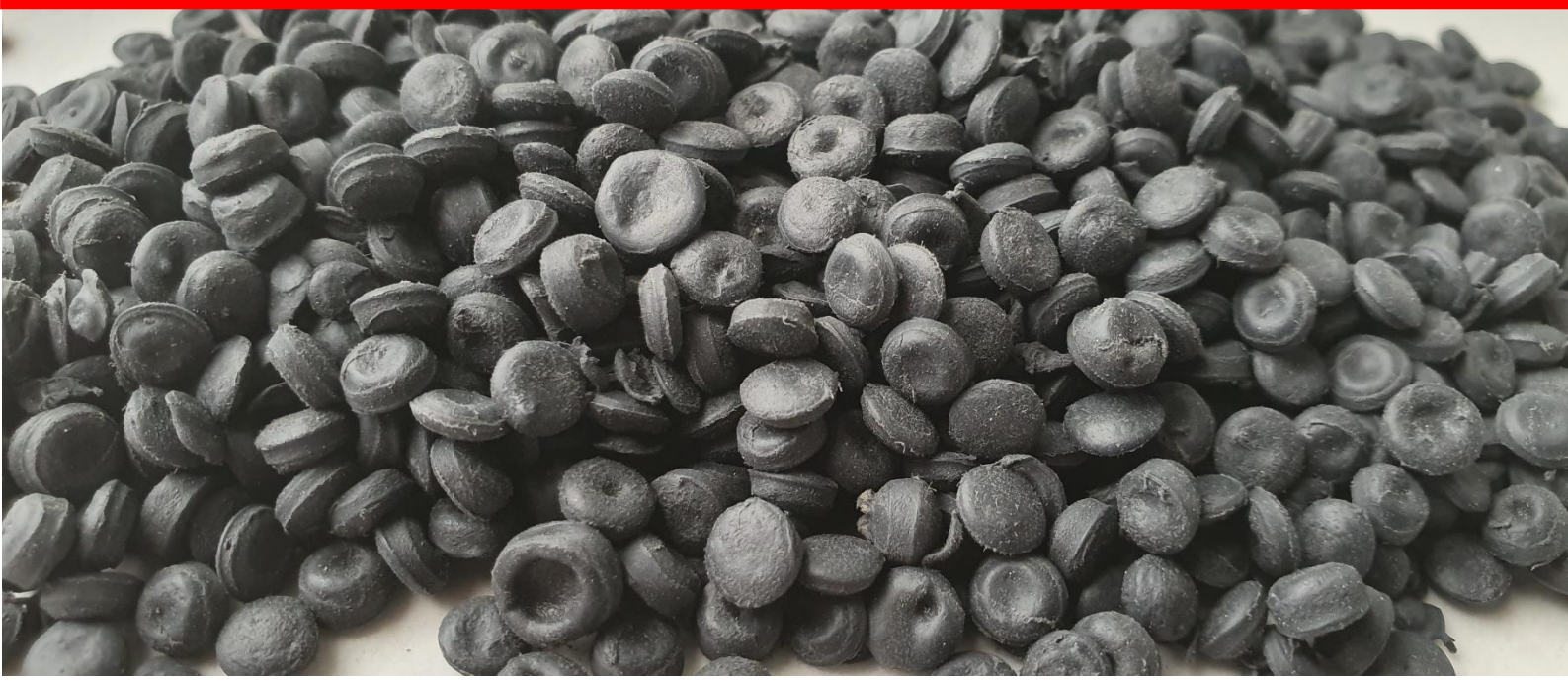
activa
Asphalt Applications

ROADPLUS P

Polymer additive that improves the mechanical performance of asphalts mixture increasing resistance to deformation



The road paving sector is constantly evolving. The increase in traffic volumes makes it necessary to use road pavements capable of maintaining safety and solidity requirements over time.

The market trend is to develop new technologies that allow the construction of road pavements, in geographic areas characterized by extreme climates, with asphalts having a longer life, better performance and higher safety standards.

At low and high temperatures, traditional bitumen can be brittle and soft, respectively. The phenomenon, associated with the dynamic stresses induced by traffic, especially intense and heavy traffic, irremediably affects the duration of a road pavement.

Improving the mechanical performance of road pavements means designing and manufacturing bituminous mixtures resistant to deformation. This can be achieved by using polymer modified bituminous binders.

DESCRIPTION

Is a granules of a compound of polymers. It is used for the road industry to improve the mechanical performance of asphalt mixture for the construction of road paving.
The use of **ROADPLUS P** enables the production of asphalts with high resistance to deformation using bitumen with penetration 35/50 or 50/70 (EN 13108-1).
ROADPLUS P is added directly into the mixer of the production plant. It can be added before, during or immediately after the addition of the bitumen.

CARATTERISTICHE CHIMICO-FISICHE	
Appearance at 25°C	: Granules
Color	: Green-Gray
Granule diameter	: 2 ÷ 5 mm
Bulk density at 25°C	: 400 ÷ 600 kg/m3
Softening Point	: 110 ÷ 130°C

ADVANTAGES

The use of **ROADPLUS P** allows obtaining:

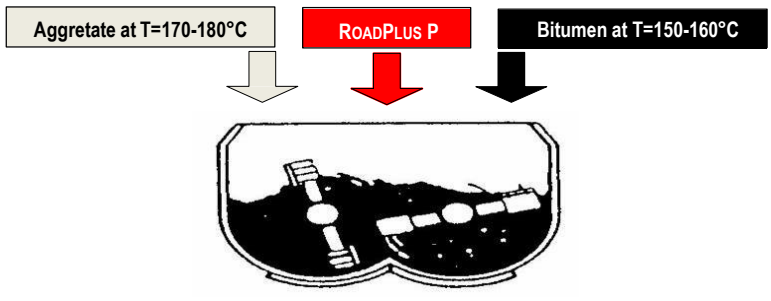
- Paving with considerable bearing capacity
- Paving with better "Resistance to Fatigue"
- Paving with high resistance to the formation of “Rutting".
- Paving with longer duration of "Useful Life".
- Possibility to reduce the thickness of the flooring by 20-30% compared to the traditional ones.

HOW TO USE

We recommended to add the aggregates mix first and immediately after the **ROADPLUS P**; after 10-15 seconds of dry mixing, the bitumen is added and mixed for about 15 seconds; then we proceed to the post-mixing phase, normally for another 10 to 15 seconds. The temperature of the aggregates must be between 170°C and 180°C, depending on the working conditions and the distance from the laying site.

DOSAGE

The dosage percentage varies according to the characteristics required to the final asphalt. The standard dosage can vary from 0,2% to 0,6% on the weight of the asphalt mixture, (equivalent from 4% to 10% on the bitumen weight).



... seconds	5-10 seconds	15 seconds	5-15 seconds
“AGGREGATES” DOSAGE	“RoadPlus P” DOSAGE	“BITUMEN” ADDITION	POST MIXING

|---------- Dry Mixing Time without bitumen ---------- | ---------- Wet Mixing time with bitumen ----------|

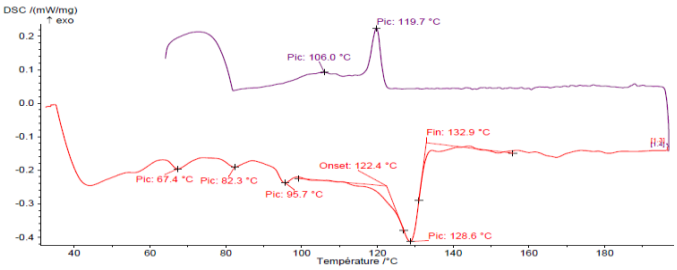
PACKAGING, STORAGE AND HANDLING

ROADPLUS P is delivered in Big-Bags (600 kg or 1.200 each) packed on wooden pallets. Can be stored for 24 months in its original sealed packaging. Stable at normal temperatures and kept in well-closed containers, covered and protected from water, at a temperature between 5°C and 30°C. It is not harmful for handling or for transport.

Laboratory Tests

Differential Scanning Calorimetry (DSC)

RoadPlus P	Softening Curve (Heating)				Solidification Curve (Cooling)	
Peak	I	II	III	IV	I	II
Temperature	71,1°C	83,6°C	95,7°C	129,2°C	119,5°C	105,3°C
	67,4°C	82,3°C	95,7°C	128,6°C	119,7°C	106,0°C
	74,8°C	84,8°C	95,7°C	129,7°C	119,3°C	104,5°C

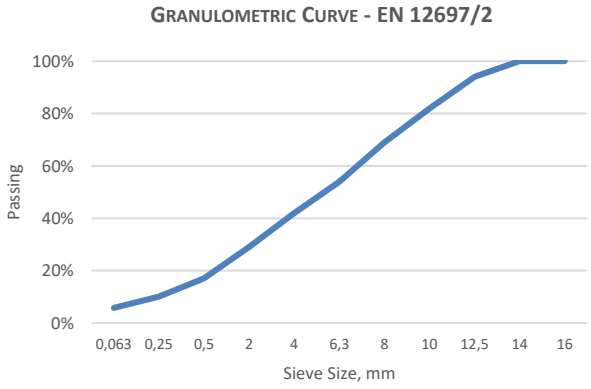


Mix Designer

Guidelines for use in the laboratory:

1. Prepare the granulometric curve relating to the aggregate mixture to be made: AC 12.
2. Heat the aggregates.
3. Add the required amount of RoadPlus P and mix for 40 - 60 seconds: 0,2%, 0,4% and 0,6% on the weight of the asphalt mixture.
4. Return the mixture to the oven until the polymer softens (preferably at least 30 minutes) and place it in the laboratory mixer.
5. Add the required amount of bitumen and mix for at least 20 - 30 seconds until the aggregates are completely covered.
6. Insert the filler at the same temperature as the aggregates and mix until completely integrated into the mixture.
7. Mix the dough for a further 5 minutes.

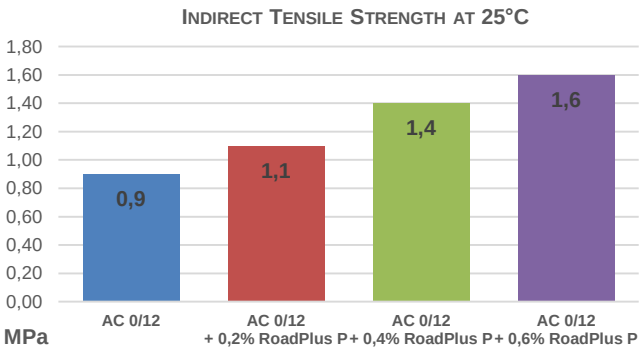
Sieve Size (mm)	Passing (%)
14	100
12.5	94
10	78
8	69
6.3	54
4	42
2	29
0,5	17
0,25	10
0,063	5,7

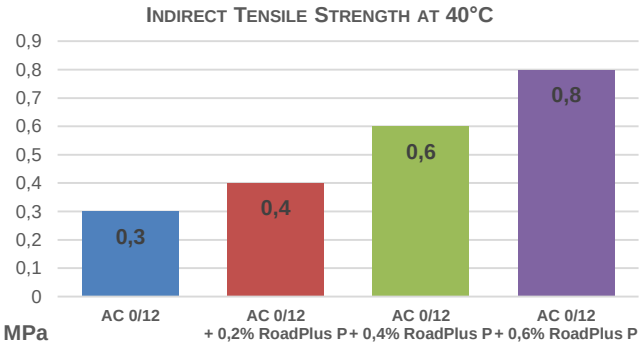


BITUMEN USED	
Characteristics	Bitumen 50/70
Penetration at 25°C	55 dmm
Softening Point	49,2°C

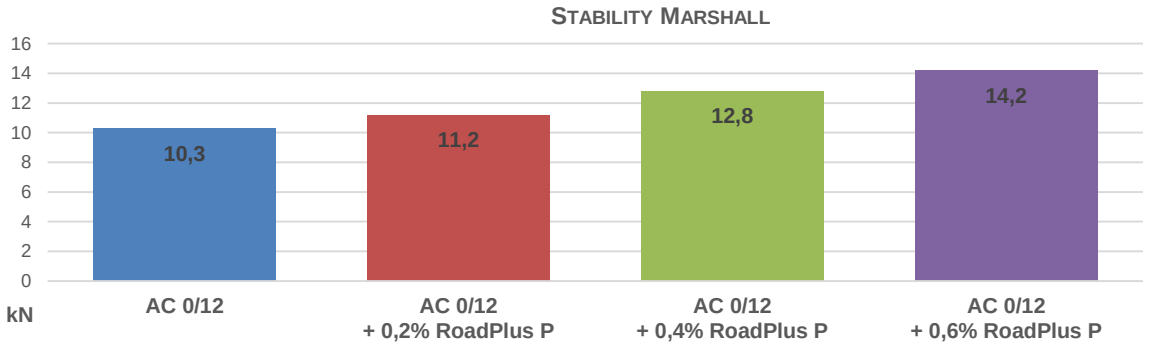
CONTENT OF BITUMEN - UNI EN 12697-1		
Mix	Weight on Aggregate (%)	Weight on Mix (%)
AC 0/12	5,1	4,8
AC 0/12 + 0,2% di RoadPlus P	5,2	4,9
AC 0/12 + 0,4% di RoadPlus P	5,1	4,9
AC 0/12 + 0,6% di RoadPlus P	5,2	4,9

INDIRECT TENSILE STRENGTH - UNI EN 12697-23							
Mix	Test Temperature	Average Height (mm)	Diameter (mm)	Load (kN)	Vertical Flow (mm)	ITS (MPa)	CTI (MPa)
AC 0/12	25°C	50	150	10.1	3.5	**0.9**	**59.2**
AC 0/12 + 0,2% di RoadPlus P	25°C	52	150	13.2	2.5	**1.1**	**103.3**
AC 0/12 + 0,4% di RoadPlus P	25°C	52	150	16.7	3.1	**1.4**	**104.8**
AC 0/12 + 0,6% di RoadPlus P	25°C	51,9	150	17.2	3.1	**1.6**	**106.7**
AC 0/12	40°C	51,9	150	3.6	2.5	**0.3**	**28.2**
AC 0/12 + 0,2% di RoadPlus P	40°C	51,8	150	5.2	2.2	**0.4**	**44.9**
AC 0/12 + 0,4% di RoadPlus P	40°C	52.6	150	6.9	2.3	**0.6**	**56.6**
AC 0/12 + 0,6% di RoadPlus P	40°C	52.4	150	6.9	2.6	**0.7**	**59.8**

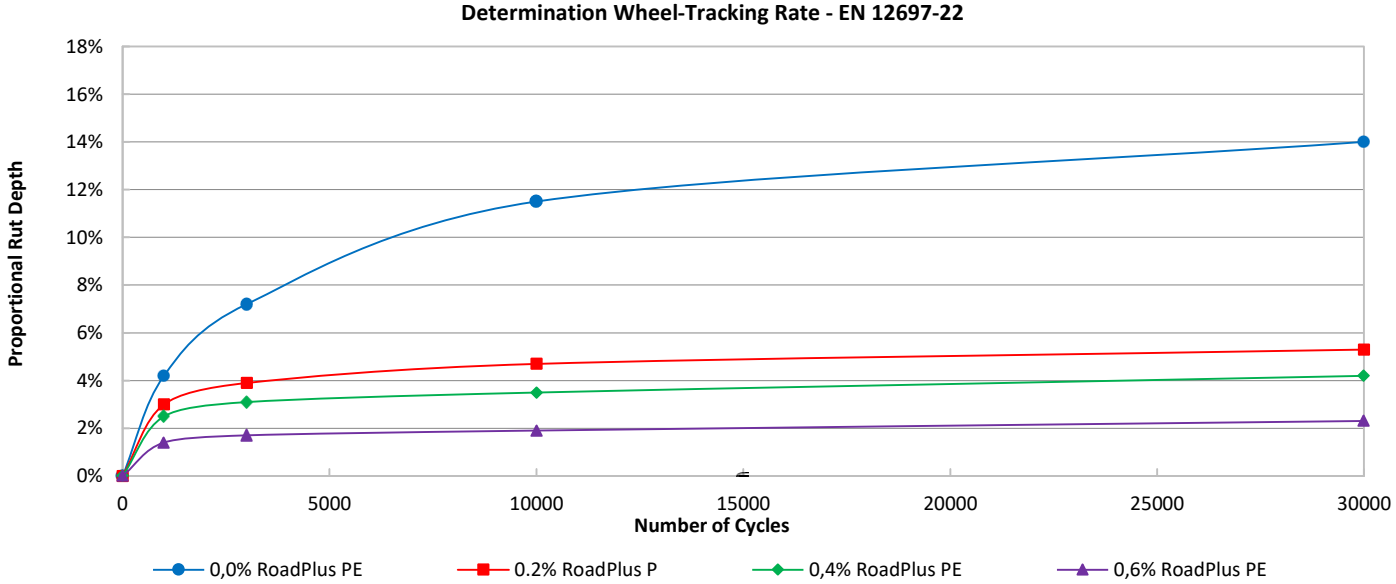




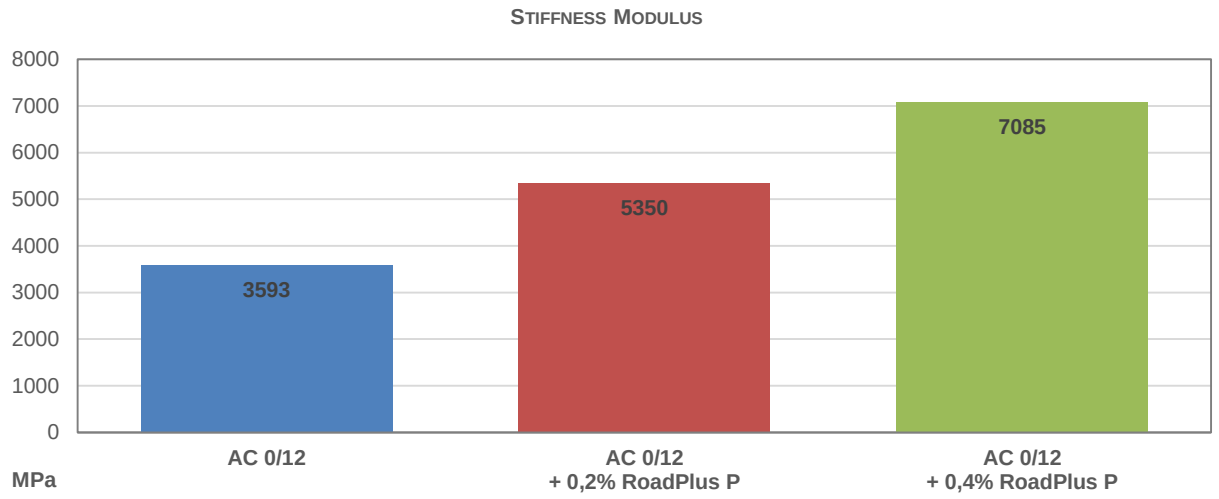
MARSHALL TEST - UNI EN 12697/34				
Mix	Average Height (mm)	Stability (KN)	Flow (mm)	Stiffness (KN/mm)
AC 0/12	64.7	10,3	3,3	3.1
AC 0/12 + 0,2% di RoadPlus P	65.8	11,2	3,4	3.3
AC 0/12 + 0,4% di RoadPlus P	63.7	13,0	3,5	3.7
AC 0/12 + 0,6% di RoadPlus P	64.8	14,2	3,6	3.9



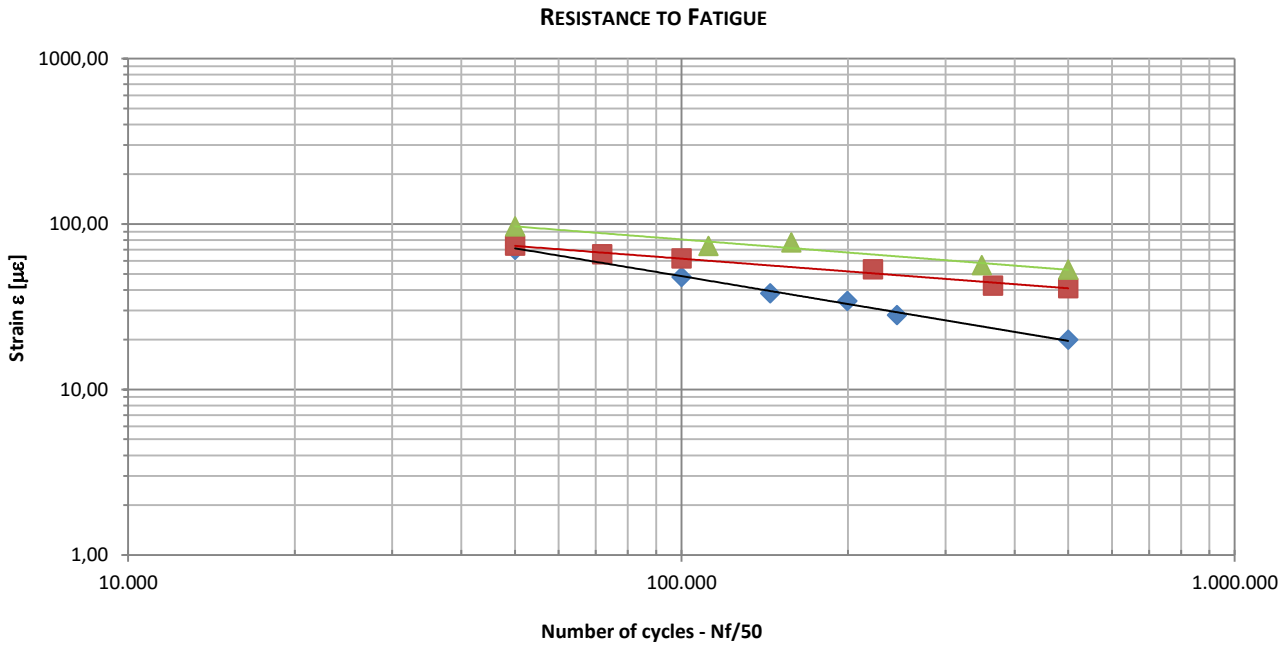
TEST METHODS FOR HOT MIX ASPHALT. WHEEL TRACKING - EN 12697-22		
Mix	Proportional rut depth at 10.000 cycles	Proportional rut depth at 30.000 cycles
AC 0/12	11.5%	14.1%
AC 0/12 + 0,2% di RoadPlus P	4.7%	5.3%
AC 0/12 + 0,4% di RoadPlus P	3.5%	4.2%
AC 0/12 + 0,6% di RoadPlus P	1.9%	2.3%



STIFFNESS IT-CY- UNI EN 12697-26, ANNEX C				
Mix	Test Temperature	Average Height	Diameter	Modulus
		(mm)	(mm)	(MPa)
AC 0/12	20°C	51,5	150	3.593
AC 0/12 + 0,2% di RoadPlus P	20°C	50,2	150	5.350
AC 0/12 + 0,4% di RoadPlus P	20°C	52,2	150	7.085



RESISTANCE TO FATIGUE UNI EN 12697-24, ANNEX E						
Mix	Test Temperature	Average Height	Diameter	Deformation corresponding at Nf/50=100 cycles, e6 [με]	Equation Trendline	
		(mm)	(mm)		y	R^2
AC 0/12	20 °C	49.5	150	13	$25669x^{-0,546}$	0,9956
AC 0/12 + 0,2% di RoadPlus P	20 °C	52	150	34	$1178.6x^{-0,256}$	0,9809
AC 0/12 + 0,4% di RoadPlus P	20 °C	51.5	150	44	$1659.1x^{-0,263}$	0,9541



ROADPLUS P is an additive to make by Activa.

Activa is an ISO 9001-2015 certified company.

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