

# Micro Surfacing On Airport Runways

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# Micro Surfacing on Airport Runways

**ICAO : International Civil Aviation  
Organization** [www.icao.int](http://www.icao.int)

## INTRODUCTION:

- ✓ Cold Micro Surfacing. Meets ICAO requirements.
- ✓ Hot Micro Surfacing. Meets ICAO requirements.
- ✓ Conventional Hot-Mixed Asphalt (C-HMA). Does not meet ICAO requirements.
- ✓ C-HMA was used on Runways some years ago. Once the HMA was spread, grooves were made on its surface. This procedure was used in Sao Paulo (Brazil) in July 2007.
- ✓ Grooving is very expensive.

# Micro Surfacing on Airport Runways

## COLD MICRO SURFACING

### **Main Machinery:**

- ✓ Truck equipped with tanks, hoppers and dosing devices.
- ✓ Pugmill and spreader box. Continuous production.

More machinery is needed in airports than in road works.

... And workers must be experienced and skilled

# Micro Surfacing on Airport Runways

1<sup>st</sup> Generation. To 1964.

Basic Slurries. Limestones.  
Good Weather.

2<sup>nd</sup>. Cationic Emulsions  
came into use. 1964 to 1965

Any season. Silica and  
Porphyry. Safety.

3<sup>rd</sup>. Modified Emulsions.  
New Machinery. 1980

Coarse Macrotexture. Any type of  
traffic. Technology is exported.

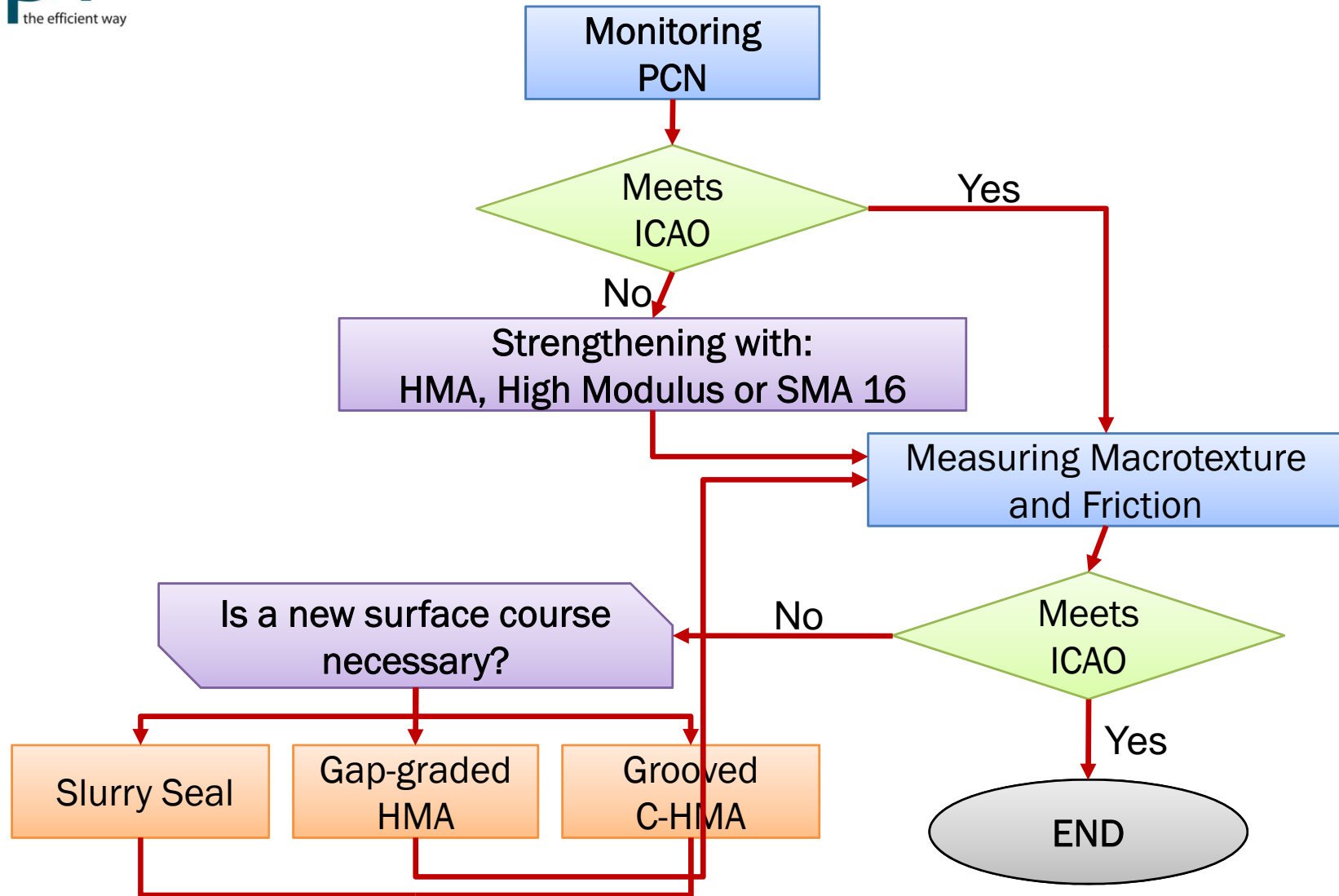
4<sup>th</sup> Generation, 1984 fibers  
and 1988 color.

Membranes. Color is  
aesthetic, safety, ecology

5<sup>th</sup>. In Airports since 1985: 1 or 2  
layers; ECL-2 d-m emulsion is used.  
Tack Coat and compaction.

Anti-Ice agent  
Used in Airports with no  
effect on aeronautic lights

# Micro Surfacing on Airport Runways





# Micro Surfacing on Airport Runways



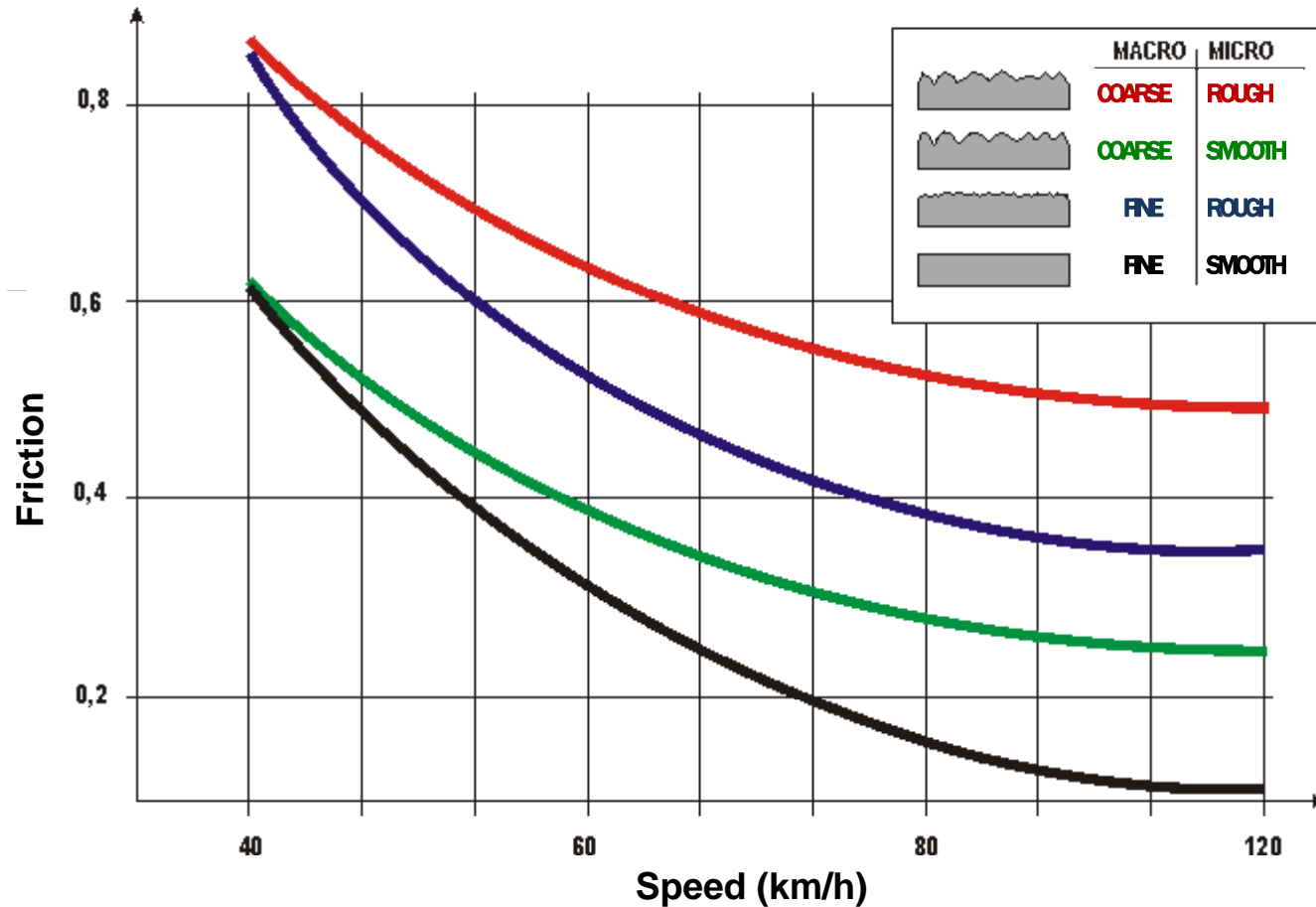
Landing at more than 300 km/h. Wind and water

DRAINAGE (Oxford Dictionary): The process by which water is drained from an area.

Better drainage with coarse Macrotexture.

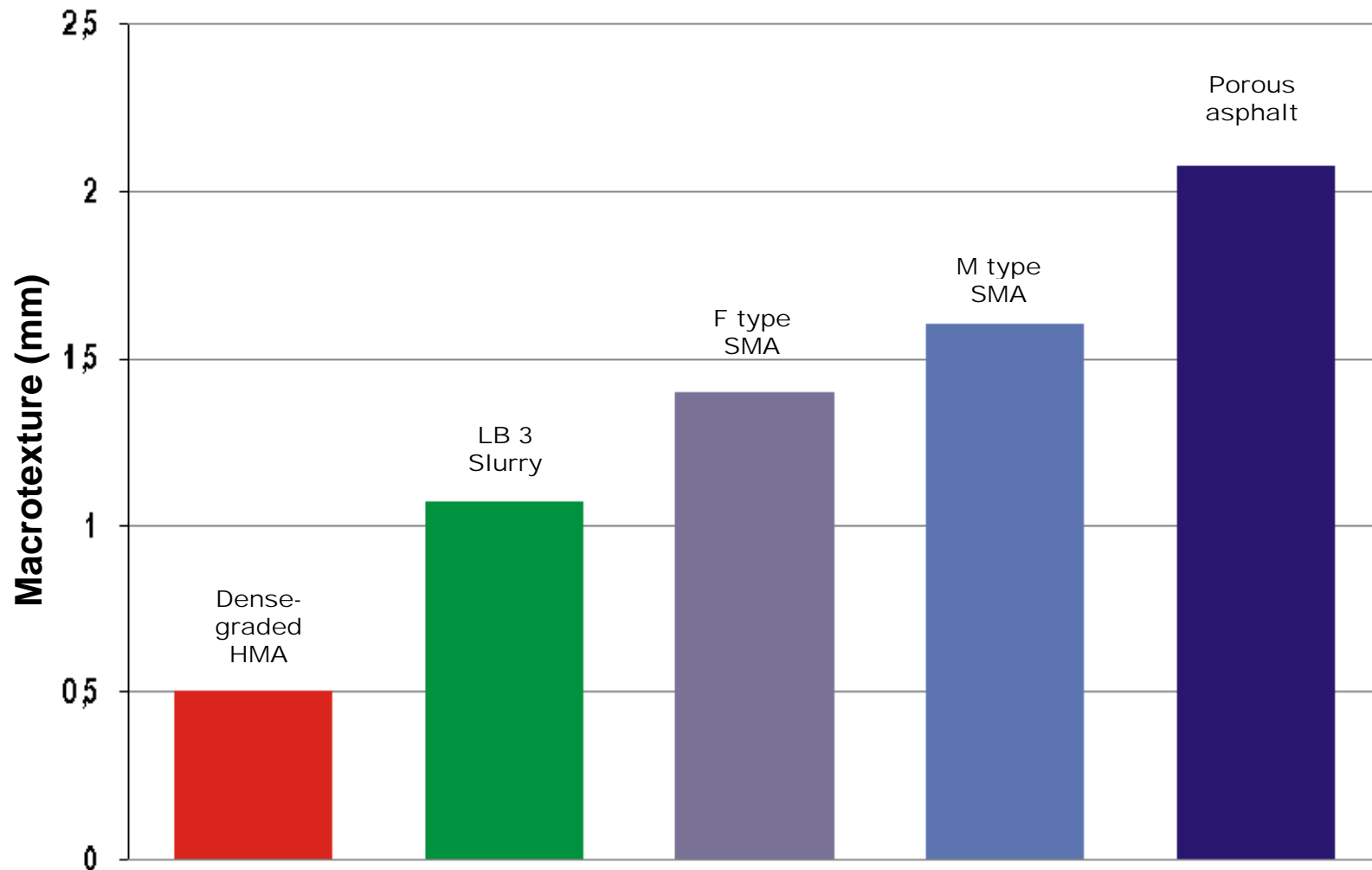
# Micro Surfacing on Airport Runways

## SURFACES ACCORDING TO TEXTURE DEPTH



# Micro Surfacing on Airport Runways

## MACROTEXTURE OF DIFFERENT PAVEMENTS

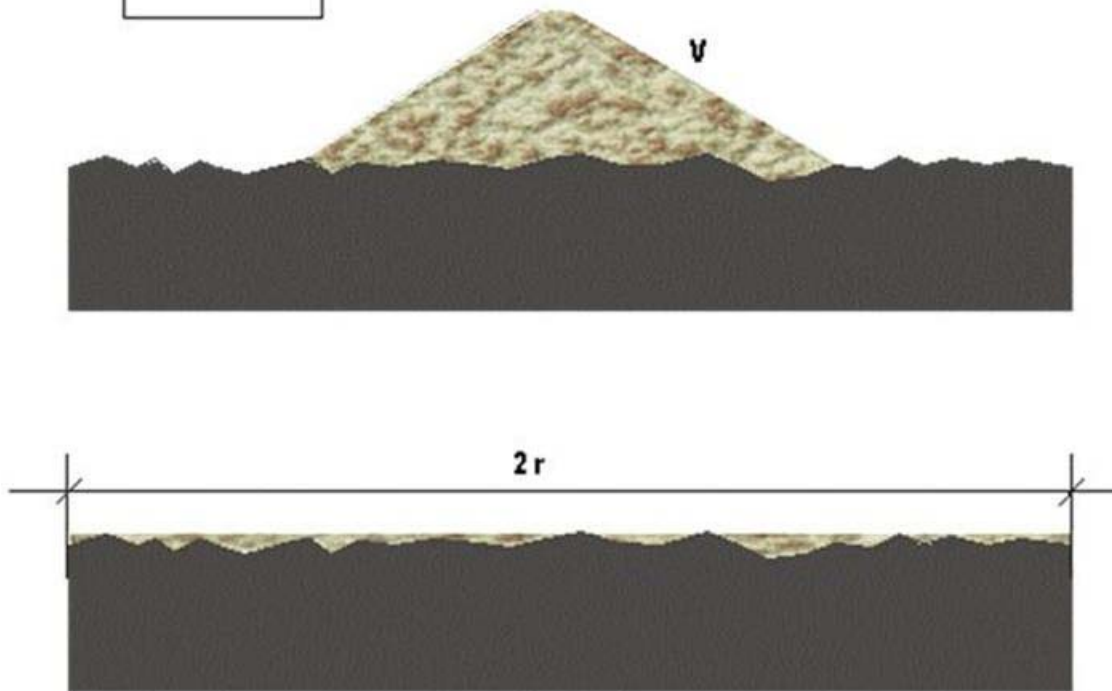




# Micro Surfacing on Airport Runways

Quality control, sand patch method

$$H = \frac{V}{\pi r^2}$$



# Micro Surfacing on Airport Runways

AIRPORTS WHERE COLD MICRO SURFACING WAS USED			
AIRPORT	Year	Ton	m <sup>2</sup>
Málaga	1993	1,470	147,000
Bilbao	1995	914	103,700
Ibiza	1997	1,260	128,000
Palma (South runway)	1997	1,350	135,000
Torrejón	1997	2,830	147,000
Alicante	1998	1,000	99,000
Gerona	1999	1,296	144,000
Jerez	2000	740	55,200
Zaragoza (2 layers)	2003	3,000	156,000
Gran Canaria 03L/21R	2004	1,420	142,000
Barajas (2 layers)	2004	4,000	245,000
Alicante	2004	1,000	99,000
Barcelona (2 layers)	2004	3,760	235,000
Gran Canaria 03R/21L	2005	1,420	142,000

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AIRPORTS WHERE COLD MICRO SURFACING WAS USED			
AIRPORT	Year	Ton	m2
Menorca	2006	1,455	138,575
Zaragoza 12R/30L	2006	1,500	150,000
Almería	2007	1,700	170,000
Ciudad Real	2007	3,520	220,000
Sevilla	2007- 2008	1,600	160,000
Palma Norte	2009	540	54,000
Jerez	2009	1,030	103,000
Huesca	2009	170	17,000
Madrid (2 layers)	2010	3,100	250,000

**Meets ICAO criteria for friction and texture**

23 Airports

# Micro Surfacing on Airport Runways

## THINGS TO DO

Before APPLYING Cold Micro Surfacing

- ✓ Maintenance Plan
- ✓ Stocks emplacement.
- ✓ Ways to access runways.
- ✓ How to communicate with tower through Runways.
- ✓ Machinery and man power authorizations.



**Removing paint and rubber before application**







Box placed in  
Madrid-Barajas airport



# Micro Surfacing on Airport Runways



**Aeronautic light Protection**



**Cleaning the loose material**



# Micro Surfacing on Airport Runways

## Application of Micro:

- ✓ Each load should be tested before leaving stock area.
- ✓ Studying the spreading width.

# Micro Surfacing on Airport Runways

## **MIXTURE DESIGN**

### **The best aggregates:**

- ✓ Lower Los Angeles value
- ✓ Higher Polished Stone Value (PSU).
- ✓ Must be clean
- ✓ Get 1 mm in sand patch method.(circulo de arena)

### **The best bitumen:**

- ✓ Bitumen that comes from naphtenic crude oil from Venezuela or other countries.
- ✓ Maximum initial cohesion in airport runways is essential.

## Lights for night works



## Auxiliar Machinery for cleaning



# Micro Surfacing on Airport Runways

## Asphalt Emulsions:

Characteristic	Termoadh.	ECR-1	ECL-2d-m
Penetration	35-60	130-200	50-80
Ring and Ball	> 60	> 40	> 65
pH	3	3	2



# Micro Surfacing on Airport Runways



Distributor applying tack coat



Detail of Distributor

# Micro Surfacing on Airport Runways

Main Equipment. “The machine”





**Gando, Canary Islands (Spain) 2004.**  
**10 MM passengers/year - more than 6 years old**







Detail of final product









Applying the first layer over the tack coat









**Quick break in seconds.  
Clean water**





Pneumatic Compaction  
For best cohesion.



# Micro Surfacing on Airport Runways



Stocks emplacement in Madrid-Barajas in 2010

**The work will be carried out more easily if the runway is closed**





**Madrid Barajas Airport  
(September 2010)**

**The 15L/33R runway after  
painting and placing lights**



# Micro Surfacing on Airport Runways





# Micro Surfacing on Airport Runways





**TEXTURE: 1.2 mm in grease  
patch method**





## Runway in Ciudad Real Airport (Spain)

Without treatment

Tack coat

Area treated with LB-4 + LB-3



It has just been painted

# Micro Surfacing on Airport Runways

## Rubber cleaning:

- ✓ The best practice is applying 800 bar of pressure. It has to be done in 2 goes.
- ✓ More pressure destroys it.
- ✓ Less pressure doesn't eliminate enough rubber.
- ✓ The equipment collects water and rubber for recycling.
- ✓ It's possible to work with wet pavement or rain.



In the picture you can see the axis paint.  
It's cleaned 800x20 m in the runway head



## Detail of turbines and hoses







Almería Airport. Construction carried out by Conelsan. Runway of 2380 x 45 m





In Madrid-Barajas the 2004 runway is  
still in good condition

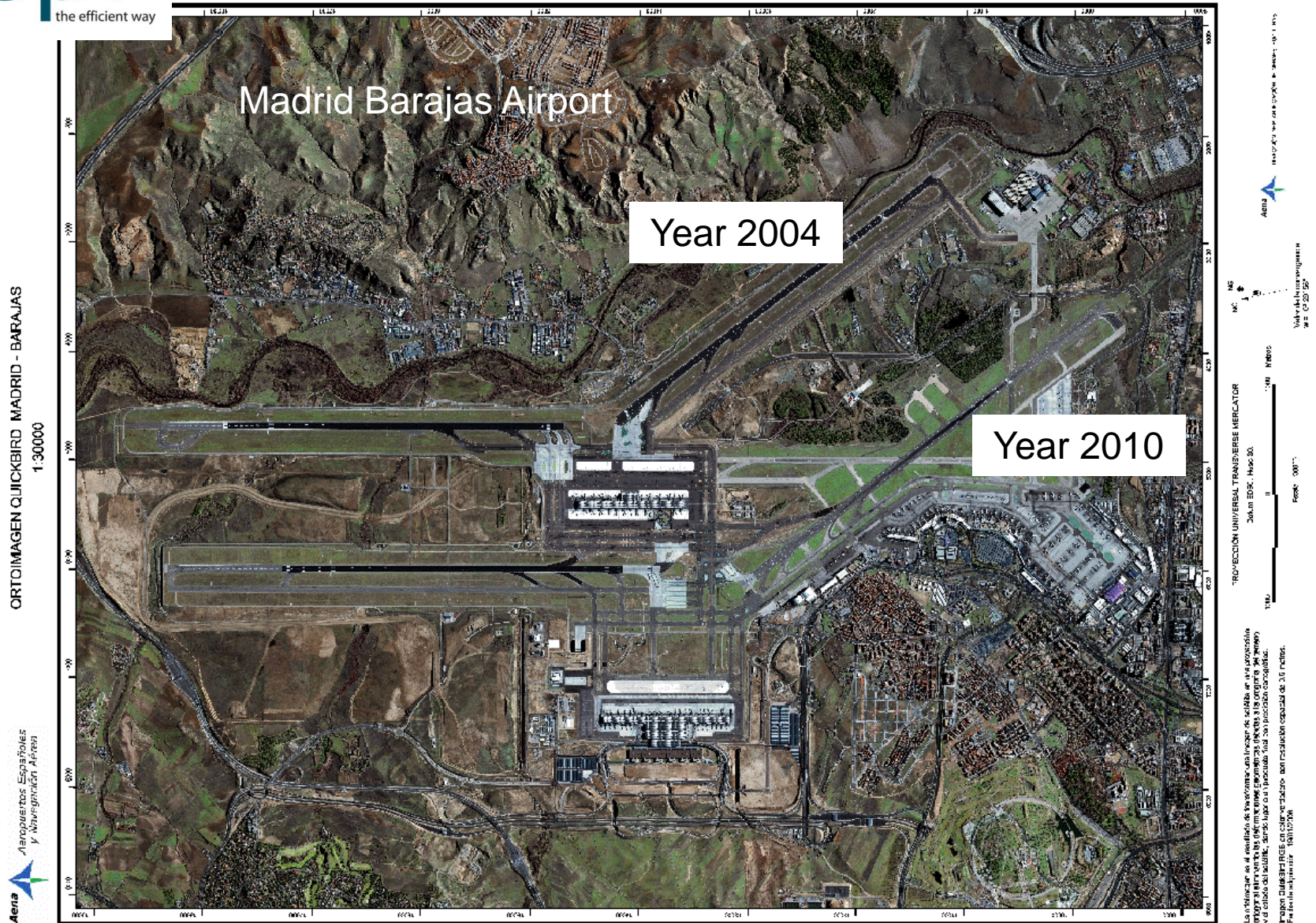
50 MM passengers/year, 1 plane lands  
every minute



Barajas 2004 15L/33R  
Barajas 2010 15R/33L



# Micro Surfacing on Airport Runways





# Micro Surfacing on Airport Runways

## SATISFACTORY BUILDING CERTIFICATES



**D. JOSE SEDANO MAZARIO**, Ingeniero Aeronáutico, colegiado nº 1.317, como Director Facultativo de las obras: **ADECUACIÓN DE PISTA-AEROPUERTO DE JEREZ. EXPDTE DIA 988/2008** para AENA.

**CERTIFICO:**

Que la empresa **INFRAESTRUCTURAS CONELSAN, S.A.** contratista de las referidas obras, las comenzó en Mayo de 2.009 y las terminó en Octubre de 2.009, por un importe total de 1.234.400,00 Euros.

Que en el desarrollo de las citadas obras fueron realizados 127.500,00 m<sup>2</sup> de tratamiento superficial de lechada bituminosa tipo LB-3. Y 7.800 m<sup>2</sup> de tratamiento superficial de lechada bituminosa tipo LB-4

Que las mismas fueron ejecutadas a plena satisfacción de la Dirección de obra.

Y para que conste, a petición del interesado, expido el presente certificado en Madrid a 26 de octubre de 2009

El Director de Obra de Aena



Fdo.: D. Jose Sedano Mazario



**D. GUSTAVO REDONDO FERNANDEZ**, Ingeniero Aeronáutico, colegiado nº 3288 como Director Facultativo de las obras: **REPAVIMENTACIÓN PISTA 03R/21L EN EL AEROPUERTO DE GRAN CANARIA. EXPDTE: 830/2004** para AENA.

**CERTIFICO:**

Que la empresa **INFRAESTRUCTURAS CONELSAN, S.A.** como contratista de las referidas obras, las comenzó en Mayo de 2005 y las terminó en Agosto de 2005, por un importe total de (novecientos dieciocho mil euros) 918.000,00 €.

Que en el desarrollo de las citadas obras fueron realizados 166.376,12 m<sup>2</sup> de Tratamiento superficial de lechada bituminosa tipo LB-3.


Que las mismas fueron ejecutadas a plena satisfacción de la Dirección de obra.

Y para que conste, a petición del interesado, expido el presente certificado en Las Palmas a 21 de octubre de 2009

El Director de Obra de Aena



Fdo.: D. Gustavo Redondo Fernandez



**D. SALVADOR FO ALONSO**, Ingeniero Técnico Aeronáutico, como Director Facultativo de las obras: **RENOVACION DE PAVIMENTO 3H-15R-AEROPUERTO DE MADRID-BARAJAS**. Para AENA.

**CERTIFICO:**


Que la empresa **INFRAESTRUCTURAS CONELSAN, S.A.** Subcontratista de las referidas obras, las comenzó en Agosto de 2.010 y las terminó en Septiembre de 2.010.

Que en el desarrollo de las citadas obras fueron realizados 250.000 m<sup>2</sup> de tratamiento superficial de lechada bituminosa tipo LB-3. Y 100.000 m<sup>2</sup> de tratamiento superficial de lechada bituminosa tipo LB-4

Que las mismas fueron ejecutadas a plena satisfacción de la Dirección de obra.

Y para que conste, a petición del interesado, expido el presente certificado en Madrid a 26 de octubre de 2010

El Director de Obra de Aena



Fdo.: D. Salvador Fo Alonso



**D. JUAN CARLOS PALOMERO ARRANZ**, Ingeniero Aeronáutico, colegiado nº 2.754, como Director Facultativo de las obras: **REGENERACIÓN DE PISTA NORTE. AEROPUERTO DE PALMA DE MALLORCA. EXPEDIENTE 778/08** para AENA.

**CERTIFICO:**

Que la empresa **INFRAESTRUCTURAS CONELSAN, S.A.**, como contratista de las referidas obras las comenzó en Abril de 2009 y las terminó en Agosto de 2009.

Que en el desarrollo de las citadas obras fueron realizados 7.577 m<sup>2</sup> de tratamiento superficial de lechada bituminosa tipo LB-4 y 54.004 m<sup>2</sup> de lechada bituminosa LB-3.

Que las mismas fueron ejecutadas a plena satisfacción de la Dirección de Obra.

Y para que conste, a petición del interesado, expido el presente certificado en Madrid, a 23 de Octubre de 2009.

El Director de Obra de AENA



Fdo.: D. Juan Carlos Palomero Arranz



**D. DANIEL RUIZ CASTILLO**, Ingeniero Técnico Aeronáutico, colegiado nº 1.280, como Director de Obra de las obras: **"TRATAMIENTO SUPERFICIAL PISTA DE VUELO. AEROPUERTO DE ALMERÍA. EXPEDIENTE 825/08"** para AENA.

**CERTIFICO:**

Que la empresa **INFRAESTRUCTURAS CONELSAN, S.A.**, como contratista de las referidas obras las comenzó en Diciembre de 2005 y las terminó en Junio de 2007.

Que en el desarrollo de las citadas obras fueron realizados 37.400 m<sup>2</sup> de tratamiento superficial de lechada bituminosa tipo LB-4 y 160.000 m<sup>2</sup> de lechada bituminosa LB-3.

Que las mismas fueron ejecutadas a plena satisfacción de la Dirección de Obra.

Y para que conste, a petición del interesado, expido el presente certificado en Madrid, a 23 de Octubre de 2009.

El Director de Obra de AENA



Fdo.: D. Daniel Ruiz Castillo



# Micro Surfacing on Airport Runways

## ADVANTAGE

Cold Micro Surfacing

5 €/m<sup>2</sup>

Hot Micro Surfacing

8 €/m<sup>2</sup> + 4,5

Both meet ICAO criteria

When using CMS it's not necessary to elevate beacons.

When using HMS 4 to 5 €/m<sup>2</sup> is spent for elevating beacons.

CMS produces less pollution than HMS

# Micro Surfacing on Airport Runways

## **SUMMARY: Cold Micro Surfacing**

- ✓ It's possible to apply it on runways whose thickness is less than 50 cm of asphalt.
  - ✓ The last millimeter must be: flat, with coarse macrotexture and rough microtexture.
  - ✓ This thin layer guarantees longer life for the remainder of pavement layers.
  - ✓ It withstands the attack of pressurized water, because rubber cleaning.
- 
- ✓ The frequency of more complicated maintenance operations is longer, so it's possible to reduce operations in Airport.
  - ✓ It's not necessary for the aeronautic lights to be raised
  - ✓ The pollution is reduced because it's a cold process





Elpidio Sánchez-Marcos

## **CORPORATE PLANNING RESULTS, SL**

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