Innovation in many cases is a linear combination of elements we already have.

Road safety: In-vehicle systems show the way.
INNOVATION : NANOSTRUCTURED BITUMEN

Where can we innovate in Asphalt products?

Different areas

Today 2; Chemical Additives to achieve long life pavement
FIRST ENVIRONMENTAL PAVEMENT IS A LONG LIFE PAVEMENT, A DIAMOND FOR THE ROADS
INNOVATION : NANOSTRUCTURED BITUMEN

Ditecpesa profile
WHAT IS ONE OF THE MAIN ENEMIES OF THE ROAD?
WATER, WATER AND WATER.

- WATER PENETRATION IN ASPHALT MIX
- CHEMICAL ATTACK; RAIN, ICE, SNOW AND WORST + SALT TO ELIMINATE SNOW
- DRAINABILITY OF BASE COURSE

SO LETS GO TO WORK ON IT.
INNOVATION: NANOstructured BITUMEN

Ferrovial @ferrovial · 31 ago.
Ditecpesa develops an asphalt bitumen specifically tailored to resist extreme climates. bit.ly/2b6Gbrh
• When snow and salt had been spreaded, the pavement is plenty of detached aggregates.
  ✖ ICE
  ✖ High salt concentration
  ✖ Snowplows which have blades.
  ✖ Water resistance

• It is demonstrated that the effect of spread salt on the pavements is very negative.
INNOVATION: NANOSTRUCTURED BITUMEN

• The water effect and more if the effect is made by water with salt, produce the lack of cohesion between bitumen and aggregates.

✗ Result: aggregates stripped around the pavements.

Source: Ferrovial Highways, Burgos, Spain.
• It is necessary to improve the bitumen-aggregate bonds

• A physical mix achieved by temperature and mechanic energy, due to bitumen and aggregates do not work well.

Source: Ferrovial, London, UK.
INNOVATION : NANOSTRUCTURED BITUMEN

Submit deeply by the water action pavement specimens

Conventional Bitumen

Nanostructured Bitumen
What have we improved?
INNOVATION: NANOSTRUCTURED BITUMEN

- Salt attack
- Water attack
- Ice attack

Source: Ferrovial Highways – 407 ETR, Toronto, Canada

@jjavier_garciap / @Leticia_ParraR
TODAY MAIN IDEA:

“innovation is like the branch of a tree, at the beginning you are looking for something but while you are working you find new innovations”
INNOVATION : NANOSTRUCTURED BITUMEN

• SO, working on water resistance we found **new improvements**
  • The better interaction between aggregate – bitumen, the better compaction.

✓ Higher density
✓ Lower period of time, to achieve the optimum density

Source: Ferrovial – Amey, UK

@jjavier_garciap / @Leticia_ParraR
INNOVATION : NANOSTRUCTURED BITUMEN

• Helps compacting in cold weather conditions and improving asphalt properties.
• Same quality and way of working as with conventional bitumen.
• Improved properties:
  ✓ Cohesion
  ✓ Adhesion
  ✓ Better workability
  ✓ Better Immersion – Compresion Test results (ASTM D1075)
  ✓ Better Boiling Water Test results (ASTM D3625)
✓ Boiling test (ASTM D3625)
  • AC16Surf 50/70S
INNOVATION : NANOSTRUCTURED BITUMEN

✓ Boiling test (ASTM D3625)
  • BBTM11B PMB 45/80-60

Conventional Bitumen

Nanostructured Bitumen
• Help in Challenges:

- Transport to projects: Distances are very important, with this bitumen is possible to cover longer distances or manufacture at lower temperatures with same distances.
- Compaction: It is easier to compact with this bitumen due to the compaction will be fine in less time. Are only needed less passes to compact as with a conventional bitumen.
- Salt/Ice/Water resistance: pavements life become longer, due to the better envolve bitumen-aggregate.
• M-601 Road - Navacerrada Mountain Ski port. (1880 m) 26 Octobre ´16.

• Project carry out with Nanostructured Bitumen.

• Area in Green with big slope.
• North of Spain Road, Asturias, between mountains and near the Cantabric Sea.

• Carried out under Winter conditions (22 January ´17)
✓ Immersion – Compression Test (ASTM D1075)

• AC16 Surf 50/70S
INNOVATION: NANOSTRUCTURED BITUMEN

- Compaction test:
  - Grey: Conventional
  - Yellow: Nanostructured Bitumen

- AC 16 Asphalt Mix
• A2 Highway, Zaragoza, (Spain).
• Applied June´17
✓ Immersion – Compression Test (ASTM D1075) – A2 Highway
• Developed on August, 2017, to Projects in Canada.

• Resistance of Compacted Hot Mix Asphalt (HMA) to Moisture-Induced Damage – AASHTO T 283-07 (2011)
Conclusions

✓ Specific Bitumen for extreme climate
✓ Improved properties, big resistance at salt chemical attack.
✓ Increase cash flow return.
✓ Reinforcement could be delayed in time.
✓ Compaction design is reached before.
✓ Reduction of laying times.
Other innovations
Other innovations

Liquid polymer modifies bitumen for very little applications
Other innovations

Using Plant Molecule Lignin in Bitumen

Origin of lignin: lignocellulosic material
Other innovations

Compactor density control during the compaction

[Video link: https://www.youtube.com/watch?v=gY8T-WQbA]

Real-time density mapping. Volvo exclusive.
INNOVATION: NANOSTRUCTURED BITUMEN

Many thanks
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