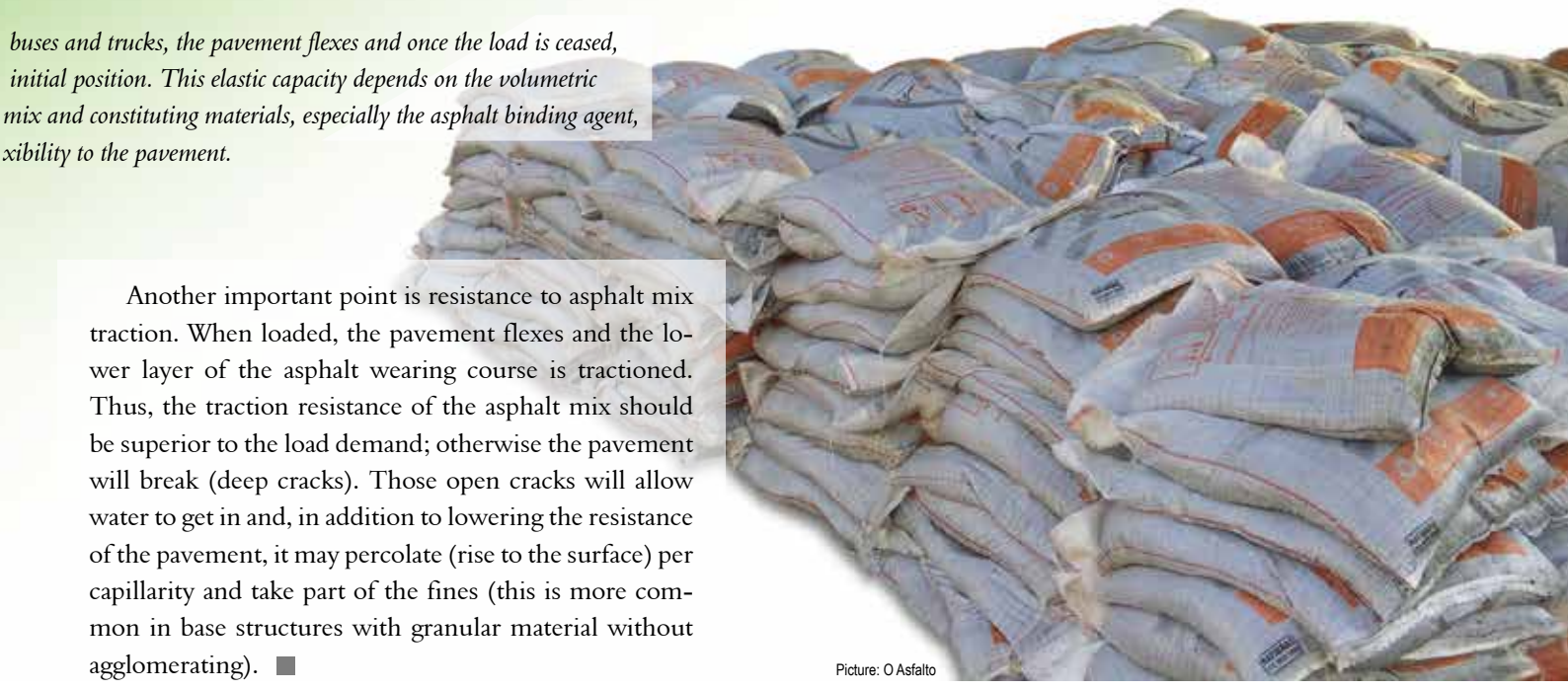
8
The exposed cracks on the surface will allow for water to get into the asphalt coating, weakening the mix even further.

7
These cracks will reflect, from bottom up, resulting in a cracked pavement, likely to receive water in its coating voids.

6
The crack starts on the line between the asphalt wearing course and the base structure, because this is the zone where the pavement suffers the highest traction during flexing, caused by loading.

5
When loaded, the weakest part of the asphalt is the binding agent pellicle mixed with very thin aggregates. This layer which is around the larger aggregates is called Mastic; its thickness around the aggregates and its viscosity are reflected on a higher or smaller capacity for the pavement to flex and return to its initial state. If the load is too heavy, this Mastic will be the pavement's weakness point, which may lead to micro-cracks that will connect voids that were not connected.

buses and trucks, the pavement flexes and once the load is ceased, initial position. This elastic capacity depends on the volumetric mix and constituting materials, especially the asphalt binding agent, xibility to the pavement.



Picture: O Asfalto

Another important point is resistance to asphalt mix traction. When loaded, the pavement flexes and the lower layer of the asphalt wearing course is tractioned. Thus, the traction resistance of the asphalt mix should be superior to the load demand; otherwise the pavement will break (deep cracks). Those open cracks will allow water to get in and, in addition to lowering the resistance of the pavement, it may percolate (rise to the surface) per capillarity and take part of the fines (this is more common in base structures with granular material without agglomerating). ■

CONCRETE PAVEMENT WITH HIGHER RESISTANCE AND LOW MAINTENANCE

Pictures: Célio Verdim

DUPLICATION WILL MAKE TRAFFIC EASIER IN THE METROPOLITAN AREA AND IT INTEGRATES THE TRANSPORT LOGISTICS PLAN OF PECÉM PORT

The state of Ceará now has a large construction work in its road network. It consists of the duplication of the Fortaleza belt highway, which receives an intense flow of large size vehicles every day and it will improve the traffic, bringing fluidity to the traffic in the metropolitan area of Fortaleza. The duplication of the highway is part of the Pecém Port's Transport Logistics Plan.

With federal investments of over R$ 200 million, and under the state responsibility, the duplication is being carried out by Galvão Engenharia (Galvão Engineering) and has a total extension of 32.1 km. The work has been divided into five sub-sections as follows: between CE-040 and BR-116 (km 0 to 3.4) in Eusébio; between BR-116 and CE-060 (km 3.4 to 13.6) in Fortaleza; between CE-060 and CE-065 (km 13.6 to 18.3) in Maracanaú; between CE-065 and BR-020/BR-222 (km 18.3 to 26.2) from Fortaleza to Caucaia and between BR-202/BR-222 and Mister Hull Avenue (km 26.2 to 32.1) in Caucaia.

TECHNICAL CHOICE OF EQUIPMENT

To meet the needs of the project, Galvão Engenharia has chosen to use the Wirtgen concrete paver SP 850, ideally suited for the production of several pavement types to

pave urban roads, highways, airport runaways, "lanes with slabs" and base courses with hydraulic connection.

"After benchmarking some rigid pavement works in Brazil, we came to the conclusion that the Wirtgen Paver SP 850 had the best references to execute our services in our job site. Besides, its main features are robustness, precision, and productivity. The finishing level it affords is extremely high, which elevates the quality of our pavement with the required productivity", explains Thiago Henrique Menezes, engineer at Galvão Engenharia.

The reason to choose the paving technique with concrete, according to Galvão Engenharia, was the resistance of the rigid pavement to elements, both physical and chemical (oil, grease, fuel), besides the better drainage characteristics, contributing to the maintenance of the pavement's integrity.

On the flexible pavement, the asphalt works as a surface course, and the base courses absorb the traffic strengths. On the rigid pavement, due to the properties of the concrete, the surface course also works as structure, redistributing the strength and decreasing the tension imposed to the foundation.

"This way, the rigid pavement has an average service life of around 30 years, whereas the flexible pavement has only six years of service life with maintenance. For this reason, the cost of maintenance is considerably lower than the flexible pavement", he adds.

According to Juliano Gewehr, Ciber Equipamentos Rodoviários Specialist, "the concrete pavement is ideally suited for roads with a high number of heavy load vehicles, since it presents higher durability and excellent resistance. The Wirtgen paver SP 850 is able to pave concrete slabs up to 10 meters wide with layers concreting and leveling systems, with the possibility of installing an automatic inserter of steel bars, which is customized according to the project", he complements.

Picture: Célio Verdim

Picture: Célio Verdim

The concrete is poured in front of the paver which, through its spreading, vibration, leveling, and finishing resources, concludes the construction of the road. The movement is smooth over four crawlers. Assembling is modular, adapted to the project's width.

Out of the total extension of the work, 26 kilometers will receive concrete paving and six kilometers will be done with asphalt. The concrete, for being more resistant and durable, meets the needs of the road, which receives an intense traffic of heavy load vehicles.

The work started in March, 2010 and the completion is scheduled to June 2015. Currently, the lane is 11 meters wide and, by the end of the duplication, each of the lanes will be 16.5 meters wide, with a total of 33 meters of width, almost three times as large as the previous one. The construction of a median strip, side bike lanes, shoulders, new markings, and returns are also included in the project. ■

TECHNICAL FEATURES

Project: Duplication of Fortaleza Road Belt
Place: Fortaleza (CE)
Extension: Total extension of 32.1 km. Divided into five sub-stretches: between CE-040 and BR-116 (km 0 to 3.4) in Eusébio; between BR-116 and CE-060 (km 3.4 to 13.6) in Fortaleza; between CE-060 and CE-065 (km 13.6 to 18.3) in Maracanaú; between CE-065 and BR-020/BR-222 (km 18.3 to 26.2) from Fortaleza to Caucaia and between BR-202/BR-222 and Mister Hull Avenue (km 26.2 to 32.1) in Caucaia. Investment: R$ 200 million
Technique: Concrete paving, out of the full extension of the work, 26 kilometers will receive concrete paving and six kilometers will be done with asphalt.
Start date: March 2010 | **End date:** June 2015

Picture: Thaiza Pimentel

MODERNITY AND VERSATILITY JANEIRO ASPHALT PRODUCTIO

BATCH PLANT PRODUCES DIFFERENT TYPES OF ASPHALT MIXTURES FOR ROADS IN THE CITY OF RIO DE JANEIRO

In another step towards the revitalization and reurbanization Rio de Janeiro has been going through, the city has acquired the most modern asphalt plant in the country. The Ciber UAB 18 E operates with cutting edge national technology, designed to meet the strictest requirements of different asphalt mixes, allowing total control of production, wi-

IN RIO DE
ON

Picture: Daniel Coelho

thout quality variation, in addition to be completely automated and powered with natural gas.

The plant is installed in Caju neighborhood; about 10 kilometers from the city center, and distributes asphalt mixes throughout the whole city. In addition to the strategic location, the whole asphalt concrete production area and material storage is covered, resulting in less humidity of aggregates and, consequently, higher production of the plant an less fuel consumption, as well as a significant reduction of dust emissions and noise.

"The new plant was planned to meet the demand of Rio de Janeiro City Hall concerning the production of special asphalt masses. The 140 t/h production capacity can be reached whenever necessary, but the main feature of the equipment is it capacity to produce the most varied types of asphalt masses without significant alterations in the rhythm of production and with full control of the process", says Marcio Freire Arzua Barbosa, Industrial Production Coordinator at Rio de Janeiro City Hall.

At the job site there is a paving laboratory, where quality control of mixes produced is done. There, some mixes are projected for later machining, such as, discontinuous mixes SMA, CPA, colored asphalt, foamed warm asphalt, and hot recycling. Currently, a combination between hot recycling and warm mixes is being planned, known as Warm Recycling.

Still, according to the coordinator, "the production of each type of mass involves equipment calibration, appropriate programming of the control system, and quality tests for the fine adjustment of the asphalt mass trace".

Currently, there are around 60 employees at Usina Caju who work in two shifts, night and day, to meet the demands of pavement construction and recovery. The daily demands of a City Hall such as Rio de Janeiro's are varied. Some of the daily demands vary from pothole covering to discontinuous mixes, from black to colored asphalt on bike lanes, and from virgin inputs to recycled ones at this industrial unit.

From left to right: Márcio Freire Arzua Barbosa, Industrial Production Coordinator; Marcus Belchior, Conservation and Public Services Secretary; Marco Aurélio Regalo, sub-secretary at Rio de Janeiro City Hall

STATE-OF-THE-ART TECHNOLOGY

One of the differentials of the plant is the capacity to produce warm mixes through asphalt foam. Also known as Warm Mix Asphalt or WMA, this technology is able to reduce the machining and compaction temperatures of the mixes through an increase in the workability of the binding agent through viscosity reduction. Water is the only additive that evaporates when mixed with the warm bitumen and causes a volumetric increase of the bitumen, reducing the resistance to the flow of this binding agent. The phenomenon is analogous to what happens with Wirtgen recyclers, but in different applications.

Still, according to the coordinator, "the reduction of those temperatures results in economic benefits with reduction of the plant's fuel consumption, environments with less gas emissions to the atmosphere, a better work environment at the plant and application, in addition to gains in the asphalt mix due to a larger compaction window and less aging of the asphalt binding agent during machining", he explains.

The plant presents different individual systems to weight fines recovered from the bag filter, of lime, and cellulose fiber or colored polymer, in addition to the individual weighting of all aggregates that will go through the drying process. This equipment still has a sustainability kit: foamed warm asphalt and hot recycling with high content of milled recyclable material or Reclaimed Asphalt Pavement – RAP.

PIONEERING

Rio de Janeiro City Hall is the pioneer in the use of RAP (Reclaimed Asphalt Pavement) as a new input for the production of hot milled asphalt. This milled recyclable material comes from the urban roads of the city, especially from the Porto Maravilha region, an area of the city that has been remodeled and re-urbanized. With this technology, the consumption of virgin raw material (aggregates and bitumen) for the production of recycled asphalt is considerably reduced. The expectation is that the rubberized asphalt production will also be leveraged with the use of milled tires.

Recycling module at Rio de Janeiro City Hall Plant

Picture: Marcelo Zubaran

Another piece of news is the possibility of producing the Porous Asphalt Layer, which allows rain water to be absorbed by the pavement coating, avoiding the formation of water pockets in rainy days.

With pigments added to the mix, the colored asphalt is also being produced by Ciber plant UAB 18 E and it is being used with the goal of marking the roads, offering more safety to the drivers and for bike lanes applications.

According to Guilherme Rodrigues, Regional Manager Southwest at Wirtgen Brazil, "the machine is ready for the different mixes for which it was designed. In a continuous process, it produced colored asphalt (red), for bike lane applications, and asphalt concrete with RAP for application in urban areas, meeting specifications with high quality".

The production of the SMA (Stone Matrix Asphalt) asphalt mix is also being studied, an asphalt pavement that is more resistant and that provides increased adherence of the tire to the pavement surface, such as the ones used in high speed lanes.

Usina do Caju focuses on sustainability, because it combines technologies, such as the foamed warm asphalt with hot recycling. The warm mix results in fuel economy in the plant (between 10% and 20%) and lower aging of the bitumen during the mix.

The capacity of using up to 50% of RAP (material with a certain aging degree) in the mix results in a significant aggregates and bitumen economy, making the mix much cheaper and with the required quality.

MAIN WORKS

The asphalt produced at Caju Plant is being used in several jobs in the city of Rio de Janeiro, such as at Porto Maravilha (port region) revitalization, recovery of asphalt pavement of the main avenues and streets of the central area and the bay of the main beaches in Rio de Janeiro, and in the Smooth Asphalt and Asphalt on the Door projects, which consist of urbanization and paving of roads in highly populated areas in the outskirts and in the north zone of the city.

It is also being used in the improvement of Radial Oeste roads - on the stretch between Maracanã Stadium and Praça da Bandeira; in the surroundings of Quinta da Boa Vista; in the surrounding of Estádio de São Januário (Stadium); on Paulo de Frontin Avenue – which connects Maracanã region to the South Zone of the city, and on Linha Vermelha (Red Line), which connects Tom Jobim Airport and Downtown Rio de Janeiro. ■

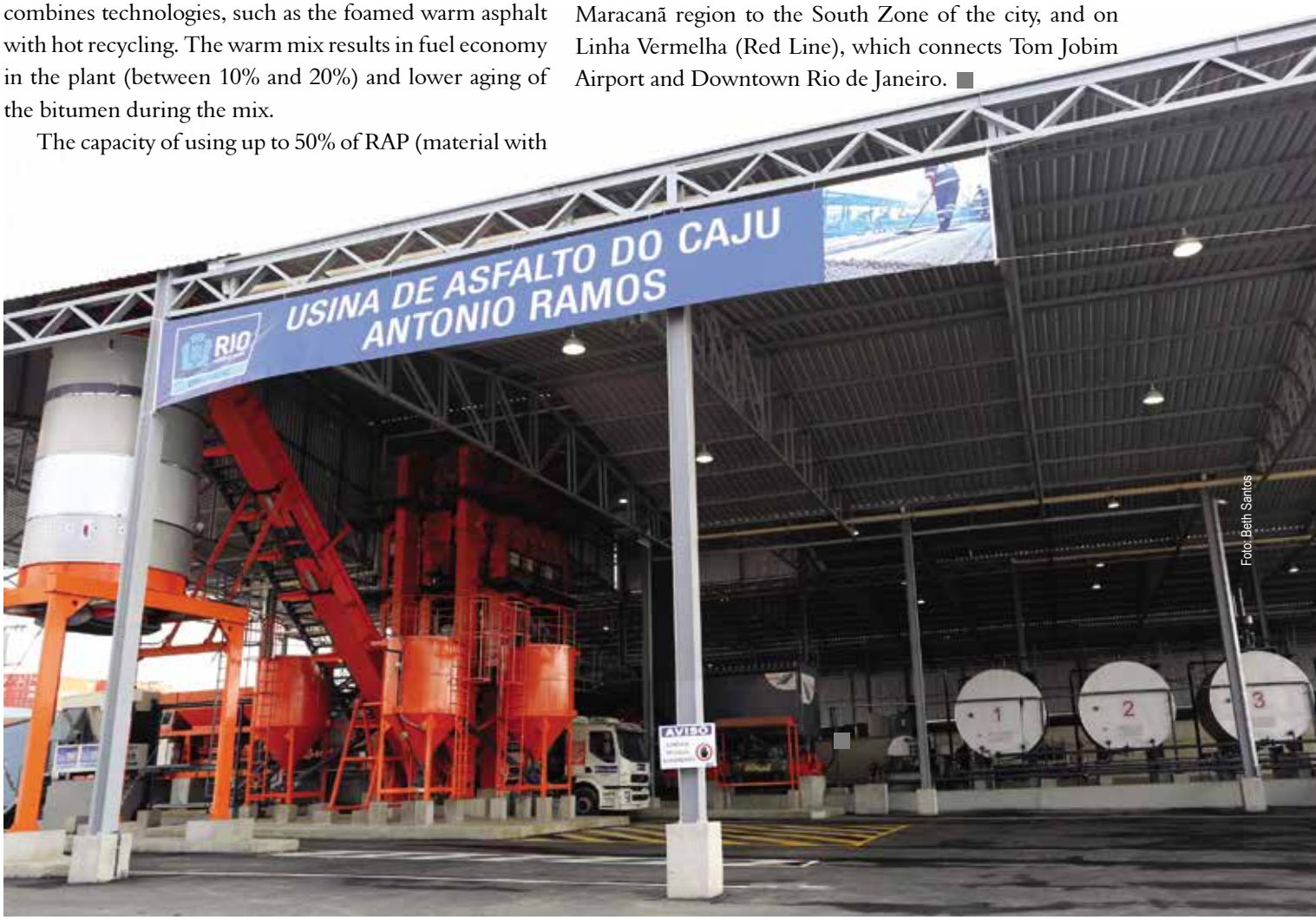


Foto: Beth Santos

Picture: Beth Santos

Picture: Ciber image gallery

QUALITY ROUTINE AND CUSTOMERS SATISFACTION

ISO 9001 CERTIFICATION REASSERTS THE QUALITY OF THE PROCESSES OF THE COMPANY FOR THE PRODUCTION OF ROAD BUILDING MACHINES

Ciber Equipamentos Rodoviários, subsidiary of Wirtgen Group in Brazil, has ISO 9001 certification for its constant effort in reviewing and improving its processes in order to meet the international standards in Quality Management.

The Certification Seal received by Ciber confirms the constant search for improvements in the company, which are part of the routine and the daily processes, besides being a formalization that shows that the company is structures to serve its customers the best way possible.

This certificate means that the company maintains its focus on customer satisfaction and on the continuous improvements of its processes. “ISO 9001 is a means for customers to be sure that they will have benefits in buying

products and services from a company that always seeks excellence in quality, aiming at customers satisfaction and continuous improvements every day", explains Jandrei Goldschmidt, Marketing Manager at Ciber Equipamentos Rodoviários.

Among the actions developed by the company which maintain the excellence level and ensure the re-certification, the work of approximation with customers can be mentioned. They can see that the company disposes of the appropriate means to capture the requirements. This is done through after-sales support, which ensures the supply of components and parts by the dealers, both in Brazil and abroad, as well as follow-up of technicians, projecting and validating products, planning execution, doing assembling, delivery, and providing after-sales support, everything according to the standards.

the definition of new guidelines to maintain the high level in the execution of its activities. "We constantly use the internal means of communication to engage and keep the organization collaborators up to date and to always have them as an active part of the QMS", he asserts.

Valid for three years, the ISO 9001:2008 Certification

Picture: Ciber image gallery

Another positive factor is the maintenance of the Quality Management System (QMS), which is always up to date. "We measure our processes based on indicators that are reviewed and altered whenever necessary, with the goal of obtaining the best picture of what is really important to be measured and followed close by Ciber", he says.

Jandrei explains that the requirements that are evaluated for ISO 9001 certification are part of the company day-to-day attention. Among other reasons that made the company reach this level is the participation of employees that help out with ideas and opinions, including the involvement of the management of Ciber, such as support in – international regulation that establishes requirements for the Quality Management System (QMS) of an organization – it has as one of its goals to provide the customers the trust that the supplier can service him with excellence and consistency. The validity period is composed by a cycle of annual audits that consist of certifications and two maintenance audits. At the end of the third year, if it is the organization's interest, a re-certification audit is necessary, that is, the process is carried out as if it were the first audit of the company. In the case of Ciber, the organ in charge of certification is TÜV-NORD Germany, represented in Brazil by BRTÜV. ■

COMPACTION BY OSCILLATION: EFFICIENCY AND QUALITY

Picture: Ciber image gallery

TECHNOLOGY FOR COMPACTING ROLLERS SHOWS THE BEST RESULTS AND IS MORE ECONOMIC, IN ADDITION TO AVOIDING COMPACTION FLAWS

Compaction is essential for a pavement to have a high bearing capacity, to offer good stability, little water permeability, regularity, and a longer service life.

For a road to be perfect, good compaction is necessary. And, in order to obtain this quality, the choice of the best compacting roller for the execution of the job is imperative. However, regardless the type of soil or equipment model, the technology used is highly important. And there is plenty of technology on Hamm compacting rollers, proof of that is that the brand has an exclusive patent of the oscillation roller.

This patent is due to the cylinders developed by the brand, which oscillate in permanent contact with the pavement, compacting at low impact thus avoiding eventual damage to the pavement, to the equipment and to adjacent constructions.

This technique optimizes the job and it is possible to use less passes than with vibrating rollers. This happens because the compaction is aimed and it increases continuously, thus, the material structure is not fragmented.

Instead of using the vibrating standard system of just one axle with eccentric weights turning at high speed, the oscillation technology uses two axes with weights which turn into opposite directions. Thus, oscillating movements of the cylinder are generated and they alternate back and forth, always in permanent contact with the soil.

According to Juliano Gewehr, Ciber Product Specialist, one of the technical advantages of the oscillating system is to obtain a higher degree of compaction with less passes: “Combining the front vibrating drum with the rear oscillating drum guarantees a higher compaction degree with less passes. At places where vibration cannot be used, for example, on bridges and overpasses, we operate with the static front drum and the rear one oscillating”, he explains.

One of the advantages of the oscillation technology, in addition to the low impact, is the automatic amplitude regulation system, which adjusts according to the hardness level of the material. When the asphalt layer is cooling down, at some point the drum does not move anymore due to the increase in material hardness, avoid breaks of

the aggregates on the recently-applied pavement, which is a common mistake in the application with conventional vibrating rollers.

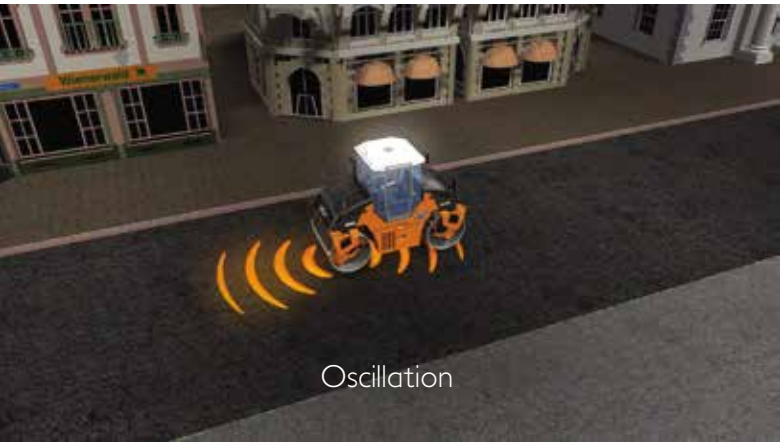
ADVANTAGES OF OSCILLATION

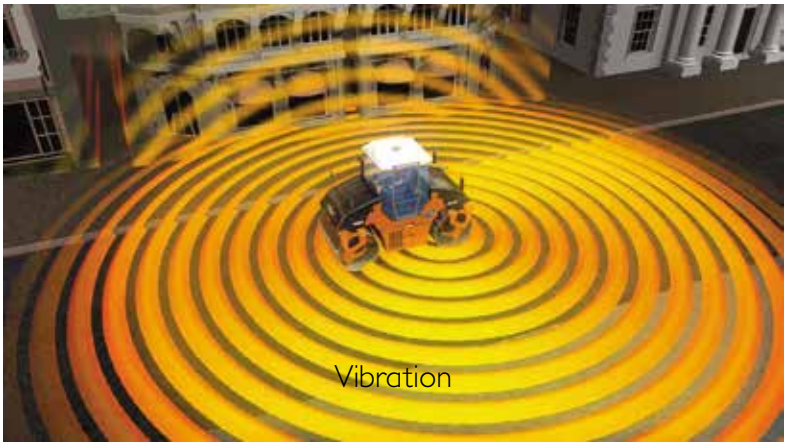
✓Higher compaction efficiency through the combination of the static load and the application of horizontal forces from the oscillating drum;
✓The rollers are in permanent contact with the soil, using continuously the load and the compaction strength, reaching maximum density very quickly.
✓There is no compaction overload;
✓Compaction increases more rapidly than with vibration, that is, there is a better compaction with less passes;
✓Compaction with a better superficial finishing;
✓Less impact on the drum ensuring a longer service life;
✓Appropriate for almost all types of materials and layers densities;
✓It avoids particles destruction, a result of vertical impact forces common to traditional vibrating rollers;
✓It avoids layer fragmentation, resulting from vibrating impact;
✓It allows compaction with minimum temperature of up to 80ºC, without damaging the layer.
✓Impermeability and great adhesion of asphalt joints and connections;
✓It avoids the exudation phenomenon, for mixes that have a higher volume of asphalt binding agent in its composition;
✓It is ideally suited for bridges, overpasses and other delicate surfaces, once the impact forces do not damage the structure.

VIBRATION

Compaction through vibration also ensures good results in different soil and asphalt conditions. The vibrating drums generate an impact that results from the interaction between frequency (number of hits per second), amplitude (high the cylinder reaches during vibration), travel speed, the own cylinder weight, the shape and size of compacted area. Differently from oscillation, vibration requires extreme care regarding the generation of shock waves to the surroundings of the job, which may cause damage to the structure of houses and buildings.

Images: Hamm image gallery





SEISMOGRAPH HAMM APP

The new Seismograph Hamm App was developed to view the shock waves generated during compaction. In this process, undesired vibrations may occur and lead to damage to neighboring structures. The app is similar to a seismograph, a device used by scientists to measure the intensity of earthquakes.

In a comparative between the vibrating and oscillatory drums, Hamm seismographer showed the loads balance. The drum with conventional vibrating system generated much more shock waves than the oscillating system, which generated less than 15% of vibration. The comparison was drawn with a double drum Hamm roller, operating both ways: front drum in vibrating mode and rear drum in oscillation mode.

The app is available for free for operational systems IOS and Android. Just go to the App Store, type in Hamm Seismograph and download it. ■

DOMINICAN REPUBLIC BETWEEN BEACHES AND WORKS

Picture: Alberto Doglioli

A CARIBBEAN PARADISE INVESTS IN INFRASTRUCTURE AND URBAN MOBILITY IN ORDER TO IMPROVE MERCHANDISE TRANSPORTATION AND ATTRACT MORE TOURISTS

A paradisiacal tourist destination with exuberating beaches, very white sands, and transparent waters with pleasant temperatures all year round. Full of colors, Dominican Republic is a country of endless attractions, historical wealth, and marked by Spanish, French, African, and Haitian influences in its culture and culinary; it is an exuberant place that allures tourists from all over the world.

Located on an island, the country has the Atlantic Ocean on the North and the Caribbean Sea on the South and covers two thirds of the island. On the other part is Haiti. With an area of about 48 thousand square kilometers, 1.5 thousand kilometers of coast and over 10 million people, Dominican Republic is the second most populated country in the Caribbean, only behind Cuba.

Dominican Republic has been experiencing a strong economic growth throughout the past few years. According to the International Monetary Fund (IMF), in 2013

the real GDP increased 4.1%, boosted by the mining, construction, agriculture, and tourism sectors.

To improve the distribution network of the production and become an even more attractive tourist destination, in the last five years the country has done strong investments in infrastructure and urban mobility, improving its road network and main accesses to the main airports, the gateway to the tourist attractions, bringing benefits for commerce, tourism and for the population. Thus, Ciber has been part of the modernization of the road network in Dominican Republic.

Looking at this scenario, three construction companies with works in the country and also in Haiti have invested in Ciber asphalt plants. Andres & Camila Materiales y Construcciones and Grupo Malespin have an UACF iNova 1200 P1 and Consórcio Remix, a model UACF 17 P Advanced.

"The choice of mobile plants was due to the dynamics of the works and the need to transport the equipment to other places and even to other countries. Also the technology and the engineering concept easy to handle were decisive factors for the choice. Another important point is the excellent asphalt mix produced, with the pug-mill type external mixer as the main highlight, which transfers a lot of energy to the mixing process and avoids early aging of the asphalt binding agent, increasing the pavement service life", says José Luiz Matallana, Sales Director in Central America and Caribbean Islands at Resansil, Ciber dealer in Dominican Republic.

The UACF iNova 1200 P1 plant, model used in the works in Dominican Republic has the most modern technology for the production of asphalt mixes, with qualities that improve the asphalt excellence. The equipment has a new chassis and suspension which afford higher stability, fours dosing silos with individual weighting in only one mobility, in addition to a new mixer, more robust and developed for the dry mix stage, and a new dryer that reduces energy consumption.

The UACF 17 P Advanced adds total portability and continuous production technology to a mixing quality comparable to the batch plants. The bitumen is not exposed to high temperatures, ensuring a longer service life of the asphalt and more quality, as a consequence. These are reliable and adaptable pieces of equipment that can be adapted to different weather conditions. ■

Picture: Alberto Doglioli

From left to right: Engineer Alberto Doglioli (Engineering Director), Engineer Marcos Malespin (President) and Rafael Parra (General Manager) - Company: Grupo Malespin

Picture: Alberto Doglioli

WORKS ON THE SP-99 REDUCE ACCIDENTS IN 69%

FIRST STRETCH OF WORKS ON RODOVIA DOS TAMOIOS WAS COMPLETED WITH AGILITY AND HIGH TECHNOLOGY

Main access road to the northern coast of the state of São Paulo, connecting the cities of São José dos Campos and Caraguatatuba, Rodovia dos Tamoios, SP-099 has a high flow of vehicles. To meet this traffic demand, a duplication work is being carried out on the road, on both sides of the lanes, from Serra do Mar - a mountain range that goes from the state of Rio de Janeiro to Santa Catarina.

Separated into parts and with R$ 1.3 billion in investment, the work started in May 2012, and the first part has already been completed and the forecast for the full completion of the duplication is April 2016, according to de state government of São Paulo. Two companies won the public bidding done by DERSA (Desenvolvimento Rodoviário S.A.) (Road Development) Encalso Construções, and S.A. Paulista de Construção e Comércio.

The first phase of the works, corresponding to Stretches 01 and 02, was completed in January this year and was done by the consortium created by the winners of the public bidding. The stretches concern the stretch from km 11.5 to km 60.4.

According to information on the portal of the state government of São Paulo, during the Carnival holiday – time with more traffic – Rodovia dos Tamoios, main connection between Vale do Paraíba region and the northern coast of the state, had a 69% reduction in the total number of accidents when compared to the same period in 2012, and 25% when compared to 2013. This reduction

in the number of accidents is due to better safety conditions generated by the works at Nova Tamoios Planalto, which had its 49 km of roads duplicated and delivered on January 24th.

With the duplication, the road got concrete barriers dividing the two lanes, antiglare screens, 3 meter wide shoulders, returns and interchanges, in addition to overpasses and pedestrian bridges. The innovations in construction ensure higher safety for driver and residents of the cities in the region, reducing the risk of accidents, especially front crash. For that, all at grade intersections were eliminated, and they are now done through underpasses or overpasses.

Among the machines used on the works, there are pavers, compacting rollers, asphalt plants, and recyclers.

According to João Pereira de Oliveira, Reciclotec Technical Assistance Manager, asphalt cement modified by SBS polymer was used for paving, an additive previously mixed with binding agent in the asphalt distributer. This mix, which has high viscosity, associated to an appropriate grading curve, results in a pavement with a longer service life when compared to mixes with conventional asphalt cement.

Still, according to the manager, the bitumen storage and heating tank, attached to the equipment, has agitators and a recirculation system, which is fundamental to maintain this type of binding agent homogeneous, avoiding the differences in temperature and viscosity during machining.

The aggregates are mixed to the asphalt binding agent, which heats the material to a temperature of 170º C until it is unloaded into the truck.

STRUCTURE ASSEMBLED ON TAMOIOS REUTILIZED JOB SITE MATERIALS

According to Celso Mouta, Civil Engineer at S.A. Paulista, due to the high volume of asphalt mix for the project, as well as the work's logistics and because it is a road in operation, it was necessary to assemble the asphalt plants on the road, located on kilometers 22 and 49 of Pista Norte and on km 53 of Pista Sul. The raw material used at Ciber plants was extracted from quarries in the road's region.

The choice of Wirtgen Group machines was due to their quality and technology: "The quality of the equipment regarding productivity and finishing was significantly higher than the ones available in the market. Due to the high volume consumed by the work it was necessary to assemble the three asphalt plants at the job site", Celso asserts.

"We assemble a structure to be practically self-reliant, thus we were able to deliver the work within the deadline. There is a whole logistics in terms of services, the people could not stop working because of lack of material", asserted the Construction Manager, Pedro Paulo Ramos. ■

TECHNICAL FEATURES
Project: Duplication of SP-099
Place: Rodovia dos Tamoios (SP)
Extension: Stretches 01 and 02 – stretch from km 11.5 to km 60
Investment: R$ 1.3 billion
Technique: Hot milled asphalt with polymer
Start date: May 2012
End date: January 2014

RECYCLING WITH ASPHALT FOAM ON RS-453

RESTAURATION PROJECT USES AN UNPRECEDENTED TECHNIQUE IN RIO GRANDE DO SUL FOR PAVEMENT REHABILITATION

A scenario of beautiful landscapes connecting Serra Gaúcha (Hills regions in Rio Grande do Sul) to the northern coast of the state, Road RS-453, also known as Rota do Sol, in Rio Grande do Sul, is of fundamental importance for the economy and tourism in the region. And, to leverage these sectors, in addition to facilitating the access in both places, DAER-RS (Autonomous Department of Roads - State of Rio Grande do Sul), in partnership with the state government, started the recovery of the roads.

THE JOB

Seeking higher resistance, performance and a longer service life of the road, DAER-RS chose the asphalt recycling technique with addition of cement and foamed bitumen. The owner of the bidding, Traçado Construções e Serviços Ltda., a company of the group Andreetta, is doing the recycling of the pavement. For that, two machines of the Wirtgen group are being used: a recycler WR 2500 and a Ciber paver AF 5500 Plus.

According to the Maintenance Manager of the Group Andreetta, Bibiano Ferraz, the recovery is being done at stages. “The first phase consists on recycling the layer with application of cement and foamed bitumen, plus the protection layer. Then, a 2 centimeter asphalt layer will be applied and maintained for one year. After this period, the second phase starts, when the road will receive an additional layer, this time with 10 centimeters, intensifying the guarantee of 10 years of service life, he explains.

Picture: Ciber image gallery

The technique used in the first phase, which consists on the formulation of the base structure, adds the rigidity of the cement with the flexibility of the foamed bitumen. The use of these two agglomerating agents ensures the excellence and durability of the asphalt layer, because it avoids permanent deformations or wheel paths formation, and makes the asphalt layer more elastic.

For Juliano Gewehr, Product Specialist at Ciber Equipamentos Rodoviários, the use of this machinery is an excellent choice for this type of technique, because it optimizes the time insuring a faster execution of the work. "The WR 2500 recycler reutilizes 100% of degraded material in the recovery of the pavement. In addition, the use of this recycler model in roads rehabilitation is a great technical alternative and it is economically more feasible, besides the fast execution", he explains.

He reinforced that "the equipment used for pavement recovery have a strong production capacity, especially the recycler, which has produced above the expectation. The choice was made based on the reliability on productivity and quality that the brands Wirtgen and Ciber offer", he added.

THE TECHNIQUE

According to the engineer Maria Cristina Passos, Road Research Superintendent at DAER/RS, on that stretch the original pavement, which had 30 cm of graded crushed stone base and 5 cm of asphalt surface course, was completely cracked at the time of the project, showing structural fatigue. The solution presented in the restoration project planned by DAER Road Research Center was foamed bitumen recycling.

"This choice was motivated by the high traffic on the stretch and by the advantages of the edition of this material, such as affording cohesion to the granular material, increasing resistance to shearing (deformation); reducing susceptibility to humidity, in addition to eliminating the risk of possible retraction cracks ", the superintendent explains.

Some of the reasons that favored the choice of recycling were the following:

✓Need of structural rehabilitation of the stretch;

✓Use of local material, avoiding the exploration of virgin material and high transportation costs of this material;

✓Expressive reduction of transportation costs due to the inexistence of a need to remove the existing material and transport new materials to the construction site;

✓High execution production with more agility in opening the stretch for traffic;

To obtain the foamed bitumen technique, it is necessary to mix Hot Milled Asphalt (HMA) with water and air under certain temperature and pressure conditions, because when the HMA gets in contact with the two elements, it expands and its volume may be increased more than 20 times, generating the foam effect.

Photos: Ciber image gallery

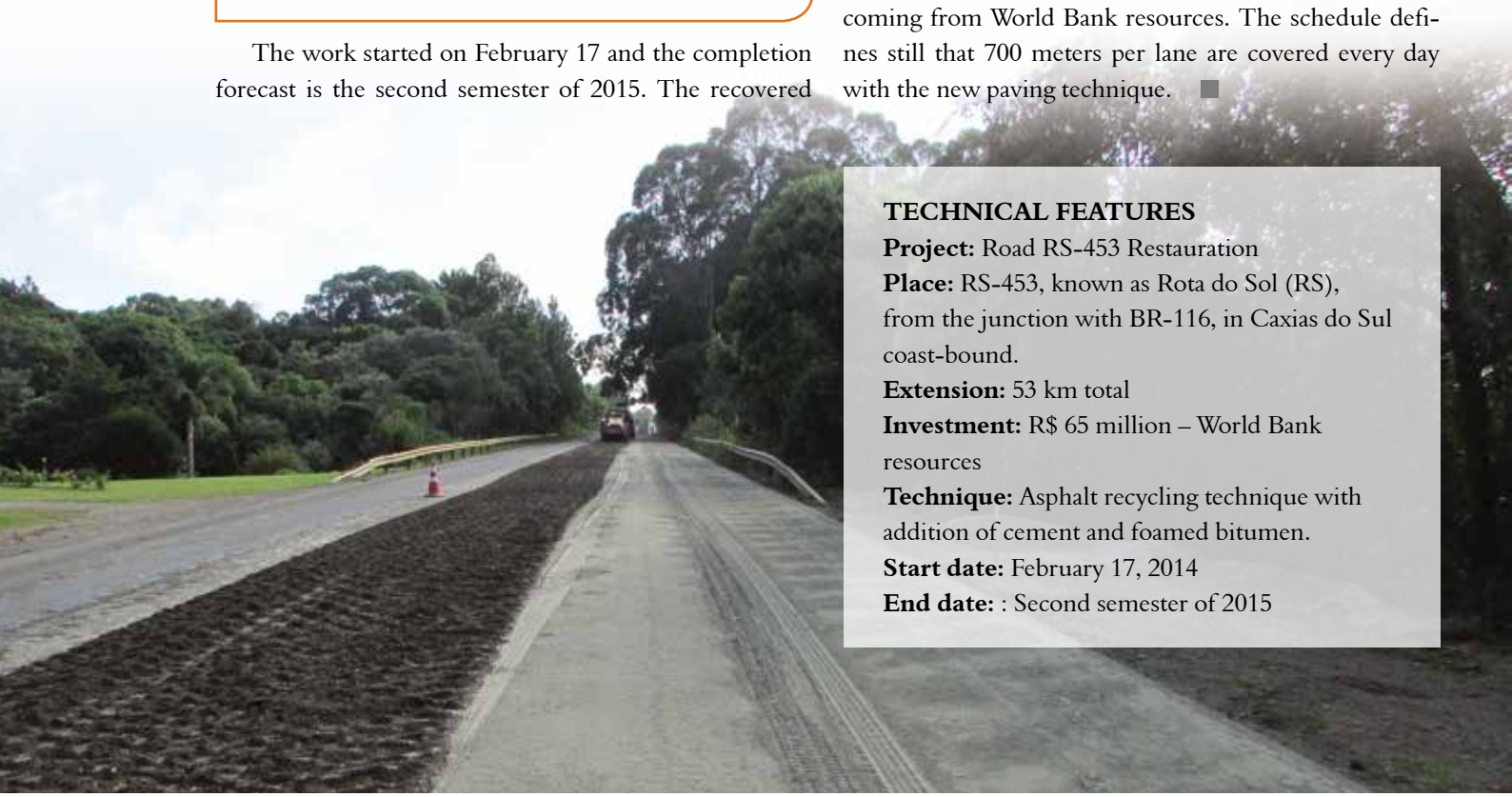
Wirtgen recyclers can be configured with a special bar for the production of foamed bitumen, which makes the right combination of air, water, and HMA to make up the foam. Inside the recycling chamber, the pavement is cut, milled, mixed with cement and foam, and the whole material is homogenized.

Still, according to Bibiano Ferraz, this technique ensures better resistance and flexibility to the base. "The technique used consists of the cold recycling of the existing asphalt layer and part of the base course with incorporation of expanded asphalt (foamed bitumen), plus the addition of Portland CP II cement, resulting in the composition of a new reinforced base course. After this process, a new wearing course is applied", he explains.

The work started on February 17 and the completion forecast is the second semester of 2015. The recovered stretch is of approximately 53 kilometers, from the junction of BR-116 in Caxias do Sul, coast bound.

The application of the foamed bitumen takes place inside the recycling compartment

According to DAER-RS, the work is part of a Contrato de Conserva, Restauro e Manutenção (Conservation, Restauration, and Maintenance Contract) (Crema-Serra) and there is a plan to invest approximately R$ 65 million coming from World Bank resources. The schedule defines still that 700 meters per lane are covered every day with the new paving technique. ■



TECHNICAL FEATURES

Project: Road RS-453 Restauration
Place: RS-453, known as Rota do Sol (RS), from the junction with BR-116, in Caxias do Sul coast-bound.
Extension: 53 km total
Investment: R$ 65 million – World Bank resources
Technique: Asphalt recycling technique with addition of cement and foamed bitumen.
Start date: February 17, 2014
End date: : Second semester of 2015

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TECHNICAL TIPS

NÚMBER 10

QUALITY AND ECONOMY

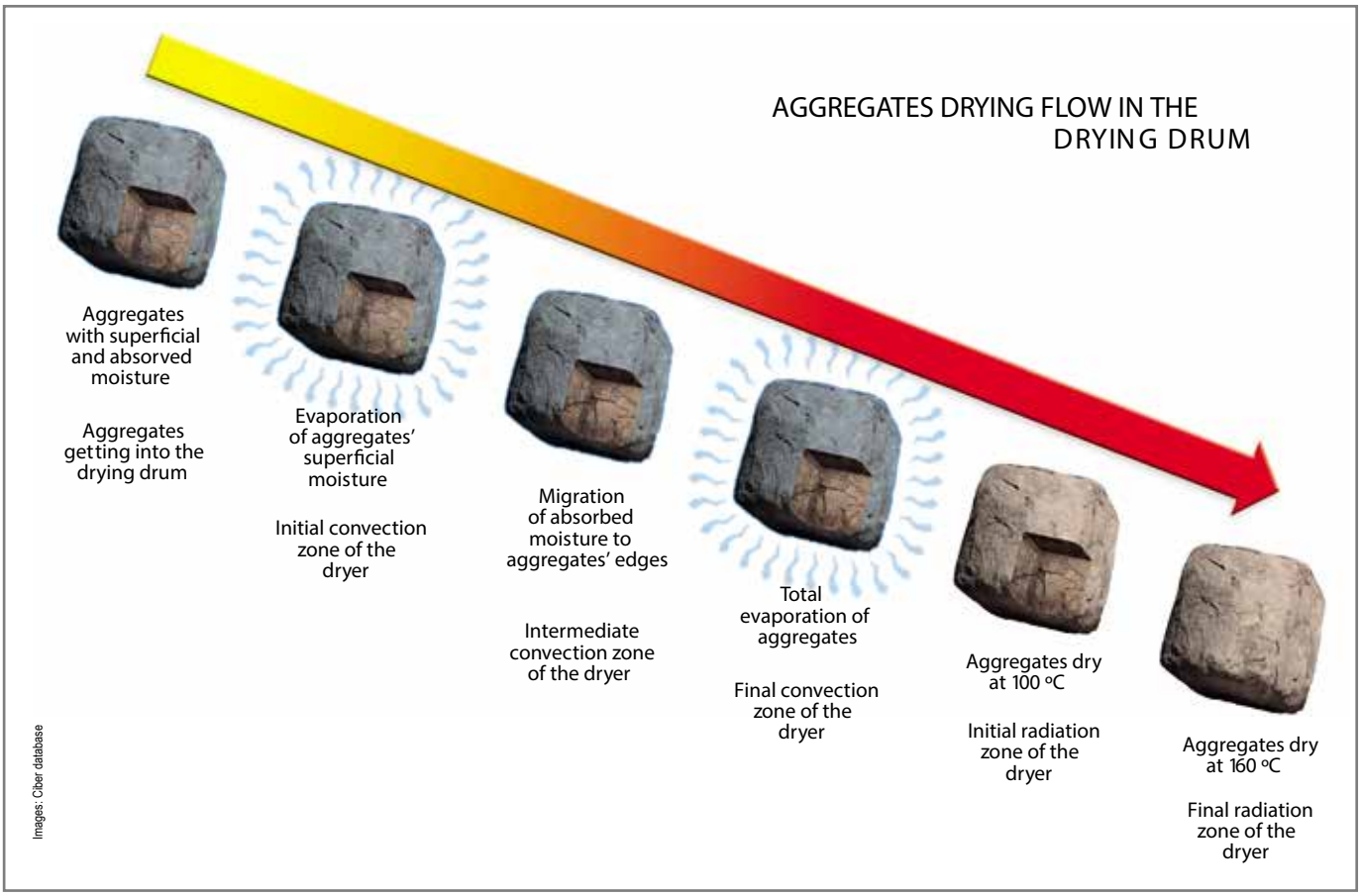
An overview on the influence of aggregates, moisture control and process adaptations

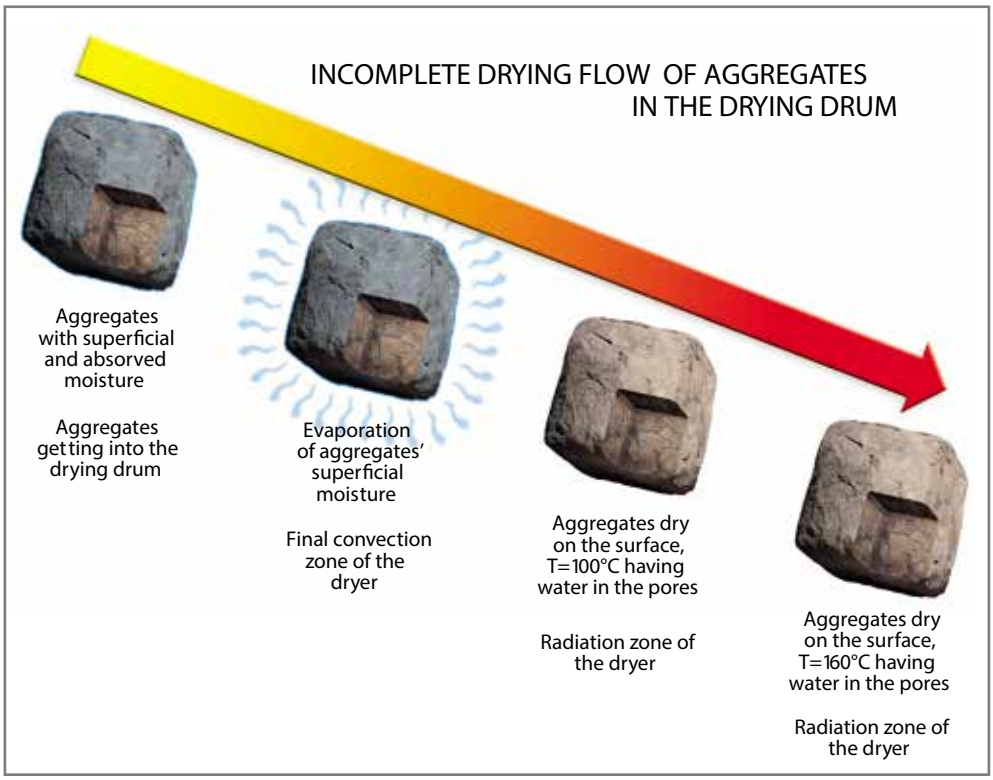
Hot Asphalt Concrete (HAC) is composed of Asphalt Cement (AC) and crushed or uncrushed aggregates (sand and stones, for example). The physical-chemical characteristics of AC basically depend on petroleum and its refinement conditions, which result in known, foreseeable characteristics. This means you know exactly what to expect from the asphalt binding agent. For their part, aggregates present specifications intrinsic to the processes of their formation, resulting from weather and other phenomena and this leads to materials with unique qualities. Aggregates have the characteristics of the minerals that make them up, so rock type can help you make some broad predictions about its physical-chemical traits, the margin of error can be great.

One of the premises for producing a HAC is to remove all the moisture from the aggregates, either on the surface and/or absorbed moist. The asphalt plant is mainly a thermal system in which one should remove all the moisture from the aggregates so that the AC's edges can be "painted." Drying is fundamental to this end, since aggregates are more attracted to water than they are to the AC. This binding agent does not adhere to the surfaces of the aggregates if there is water, degrading asphalt mixture quality.

Aggregates

Image: Ciber database


AGGREGATES DRYING FLOW IN THE DRYING DRUM
Aggregates with superficial and absorved moisture
Aggregates getting into the drying drum
Evaporation of aggregates' superficial moisture
Initial convection zone of the dryer
Migration of absorbed moisture to aggregates' edges
Intermediate convection zone of the dryer
Total evaporation of aggregates
Final convection zone of the dryer
Aggregates dry at 100 ºC
Initial radiation zone of the dryer
Aggregates dry at 160 ºC
Final radiation zone of the dryer
Images: Ciber database


INCOMPLETE DRYING FLOW OF AGGREGATES IN THE DRYING DRUM
Aggregates with superficial and absorved moisture
Aggregates getting into the drying drum
Evaporation of aggregates' superficial moisture
Final convection zone of the dryer
Aggregates dry on the surface, T=100°C having water in the pores
Radiation zone of the dryer
Aggregates dry on the surface, T=160°C having water in the pores
Radiation zone of the dryer

Regarding moisture of the aggregates, removing water trapped on the surface of the rocks is not such a tough job. Adsorption is the phenomenon that keeps water adhered to the edges of the soil/aggregates, which is why there is no such thing as dry rocky material in nature. For its part, absorption is the quantity of water an aggregate can absorb in its pores when immersed in water. Removing absorbed water is much more complex and time-consuming. In addition, after removing the water absorbed by the aggregates, the AC enters partially in the water-free pores (not fully, because AC is more viscous than water) and the greater an aggregate's absorption, the greater its absorption of AC during mixing, meaning the mixture will consume more AC in the HAC, making the mixture more expensive but with no added benefits.

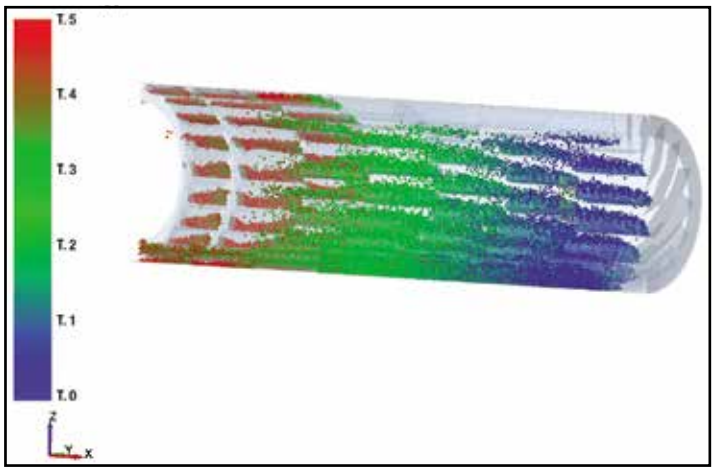
One of the characteristics of rocks that makes drying difficult, especially absorbed water, is the presence of clayish minerals, especially if the minerals belong to the smectite group. These clayish minerals retain water in their structure and this retained water becomes more viscous, making flow more difficult. One should also take aggregate pore geometry into account. The smaller the pores where the water penetrates, the longer the path for water to exit, making the drying process more difficult.

The type of rock used as an aggregate has a slight influence on its behavior with moisture. Rocks like granite and gneiss tend to present more clayish minerals, while rocks like basalt can also feature clayish minerals, although usually in smaller quantities. In general, basalt is more porous than granite and gneiss. In addition, un-crushed aggregates from rivers like sand and rolled stones have a great capacity for absorbing water and roundish shapes, and this is prejudicial to the asphalt mixture as a result of their reduced resistance to shearing and tendency to deform permanently.

Adherence between aggregates and the AC completely depends on drying of the aggregates, as well as their surface polarity, resulting from the minerals that make them up. Granite and gneiss aggregates are negatively charged on their surface (they are acid) and basalt and limestone are positively charged (or alkaline). An alternative to correct granite and gneiss acidity is to add hydrated lime originating from calcite. Also referred to as filler, this lime reverses the surface polarity of acidic aggregates and improves its ability to adhere to the AC, since it is slightly acid.

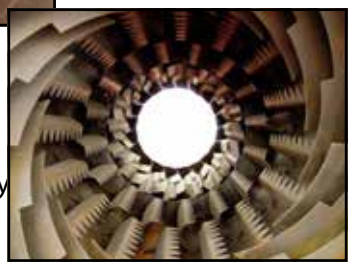
The plant should be set to work according to the characteristics of the materials used to produce the HAC. More porous aggregates should spend more time in the thermal system, while acid aggregates should be heated more than alkaline ones. The variations of these characteristics should be understood by the asphalt plant, which should compile these variations to produce known asphalt mixtures that are adapted to use.

It is during the heat exchange, between the flame of the burner and the aggregates, that three phenomena of heat exchange take place, in different points and each of them with their own significance. The inflow of aggregates to the drum is assisted by a screw conveyor that projects them into the dryer system. At this stage the cascading process begins, and its main heat transfer mechanism is



Dryer's residency time


Dryer with 1990s technology


Dryer with 2010s technology

Images: Ciber database

the convection. Removal of moisture from the aggregates occurs in the convection zone, therefore the larger this zone is, the greater its capacity to dry aggregates. Thus, more porous aggregates should stay in the dryer's convection zone longer. The cascading blades are configurable, in order to vary convection times. In addition, it is possible to change the quantity of retention blades, deflectors that are located between two zones of cascading blades and reduce the flow speed of aggregates in the dryer. After the cascading zone there are mixed blades that provide heat exchange through convection, radiation and even conduction, since the aggregates are closer to the heat source and stay longer on the blades. At the end of the dryer there is no more cascading and the aggregates run through the lower part of the drum, receiving heat mainly by radiation, heating up the aggregates to the temperature stipulated by the project. The horizontal angle of the dryer and its spinning speed also determine the time aggregates remain in the thermal system. The lower the angle and speed, the greater the drying time and capacity, being the need to transport aggregates all along the dryer a restriction that greatly increases the time inside. The length of the dryer is also proportional to its drying capacity, regardless of heating.

After going through the entire thermal system of plant, the aggregates should be dry and the temperature set on the project. In practice, it accepts up to 0.3% residual moisture of the aggregates, but the objective is to reduce the maximum residual moisture, always seeking the total elimination.

Depending on the geometry of the pores and minerals in the cavities, the aggregates might take a long time to dry completely and at times the stone is dry on the surface, with AC adhesion occurring in the mixer even with the water temporarily confined in the pores. In these cases, at a certain point the water begins to boil inside the pores and breaks the adhesive bond with the AC. Dripping water will then be seen in the truck right after mixing and/or during application. This loss of adherence not only harms mixture cohesiveness, as it also reduces the volume of spaces within the mixture, since the portion of AC that would be absorbed in the pores of the aggregates isn't absorbed, leaving more AC in the mix, and this reduces the volume of spaces. In these cases, aggregates should stay longer in the initial zone of the dryer, where heat exchange by convection occurs. If this adaptation is not enough, you should think about changing your aggregates and avoid both plants with parallel flow dryers and those with internal mixing, even the counterflow types. These technologies are less efficient at removing moisture from the aggregates. This is common when working with river sand or with aggregates that have a high absorption rate and a large quantity of clayish minerals from the smectite group.

When working with acidic aggregates with high absorption and no lime originating from calcite is available, it is common to use agents to improve adherence. Normally referred to as Dope, this aggregate reduces AC surface tension and thereby improves adherence even with slightly moist aggregates. The type of AC can also help in adherence. More viscous asphalt cement increases the thickness of the binding film around the edges of the aggregates, which improves mixture cohesion. Recent techniques such as Warm Mix Asphalt (WMA) or warm mixtures also make adhesion possible with slightly moist aggregates.

Regardless of the material choice, the aggregates available on the site should always be stored in a covered location, especially the finer ones, since they have a larger surface area and retain a greater percentage of moisture. When aggregates are porous and contain the clayish materials, coverage becomes even more essential. The productivity of an asphalt plant is inversely proportional to the humidity of the aggregates. Therefore, the lower the moisture, the lower the plant's fuel consumption will be, in addition to the benefits related to mixture quality. Fuel savings achieved through aggregate's coverage and setting up a proper storage location, for example, will easily pay off their own investment in a few months and lead to financial returns. For more information, visit our website www. ciber.com.br.