

# Repsol ADVANCE and EFI ADVANCE



Bituminous emulsions are colloidal dispersions of [conventional or modified] bitumen droplets in an aqueous phase, composed of water and one or more anionic and cationic emulsifying agents, in addition to other additives such as latex for modified emulsions, which have the purpose of dispersing the bitumen, ensuring the emulsion is stable and guaranteeing adhesion to aggregates at room temperature.

The main characteristic of bituminous emulsions is that they can be used as a binder at lower temperatures than usual, even at room temperature. Their consistency allows them to be used as a tack coat to improve adhesion between the different layers of the road surface courses or mixed and/or bound with aggregates. This is achieved during the emulsion breaking process, where the free bitumen particles provide cohesion to the whole. Bituminous emulsions are the fundamental base that has made it possible to develop cold-mix technology for roads. Moreover, modified bituminous emulsions can be used in road surface layers that require high performance in the presence of heavy-duty traffic and adverse weather conditions, guaranteeing excellent bonding between layers and exceptional cohesion to aggregates.

Repsol produces all kinds of bituminous emulsions [cationic and anionic, conventional and modified] that cover all fields of use of these materials. The cationic emulsions meet CE Marking requirements, as according to the EN 13808 standard, and anionic emulsions meet the requirements established in Spain the UNE 51603 standard.

## APPLICATIONS

Repsol ADVANCE and EFI-ADVANCE emulsions can be applied as an auxiliary treatment, such as in tack coats, or combined with quality aggregates for different types of high-performance treatments.

## Anionic bituminous emulsions

APPLICATION	TYPE OF EMULSION
Primer coats	Repsol ADVANCE A60BFL
	Repsol ADVANCE A50BFL
Tack coats	Repsol ADVANCE A60BR
Seal coats	Repsol ADVANCE A60BR
Anti-dust coats	Repsol ADVANCE A50BR
Cold microsurfacing and slurry seals	Repsol EFI ADVANCE A60BL
Surface dressing with gravel chippings	Repsol ADVANCE A65BR
Open-graded bituminous mixtures	Repsol ADVANCE A67BFM

## Conventional and modified cationic bituminous emulsions

APPLICATION	TYPE OF EMULSION
Primer coats	Repsol ADVANCE C50BF4 IMP
	Repsol ADVANCE C60BF4 IMP
	Repsol EFI ADVANCE C50B4 IMP HPP
Tack coats	Repsol ADVANCE C50B3 ADH
	Repsol ADVANCE C60B3 and C60B2 ADH C60BP2 ADH C60BP3 ADH C60BP3 ADH d
	Repsol ADVANCE C60B3 ADH d Repsol ADVANCE C69BP3 ADH d
Seal coats	Repsol ADVANCE C60B3 ADH d Repsol ADVANCE C69BP3 ADH d
	Repsol EFI ADVANCE C60B3 TER and TER PLUS C60BP3 TER and TER PLUS
	Repsol ADVANCE C50B3 CUR
Cold microsurfacing and slurry seals	Repsol ADVANCE C60B3 and C60B2CUR
	Repsol ADVANCE C60B3 CUR d
	Repsol EFI ADVANCE C60B4 MIC C60BP4 MIC C60BP4 MIC b C65BP5 MIC d HP
Gravel emulsion	Repsol ADVANCE C60B5 GE
Surface dressing with gravel chippings	Repsol ADVANCE C65B2 and C65B3TRG C65BP2 TRG C65BP3 TRG
	Repsol ADVANCE C65B3 TRG d C65BP2 TRG d C65BP3 TRG d
	Repsol ADVANCE C69B3 and C69B2 TRG C69BP2 TRG C69BP3 TRG
Open-graded bituminous mixtures	Repsol ADVANCE C67BF3 MBA C67BPF3 MBA
	Repsol ADVANCE C67BF3 MBA d
	Repsol ADVANCE C69BF3 MBA d
Half war mix asphalt	Repsol EFI ADVANCE C67B2 HW and C69B2 HW C67PB2 HW and C69BP2 HW
Anti-dust coat emulsions	Repsol ADVANCE C35B3 ERP
Emulsions for cold-mix recycling	Repsol EFI ADVANCE C60B5 REC C60B5 REC REJUV
Surface dressing with emulsion	Repsol ADVANCE C50B2 PROTECT and C50BP2 PROTECT

**PRODUCT CHARACTERISTICS**

The following table shows the characteristics of bituminous emulsions:

**Conventional cationic bituminous emulsions described in the national annex in Spain of the EN 13808 standard**

Standard EN 13808			Repsol ADVANCE C50BF4 IMP	Repsol ADVANCE C60BF4 IMP	Repsol ADVANCE C60B3 ADH <sup>1</sup>	Repsol EFI ADVANCE C60B3 TER PLUS
CHARACTERISTICS	EN STANDARD	UNIT	TESTS ON ORIGINAL EMULSION			
Particle polarity	1430	-	Positive	Positive	Positive	Positive
Breaking value	13075-1	-	110-195 class 4	110-195 class 4	70-155 class 3	70-155 class 3
Binder content (per water content)	1428	%	48-52 class 4	58-62 class 6	58-62 class 6	58-62 class 6
Binder content recovered by distillation	1431	%	≥48 class 4	≥58 class 6	≥58 class 6	≥58 class 6
Fluxing agent content recovered by distillation	1431	%	5-15 class 7	≤ 8 class 5	≤ 2,0 class 2	≤ 2,0 class 2
Fluency time [2 mm, 40°C]	12846-1	s	15-70 class 3	15-70 class 3	15-70 class 3	15-70 class 3
Residue after sieving [0.5 mm sieve]	1429	%	≤ 0,1 class 2	≤ 0,1 class 2	≤ 0,1 class 2	≤ 0,1 class 2
Sedimentation tendency [7 days]	12847	%	≤ 10 class 3	≤ 10 class 3	≤ 10 class 3	≤ 10 class 3
Adhesion	13614	%	≥ 90 class 3	≥ 90 class 3	≥ 90 class 3	≥ 90 class 3
<b>RECOVERY BY DISTILLATION, ACCORDING TO EN 1431</b>						
Needle penetration at 25°C	1426	0,1 mm	≤ 270 class 6	≤ 220 class 5	≤ 220 class 5	≤ 50 class 2
Softening point	1427	°C	≥ 35 class 8	≥ 35 class 8	≥ 35 class 8	≥ 50 class 4
<b>RECOVERY BY EVAPORATION, ACCORDING TO EN 13074-1</b>						
Needle penetration at 25°C	1426	0,1 mm	90-170 class 8	≤ 330 class 7	≤ 330 class 7	≤ 50 class 2
Softening point	1427	°C	≥ 35 class 8	≥ 35 class 8	≥ 35 class 8	≥ 50 class 4
<b>RECOVERY BY EVAPORATION, ACCORDING TO EN 13074-1 AND STABILISATION EN 13074-2</b>						
Needle penetration at 25°C	1426	0,1 mm	≤ 220 class 5	≤ 220 class 5	≤ 220 class 5	≤ 50 class 2
Softening point	1427	°C	≥ 35 class 8	≥ 35 class 8	≥ 35 class 8	≥ 50 class 4

Standard EN 13808			Repsol ADVANCE C60B3 <sup>1</sup> CUR	Repsol EFI ADVANCE C60B4 MIC	Repsol ADVANCE C60B5 GE	Repsol EFI ADVANCE C60B5 REC
CHARACTERISTICS	EN STANDARD	UNIT	TESTS ON ORIGINAL EMULSION			
Particle polarity	1430	-	Positive	Positive	Positive	Positive
Breaking value	13075-1	-	70-155 class 3	110-195 class 4	> 170 class 5	> 170 class 5
Binder content (per water content)	1428	%	58-62 class 6	58-62 class 6	58-62 class 6	58-62 class 6
Binder content recovered by distillation	1431	%	≥ 58 class 6	≥ 58 class 6	≥ 58 class 6	≥ 58 class 6
Fluxing agent content recovered by distillation	1431	%	≤ 2,0 class 2	≤ 2,0 class 2	≤ 2,0 class 2	≤ 2,0 class 2
Fluency time [2 mm, 40°C]	12846-1	s	15-70 class 3	15-70 class 3	15-70 class 3	15-70 class 3
Residue after sieving [0.5 mm sieve]	1429	%	≤ 0,1 class 2	≤ 0,1 class 2	≤ 0,1 class 2	≤ 0,1 class 2
Sedimentation tendency [7 days]	12847	%	≤ 10 class 3	≤ 10 class 3	≤ 10 class 3	≤ 10 class 3
Adhesion	13614	%	≥ 90 class 3	≥ 90 class 3	≥ 90 class 3	≥ 90 class 3
<b>RECOVERY BY DISTILLATION, ACCORDING TO EN 1431</b>						
Needle penetration at 25°C	1426	0,1 mm	≤ 220 class 5	≤ 100 class 3	≤ 220 class 5	≤ 270 class 6
Softening point	1427	°C	≥ 35 class 8	≥ 43 class 6	≥ 39 class 7	≥ 35 class 8
<b>RECOVERY BY EVAPORATION, ACCORDING TO EN 13074-1</b>						
Needle penetration at 25°C	1426	0,1 mm	≤ 330 class 7	≤ 100 class 3	≤ 220 class 5	≤ 330 class 7
Softening point	1427	°C	≥ 35 class 8	≥ 43 class 6	≥ 39 class 7	≥ 35 class 8
<b>RECOVERY BY EVAPORATION, ACCORDING TO EN 13074-1 AND STABILISATION EN 13074-2</b>						
Needle penetration at 25°C	1426	0,1 mm	≤ 220 class 5	≤ 100 class 3	≤ 220 class 5	≤ 270 class 6
Softening point	1427	°C	≥ 35 class 8	≥ 43 class 6	≥ 39 class 7	≥ 35 class 8

[1] Emulsions are available with class 2 rupture index value <110.

Standard EN 13808			Repsol ADVANCE C65B2 <sup>2</sup> TRG	Repsol ADVANCE C69B2 <sup>2</sup> TRG	Repsol ADVANCE C67BF3 MBA
CHARACTERISTICS	EN STANDARD	UNIT	TESTS ON ORIGINAL EMULSION		
Particle polarity	1430	-	Positive	Positive	Positive
Breaking value	13075-1	-	<110 class 2	<110 class 2	70-155 class 3
Binder content (per water content)	1428	%	63-67 class 7	67-71 class 9	65-69 class 8
Binder content recovered by distillation	1431	%	≥ 63 class 7	≥ 67 class 9	≥ 65 class 8
Fluxing agent content recovered by distillation	1431	%	≤ 2,0 class 2	≤ 2,0 class 2	≤ 10 class 6
Fluency time (4 mm, 40°C)	12846-1	s	5-70 class 5	5-70 class 5	5-70 class 5
Residue after sieving (0.5 mm sieve)	1429	%	≤ 0,1 class 2	≤ 0,1 class 2	≤ 0,1 class 2
Sedimentation tendency (7 days)	12847	%	≤ 10 class 3	≤ 5 class 2	≤ 5 class 2
Adhesion	13614	%	≥ 90 class 3	≥ 90 class 3	≥ 90 class 3
<b>RECOVERY BY DISTILLATION, ACCORDING TO EN 1431</b>					
Needle penetration at 25°C	1426	0,1 mm	≤ 220 class 5	≤ 220 class 5	≤ 330 class 7
Softening point	1427	°C	≥ 35 class 8	≥ 35 class 8	≤ 35 class 9
<b>RECOVERY BY EVAPORATION, ACCORDING TO EN 13074-1</b>					
Needle penetration at 25°C	1426	0,1 mm	≤ 330 class 7	≤ 330 class 7	140-260 class 9
Softening point	1427	°C	≥ 35 class 8	≥ 35 class 8	≤ 35 class 9
<b>RECOVERY BY EVAPORATION, ACCORDING TO EN 13074-1 AND STABILISATION EN 13074-2</b>					
Needle penetration at 25°C	1426	0,1 mm	≤ 220 class 5	≤ 220 class 5	≤ 220 class 5
Softening point	1427	°C	≥ 35 class 8	≥ 35 class 8	≥ 39 class 7

(2) Emulsions with class 3 rupture index value 70-155 are available.

## Modified cationic bituminous emulsions described in the national annex in Spain of the EN 13808 standard

Standard EN 13808			Repsol ADVANCE C60BP2 ADH	Repsol EFI ADVANCE C60BP3 TER	Repsol EFI ADVANCE C60BP4 MIC
CHARACTERISTICS	EN STANDARD	UNIT	TESTS ON ORIGINAL EMULSION		
Particle polarity	1430	-	Positive	Positive	Positive
Breaking value	13075-1	-	<110 class 2	70-155 class 3	110-195 class 4
Binder content (per water content)	1428	%	58-62 class 6	58-62 class 6	58-62 class 6
Binder content recovered by distillation	1431	%	≥ 58 class 6	≥ 58 class 6	≥ 58 class 6
Fluxing agent content recovered by distillation	1431	%	≤ 2,0 class 2	≤ 2,0 class 2	≤ 2,0 class 2
Fluency time (2 mm, 40°C)	12846-1	s	15-70 class 3	15-70 class 3	15-70 class 3
Residue after sieving (0.5 mm sieve)	1429	%	≤ 0,1 class 2	≤ 0,1 class 2	≤ 0,1 class 2
Sedimentation tendency (7 days)	12847	%	≤ 10 class 3	≤ 10 class 3	≤ 10 class 3
Adhesion	13614	%	≥ 90 class 3	≥ 90 class 3	≥ 90 class 3
<b>RECOVERY BY DISTILLATION, ACCORDING TO EN 1431</b>					
Needle penetration at 25°C	1426	0,1 mm	≤ 220 class 5	≤ 50 class 2	≤ 100 class 3
Softening point	1427	°C	≥ 43 class 6	≥ 55 class 3	≥ 50 class 4
Cohesion by pendulum test	13588	J/cm <sup>2</sup>	≥ 0,5 class 6	≥ 0,5 class 6	≥ 0,5 class 6
Elastic recovery, 25 °C	13588	%	DV class 1	DV class 1	DV class 1
<b>RECOVERY BY EVAPORATION, ACCORDING TO EN 13074-1</b>					
Needle penetration at 25°C	1426	0,1 mm	≤ 330 class 7	≤ 100 class 3	≤ 100 class 3
Softening point	1427	°C	≥ 35 class 8	≥ 50 class 4	≥ 50 class 4
Cohesion by pendulum test	13588	J/cm <sup>2</sup>	≥ 0,5 class 6	≥ 0,5 class 6	≥ 0,5 class 6
Elastic recovery, 25 °C	13588	%	DV class 1	DV class 1	DV class 1
<b>RECOVERY BY EVAPORATION, ACCORDING TO EN 13074-1 AND STABILISATION EN 13074-2</b>					
Needle penetration at 25°C	1426	0,1 mm	≤ 220 class 5	≤ 50 class 2	≤ 100 class 3
Softening point	1427	°C	≥ 43 class 6	≥ 55 class 3	≥ 50 class 4
Cohesion by pendulum test	13588	J/cm <sup>2</sup>	≥ 0,5 class 6	≥ 0,5 class 6	≥ 0,5 class 6
Elastic recovery, 25 °C	13588	%	DV class 1	DV class 1	DV class 1

[1] There are emulsions with a class 2 breaking value of <110..

[2] There are emulsions with a class 3 breaking value of 70-155.

## Modified cationic bituminous emulsions described in the national annex in Spain of the EN 13808 standard

Standard EN 13808			Repsol ADVANCE C65BP2 <sup>2</sup> TRG	Repsol ADVANCE C69BP2 <sup>2</sup> TRG	Repsol ADVANCE C67BPF3 MBA
CHARACTERISTICS	EN STANDARD	UNIT	TESTS ON ORIGINAL EMULSION		
Particle polarity	1430	-	Positive	Positive	Positive
Breaking value	13075-1	-	<110 class 2	<110 class 2	70-155 class 3
Binder content (per water content)	1428	%	63-67 class 7	67-71 class 9	65-69 class 8
Binder content recovered by distillation	1431	%	≥ 63 class 7	≥ 67 class 9	≥ 65 class 8
Fluxing agent content recovered by distillation	1431	%	≤ 2,0 class 2	≤ 2,0 class 2	≤ 10 class 6
Fluency time (4 mm, 40°C)	12846-1	S	5-70 class 5	5-70 class 5	5-70 class 5
Residue after sieving (0.5 mm sieve)	1429	%	≤ 0,1 class 2	≤ 0,1 class 2	≤ 0,1 class 2
Sedimentation tendency (7 days)	12847	%	≤ 10 class 3	≤ 10 class 3	≤ 5 class 2
Adhesion	13614	%	≥ 90 class 3	≥ 90 class 3	≥ 90 class 3
<b>RECOVERY BY DISTILLATION, ACCORDING TO EN 1431</b>					
Needle penetration at 25°C	1426	0,1 mm	≤ 220 class 5	≤ 220 class 5	≤ 220 class 5
Softening point	1427	°C	≥ 43 class 6	≥ 43 class 6	≥ 39 class 7
Cohesion by pendulum test	13588	J/cm <sup>2</sup>	≥ 0,5 class 6	≥ 0,5 class 6	≥ 0,5 class 6
Elastic recovery, 25 °C	13588	%	DV class 1	DV class 1	DV class 1
<b>RECOVERY BY EVAPORATION, ACCORDING TO EN 13074-1</b>					
Needle penetration at 25°C	1426	0,1 mm	≤ 330 class 7	≤ 330 class 7	≤ 330 class 7
Softening point	1427	°C	≥ 35 class 8	≥ 35 class 8	≥ 35 class 8
Cohesion by pendulum test	13588	J/cm <sup>2</sup>	≥ 0,5 class 6	≥ 0,5 class 6	≥ 0,5 class 6
Elastic recovery, 25 °C	13588	%	DV class 1	DV class 1	DV class 1
<b>RECOVERY BY EVAPORATION, ACCORDING TO EN 13074-1 AND STABILISATION EN 13074-2</b>					
Needle penetration at 25°C	1426	0,1 mm	≤ 220 class 5	≤ 220 class 5	≤ 220 class 5
Softening point	1427	°C	≥ 43 class 6	≥ 43 class 6	≥ 39 class 7
Cohesion by pendulum test	13588	J/cm <sup>2</sup>	≥ 0,5 class 6	≥ 0,5 class 6	≥ 0,5 class 6
Elastic recovery, 25 °C	13588	%	DV class 1	DV class 1	DV class 1

[1] There are emulsions with a class 2 breaking value of <110..

[2] There are emulsions with a class 3 breaking value of 70-155.

## Conventional and modified anionic bituminous emulsions not included in the national annex in Spain but described in the UNE 51603 standard

Denominación UNE 51603			Repsol ADVANCE A50BR	Repsol ADVANCE A50BFR	Repsol ADVANCE A60BR	Repsol ADVANCE A65BR
CHARACTERISTICS	EN STANDARD	UNIT	TESTS ON ORIGINAL EMULSION			
Particle polarity	1430	-	Negative	Negative	Negative	Negative
Binder content (per water content)	1428	%	48-52	48-52	58-62	63-67
Fluxing agent content recovered by distillation	1431	%	<3	3-5	3-8	<3
Fluency time [2 mm, 40°C]	12846-1	s	15-70	15-70	15-70	
Fluency time [4 mm, 40°C]	12846-1	s	-	-	-	5-70
Residue after sieving [0.5 mm sieve]	1429	%	≤ 0,1	≤ 0,1	≤ 0,1	≤ 0,1
Sedimentation tendency [7 days]	12847	%	≤ 10	≤ 10	≤ 10	≤ 5
RECOVERY BY DISTILLATION, ACCORDING TO EN 1431						
Needle penetration at 25°C	1426	0,1 mm	≤ 220	≤ 220	≤ 220	≤ 220
Softening point	1427	°C	<35	<35	> 35	> 35

Denominación UNE 51603			Repsol ADVANCE A67BFM	Repsol ADVANCE A67BPFM	Repsol ADVANCE A60BFL	Repsol ADVANCE EFI ADVANCE A60BL	Repsol ADVANCE A50BFL
CHARACTERISTICS	EN STANDARD	UNIT	TESTS ON ORIGINAL EMULSION				
Particle polarity	1430	-	Negative	Negative	Negative	Negative	Negative
Binder content (per water content)	1428	%	65-69	65-69	58-62	58-62	48-52
Fluxing agent content recovered by distillation	1431	%	3-10	3-10	3-8	<3	5-15
Fluency time [2 mm, 40°C]	12846-1	s	-	-	15-70	40-130	15-70
Fluency time [4 mm, 40°C]	12846-1	s	5-70	5-70	-	-	-
Residue after sieving [0.5 mm sieve]	1429	%	≤ 0,1	≤ 0,1	≤ 0,1	≤ 0,1	≤ 0,1
Sedimentation tendency [7 days]	12847	%	≤ 5	≤ 5	≤ 10	≤ 10	≤ 10
Stability by mixing with cement	12848	%	-	-	-	≤ 2	-
RECOVERY BY DISTILLATION, ACCORDING TO EN 1431							
Needle penetration at 25°C	1426	0,1 mm	≤ 270	≤ 220	≤ 220	≤ 220	220-330
Softening point	1427	°C	≥ 35	≥ 39	≥ 35	≥ 35	≥ 35
Elastic recovery	13398	%	-	≤ 40	-	-	-



## Other cationic bituminous emulsions with special applications included in the standard EN 13808

Repsol has developed specific emulsions for different types of applications not included the national annex in Spain, but for which the CE Marking is available, according to standard EN 13808, whose characteristics are described in different data sheets. It is possible to manufacture emulsions that are highly stable in storage for the Export and Long-Life emulsion ranges.





# Repsol EFI ADVANCE TER



**Thermoadherent emulsions** are quick-breaking emulsions with special characteristics to ensure adhesion between layers, adhesion to support structures and little or no stickiness to construction vehicle tyres.

Due to the product's thermoadherent properties, no elements become sticky until the hot bituminous mixture is applied, modifying the viscosity of the binder and facilitating adhesion between layers.

The residual bitumen from conventional emulsions used in tack coats tends to come off the road surface as construction traffic and mixture-spreading machinery passes by. This reduces adhesion between layers due to a lack of solidity, which in turn significantly diminishes the surface course's service life.

Repsol EFI-ADVANCE TER thermoadherent emulsions prevent this situation, providing the following advantages:

- The adherence coating is not removed after application.
- It allows significant cost savings by optimising the amount of emulsion and the means used to implement it by not having to go over areas not covered by the emulsion.
- It is not necessary to stop the construction traffic (greater availability).

Repsol's range of thermoadherent emulsions includes the following types: **Repsol EFI-ADVANCE C60B3 TER**, **Repsol EFI-ADVANCE C60B3 TER PLUS**, **Repsol EFI-ADVANCE C60BP3 TER** and **Repsol EFI-ADVANCE C60BP3 TER PLUS**. They are all quick-breaking cationic emulsions and are made from hard bitumens or low-penetration, polymer modified bitumens.

## APPLICATIONS

Thermoadherent emulsions are generally used in tack coats below layers of bituminous mixtures applied at temperatures of over 100 °C.

The **Repsol EFI-ADVANCE C60BP3 TER PLUS** emulsion is normally used for wearing course tack coats, especially when the course contains porous asphalt (PA) mixtures or thin-layer mixtures (BBTM, SMA or AUTL). **Repsol EFI-ADVANCE C60B3 TER** and **EFI-ADVANCE C60B3 TER PLUS** emulsions are preferably used for the tack coats of all other layers.



**PRODUCT CHARACTERISTICS**

The following table shows the characteristics of thermoadherent bitumens:

Standard EN 13808			Repsol EFI ADVANCE C60B3 TER <sup>1</sup>	Repsol EFI ADVANCE C60B3 TER PLUS <sup>2</sup>	Repsol EFI ADVANCE C60BP3 TER <sup>1</sup>	Repsol EFI ADVANCE C60BP3 TER PLUS <sup>2</sup>
CHARACTERISTICS	EN STANDARD	UNIT	TESTS ON ORIGINAL EMULSION			
Particle polarity	1430	-	Positive	Positive	Positive	Positive
Breaking value	13075-1	-	70-155 class 3	70-155 class 3	70-155 class 3	70-155 class 3
Binder content (per water content)	1428	%	58-62 class 6	58-62 class 6	58-62 class 6	58-62 class 6
Binder content recovered by distillation	1431	%	≥ 58 class 6	≥ 58 class 6	≥ 58 class 6	≥ 58 class 6
Fluxing agent content recovered by distillation	1431	%	≤ 2,0 class 2	≤ 2,0 class 2	≤ 2,0 class 2	≤ 2,0 class 2
Fluency time (2 mm, 40°C)	12846-1	s	15-70 class 3	15-70 class 3	15-70 class 3	15-70 class 3
Residue after sieving (0.5 mm sieve)	1429	%	≤ 0,1 class 2	≤ 0,1 class 2	≤ 0,1 class 2	≤ 0,1 class 2
Sedimentation tendency (7 days)	12847	%	≤ 10 class 3	≤ 10 class 3	≤ 10 class 3	≤ 10 class 3
Adhesion	13614	%	≥ 90 class 3	≥ 90 class 3	≥ 90 class 3	≥ 90 class 3
<b>RECOVERY BY DISTILLATION, ACCORDING TO EN 1431</b>						
Needle penetration at 25°C	1426	0,1 mm	≤ 50 class 2	≤ 50 class 2	≤ 50 class 2	≤ 50 class 2
Softening point	1427	°C	≥ 50 class 4	≥ 50 class 4	≥ 55 class 3	≥ 55 class 3
Cohesion by pendulum test	13588	J/cm <sup>2</sup>	-	-	≥ 0,5 class 6	≥ 0,5 class 6
Elastic recovery, 25 °C	13588	%	-	-	DV class 1	DV class 1
<b>RECOVERY BY EVAPORATION, ACCORDING TO EN 13074-1</b>						
Needle penetration at 25°C	1426	0,1 mm	≤ 100 class 3	≤ 50 class 2	≤ 100 class 3	≤ 50 class 2
Softening point	1427	°C	≥ 50 class 4	≥ 50 class 4	≥ 50 class 4	≥ 55 class 3
Cohesion by pendulum test	13588	J/cm <sup>2</sup>	-	-	≥ 0,5 class 6	≥ 0,5 class 6
Elastic recovery, 25 °C	13588	%	-	-	DV class 1	DV class 1
<b>RECOVERY BY EVAPORATION, ACCORDING TO EN 13074-1 AND STABILISATION EN 13074-2</b>						
Needle penetration at 25°C	1426	0,1 mm	≤ 50 class 2	≤ 50 class 2	≤ 50 class 2	≤ 50 class 2
Softening point	1427	°C	≥ 50 class 4	≥ 50 class 4	≥ 55 class 3	≥ 55 class 3
Cohesion by pendulum test	13588	J/cm <sup>2</sup>	-	-	≥ 0,5 class 6	≥ 0,5 class 6
Elastic recovery, 25 °C	13588	%	-	-	DV class 1	DV class 1

(1) Emulsion made using bitumen with a penetration grade of 35/50.

(2) Emulsion made using bitumen with a penetration grade of 15/25.

## RECOMMENDATIONS FOR USE

The emulsions are installed at temperatures of 50° and 70°C. Breaking occurs more or less quickly, depending on the surface course temperature, the weather conditions (temperature, wind, humidity and sun) and the type of support structure. This can vary from five to 10 minutes in ideal conditions and up to 60 minutes in more extreme conditions.

A sprayer tank with clean injectors in good condition is necessary for installation. A spray wand should be avoided. Once the emulsion has broken, the hot bituminous mixture is laid.

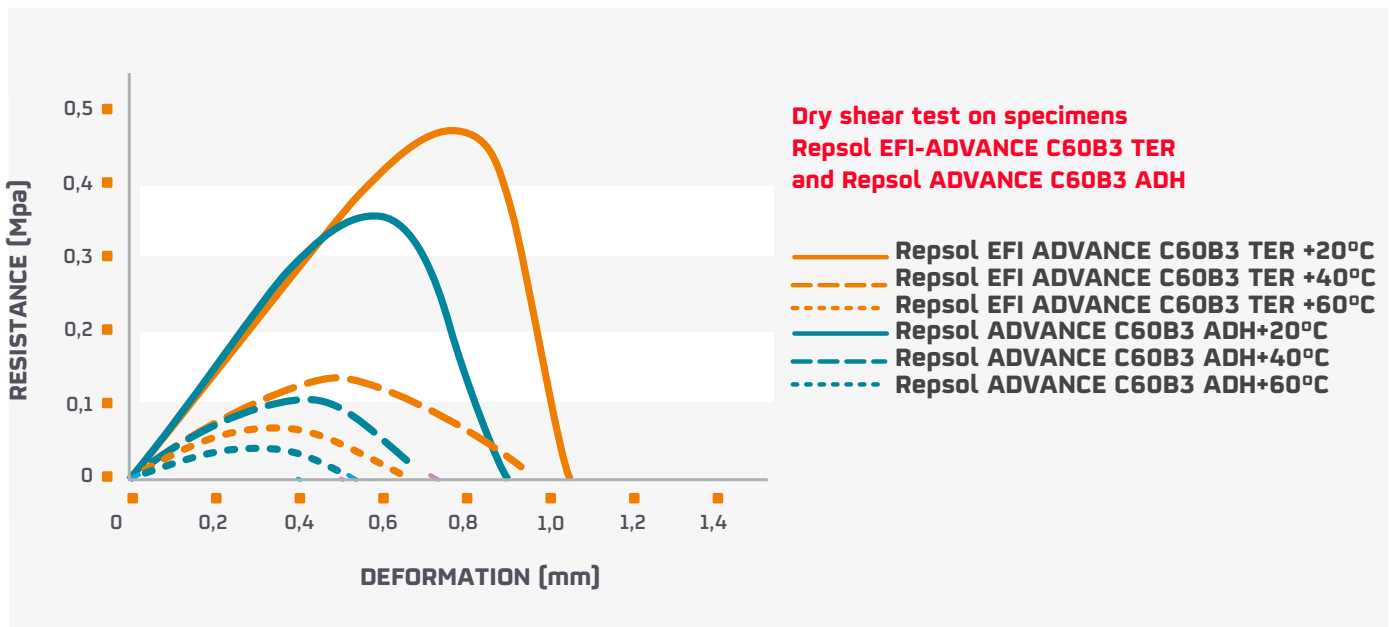
The characteristics of hardness of the residual binder of the **Repsol EFI-ADVANCE TER PLUS** emulsion does not require the application of lime milk as an auxiliary treatment to prevent the binder from being removed by construction traffic.

If these simple rules are respected, this type of emulsion behaves excellently against construction traffic.

## EVALUATION AND CONTROL OF THERMAL-ADHESIVE EMULSIONES

To verify the optimal behaviour of emulsions made with a bitumen with less penetration compared to the Repsol ADVANCE C60B3 ADH conventional emulsion, a comparative study was carried out using the LCB cut-off test developed at the Polytechnic University of Catalonia (UPC).

This study found that adhesion between layers when using a Repsol EFI-ADVANCE C60B3 TER thermal-adhesive emulsion is superior to that of the Repsol ADVANCE C60B3 ADH emulsion. This result is shown in the graph below:





# Repsol ADVANCE and Repsol EFI ADVANCE EXPORT



Emulsions are defined as a heterogenous, thermodynamically unstable system that is composed of two phases: the bitumen phase and the water phase, formed by water, emulsifiers and pH regulators. Due to this natural instability, a process takes place over time that causes decantation of the binder phase, with the water and bitumen gradually separating. This ultimately causes the emulsion to break down in part or in full, going from a typical phenomenon of flocculation to coalescence and finally sedimentation.

To solve these problems, Repsol has developed a range of emulsions called **Repsol ADVANCE and EFI-ADVANCE EXPORT**, which have great storage stability, improving the natural sedimentation process during prolonged periods of storage in customs and transport over long distances.

## APPLICATIONS

**Repsol ADVANCE EXPORT** and **EFI-ADVANCE EXPORT** emulsions have the same applications as cationic bituminous emulsions for roads:

- Primer coats.
- Tack coats.
- Seal coats.
- Cold microsurfacing and slurry seals.
- Gravel emulsion.
- Surface dressing with gravel chippings.
- Open-graded bituminous mixtures.
- Cooled mixtures made using emulsion.

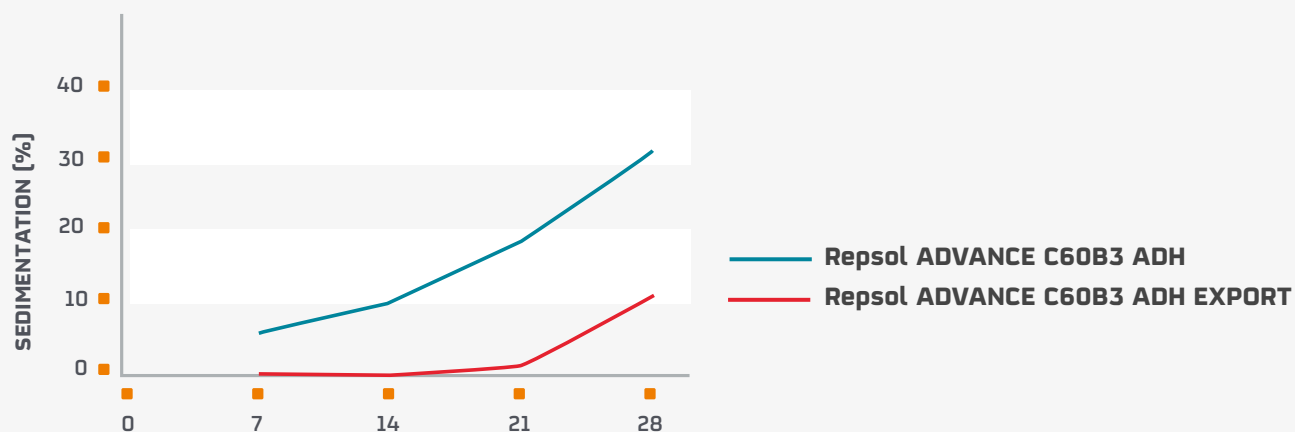
## PRODUCT CHARACTERISTICS

The **Repsol ADVANCE EXPORT** and **EFI-ADVANCE EXPORT** emulsion range meets the requirements of European standard EN 13808 for cationic emulsions. The main characteristic of this type of emulsion is a lower tendency to sediment than conventional emulsions of the same type, confirming an extended storage period and preserve suitable properties for use.

SEDIMENTATION TENDENCY	STORAGE PERIOD*			
	7 days	14 days	21 days	28 days
Repsol ADVANCE C60B3 ADH	3,5	10	18	32
Repsol ADVANCE C60B3 ADH EXPORT	0,1	0,2	1,3	10,4

\* These data are illustrative and not binding..

## Repsol ADVANCE C60B3 emulsions



### ADVANTAGES

- Good storage stability compared to conventional emulsions, improving sedimentation results.
- Repsol ADVANCE EXPORT and EFI-ADVANCE EXPORT emulsions can be stored for long periods, such as during shipping in maritime transport, while waiting to be loaded and unloaded in ports and during long-distance land transport.
- They are ideal for use in projects that require prolonged storage and can be transported and stored in IBC containers, flexitanks or conventional tanks.





# Repsol ADVANCE and Repsol EFI ADVANCE LONG LIFE



Emulsions are defined as a heterogeneous, thermodynamically unstable system that is composed of two phases: the bitumen phase and the water phase, formed by water, emulsifiers and pH regulators. Due to this natural instability, a process takes place over time that causes decantation of the binder phase, with the water and bitumen gradually separating. This ultimately causes the emulsion to break down in part or in full, going from a typical phenomenon of flocculation to coalescence and finally sedimentation.

To solve these problems, Repsol has developed a range of emulsions called **Repsol ADVANCE and EFI-ADVANCE LONG LIFE**, which have a great storage stability, improving the natural sedimentation process over time.

These types of emulsions can be stored in tanks for use in small, sporadic actions, making them available in suitable handling conditions and with all the proper characteristics for use.

## APPLICATIONS

**Repsol ADVANCE** and **EFI-ADVANCE LONG LIFE** Emulsions have the same applications as cationic bituminous emulsions for roads:

- Primer coats.
- Tack coats.
- Seal coats.
- Cold microsurfacing and slurry seals.
- Gravel emulsion.
- Surface dressing with gravel chippings.
- Open-graded bituminous mixtures.
- Cooled mixtures made using emulsion.

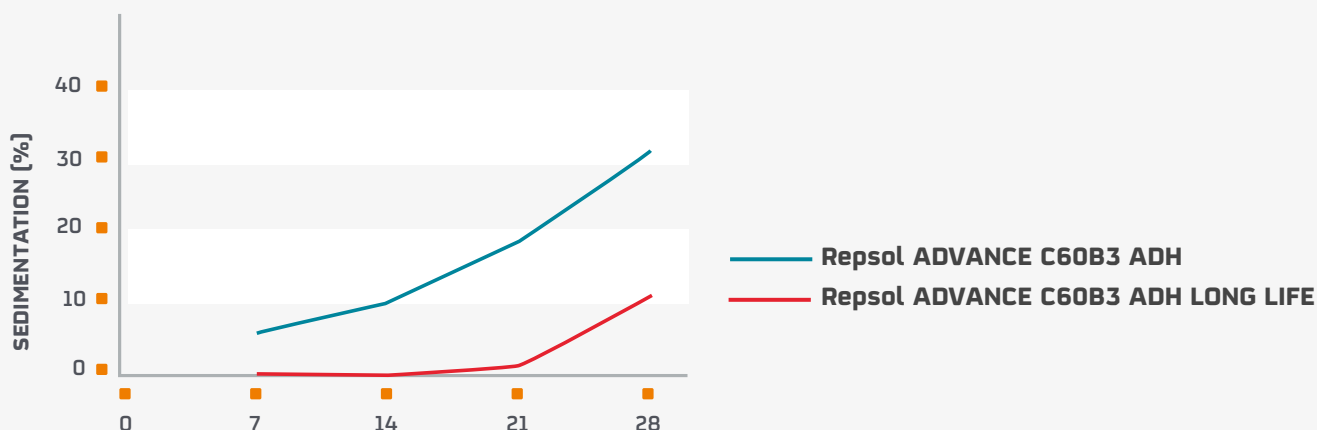
## PRODUCT CHARACTERISTICS

The **Repsol ADVANCE** and **EFI-ADVANCE LONG LIFE** emulsion range meets the requirements of European standard EN 13808 for cationic emulsions. The main characteristic of this type of emulsion is a lower tendency to sediment than conventional emulsions of the same type, confirming an extended storage period and suitable properties for use.

SEDIMENTATION TENDENCY	STORAGE PERIOD*			
	7 days	14 days	21 days	28 days
Repsol ADVANCE C60B3 ADH	3,5	10	18	32
Repsol ADVANCE C60B3 ADH LONG LIFE	0,1	0,2	1,3	10,4

\*These data are illustrative and not binding.

## Repsol ADVANCE C60B3 ADH LONG LIFE emulsions



### ADVANTAGES

- Good stability in storage compared to conventional emulsions, with improved sedimentation results.
- Repsol ADVANCE LONG LIFE and EFI-ADVANCE LONG LIFE emulsions can be stored for prolonged periods of time, such as those required for maintenance in tanks when they are used in small amounts over time in project operations.





# Repsol EFI ADVANCE C50B4 IMP HPP



This is a primer coat emulsion that does not contain a fluxing agent and has greater penetration of granular layers, named **Repsol EFI-ADVANCE C50B4 IMP HPP**.

In accordance with EU guidelines and national bodies, Repsol has developed this line of products with a lower environmental impact and improved performance.

**Repsol EFI-ADVANCE C50B4 IMP HPP** is a low-concentration, slow-breaking emulsion with high penetration power and a lower environmental impact. It contains no fluxing agents/fluidisers and is more stable in storage than its traditional equivalent, Repsol ADVANCE C50BF4 IMP.

## APPLICATIONS

The main application of the **Repsol EFI-ADVANCE C50B4 IMP HPP** Emulsion:

- Priming of granular support structures.



**PRODUCT CHARACTERISTICS**

The characteristics appear in the table below:

Standard EN 13808			Repsol EFI ADVANCE C50B4 IMP HPP	
CHARACTERISTICS	UNIT	EN STANDARD	TESTS ON ORIGINAL EMULSION	
Particle polarity	-	1430	Positive	-
Breaking value	-	13075-1	110-195	4
Binder content (per water content)	%	1428	48 a 52	4
Binder content recovered by distillation	%	1431	≥ 48	4
Fluxing agent content recovered by distillation	%	1431	≤ 2	2
Fluency time [2 mm, 40°C]	s	12846-1	15-70	3
Residue after sieving [0.5 mm sieve]	%	1429	≤ 0,1	2
Sedimentation tendency [7 days]	%	12847	≤ 10	3
Adhesion	%	13614	≥ 90	3
<b>RECOVERY BY DISTILLATION, ACCORDING TO EN 1431</b>				
Penetration at 25°C	0,1 mm	1426	≤ 220	5
Softening point	°C	1427	≥ 35	8
<b>RECOVERY BY EVAPORATION, ACCORDING TO EN 13074-1</b>				
Penetration at 15°C	0,1 mm	1426	≤ 220	5
Softening point	°C	1427	≥ 35	8
<b>RECOVERY BY EVAPORATION, ACCORDING TO EN 13074-1 AND STABILISATION EN 13074-2</b>				
Penetration at 25°C	0,1 mm	1426	≤ 220	5
Softening point	°C	1427	≥ 35	8

**ADVANTAGES**

The **Repsol EFI-ADVANCE C50B4 IMP HPP** emulsion provides the following advantages in application:

- Better priming of the support structure.
- Improved passage of construction traffic.
- Makes it possible to adapt the base binder depending on the application objective.
- Greater sealing of the support structure.
- Lower environmental impact.



# Repsol ADVANCE C50B2 and C50BP2 PROTECT



Repsol has a technologically conceived emulsion for preventive conservation treatments on pavements that are aged, microcracked or show signs of particle loss.

The **Repsol ADVANCE C50B2** and **Repsol ADVANCE C50BP2 PROTECT** emulsions are formulated for use in preventive protection coats for pavement maintenance operations.

Conservation treatments are used to prevent pavement from deteriorating as a result of ageing, loss of superficial aggregates and cracking, as well as for sealing and waterproofing. They work by sealing the surface courses of asphalt pavements, thereby impeding the entry of water and reducing bitumen oxidation. This provides greater surface course tenacity, slowing down the deterioration process and extending the pavement's service life.

**Repsol ADVANCE C50B2** and **Repsol ADVANCE C50BP2 PROTECT** are low-concentration, quick-breaking emulsions with residual binders designed to seal surface courses without the need to use protective aggregates and/or sand in the coat. These residual binders can be rheologically modified with polymers to improve their tenacity and/or resistance.

Moreover, depending on the needs of the surface course to be protected, the use of rejuvenators may be considered in these emulsions to enhance this quality.

## APPLICATIONS

The main applications of the emulsions **Repsol ADVANCE C50B2** and **C50BP2 PROTECT** are:

- Protective coats for pavements that show signs of particle loss.
- Protective coats for aged, microcracked pavements.
- Pavement sealing coats.
- Sealing of surface courses dressing with gravel chippings.
- Tack coats between layers.



## PRODUCT CHARACTERISTICS

The characteristics appear in the table below:

Standard EN 13808			Repsol ADVANCE C50B2 PROTECT		Repsol ADVANCE C50BP2 PROTECT	
CHARACTERISTICS	UNIT	EN STANDARD	TESTS ON ORIGINAL EMULSION			
Particle polarity	-	1430	Positive	-	Positive	-
Breaking value	-	13075-1	<110	2	<110	2
Binder content (per water content)	%	1428	48 a 52	4	48 a 52	4
Binder content recovered by distillation	%	1431	≥ 48	4	≥ 48	4
Fluxing agent content recovered by distillation	%	1431	≤ 2,0	2	≤ 2,0	2
Fluency time [2 mm, 40°C]	s	12846-1	15 a 70	3	15 a 70	3
Residue after sieving [0.5 mm sieve]	%	1429	≤ 0,1	2	≤ 0,1	2
Sedimentation tendency [7 days]	%	12847	≤ 10	3	≤ 10	3
Adhesion	%	13614	≥ 90	3	≥ 90	3
<b>RECOVERY BY EVAPORATION, ACCORDING TO EN 13074-1</b>						
Penetration at 25°C	0,1 mm	1426	≤ 50	2	≤ 50	2
Softening point	°C	1427	≥ 50	4	≥ 55	3
Cohesion by pendulum test	J/cm <sup>2</sup>	13588	-	-	≥ 0,5	6
Elastic recovery at 25°C	%	13398	-	-	DV	1
<b>RECOVERY BY EVAPORATION, ACCORDING TO EN 13074-1 AND STABILISATION EN 13074-2</b>						
Penetration at 25°C	0,1 mm	1426	≤ 50	2	≤ 50	2
Softening point	°C	1427	≥ 50	4	≥ 55	3
Cohesion by pendulum test	J/cm <sup>2</sup>	13588	-	-	≥ 0,5	6
Elastic recovery at 25°C	%	13398	-	-	DV	1
<b>RECOVERY BY DISTILLATION, ACCORDING TO EN 1431</b>						
Penetration at 25°C	0,1 mm	1426	≤ 50	2	≤ 50	2
Softening point	°C	1427	≥ 50	4	≥ 55	3
Cohesion by pendulum test	J/cm <sup>2</sup>	13588	-	-	≥ 0,5	6
Elastic recovery at 25°C	%	13398	-	-	DV	1

## ADVANTAGES

The emulsions **Repsol ADVANCE C50B2** and **ADVANCE C50BP2 PROTECT** allow:

- Preventive maintenance operations that lengthen the pavement's service life, avoiding the need for more costly paving operations.
- Quick reopening to traffic, with no risk of the protection coat being eliminated by vehicles and no need for protection with virgin aggregates.
- Rejuvenation of pavement surface courses.



# Repsol EFI ADVANCE C65BP4 MIC d HP



Repsol has developed the high-performance emulsion **Repsol EFI ADVANCE C65BP4 MIC d HP** which makes it possible to achieve very fast-breaking cold micro-agglomerates and very high cohesion, capable of withstanding the most adverse working conditions.

This emulsion is suitable for areas that require excellent cold-mix microsurfacing performance, both to obtain strong macrotextures and for safety reasons, preventing the projection of particles by vehicle traffic or to minimise pavement conservation needs.

## APPLICATIONS

- Airport runways and platforms.
- Reflective cracking prevention techniques using polymer or metallic mesh.
- Wearing courses with high levels of traffic, such as highways and motorways.
- Treatments to improve adhesion in areas with winding curves.
- Safety and warning pavements in hazardous road sections.



**PRODUCT CHARACTERISTICS**

The following table compares the characteristics of the Repsol EFI-ADVANCE C65BP4 emulsion with Repsol EFI-ADVANCE C60BP4 emulsion.

Standard EN 13808			Repsol EFI ADVANCE C60BP4 MIC		Repsol EFI ADVANCE C65BP4 MIC d HP	
CHARACTERISTICS	UNIT	EN STANDARD	TESTS ON ORIGINAL EMULSION			
Particle polarity	1430	-	-	-	-	-
Breaking value	13075-1	-	110-195	4	110-195	4
Binder content (per water content)	1428	%	58-62	6	63-67	7
Binder content recovered by distillation	1431	%	≥ 58	6	≥ 63	7
Fluxing agent content recovered by distillation	1431	%	≤ 2	2	≤ 2	2
Fluency time (4 mm, 40°C)	12846-1	s	-	-	40-130	4
Fluency time (2 mm, 40°C)	12846-1	s	15-70	3	-	-
Residue after sieving (0.5 mm sieve)	1429	%	≤ 0,1	2	≤ 0,1	2
Sedimentation tendency (7 days)	12847	%	≤ 10	3	≤ 10	3
Adhesion	13614	%	≥ 90	3	≥ 90	3
<b>RECOVERY BY EVAPORATION, ACCORDING TO EN 13074-1</b>						
Needle penetration at 25°C	1426	0,1 mm	≤ 100	3	≤ 100	3
Softening point	1427	°C	≥ 50	4	≥ 50	4
Cohesion by pendulum test	13588	J/cm <sup>2</sup>	≥ 0,5	6	≥ 0,5	6
Elastic recovery, 25°C	13398	%	DV	1	DV	1
<b>RECOVERY BY EVAPORATION, ACCORDING TO EN 13074-1 AND STABILISATION EN 13074-2</b>						
Needle penetration at 25°C	1426	0,1 mm	≤ 100	3	≤ 100	3
Softening point	1427	°C	≥ 50	4	≥ 50	4
Cohesion by pendulum test	13588	J/cm <sup>2</sup>	≥ 0,5	6	≥ 0,5	6
Elastic recovery, 25°C	13398	%	DV	1	DV	1
<b>RESIDUO POR EVAPORACIÓN, SEGÚN UNE EN 1431</b>						
Needle penetration at 25°C	1426	0,1 mm	≤ 100	3	≤ 100	3
Softening point	1427	°C	≥ 50	4	≥ 50	4
Cohesion by pendulum test	13588	J/cm <sup>2</sup>	≥ 0,5	6	≥ 0,5	6
Elastic recovery, 25°C	13398	%	DV	1	DV	1

**PRODUCT BEHAVIOUR IN THE MIXTURE**

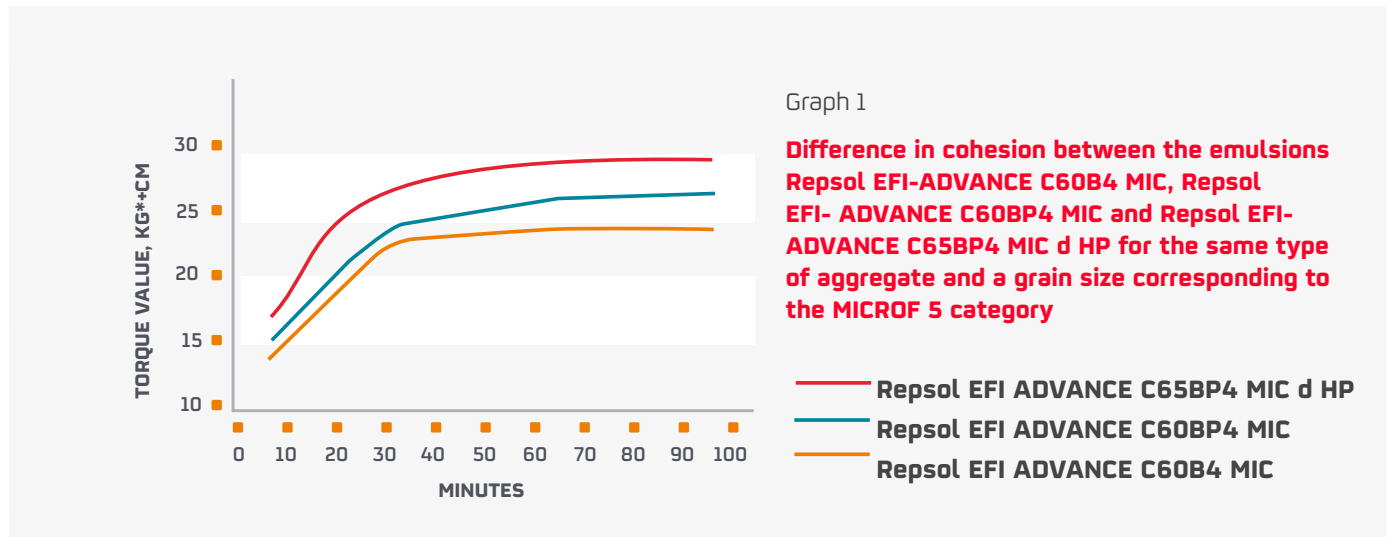
Compared to conventional emulsions used in cold micro-agglomerates, the **Repsol EFI-ADVANCE C65BP4 MIC d HP** emulsion developed by Repsol offers the following advantages:

- Increased cohesion (greater resistance to breaking under torque and tensile stress).
- Improved resistance to skidding due to the improved surface course macrotexture.
- Greater adhesion to aggregates.
- Better resistance to ageing.
- Better performance at low temperatures.

This high-performance emulsion has **excellent performance in terms of cohesion and abrasion.**

As seen in Graph 1, in the EN 12274-4 torque test, Repsol EFI-ADVANCE C65BP4 MIC d HP high-performance emulsion achieves a minimum torque value of 20 kg\*cm, which makes it possible to reopen the road to traffic in half the time of the conventional Repsol EFI-ADVANCE C60BP4 MIC emulsion. The time required to reopen the road to traffic is even lower when compared to the Repsol EFI-ADVANCE C60B4 MIC emulsion.

As can be seen, less mass is lost in g/m<sup>2</sup> with the use of the Repsol EFI-ADVANCE C65BP4 MIC d HP emulsion.



LOSS OF MASS [g/m <sup>2</sup> ]*		
Repsol EFI ADVANCE C65BP4 MIC d HP	Repsol EFI ADVANCE C60BP4 MIC	Repsol EFI ADVANCE C60B4 MIC
175	270	440

\*EN 12274-5 wet track abrasion test.





# Repsol EFI ADVANCE C60B5 REC REJUV



The emulsion **Repsol EFI ADVANCE C60B5 REC Rejuv**, especially developed for Repsol for the cold-mix recycling of aged surface courses, is a slow-breaking emulsion with rejuvenating binders that meets the requirements of the National Annex of standard EN 13808 in Spain, on the recycling of bituminous surface courses and pavements in relation to Repsol EFI-ADVANCE C60B5 REC-type emulsions. This product is specifically designed for each project and provides the components that the original bitumen has lost due to ageing, restoring its original characteristics.

Repsol has extensive experience in the use of special emulsions for cold-mix recycling with rejuvenators (Repsol EFI-ADVANCE C60B5 REC REJUV), achieving excellent results in installation.

## APPLICATIONS

**Repsol EFI-ADVANCE C60B5 REC REJUV** is an emulsion that has been specifically designed for use in cold-mix recycling that requires high-quality standards.

It is recommended for cold-mix recycling with **Repsol EFI-ADVANCE C60B5 REC REJUV** as a binder in the following situations:

- Structurally conceived surface courses.
- Aged surface courses.
- Irregular pavements.
- Selective rehabilitation (on roads with heavy-duty traffic, for example).

Repsol's technical team designs the emulsion's specific formula based on the surface course to be rehabilitated, establishing the ideal emulsion formulation to guarantee optimal performance in the final resulting mixture.

Repsol has co-developed an application system for the emulsion **Repsol EFI-ADVANCE C60B5 REC REJUV**, called RFE.API (a Spanish acronym for Cold-Mix Recycling with Initial High-Performance Emulsion), which involves a new formulation for cold-mix recycling with emulsion that overcomes the existing problems in this procedure when used on roads with high traffic and quality demands. The aim of this emulsion was to overcome two obstacles of these mixtures: their low mechanical performance in the initial phase and the need for a maturing period before the next levels are laid. This system allows for the reinforcing and/or wearing course layer to be laid right away, thereby speeding up curing, minimising the amount of pre-mix water, ensuring it is eliminated in a short period of time and guaranteeing that the mixture quickly becomes rigid to rapidly reduce deflections of the wearing course and consume less of its service life.





**PRODUCT CHARACTERISTICS**

The following table shows the characteristics of the **Repsol EFI-ADVANCE C60B5 REC REJUV** emulsion:

Standard EN 13808			Repsol EFI ADVANCE C60B5 REC REJUV	
CHARACTERISTICS	UNIT	EN STANDARD	TESTS ON ORIGINAL EMULSION	
Particle polarity	-	1430	Positive	-
Breaking value	-	13075-1	> 170	5
Binder content (per water content)	%	1428	58 to 62	6
Binder content recovered by distillation	%	1431	≥ 58	6
Fluxing agent content recovered by distillation	%	1431	≤ 2,0	2
Fluency time (2 mm, 40°C)	s	12846-1	15 to 70	3
Residue after sieving (0.5 mm sieve)	%	1429	≤ 0,1	2
Sedimentation tendency (7 days)	%	12847	≤ 10	3
Adhesion	%	13614	≥ 90	3
<b>RECOVERY BY EVAPORATION, ACCORDING TO EN 13074-1</b>				
Penetration at 25°C	0,1 mm	1426	≤ 330	7
Softening point	°C	1427	≥ 35	8
<b>RECOVERY BY EVAPORATION, ACCORDING TO EN 13074-1 AND STABILISATION EN 13074-2</b>				
Penetration at 25°C	0,1 mm	1426	≤ 270	6
Softening point	°C	1427	≥ 35	8
<b>RECOVERY BY DISTILLATION, ACCORDING TO EN 1431</b>				
Penetration at 25°C	0,1 mm	1426	≤ 270	6
Softening point	°C	1427	≥ 35	8

## PRODUCT BEHAVIOUR IN THE MIXTURE

The **Repsol EFI-ADVANCE C60B5 REC REJUV** emulsion provides mixtures with excellent initial cohesion, allowing roads to be reopened to traffic quickly without the need for a protective coat. This leads to flexible and efficient project organisation, thereby reducing execution times.

To achieve the working formula, tests are carried out to evaluate the resistance of the recycled mixture and the effect of water on it.

The optimum content of emulsion with rejuvenating agents to be used in the mixture is achieved with these tests.

The points on which greater attention should be paid for the technique to be successful are the following:

- Design of a custom emulsion depending on the material to be treated and the development of a suitable working formula.
- Careful installation and strict control of the evolution of the mixture over time.

## ADVANTAGES

The advantages that the “in situ” cold recycling technique with emulsion offers to a surface course can be summarised as: the achievement of gradual mechanical resistance, improvement in fatigue behaviour, energy and resource savings and efficient execution.

The use of the **Repsol EFI-ADVANCE C60B5 REC REJUV** emulsion also provides the following benefits:

- The road can be reopened to traffic thanks to the mixture's excellent initial cohesion.
- The mixture gains stability quickly, shortening waiting times to install the top layer.
- Vehicle traffic safety is improved as particles are not detached or projected
- There is no need for a sealing treatment, with its execution being recommended in adverse weather conditions.





# Repsol ADVANCE C67BF3 MBA EFIMUL



Repsol has developed the medium-breaking bituminous **Repsol ADVANCE C67BF3 MBA EFIMUL**, formulated ad-hoc for open-graded mixtures that can be stored and handled at room temperature. It is specially designed to use the versatility and mobility offered by machinery for manufacturing and spreading bitumen slurry.

## APPLICATIONS AND PRODUCT BEHAVIOUR IN THE MIXTURE

In some cases, it is not possible to install cold-mix surface course plants due to the characteristics of the project, either because there are no suitable locations or because of problems in getting the required administrative and/or industrial licences.

The **Repsol ADVANCE C67BF3 MBA EFIMUL** emulsion can be used to manufacture open-grade cold mixtures in a bitumen slurry manufacturing unit, providing the following properties:

- Stability with regard to the aggregate studied.
- Stability in storage.
- Optimal adhesion conditions to the aggregate/binder.
- Suitable viscosity for the aggregate used and the components of the manufacturing equipment.
- Versatility and easy handling in manufacturing and supply.

This product is custom-designed for each project (depending on the type of aggregate and location). Repsol's Technical Support and Development Department can help customers to create ideal work formulas.



**PRODUCT CHARACTERISTICS**

The following table shows the characteristics of the Repsol ADVANCE C67BF3 MBA EFIMUL emulsion:

Standard EN 13808			Repsol ADVANCE C67BF3 MBA EFIMUL	
CHARACTERISTICS	EN STANDARD	UNIT	TESTS ON ORIGINAL EMULSION	
Particle polarity	1430	-	Positive	Positive
Breaking value	13075-1	-	70-155	3
Binder content (per water content)	1428	%	65-69	8
Binder content recovered by distillation	1431	%	≥ 65	8
Fluxing agent content recovered by distillation	1431	%	≤ 10	6
Fluency time (4 mm, 40°C)	12846-1	s	5-70	5
Residue after sieving (0.5 mm sieve)	1429	%	≤ 0,1	2
Sedimentation tendency (7 days)	12847	%	≤ 5	2
Adhesion	13614	%	≥ 90	3
<b>RECOVERY BY DISTILLATION, ACCORDING TO EN 1431</b>				
Needle penetration at 25°C	1426	0,1 mm	≤ 330	7
Softening point	1427	°C	< 35	9
<b>RECOVERY BY EVAPORATION, ACCORDING TO EN 13074-1</b>				
Needle penetration at 25°C	1426	0,1 mm	140-260	9
Softening point	1427	°C	< 35	9
<b>RECOVERY BY EVAPORATION, ACCORDING TO EN 13074-1 AND STABILISATION EN 13074-2</b>				
Needle penetration at 25°C	1426	0,1 mm	≤ 220	5
Softening point	1427	°C	≥ 39	7

**ADVANTAGES OF USING A COMPACT MACHINE + EMULSION Repsol ADVANCE C67BF3 MBA EFIMUL**

- Versatility as a project unit.
- Efficient manufacturing/application system.
- System that makes it possible to use the available resources, without replacing the traditional system.
- Savings in assembly and disassembly of manufacturing machines compared to traditional means.
- Eco-efficient system: emission-free and low electricity and fuel consumption.
- System adapted to the geographical area of the project, nature of the aggregates, transport possibilities, worksite location, etc.



# Repsol EFI ADVANCE HW and REC HW



Repsol has developed the **Repsol EFI ADVANCE HW** and **REC HW** emulsion ranges specifically for the use and manufacturing of half-warm asphalt mixtures.

In recent years, the use of special emulsions in the manufacture of half-warm asphalt mixtures has made it possible to lower temperatures, which in turn entails a reduction in greenhouse gas emissions, increased occupational health and safety and energy savings in this activity.

The **Repsol EFI-ADVANCE HW** range meets the following requirements:

- Good wetting/coverage of the aggregate at the manufacturing temperature.
- Low percentage of water in the composition.
- Possibility of handling the mixture in the application area.
- Base binder with required properties for the intended use of the mixture.

The **Repsol EFI-ADVANCE REC HW** range combines the aforementioned advantages, in addition to those associated with the reuse of milled or demolition material coming from the road. With these emulsions and a suitable mixture manufacturing process, it is possible to reuse 100% of the recycled material in manufacturing the new mixture.

All emulsions have CE Marking, in accordance with the EN 13808 standard.

## APPLICATIONS

The Sustituir por Repsol EFI-ADVANCE HW y Repsol EFI-ADVANCE REC HW emulsions that can be used to produce open- and closed-grade half-warm bituminous emulsions are as follows:

TYPE OF EMULSION	APPLICATION	TIPO MEZCLA
Repsol EFI ADVANCE C69B2 MBA HW	Open-graded half-warm bituminous mixtures for road maintenance and construction	BBTM, SMA, PA
Repsol EFI ADVANCE C69BP2 MBA HW	Open-graded half-warm bituminous mixtures for road maintenance and construction	BBTM, SMA, PA
Repsol EFI ADVANCE C69B2 MBC HW	Closed-graded half-warm bituminous mixtures for road maintenance and construction	AC
Repsol EFI ADVANCE C67B2 MBC REC HW	Recycled closed-graded half-warm bituminous mixtures for road maintenance and construction	AC

**PRODUCT CHARACTERISTICS**

The following table shows the characteristics of **Repsol EFI-ADVANCE HW** and **EFI-ADVANCE REC HW** emulsion ranges:

**Repsol EFI ADVANCE HW**

Standard EN 13808			Repsol EFI ADVANCE C69BP2 HW		Repsol EFI ADVANCE C67BPF3 HW		Repsol EFI ADVANCE C69B2 HW	
CHARACTERISTICS	UNIT	EN STANDARD	TESTS ON ORIGINAL EMULSION					
Particle polarity	-	1430	Positive	-	Positive	3	Positive	-
Breaking value	-	13075-1	<110	2	70-155	8	<110	2
Binder content (per water content)	%	1428	67 to 71	9	65 to 69	8	67 to 71	9
Binder content recovered by distillation	%	1431	≥ 67	9	≥ 65	5	≥ 67	9
Fluxing agent content recovered by distillation	%	1431	≤ 2,0	2	≤ 8,0	5	≤ 2,0	2
Tiempo de fluencia (4 mm, 40°C)	s	12846-1	40 to 100	6	5 to 70	2	40 to 100	6
Residue after sieving (0.5 mm sieve)	%	1429	≤ 0,1	2	≤ 0,1	3	≤ 0,1	2
Sedimentation tendency (7 days)	%	12847	≤ 10	3	≤ 10	3	≤ 10	3
Adhesion	%	13614	≥ 90	3	≥ 90	3	≥ 90	3
<b>RECOVERY BY EVAPORATION, ACCORDING TO EN 13074-1</b>								
Penetration at 25°C	0,1 mm	1426	≤ 100	3	≤ 150	4	≤ 100	3
Softening point	°C	1427	≥ 43	6	≥ 43	6	≥ 43	6
Cohesion by pendulum test	J/cm <sup>2</sup>	13588	≥ 0.5	6	≥ 0.5	6	-	-
Elastic recovery	%	13398	DV	1	DV	1	-	-
<b>RECOVERY BY EVAPORATION, ACCORDING TO EN 13074-1 AND STABILISATION EN 13074-2</b>								
Penetration at 25°C	0,1 mm	1426	≤ 100	3	≤ 100	5	≤ 100	3
Softening point	°C	1427	≥ 43	6	≥ 50	7	≥ 43	6
Cohesion by pendulum test	J/cm <sup>2</sup>	13588	≥ 0.5	6	≥ 0.5	6	-	-
Elastic recovery, 25°C	%	13398	DV	1	DV	1	-	-
<b>RECOVERY BY DISTILLATION, ACCORDING TO EN 1431</b>								
Penetration at 25°C	0,1 mm	1426	≤ 100	3	≤ 220	3	≤ 100	3
Softening point	°C	1427	≥ 43	6	≥ 39	6	≥ 43	6
Cohesion by pendulum test	J/cm <sup>2</sup>	13588	≥ 0.5	6	≥ 0.5	-	-	-
Elastic recovery, 25°C	%	13398	DV	1	DV	-	-	-

## Repsol EFI ADVANCE REC HW

Standard EN 13808			Repsol EFI ADVANCE C67B2 REC HW*	
CHARACTERISTICS	UNIT	EN STANDARD	TESTS ON ORIGINAL EMULSION	
Particle polarity	-	1430	Positive	-
Breaking value	-	13075-1	<110	2
Binder content (per water content)	%	1428	67 to 71	9
Binder content recovered by distillation	%	1431	≥ 67	9
Fluxing agent content recovered by distillation	%	1431	≤ 2,0	2
Fluency time [4 mm, 40°C]	s	12846-1	5 to 70	5
Residue after sieving [0.5 mm sieve]	%	1429	≤ 0,1	2
Sedimentation tendency [7 days]	%	12847	≤ 10	3
Adhesion	%	13614	≥ 90	3
<b>RECOVERY BY EVAPORATION, ACCORDING TO EN 13074-1</b>				
Penetration at 25°C	0,1 mm	1426	≤ 220	5
Softening point	°C	1427	≥ 35	8
<b>RECOVERY BY EVAPORATION, ACCORDING TO EN 13074-1 AND STABILISATION EN 13074-2</b>				
Penetration at 25°C	0,1 mm	1426	≤ 220	5
Softening point	°C	1427	≥ 35	8
<b>RECOVERY BY DISTILLATION, ACCORDING TO EN 1431</b>				
Penetration at 25°C	0,1 mm	1426	≤ 220	5
Softening point	°C	1427	≥ 35	8

\*The base binder must be adapted depending on the amount of recycled material used, the condition of the aged binder, the type of mixture and the layer..

### PRODUCT BEHAVIOUR IN THE MIXTURE

Emulsions in the **Repsol EFI-ADVANCE HW** and **EFI-ADVANCE REC HW** ranges can be used to manufacture half-warm mixtures with a similar mechanical performance to hot bituminous mixtures.

Due to the lower manufacturing temperature, the bitumen ages less, thereby improving the durability of the mixture. From the point of view of half-warm bituminous mixture manufacturing, other advantages include notable fuel savings and the fact that hot-mix production plants can be adapted to use these techniques.

Furthermore, use of the **Repsol EFI-ADVANCE REC HW** range leads to a savings in raw material consumption due to the reuse of material coming from the road.



**REPSOL**

*Let's invent the future*