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FICHA TÉCNICA DE PRODUCTO

RUBBER ADDITIVE (FROM NFVU END-OF-LIFE TYRES)

RARX is an environmentally friendly elastomeric additive made from recycled rubber from end-of-life tyres, which is processed and treated using a patented technology, resulting in a dry-digested rubber that directly achieves the performance of a modified asphalt mix.

Its behaviour after incorporation into the bituminous mix can be interpreted as an elastomeric additive to the asphalt, modifying and enhancing its fatigue resistance, increasing its lifespan and resistance to cracking.

®RARX can be added to any type of hot mix asphalt. During asphalt production, **RARX** is added directly to the plant's mixer or drying drum, along with the aggregates before the bitumen is incorporated, using the plant's existing silos or batching units for mineral powder and/or additives.

®RARX is a CE-marked technical additive, which guarantees its quality.

PRODUCT AND COMPANY IDENTIFICATION

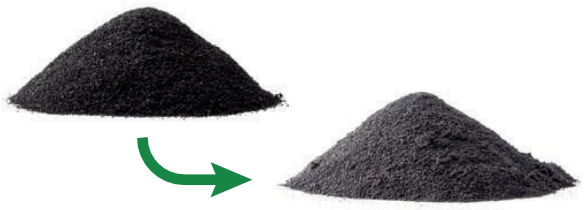
Product identification :

Product name :	®(RARX)
Material use :	NFVU elastomeric rubber additive
Company identification:	CIRTEC (Círculo Tecnológico 2020 S.L.)

GENERAL DESCRIPTION

®RARX is composed of recycled rubber powders from end-of-life tyres, bitumen, mineral products and other additives.

Physical state :	Solid, dark grey powder
Odour and appearance :	Fine-grained greyish granules.
Moisture :	<0.3‰
Bulk density:	0.6 [± 0.03] gr/cm3
Specific gravity:	1.031 gr/cm3 [± 0.03]
Flash point [°C]:	> 300 (degrees Celsius)
Solubility :	Insoluble in water
Chemical stability :	Incompatible as a strong oxidant



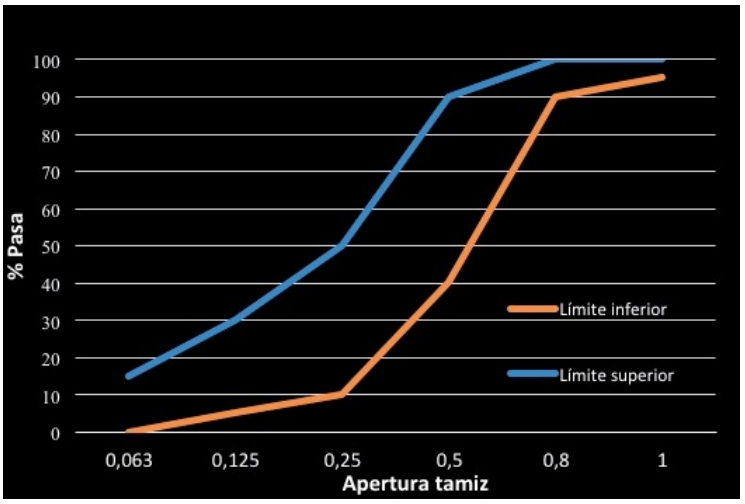
RARX Enhanced Elastomeric Asphalt Extender

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SCREEN (MM)	LOWER LIMIT (% of success)	UPPER LIMIT (% success rate)
1,000	95	100
0,800	90	100
0,500	40	90
0,250	10	50
0,125	5	30
0,063	0	



®The typical particle sizes of RARX follow the above diagram.

PRODUCT COMPOSITION

Composition to be taken into account in the working formula :

NFVU powder content :	60%
Bitumen content :	16% (±3%)
Limestone-based fillers and additives $Ca(OH)_2$:	24% (±3%)

SUPPLIES

RARX is supplied in a 0.55 t bigbag or loose in tanks with a solids delivery system for storage and working from the asphalt plant's feed silo.

STORAGE

If supplied in bigbags, keep dated bigbags in a ventilated area. Avoid direct sunlight and keep them in a dry place to avoid degradation of the bigbag.

SHELF LIFE

The product is not decadent, but it is advisable to use it within one year of the production date. If this period is exceeded, it is recommended that the product be sieved with a vibrating sieve, in order to break up any clumping that may occur as a result of prolonged storage.



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TRANSPORT

No special transport is required (no ATEX product).

ASPHALT PLANT MANAGEMENT

When handling RARX, always follow the recommendations in the product's SDS.

In any case :

®Functioning of RARX in the BIGBAG

®The RARX will be dosed in the plant according to different options, depending on the means available to the plant:

- Batch plant without solids dosing system: the bigbags are unloaded directly into the plant's filling silo. Batching is therefore automatic. The RARX allows the use of conventional filling dosing systems.
- ®Batch plant with solids addition hopper: the density of the product must be taken into account when calculating the RARX dosage. In the case of sites with high contents, the use of hoppers with pressurised distribution systems is recommended.
- Continuous installations: it is advisable to feed the mixer directly from a hopper fitted with a screw conveyor with variable speed and flow rate control. Handling bulk RARx
- ®If RARX is delivered in bulk from a tanker truck, handling in the plant is the same as for the filler and no additional means are required in the plant.

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RECOMMENDATIONS FOR THE MANUFACTURE OF BITUMINOUS MIXES

®RARX must be added in a percentage previously defined by the working formula of the bituminous mix, this value varying between 0.5% and 4.5% of the total weight of the bituminous mix, depending on the type of mix to be used. **®RARX** can be applied in different types of asphalt: rough, open, dense, thin-bed, conventional, SMA, etc.

®The exact amount of **RARX**, the mixing temperature and the minimum mixing time should be determined by a mixture formulation study prepared by an independent testing laboratory experienced in the formulation of this type of mixture.

®Once the exact percentage of **RARX** has been defined, we cannot vary this value by more than +/- 0.5%.

®For the production of asphalt mixes with **RARX**, a conventional asphalt mixing plant, in continuous or discontinuous production, will be used. ®To ensure a homogeneous mix, **RARX** is added to the mixer with the aggregates before the bitumen is added. It must be mixed for the time required to ensure homogeneous distribution with the aggregates (maximum 5 seconds, depending on the asphalt plant) before the bitumen is added.

RARX is an asphalt modifier which considerably increases the final viscosity of the asphalt. For this reason, it is recommended to use working temperature ranges similar to those used with modified bitumens, i.e. between 10 and 15 degrees above the temperature of conventional mixes. This temperature may be lower when using additives for semi-warm mixes.

It is recommended that the mix production temperature be maintained between 175ºC and 180ºC. The mixing sequence with **®RARX** can be summarised as follows:

1. Adding aggregates to the mixer
2. Addition of RARX
3. Mixing time dry, maximum 5 seconds
4. Addition of bitumen
5. Wet mixing time, maximum 20 seconds

Note: In general, in the design of asphalt mixes with tyre dust and more specifically in asphalt mixes with RARX, where RARx already provides a high quality filler, the downward adjustment of the filler in the mix should be taken into account and it is not necessary to follow the recommendations for conventional asphalt mixes with regard to the filler/bitumen ratio.

RECOMMENDATIONS FOR LAYING AND COMPACTION

The performance of mixes manufactured with a high **RARX** content is similar to that of bituminous mixes manufactured with modified and high viscosity bitumens.

During start-up, it is recommended to maintain a compaction temperature above 165°C (this temperature may be lower when using additives for semi-hot mixes). For high-grade mixes, BBTM, SMA, GAP, it is recommended to start with metal roller compactors, wetted in water containing approximately 2% hydraulic lime. For thin layers, the paver's vibration and tamper should be adjusted to prevent the screed from bouncing off the coarse aggregate in the mix. High compaction must be transferred to the mix at the front of the screed. In this way, the screed will flatten and level a mix that has already been heavily pre-compacted.

Compacting is carried out using a number of rollers to ensure good compaction, one of which is located close to the paver, at distances of no more than 15 metres.

RAR X
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