



**Hrvatsko asfaltno društvo**



**Croatian asphalt association**

# **Razvoj asfaltne industrije u Sloveniji**

# **Development of Asphalt Industry in Slovenia**

**Slovenko Henigman, ZAS**

**Međunarodni seminar ASFALJNI KOLNICE 2016**  
**International seminar ASPHALT PAVEMENTS 2016**

**Opatija, 06.–07. 04. 2016.**

In memory of |  
Dr. Zdravko Ramljak



# Content

- SLOVENIA – Basic Information
- ZAS, The Slovenian Asphalt Pavement Association
- Roads, Traffic and Pavement Design
- Asphalt Production
- Development in the Asphalt Industry
- Slovenian Asphalt Industry in the future

# SLOVENIA

## Basic Information

## SLOVENIA - in the middle of Europe



Population: 2,060,000 Mio

Independence gained in  
1991

Full member of the EU:  
May 1, 2004

Surface: 20,256 km<sup>2</sup>

GDP 23.289 USD (2013),  
18.000 EUR (2014)

Currency: Euro (€)

# ZAS

# The Slovenian Asphalt Pavement Association

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## Slovenian Asphalt Pavement Association

Founded: 1996

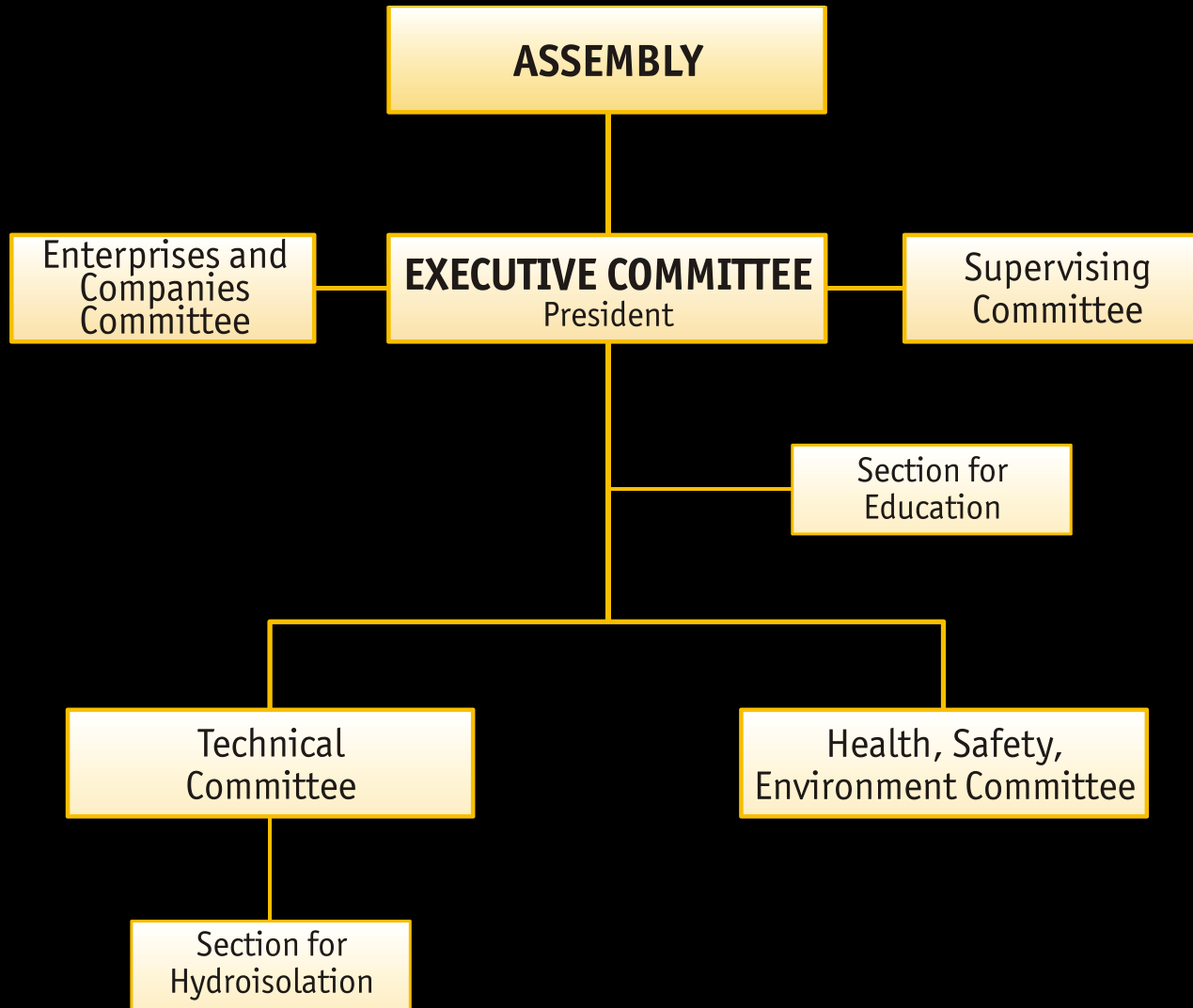
Head Office: **Kotnikova ulica 32, Ljubljana, Slovenia**

Members:

- **Individuals: 100**
- **Companies: 46**

**Number of employees in the Slovenian asphalt industry:**  
2.000

# ZAS - Organisation





# Schooling and Seminars



# Practical Schooling



# Colloquium on Asphalt and Bitumen | Bled 2013 - 2015



# ZAS - Slovenian Asphalt Pavement Association

## EVENTS

Events	Number	Speakers	Participation
General Assembly	20		2.000
Different events	64	152	6.000
Schooling	20	106	3.000
Colloquium on asphalt and bitumen	15	194	2.500
Together	119	452	13.500*

\* > 5 % international

# Slovenian Asphalt Pavement Association – Members and Meetings

## PARTNERS: CPG, MAPRI, POMGRAD, TRGOGRAD, CGP

### 1. RANG

ASFALTI PTUJ, d.o.o.  
 CGP, d.d.  
 CP ASFALT, d.o.o.  
 CPG, d.d.  
 DRI upravljanje investicij, d.o.o.  
 GGD, d.d.  
 MAPRI PROASFALT, d.o.o.  
 PETROL, d.d.  
 SGP POMGRAD, d.d.  
 STRABAG AG, Podružnica Ljubljana  
 TRGOGRAD, d.o.o., Litija

### 2. RANG

AHAC NG, d.o.o.  
 AMMANN, Schweiz, AG (CH)  
 ASFALT KOVAČ, d.o.o.  
 ASFALTING, d.o.o.  
 BENNINGHOVEN, GmbH (D)  
 CPK, d.d.  
 CVP Inženiring, d.o.o.  
 HARSCO Minerali, d.o.o.  
 HIPOX, d.o.o.  
 IGMAT, d.d.  
 Komunala Slovenske Gorice, d.o.o.  
 KPL, d.d.  
 OMV, GmbH (A)  
 POSSEHL, d.o.o.  
 RV Rheinbraun, GmbH (D)  
 TAČ, d.o.o.  
 TAK, d.o.o.  
 VIANOVA SLOVENIJA  
 VILLAS Austria, GmbH (A)  
 JOSEPH VÖGELE, AG (D)  
 ZAG

### 3. RANG

B&A&M, d.o.o.  
 BGR inženiring, d.o.o.  
 GI ZRMK, d.o.o.  
 INTERCHEM, HmbH (A)  
 KERN 90, d.o.o.  
 LESPATEX, d.o.o.  
 MC Metal, d.o.o.  
 RAMTECH, d.o.o. (CRO)  
 RD-TEHNOLOGIJA, d.o.o.  
 SIKA, d.o.o.  
 STRUCTUM, d.o.o.  
 WEISIG, GmbH (D)



• Individual members



## ZAS - International Cooperation

- EAPA (B), E&E Congress Vienna 2004
- DRC (SLO)
- FSV (A)
- GESTRATA (A)
- HAPA (HU)
- HAD (CRO)
- DAV (GER)



# ZAS & EAPA General Assembly, Executive Committee, Meetings



## ZAS - International Activities

- **ZAS Study tours:**
  - Bratislava (Slovakia),
  - Vienna (Austria),
  - Sydney (Australia),
  - Sheffield (UK)
  - Washington & Lexington (USA)
- **E & E Congresses**
  - Barcelona (Spain),
  - Vienna (Austria),
  - Copenhagen (Denmark),
  - Istanbul (Turkey)



# USA tour 2006 – World of Asphalt Pavement



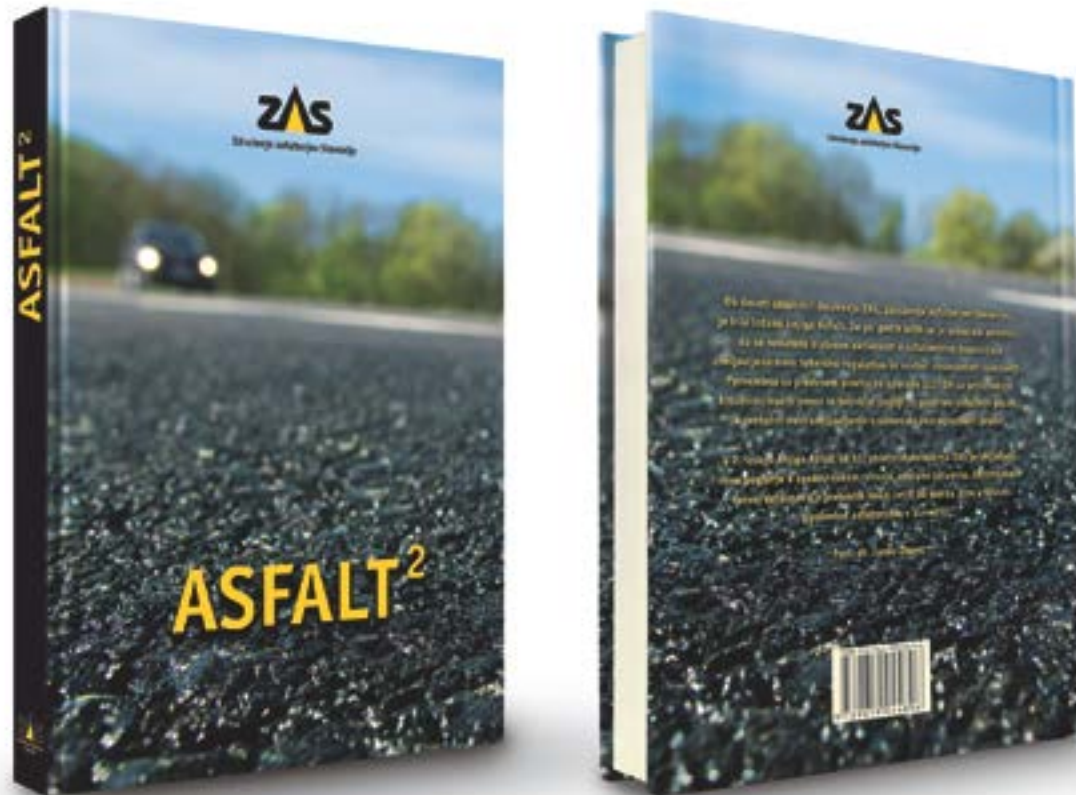
# NCAT, National Center for Asphalt Technology



# Visiting NAPA Washington, & Asphalt Institute Lexington 2015



# Publishing



Book "Asphalt"

# Publishing



Newsletter "from assembly to Assembly"

# SLOVENIA

## Roads, Traffic and Pavement Design

# Slovenian Roads

Motorways + Expressways 762 km

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Main and regional roads 5.936 km

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Local roads and public ways 32.224 km

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**All together: 38.933 km**



# Slovenian Roads





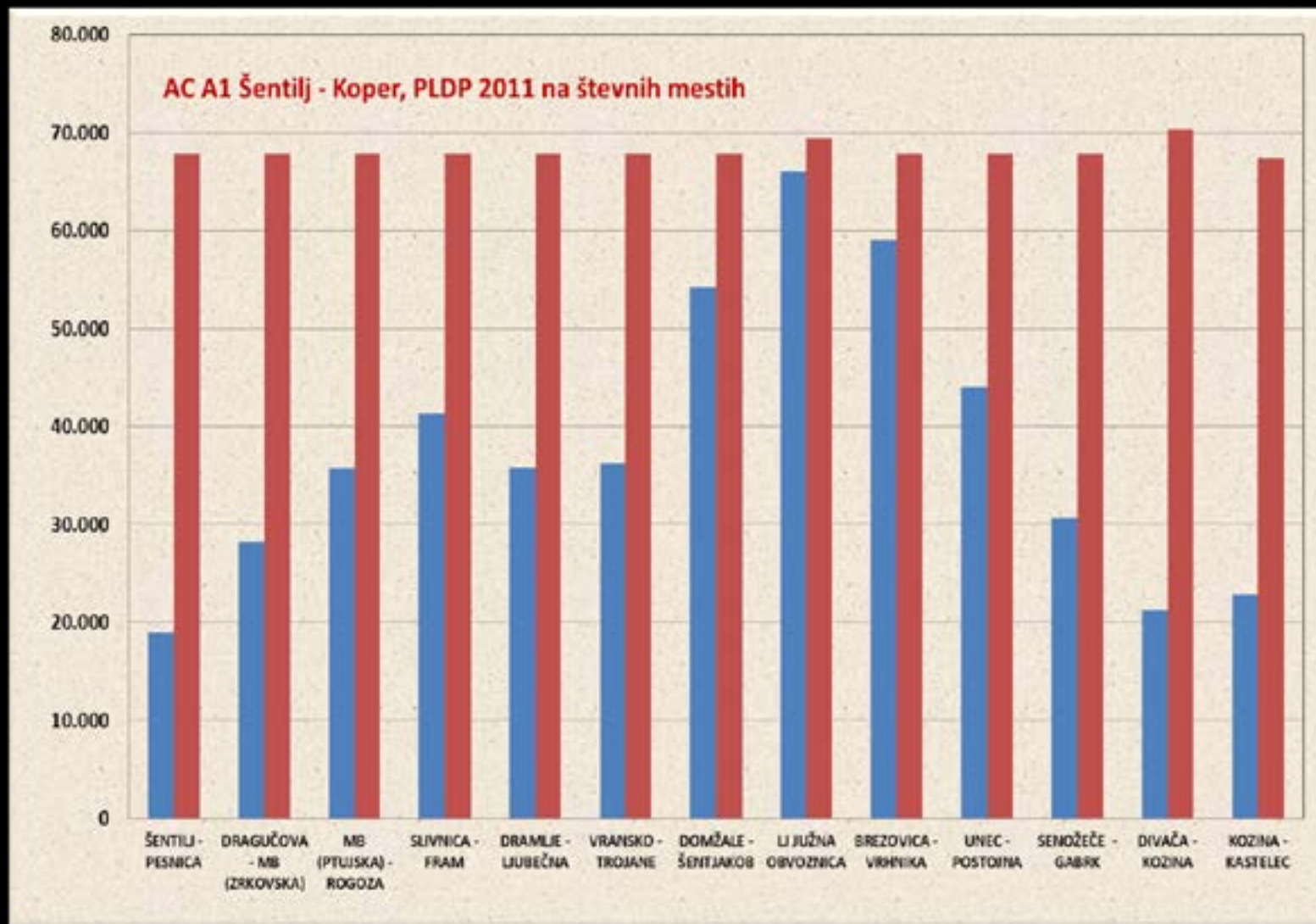
# Motorway



# State road

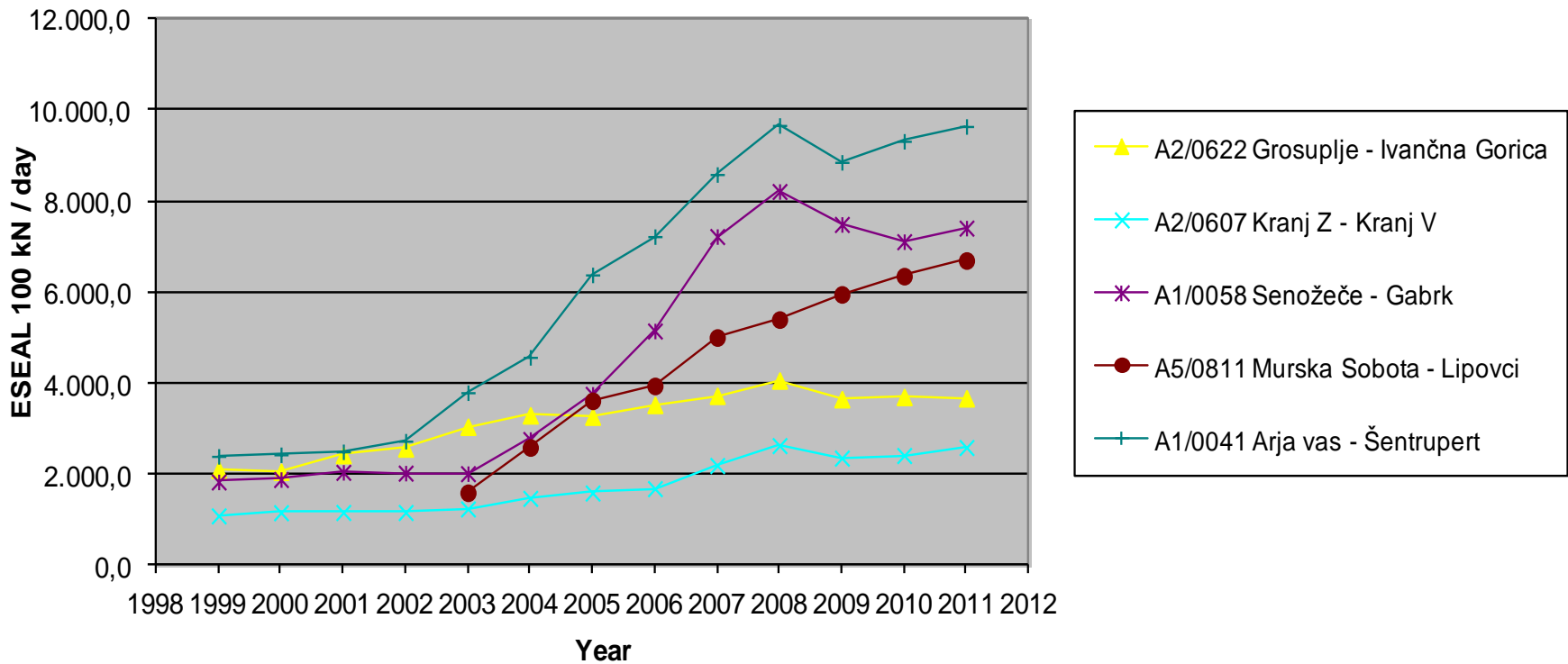


# Average Daily Traffic: East - West



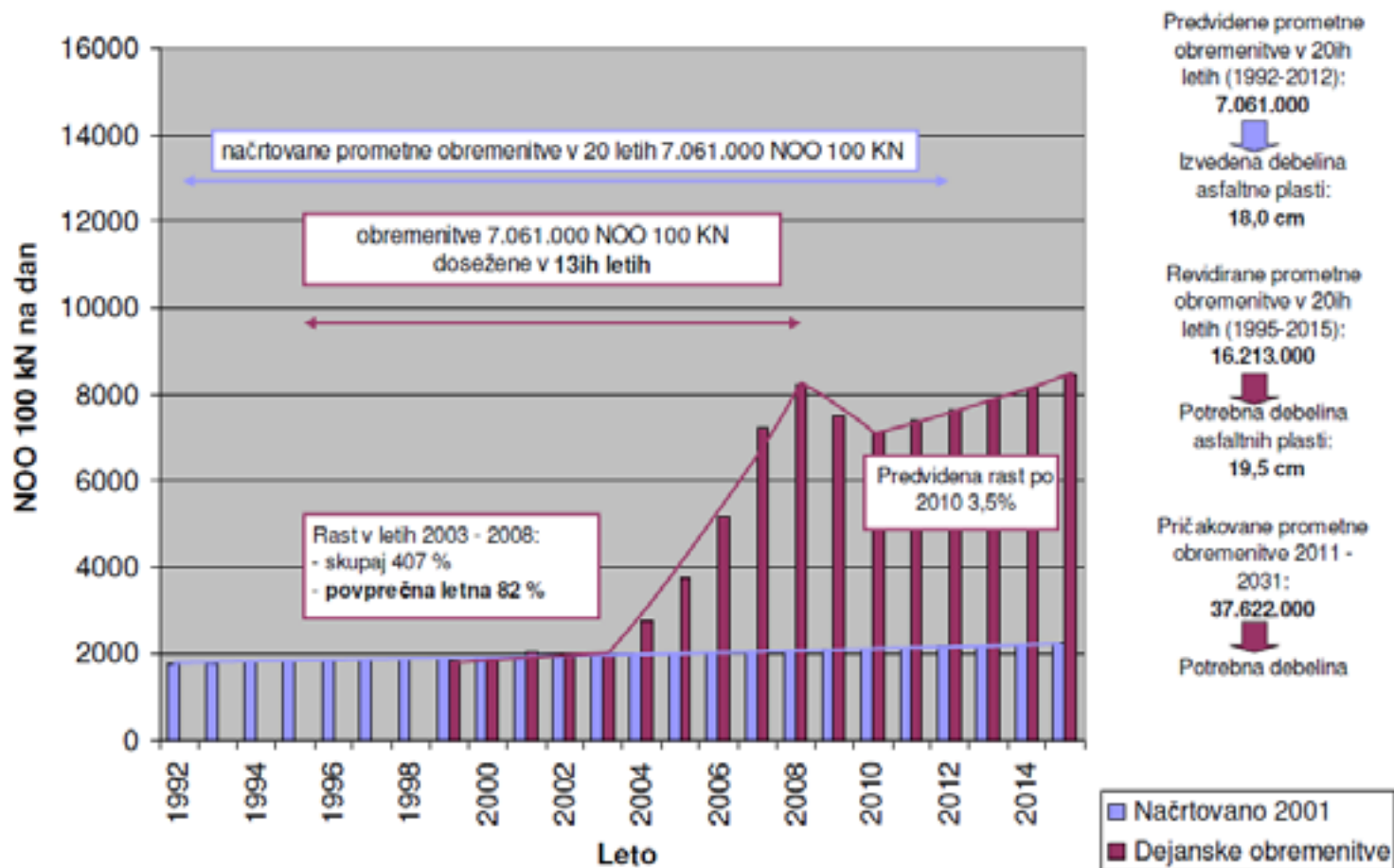
# Traffic Loading on Motorways

## Daily ESAL 100 kN passes



# Traffic Loading on Motorway Gabrk - Divača

## Prometne razmere na odseku AC - A1/0058 Senožeče - Gabrk



# The Importance of Pavement Structures

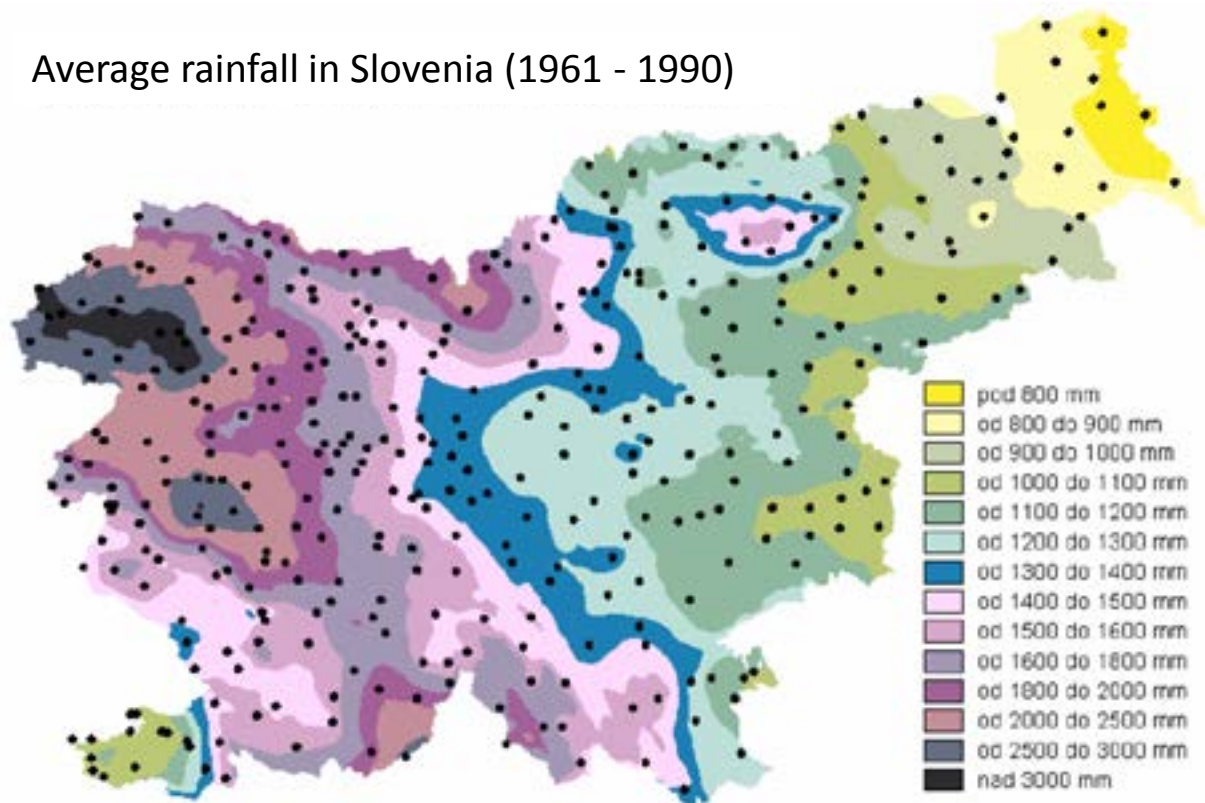
- Level of service for the users (evenness, skid resistance)
- Environment protection (noise)
- Traffic safety (change of transverse slope between two curves)
- Sustainability (cracks, deformations, potholes, wear)



**Pavements structure**  
is the most important element of the road.

# Temperatures and rainfall in Slovenia

Average rainfall in Slovenia (1961 - 1990)



## Weather monitoring station

Temperature	Portorož	Ljubljana	Slovenj Gradec	Murska Sobota
- highest - °C	36,3	37,1	34,5	37,9
- lowest - °C	- 10,3	- 20,3	- 27,0	- 26,9

## Pavement Design

The basis for the design are (AASHTO):

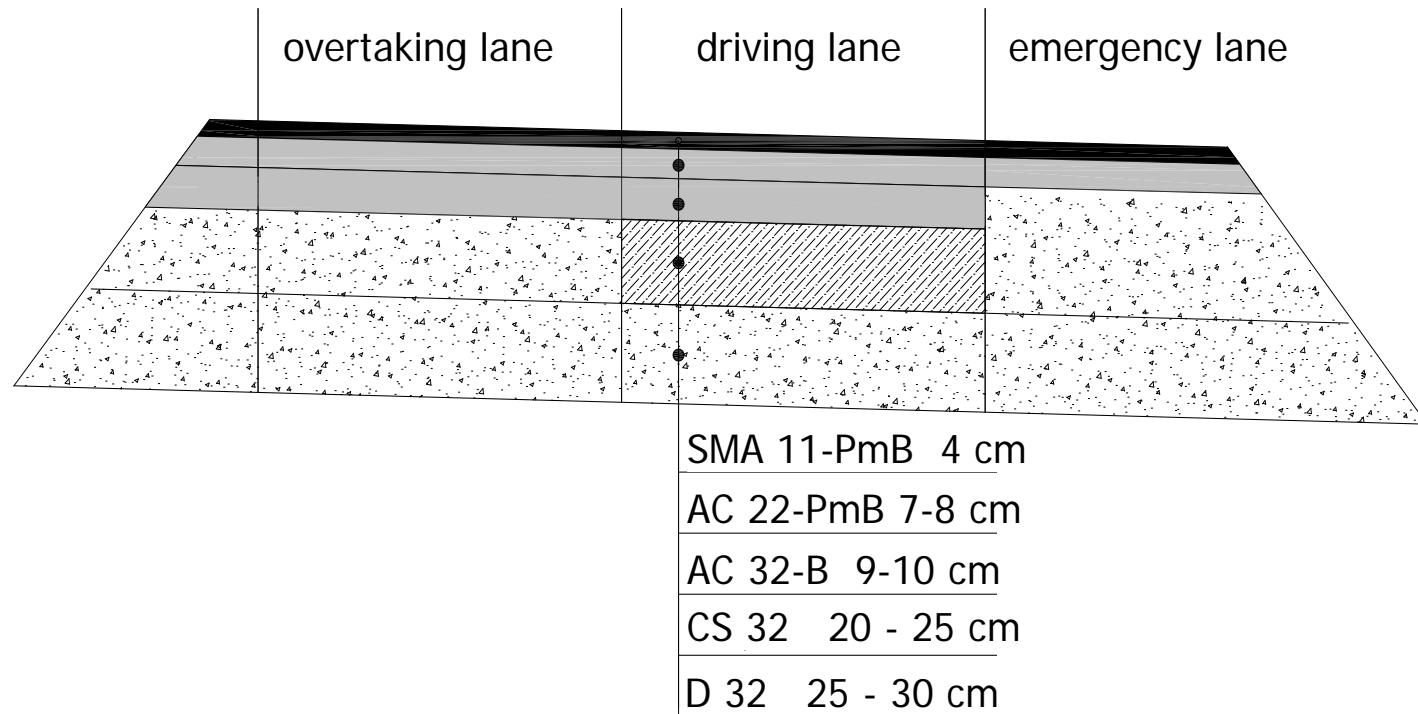
- Loading (traffic, climate, hydrological, ...)
- Geomechanical and geological conditions
- Planned life span:
  - For new constructions 20 years (30)
  - For rehabilitation measures 10 years



## Pavement Design

- All pavement structures are designed – we don't use package (uniformed) upgrades!?
- The construction of motorways has brought a significant development:
  - before 1995: less than 200 km
  - from 1995 to 2010: more than 500 km

# Typical Pavement structures – development during periods – (after 2005)

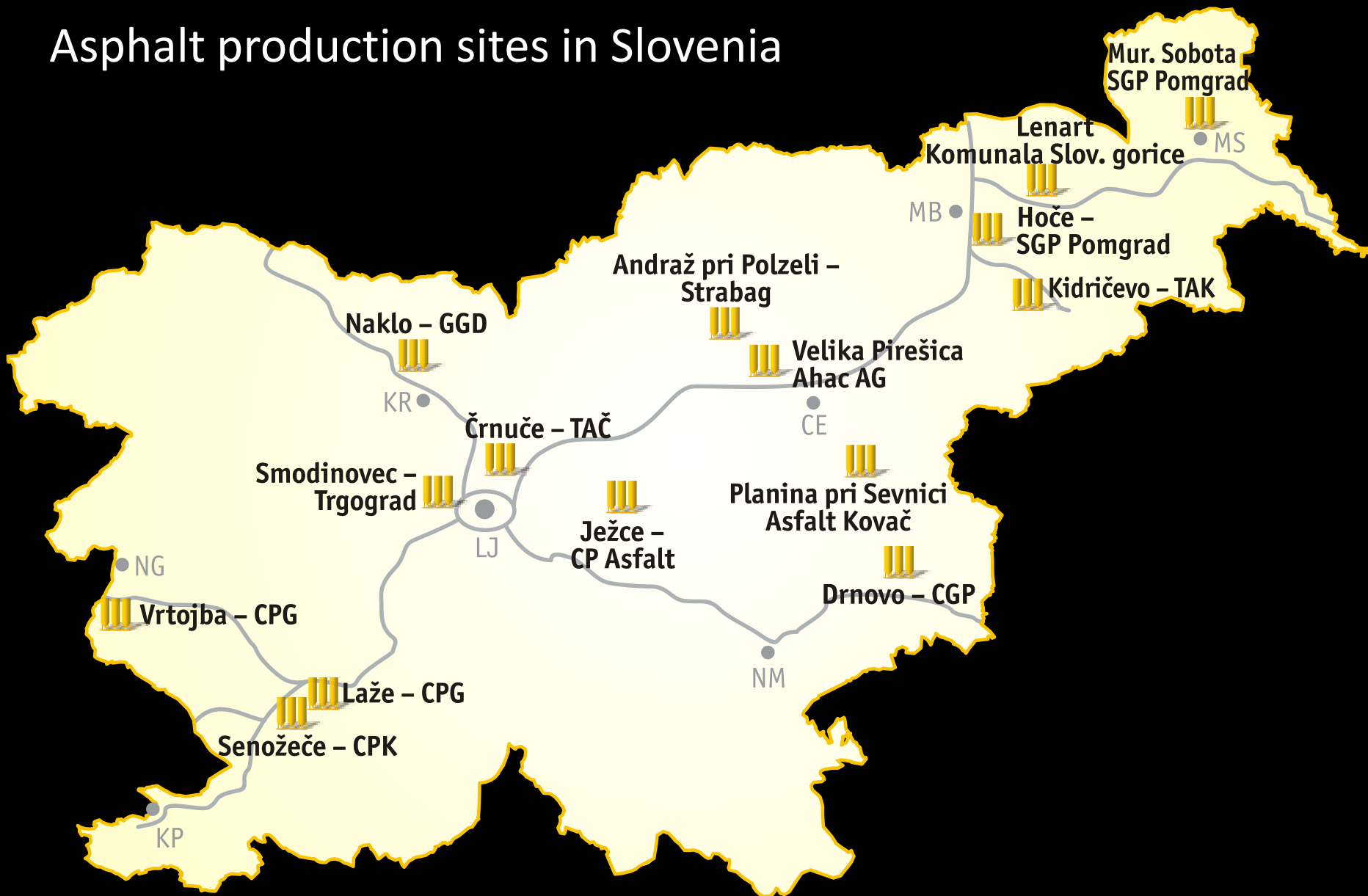


# ASPHALT PRODUCTION

## Asphalt plants

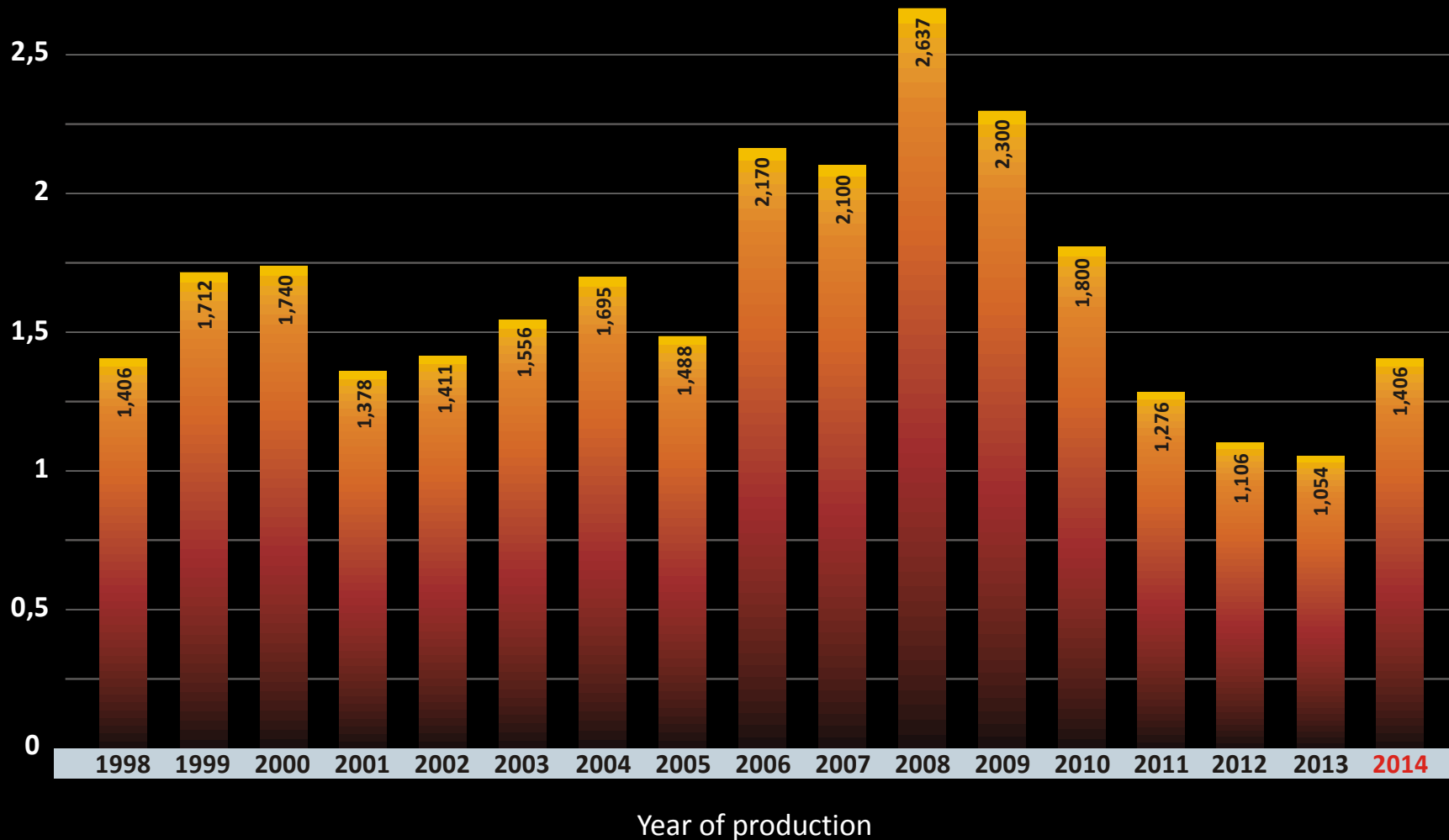
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# Asphalt production sites in Slovenia



# Production of asphalt mixtures in Slovenia 1998 - 2014

(Mio tons)



# Asphalt laying



# Asphalt plant near Ljubljana



# DEVELOPMENTS in the Asphalt Industry



## Development in the asphalt industry

- Dynamic laboratory tests (bitumen, asphalt,...)
- Recycling (on the plant and in situ with foam bitumen),
- Black and White (Concrete on Trucks line)
- Asphalt on bridges (MA, SMA,...)
- Different materials: PmB, PA, natural bitumen, slag, rubber
- Low temperature asphalt
- Low noise asphalt

# Road Reconstruction with Foam bitumen



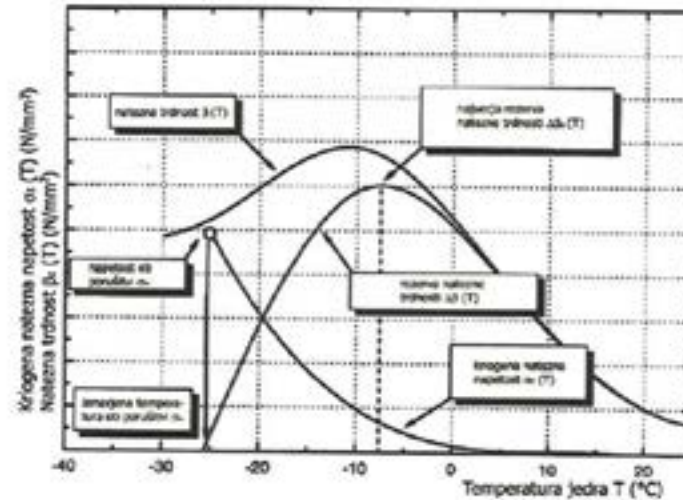
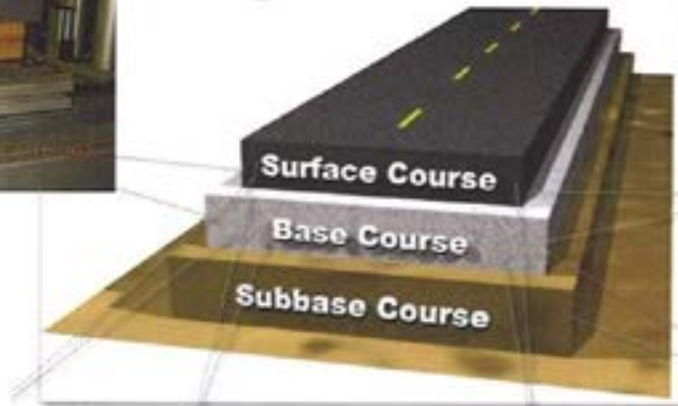
# Asphalt (concrete) pavements – development and innovations



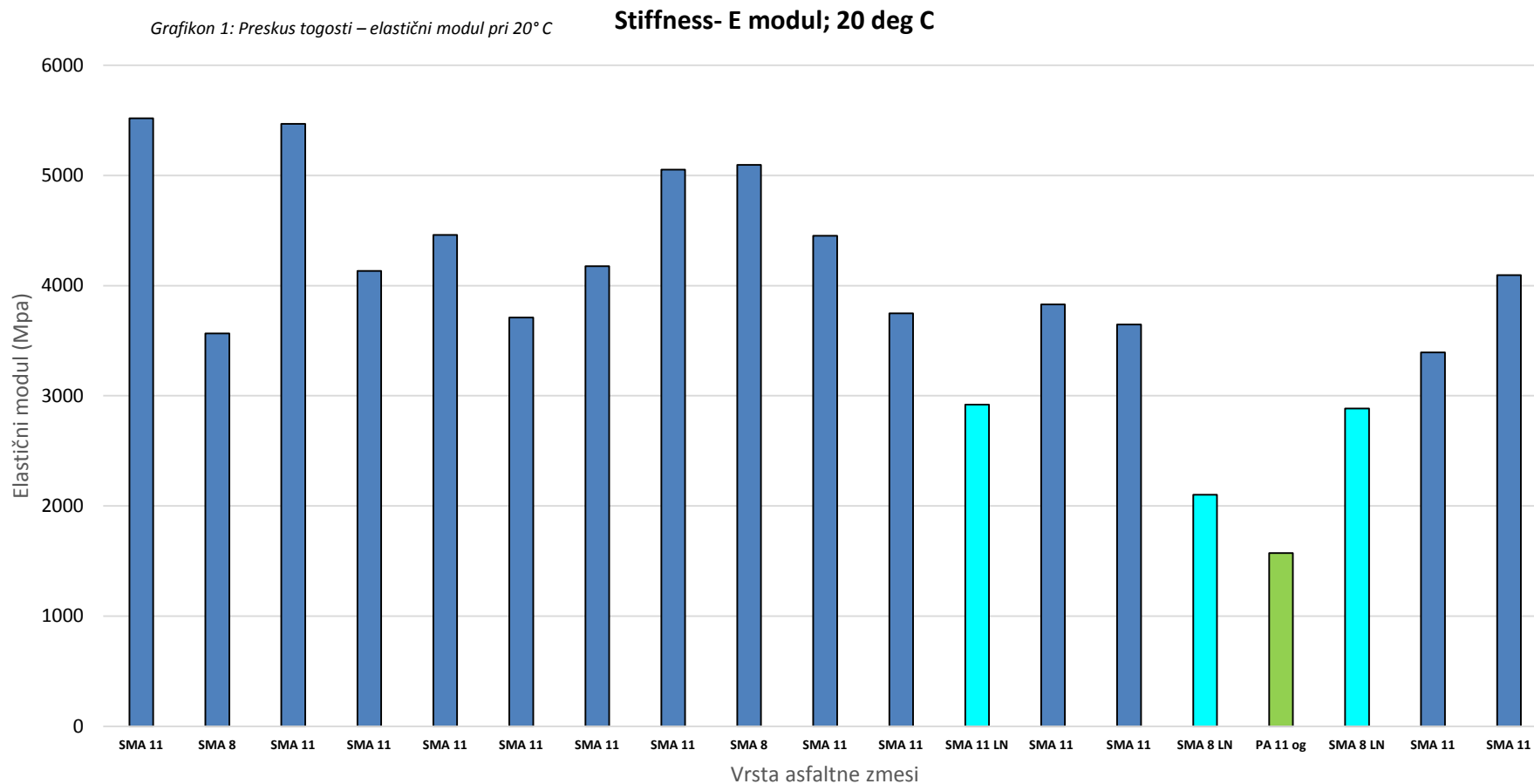
# Asphalt mixtures on Bridges



# Dynamic laboratory tests

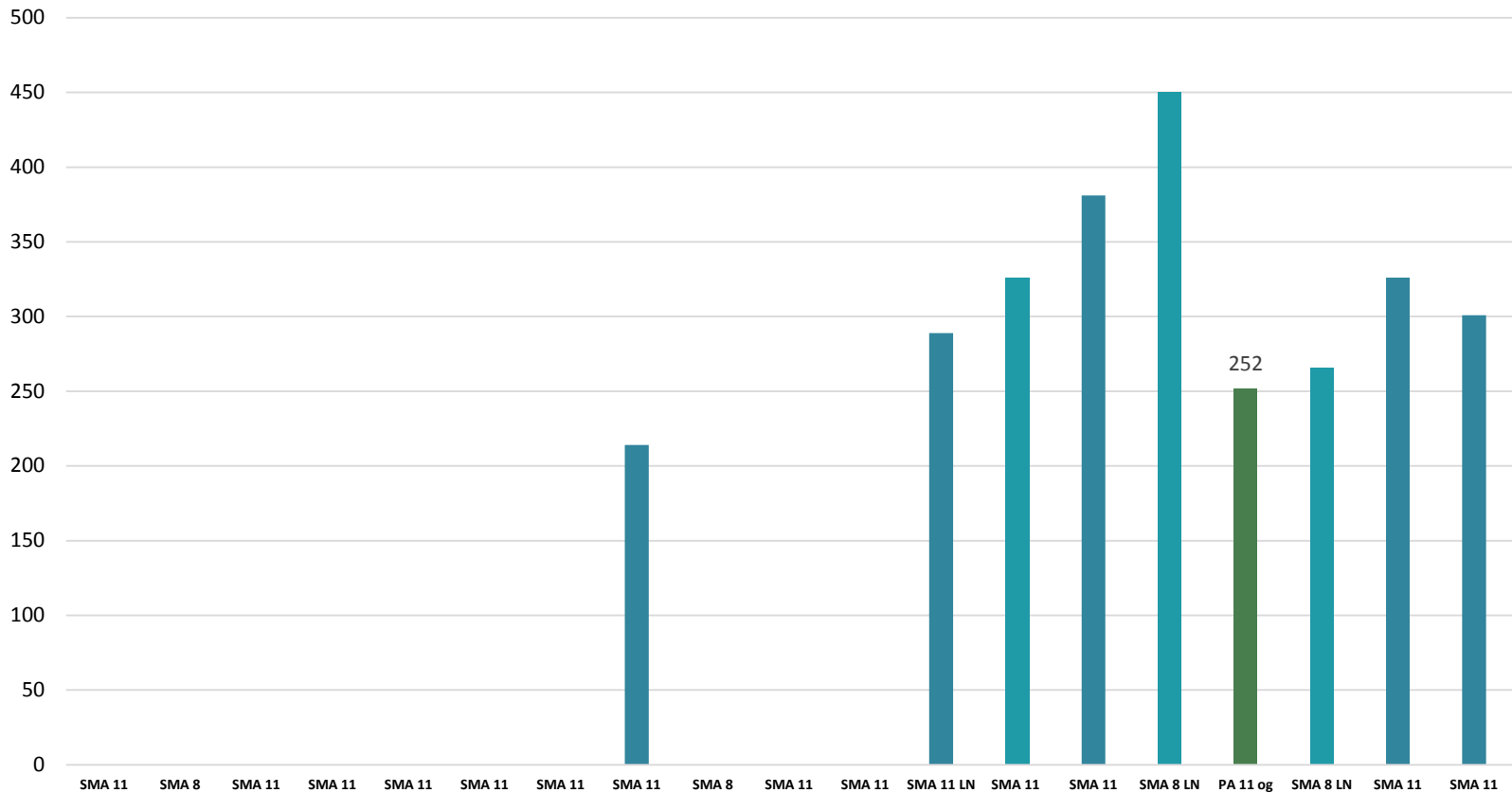


# Dynamic laboratory tests - stiffness



# Dynamic laboratory tests - Fatigue

Fatigue - 4PB-PR; 20 deg. C



# Dynamic laboratory tests – Low Temperature Behavior

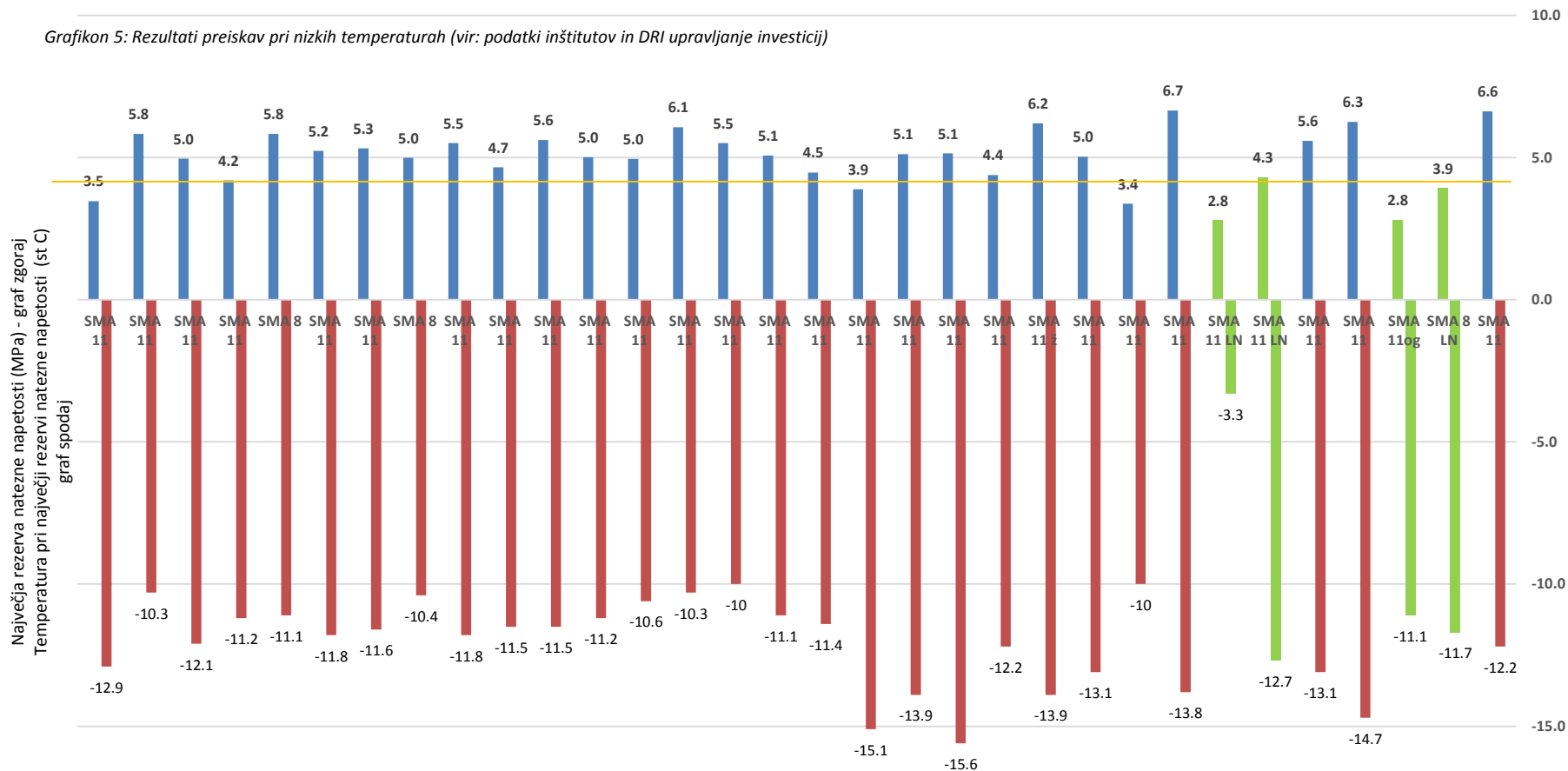
Zap. št	Izvajalec in asfaltna zmes	Temperatura pri največji rezervi natezne napetosti [° C]	Največja rezerva natezne napetosti [MPa]
1	CP LJ SMA 11	-12,9	3,47
2	CMC SMA 11 PmB 45/80-65 A2	-10,3	5,839
3	SCT Iormani SMA 11 PmB 45/80-65 A2	-12,1	4,962
4	SCT Iormani SMA 11 PmB 45/80-65 A2	-11,2	4,2
5	CGP Drnovo-Primorje SMA 8 PmB 45/80-65 A2	-11,1	5,84
6	CPM SMA 11 PmB 45/80-65 A1	-11,8	5,24
7	TAP SMA 11 PmA 45/80-65 A1	-11,6	5,33
8	CPK SMA 8 PmB 45/80-65 A2	-10,4	4,99
9	TAP SMA 11 PmA 45/80-65 A1	-11,8	5,51
10	SMA 11-2006	-11,5	4,6594
11	SMA 11-2006	-11,5	5,6238
12	SMA 11-2006	-11,2	5,0123
13	SMA 11-2006	-10,6	4,9537
14	SMA 11-2006	-10,3	6,0722
15	SMA 11-2006	-10	5,5147
16	SMA 11-Bitupol C	-11,1	5,07
17	SMA 11-Zaloplast II	-11,4	4,48
18	SMA 11-Vilabit 65	-15,1	3,89
19	CP LJ SMA 11-Vilabit 65	-13,9	5,121
20	SCT SMA 11-Starfalt50-90	-15,6	5,149
21	Strabag SMA 11-Vilabit 65	-12,2	4,392
22	Primorje žindra SMA11 Polyplast A1	-13,9	6,21
23	SCT SMA 11 Vilabit 65	-13,1	5,035
24	Primorje SMA 11 45/80-65 Polyplast A1	-10	3,377
25	Strabag SMA 11 45/80-65 Starfalt	-13,8	6,655
26	CPK SMA LN 11 45/80-65 Polyplast A1	-3,3	2,796
27	CPK SMA LN 11 45/80-65 Starfalt	-12,7	4,3
28	CPK SMA 11 45/80-65 Starfalt	-13,1	5,594
29	Strabag SMA 11 45/80-65	-14,7	6,26
30	CPG PA 11 og RmB	-11,1	2,802
31	CPG SMA 8 InPmB	-11,7	3,926
32	CPG SMA 11 PmB	-12,2	6,626



# Dynamic laboratory tests – Low Temperature Behavior

Največja rezerva natezne napetosti (v MPa) in pripadajoča temperatura (st. C)

Grafikon 5: Rezultati preiskav pri nizkih temperaturah (vir: podatki inštitutov in DRI upravljanje investicij)



# The Slovenian Asphalt Industry in the future

## Asphalt industry in the future

- Environment protection and green industry (WMA, recycling, low noise)
- Development of new equipment (plants, machines,... compatible with internet, self controlled)
- Development of new mix concepts
- New binders (rejuvenators and others)
- Making the industry attractive to get best possible people and
- Schooling

Thank you for listening.  
Welcome to Slovenia!

[www.zdruzenje-zas.si](http://www.zdruzenje-zas.si)