



HRVATSKO ASFALTERSKO DRUŠTVO



CROATIAN ASPHALT ASSOCIATION

ASPHALT 4.0  
ASFALT 4.0  
JUAN JOSE POTTI, ASEFMA



MEĐUNARODNI SEMINAR ASFALJNI KOLNICI 2021  
INTERNATIONAL SEMINAR ASPHALT PAVEMENTS 2021

OPATIJA, 30.09. – 01.10. 2021.

## TOPICS

- ▶ Asphalt 4.0 definition
- ▶ The world 125 years ago
- ▶ Asphalt 4.0 in our activity
- ▶ General reflexion
- ▶ Conclussions

## ASPHALT 4.0 DEFINITION

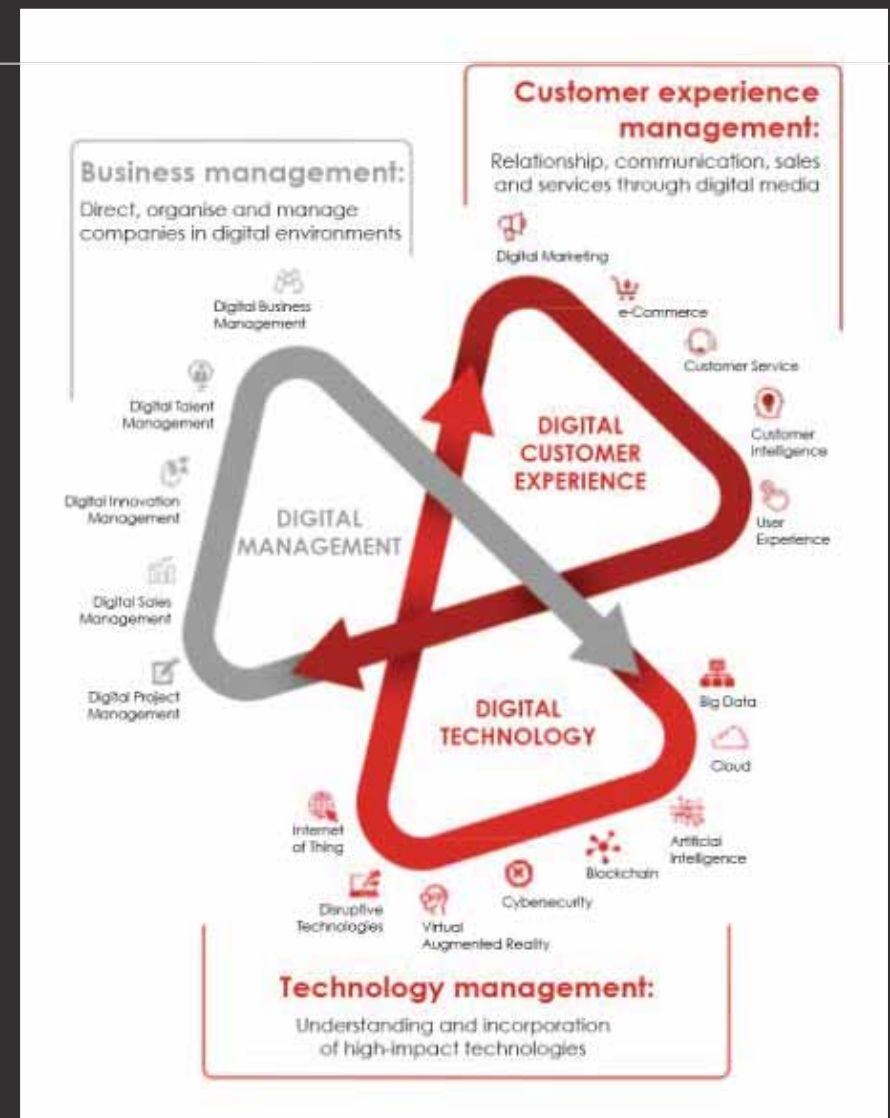


## ASPHALT 4.0 DEFINITION

- ▶ <https://eapa.org/asphalt-40/>
- ▶ What is Asphalt 4.0?
  - ▶ Digital transformation of road paving, also known as Asphalt 4.0, refers to a series of smart and autonomous systems fueled by big data, machine learning, artificial intelligence, blockchain, internet of things (IoT), etc.. with capacity to significantly push forward the efficiency, productivity, quality, reliability and sustainability of asphalt roads

## ASPHALT 4.0 DEFINITION

- ▶ <https://eapa.org/asphalt-40/>
- ▶ What is Asphalt 4.0?
  - ▶ Digital technologies,
  - ▶ smart management system,
  - ▶ customer experience



## 125 YEARS AGO....



CULTURA  
DIGITAL

ÉSTAS IMÁGENES  
TIENEN 125 AÑOS DE  
ANTIGÜEDAD

## EASTER PARADE ON FIFTH AVENUE, NEW YORK CITY, 1905



# Initial requests

- In the past:
- Dust





# Actual requests (customers)

- Security
- Confort



# Future requests *customers*

- Mobility  
SMART



# GOOGLE CAR



## **EEUU reconoce a los ordenadores de Google como conductores**

La Agencia Nacional de Seguridad de Tráfico dice que el sistema de inteligencia artificial que pilota los coches autónomos de Google podría considerarse un conductor.

# APPLE CAR

JAVIER LÓPEZ TAZÓN | Madrid

 @twazonJLT

ACTUALIZADO 12/01/2016 17:23

Como quien no quiere la cosa, Elon Musk ha confirmado el rumor y ha calificado como "secreto a voces" que **Apple está desarrollando un coche eléctrico**.

Apple ha ido fichando ingenieros de Samsung, Volkswagen, Chrysler, General Motors, Ford y la propia Tesla. Así es fácil que Elon Musk dijera: **"Es bastante difícil ocultar algo si tú contratas miles de ingenieros para hacer ese algo"**. "Apple va en serio".

## PROJECT TITAN

El coche eléctrico de Apple



- Project TITAN before 2024

# PORSCHE TAYCAN



- Full electric, more than 600 CV (2020)

# ELECTRIC CAR CHARGING LANES

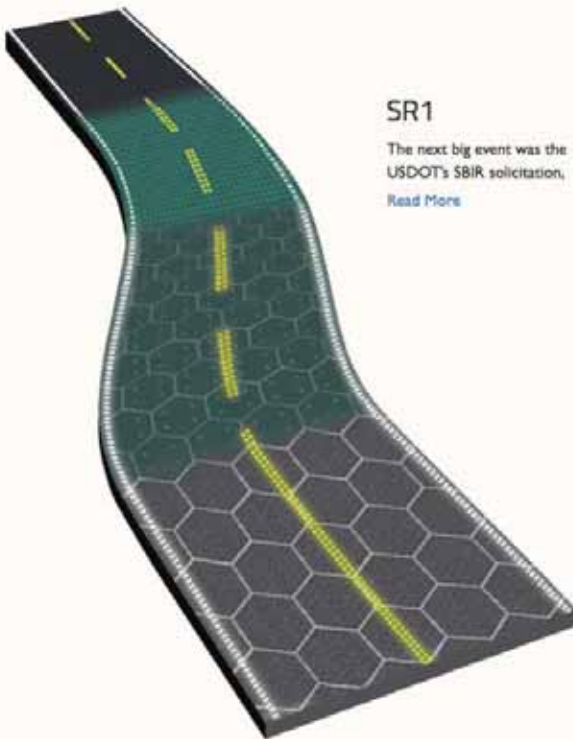


# SOLAR ROADWAYS

<http://solarroadways.com>

**Concept Phase:**  
The Solar Roadways® journey began on an ordinary day, as  
[Read More](#)

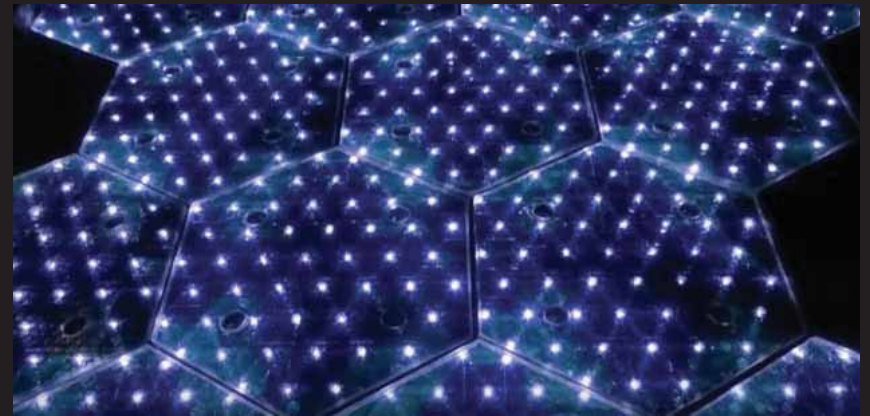
**SR2**  
We were awarded a 2-year \$750,000 Phase II SBIR  
[Read More](#)



**SR1**  
The next big event was the USDOT's SBIR solicitation,  
[Read More](#)

**SR3**  
At the end of our Phase II contract, we were invited back  
[Read More](#)

<https://youtu.be/qITA3rnpqzU>



<https://www.youtube.com/watch?v=PVIijwullxY>



- Energy and road safety

# SCALEXTRIC ON THE ROADS

The screenshot shows the top navigation bar of the eRoadArlanda website. The logo 'eRoadArlanda' is on the left. A green button labeled 'About the project' is highlighted. Other navigation links include 'Why e-roads?', 'The technology', 'Press and media', and 'Contact' with a Swedish flag icon.

The main content area is split into two sections. The left section features an aerial photograph of a road winding through a forested area, with the text 'Roads of the future – electrified roads' overlaid in white. The right section features a close-up photograph of a road surface with embedded charging cables, with the text 'Vehicles are recharged while driven' overlaid in black.



# CONNECTED CAR



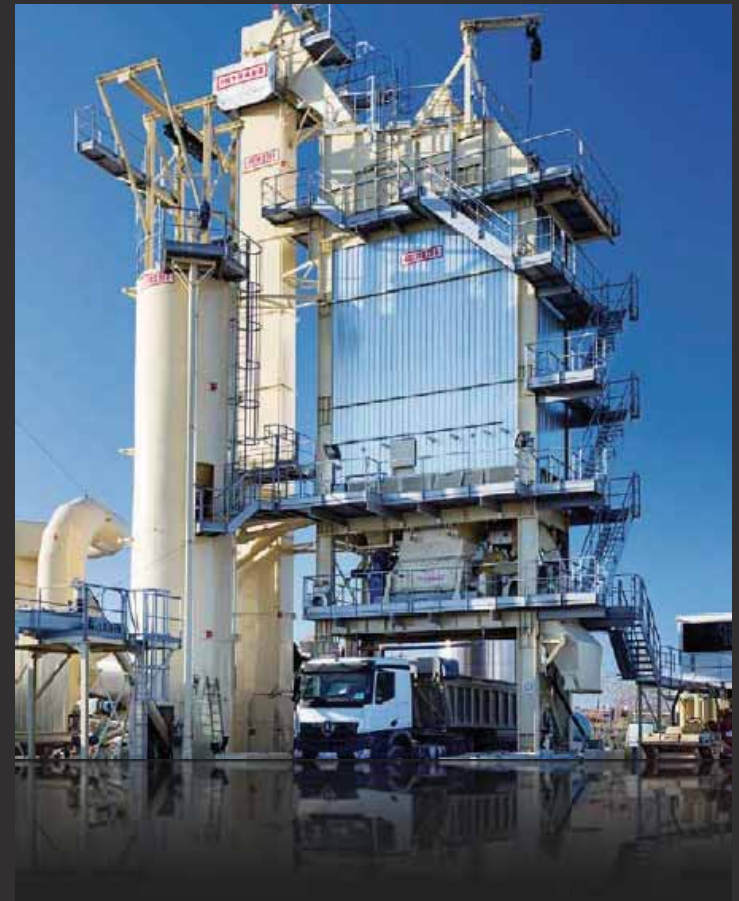
## ASPHALT 4.0 IN OUR ACTIVITY

- ▶ Consisting in the digital transformation to the paving activity, in all its stages:
  - ▶ Manufacturing, Transportation, Laying, Compaction and Total Control of the process
  - ▶ All this would correspond only to the Technology Management of the Paving Process



## ASFALTO 4.0 APLICADO A LAS PLANTAS DE PRODUCCIÓN DE MEZCLAS

- ▶ Factory Production Control or FPC (EN 13108-21), according to the FPC procedure
- ▶ A constant and homogeneous production allows constant properties of the mixture, both in terms of its final characteristics and its workability during commissioning



# ASFALTO 4.0 APLICADO AL TRANSPORTE DE LA MEZCLA ASFÁLTICA

- ▶ GIS monitoring of the Production supply from the Bituminous Mixture Manufacturing Plant
- ▶ From a tablet or smartphone, real-time control of the supply from the plant to the construction site is carried out



## ASPHALT 4.0 APPLIED TO THE LAYING OF THE ASPHALT MIX



**Figura 2.** Los sistemas de control de las extendedoras, apoyados en distintos sensores, varían enormemente en su complejidad y resultan muy útiles en la fase de ejecución.

- ▶ The paver's own control systems, sensors (thermal, weather station, GIS, etc.) and IoT technology allow this stage to be transformed

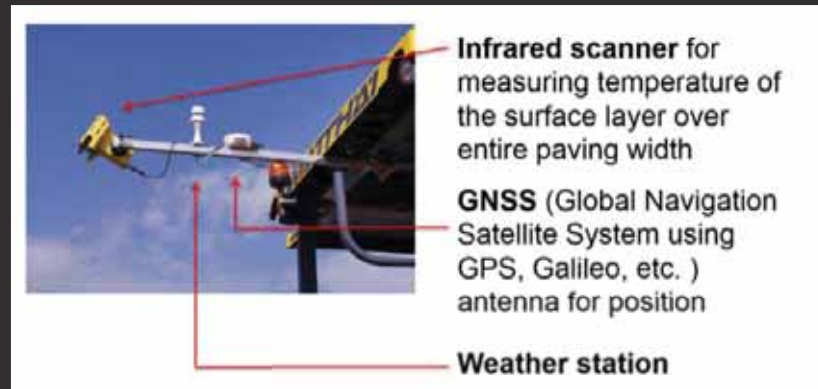
## ASPHALT 4.0 APPLIED TO THE LAYING OF THE ASPHALT MIX



- ▶ Stops can lead to uneven temperatures, material segregation, and ultimately an uneven surface. The Material Transfer Vehicle (MTV) or "transfer" can help minimize these stops and starts, and avoid thermal segregation.

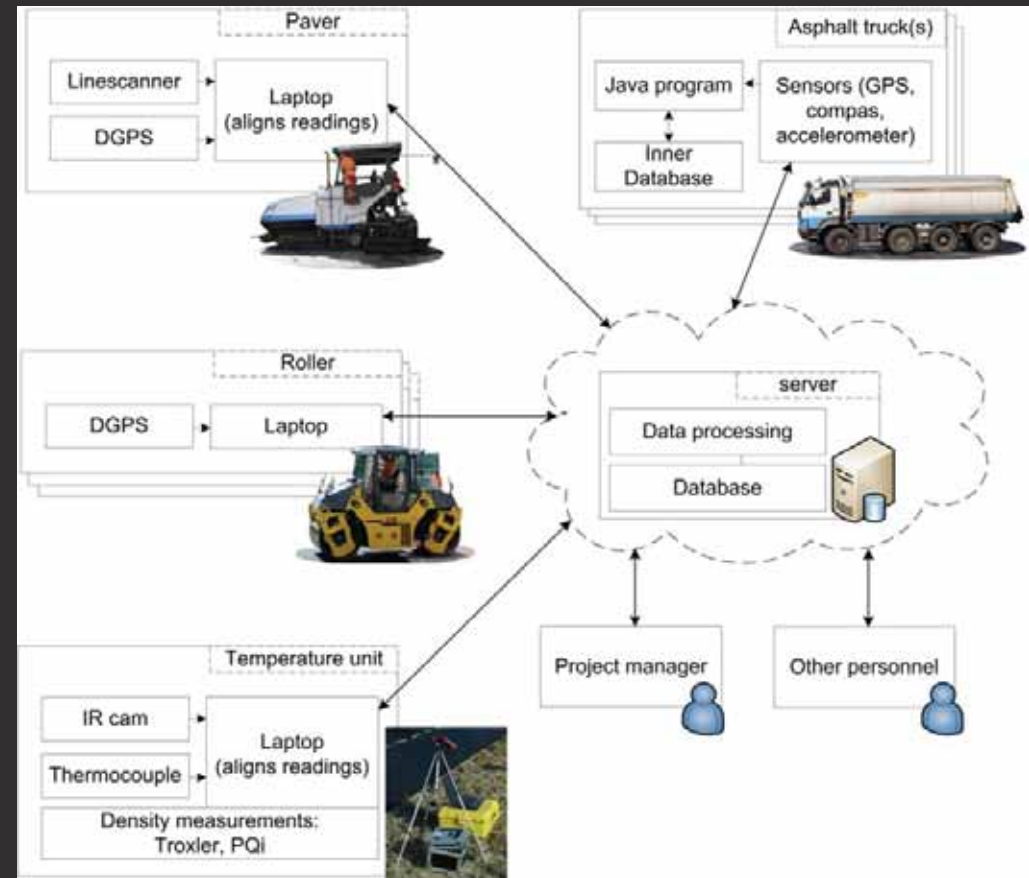
## ASPHALT 4.0 APPLIED TO THE LAYING OF THE ASPHALT MIX

- ▶ The position of the paver ruler is remotely measured
  - ▶ Project data is compared to the actual position of the rule
  - ▶ Deviations between design and actual position are adjusted by the leveling adjuster. This adds accuracy and flexibility to 3D technology and also allows paving with variable depth and slope based on 3D design
- ▶ 3D technology eliminates the use of reference wires



## ASPHALT 4.0 APPLIED TO DIGITAL DATA MANAGEMENT

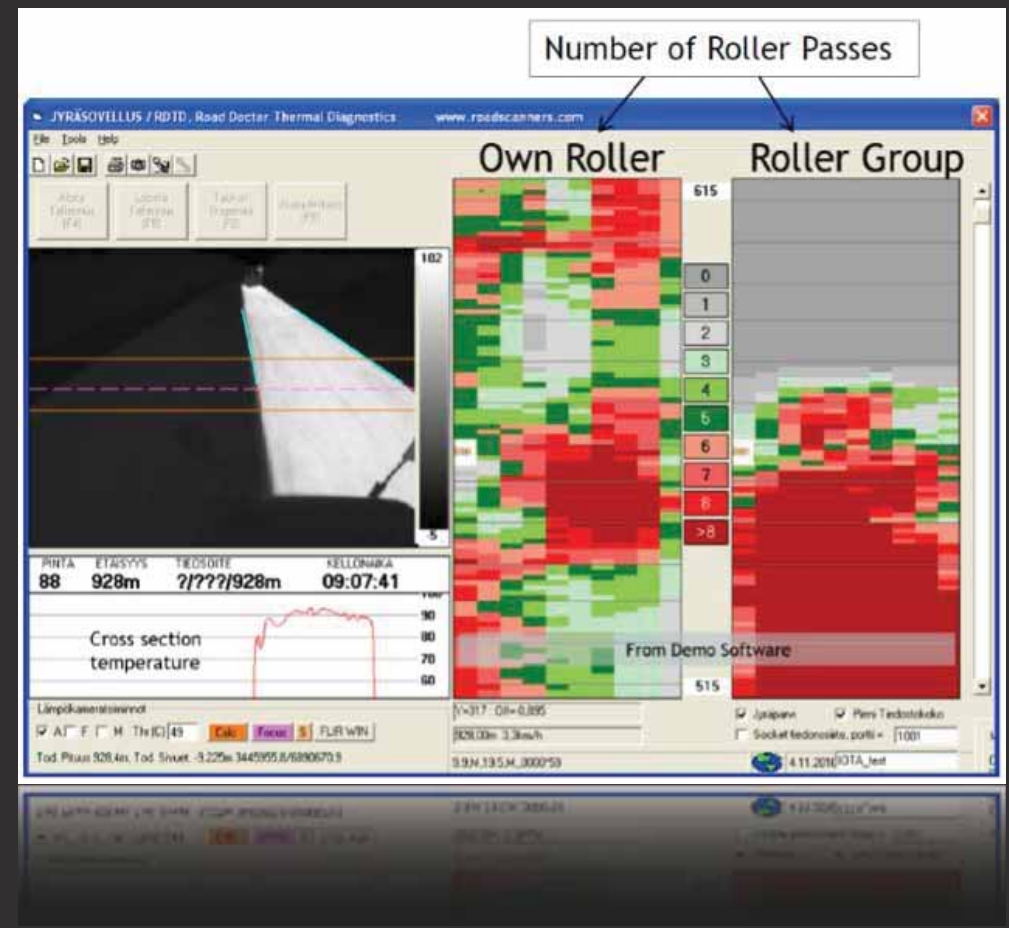
- ▶ Thanks to the possibilities of integrating the digital information offered by each of the mechanical elements and the sensors mentioned before, it is possible to store many data that can be used at a later stage to analyze the paving process as a whole





## ASPHALT 4.0 APPLIED TO THE COMPACTION PROCESS

- ▶ Today it is possible to send the data from the paver's temperature scanner to the compaction roller
- ▶ In this way, the temperature of the asphalt mix behind the compaction roller can be known. When the roller driver knows the right temperature range to compact the asphalt mix, he can adjust his compaction system

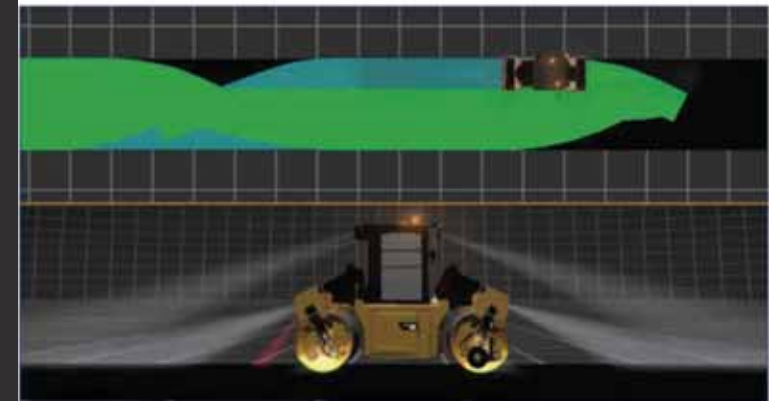


## ASPHALT 4.0 APPLIED TO THE COMPACTION PROCESS

- ▶ The objective of compaction is to achieve the adequate void content so that the characteristics of the bituminous mixture correspond to what was established in the design stage
- ▶ Only with an excellent homogeneity / uniformity of the extended bituminous mixture, homogeneous final characteristics could be obtained

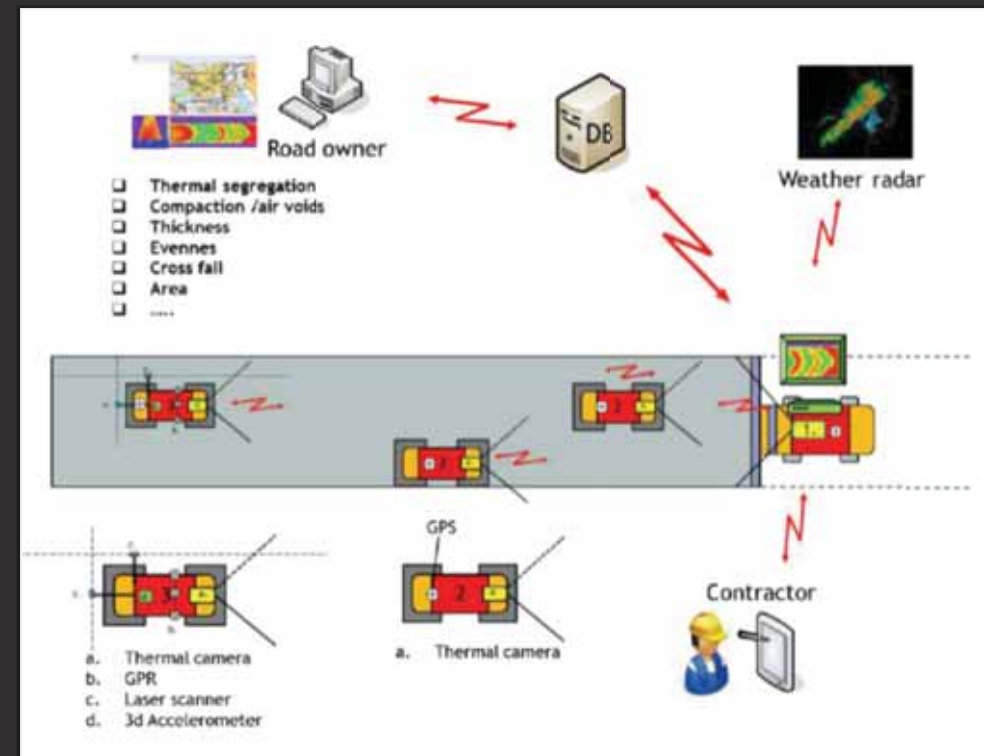


Figura 6. La homogeneidad de la mezcla extendida afecta de manera muy directa a la vida útil del pavimento.

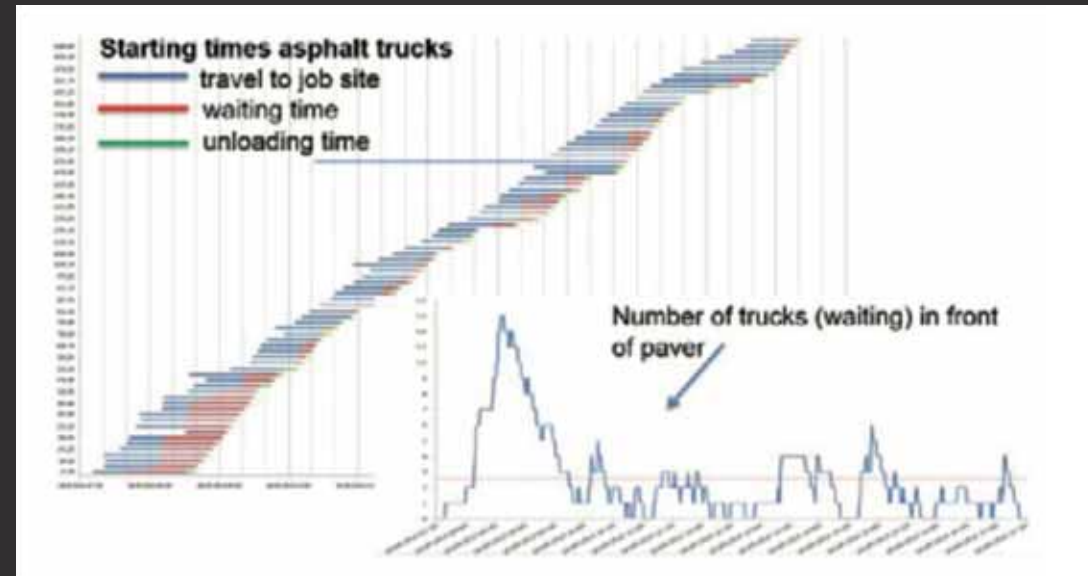
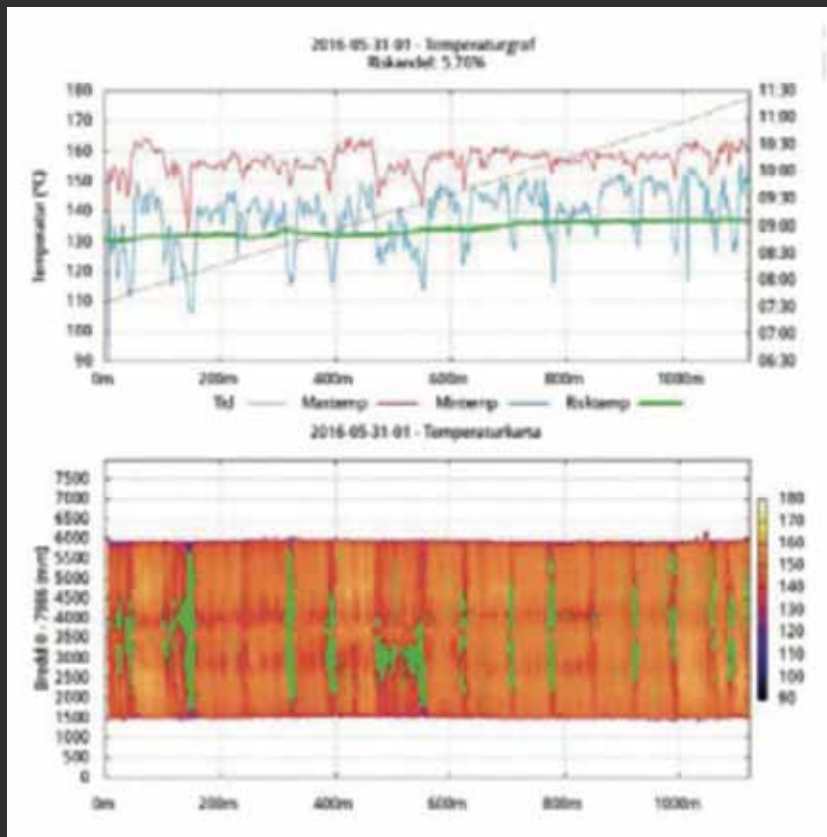


## ASPHALT 4.0 APPLIED TO THE COMPACTION PROCESS

- ▶ A Continuous Compaction Control System (SCCC) can help the compaction roller driver but cannot replace their knowledge.
- ▶ This is why having the right staff is so important
  - ▶ Paving sector need specialized workers

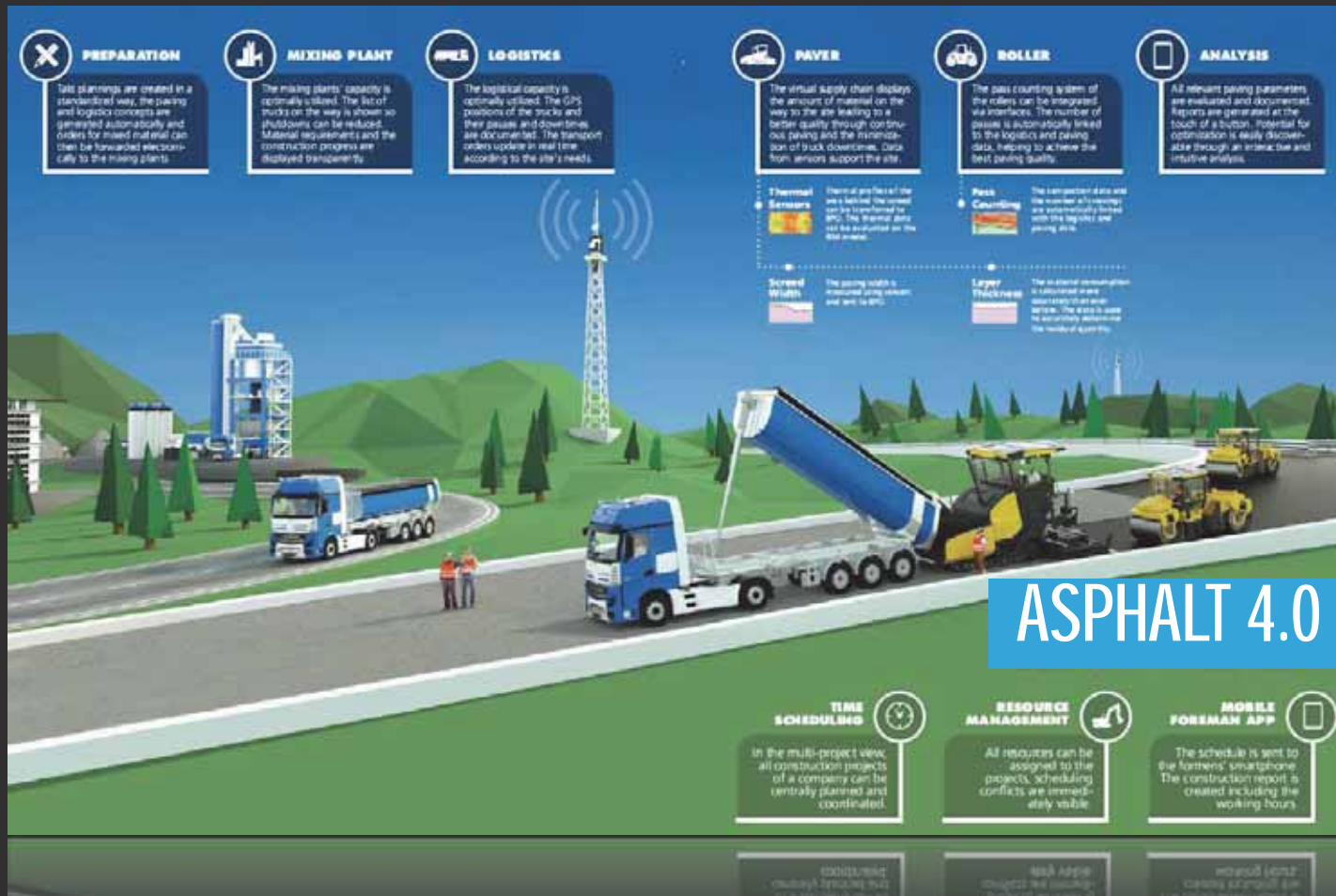


# ASPHALT 4.0 APPLIED TO THE COMPACTION PROCESS



- ▶ All the data of each machine can be recorded (quantities supplied, number of loads, unloading times, etc.) and can be used to check if the material was delivered at the scheduled time and in the correct place. Also, these data can be used to improve calculation and planning tools

# ASPHALT 4.0 APPLIED TO THE PAVING PROCESS



# ASPHALT 4.0 APPLIED TO THE PAVING PROCESS

ASPHALT 4.0

## PLANNING

BPO ASPHALT standardizes the planning of construction sites. The basis for process optimization is created by a clearly defined process of work preparation similar to a checklist. With BPO ASPHALT this is as simple as it is intuitive.

In the **project planning**, the geometry is determined using the integrated CAD module and the masses are calculated. The construction sequence is then defined and the individual construction sections are assigned to the respective days. Changes can easily be entered in just a few moments, on the go.

In the **logistics planning**, the daily mix requirements are calculated. This results in the necessary number of trucks. The loads are optimally matched to the demands of the site process and time specifications for mixing plants and each truck driver are created. This minimizes waiting times for trucks and the construction site in advance.

The results are bundled in the paving and logistics concept, material orders as well as loading and unloading lists. These target values serve as the basis for the target-actual comparison in the real-time system.

## REAL TIME



**TARGET-ACTUAL COMPARISON**

During the paving process, actual data is compared to target data in real-time and displayed clearly for site managers and farmers.



**LOCATING TRUCKS WITH GPS**

The trucks can be easily localized either via the free app "BPO Live" or via an interface connected to a fleet management system.



**WEIGHING SYSTEM**

The interface connection between BPO and the weighing system automatically transfers all parties on the note data from the delivery notes. The interface is easy to set up.



**TEMPERATURES**

Temperatures can be obtained for every delivery note. An interface connection to the thermography stations integration and evaluation of the thermal profile.



**PASS COUNTING SYSTEM**

The roller passes can be assigned to each section in the data model (BIM). Via GPS it is clear how much and which delivery note is compacted and how hot the asphalt was.



**ELECTRONIC DELIVERY SYSTEM**

The signature is digitally captured on site with BPO and sent to BPO Materials to generate the delivery note in real time. All relevant data is included and ready for weighing.



**REAL-TIME NETWORK**

Weighing bridge, truck logistics and sites are connected in real-time, to guarantee better controlling and the ability to intervene in time.



**CONSTRUCTION DIARY**

Samples, temperatures or progress can be documented in the construction diary. For the analysis, all of the data will be assigned to the delivery notes.



**QR CODE**

If there is no existing interface connecting the weighing bridge, all necessary data can be gathered through the QR code on the delivery note and transferred to BPO.



**PAVING VARIETIES**

BPO Asphalt supports all paving varieties. Regardless of whether you are working with a paver, by hand in small sites, hot or hot paving or compact asphalt.



**SENSOR DATA**

Sensor data can be integrated into BPO, as well as the width of the screed and the layer thickness measurements. Blawieplay is also integrated in BPO. All data can be evaluated digitally.



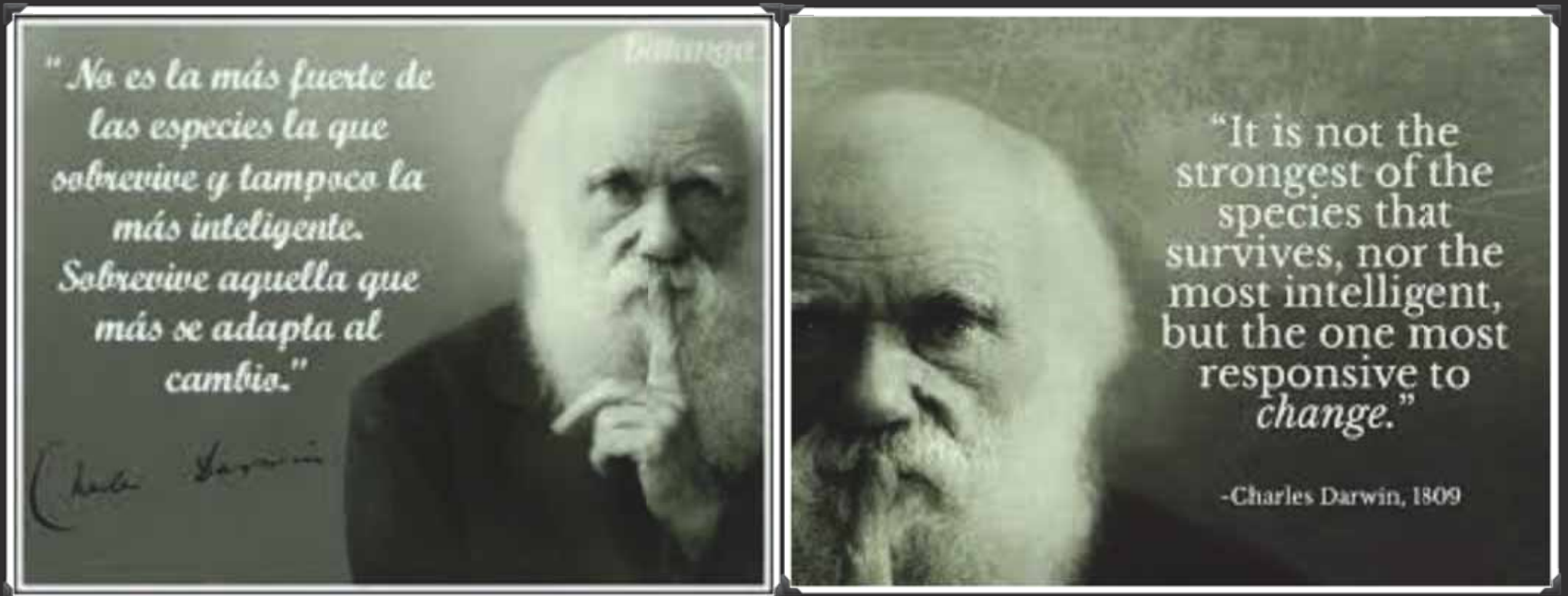
**INDIVIDUALLY EXPANDABLE**

Do you have further ideas or requests for your system? This is not a problem! BPO is individually expandable and can be customized to fit the needs of each client specifically.



www.bpo-materials.com  
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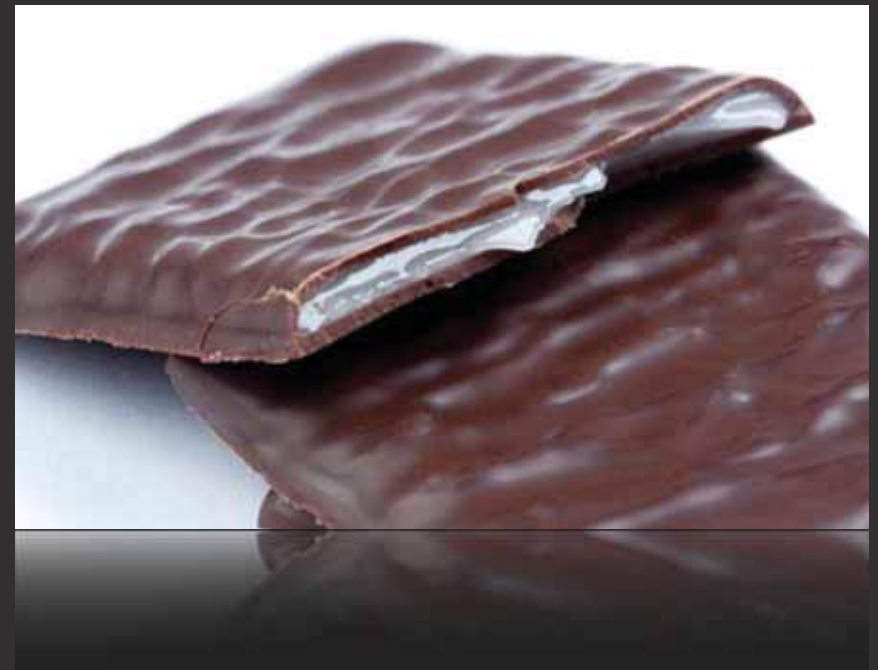
## GENERAL REFLECTION



@jjpotti  
@asefma\_es

## FINAL CONCLUSION

- ▶ We need to adapt our LIVES <> VIDAS:
  - ▶ Verde (Green), increased environmental sensibility
  - ▶ Innovadores (Innovative), to face the challenges
  - ▶ Digitalizados (Digitalised), without giving up the analogic way
  - ▶ Abiertos (Open) to share information to reach the citizen
  - ▶ Seguridad (Safety), road safety





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GRACIAS POR SU ATENCION!!

