25-year pavement surface monitoring of 60 trial sections

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1. Background

Pavement design functional inputs

Tool	Time requirement	Reliability
Mechanistic (computer) models, analysis	days	low
Laboratory testing	weeks	limited
Test roads, ALT, HVS	months	fair (medium)
(Long-term) pavement monitoring	(10) years	high

2. Methodology of pavement monitoring I.

60 trial sections (motorways, main and secondary roads),
500 m length, one traffic lane
14 „road section classes" (as a function of pavement
type, traffic size and subgrade soil type)

Yearly monitoring since 1991:
bearing capacity (KUAB),
unevenness + rut depth + micro + macro texture (RST),
surface defects (Road Master)

2. Methodology of pavement monitoring II.

Bearing capacity (every 50m)

2. Methodology of pavement monitoring III.

Pavement unevenness (IRI and rut depth) + texture (practically continuous)

2. Methodology of pavement monitoring IV.

Surface defects
(Road Master key-board
device aided visual)
(continuous)

3. Monitoring results I.

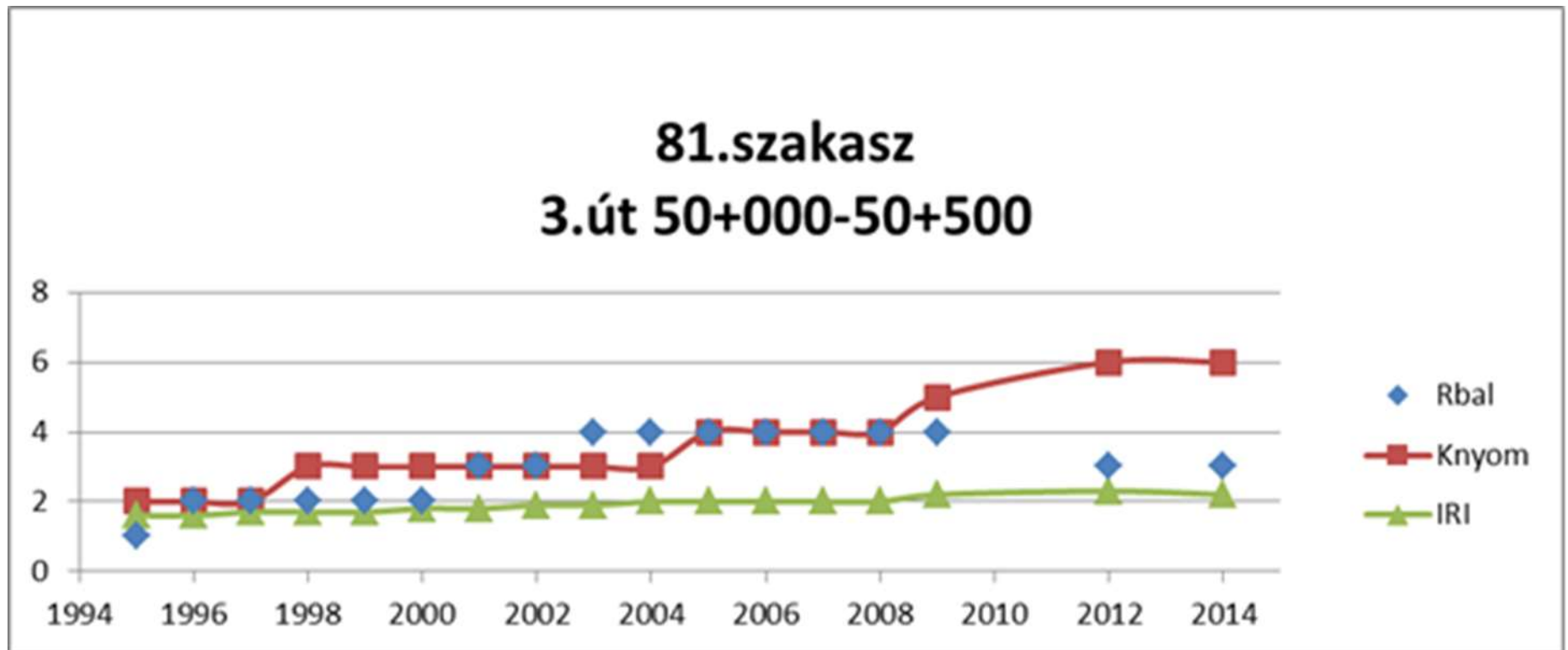Pavement performance models in road section classes:

3-5 trial sections' cumulated condition evolution data (quasi data time series) for each condition parameter; as a function of age or traffic passed (since construction or past rehabilitation year); problems with bearing capacity performance models ("yearly" factors?).

More than 85%: already rehabilitated during the monitoring period

Actual condition improving effect of rehabilitation strategies could be scrutinized: at which level; improvement; new deterioration trend
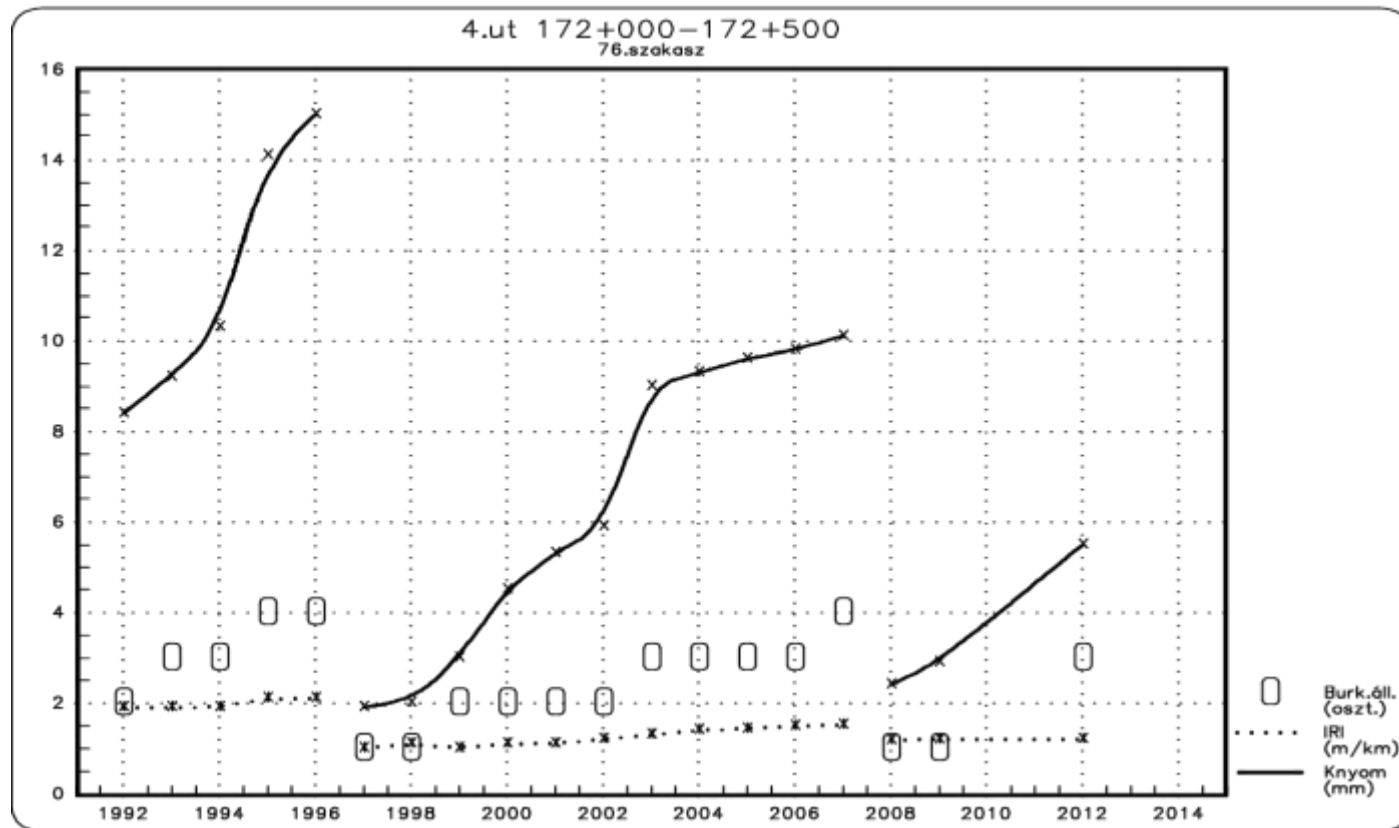
3. Monitoring results II.

No pavement rehabilitation between 1995 and 2014

81.szakasz
3.út 50+000-50+500

3. Monitoring results III.

Double resurfacing in 1996 and 2007

4.ut 172+000−172+500
76.szakasz

4. Effect of pavement rehabilitation I.

Actual condition improving effect of rehabi-litation strategies could be scrutinized:

- at which level;
- improvement;
- new deterioration trend.

4. Effect of pavement rehabilitation II.
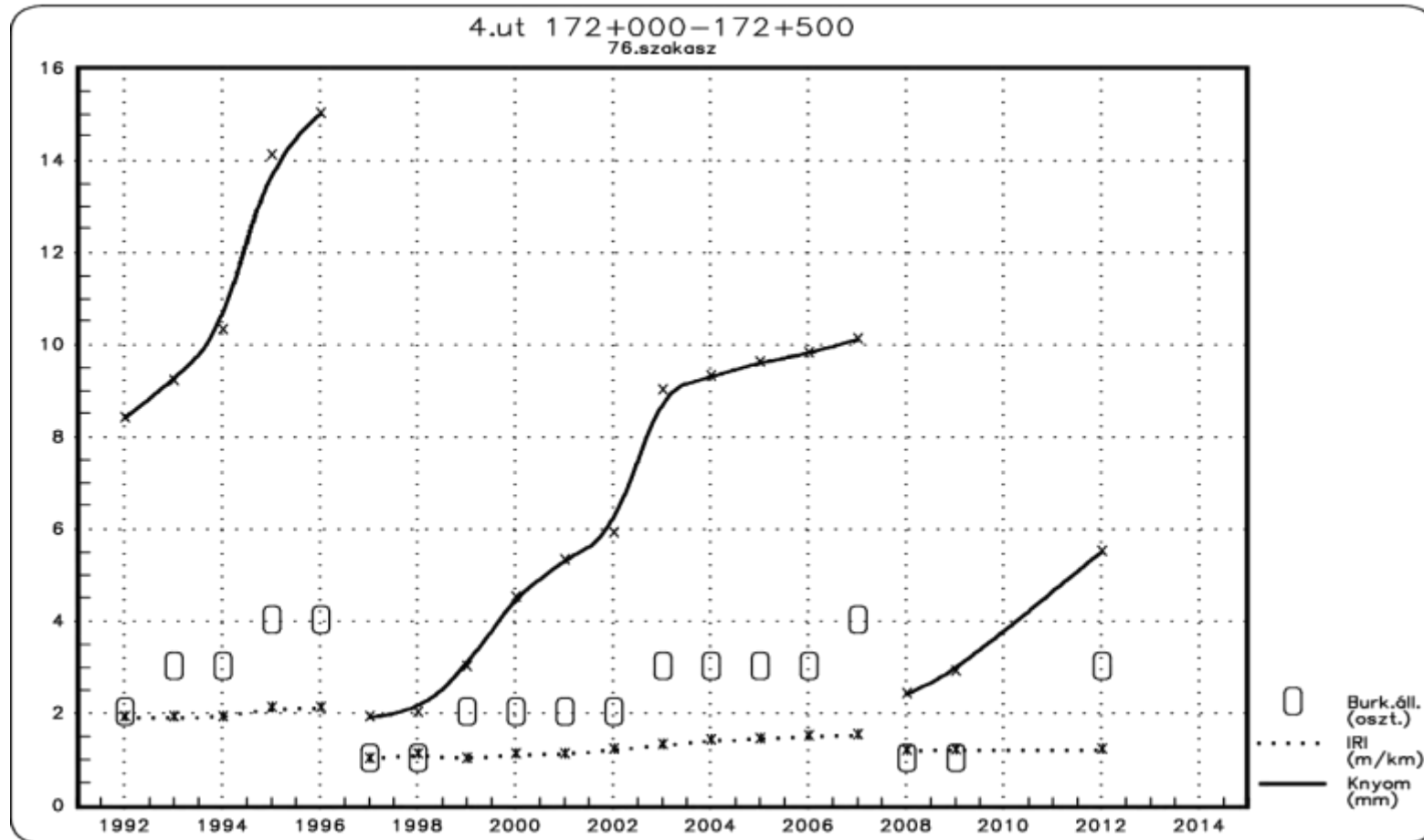
Some initial data:

- Strengthening: 11-15 years old

- Strengthening: 1.5-14.8 mm rut depth

- Surface dressing: 1.8-6.0 m/km IRI

- Surface dressing: 2.0-9.0 mm rut depth

- Surface dressing: 0,20-0,65

- Surface dressing: 0,13-0,38.

4. Effect of pavement rehabilitation III.
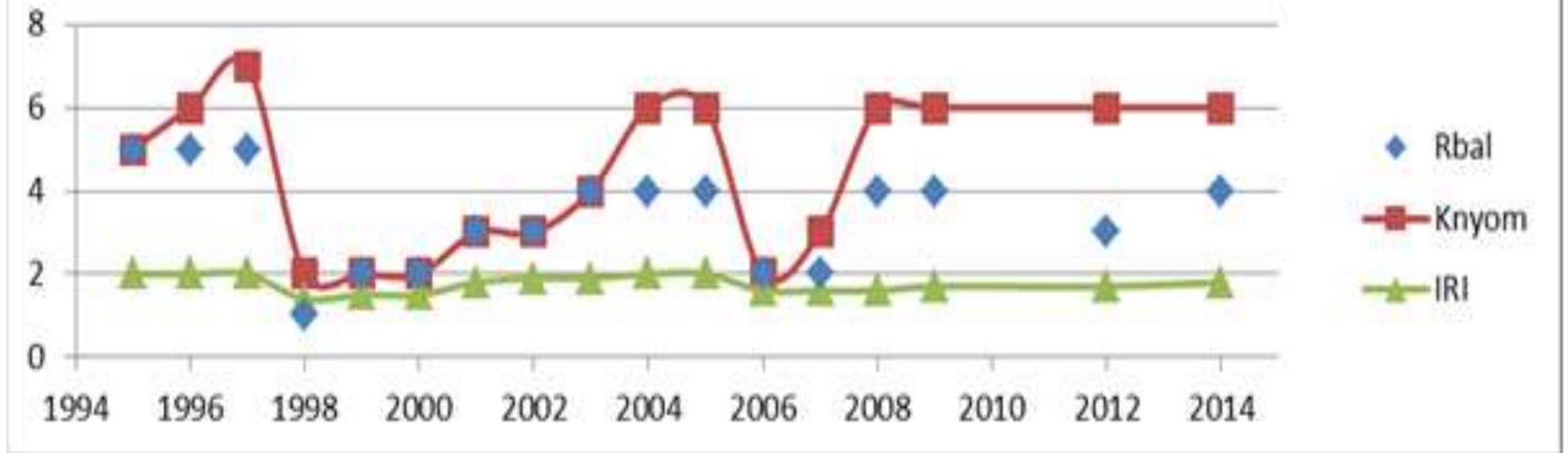
Improvement:

- 0,5-1,5 m/km IRI if even initially
- Extreme changing: 7.1 → 2.3m/km
- New rut depth:1.0-3.0mm if min. 2 layers
- New rut depth: 5.0-7.5mm after 1 layer if initial: 9.8-11.3mm
- 0.10-0.20 in macro roughness parameter
- 0.05-0.13 in micro roughness parameter (extremes: 0.22-0.41)

4. Effect of pavement rehabilitation IV.

4. Effect of pavement rehabilitation V.

4. Effect of pavement rehabilitation VI.

Section	Year of strengthening	Initial IRI (m/km)	New IRI (m/km)	Improvement in IRI (m/km)
63.út 28+000-28+500	2000	2,2	1,4	0,6
63.út 28+000-28+500	2010	2,0	2,0	0,0
33.út 71+000-71+500	1999	2,6	1,1	1,5
47.út 90+000-90+500	1996	2,2	1,0	1,2
61.út 40+000-40+500	1997	2,1	1,9	0,2
3401.út 15+000-15+500	1995	2,5	1,6	0,9
53107.út 2+000-2+500	2001	7,1	2,3	4,8
6.út 234+000-234+500	1992	2,1	1,7	0,4
33.út 20+000-20+500	1997	2,4	2,0	0,4
3.út 104+100-104+600	1995	1,2	1,0	0,2
4.út 172+000-172+500	1997	2,0	1,1	0,9
11.út 53+000-53+500	2000	2,3	1,0	1,3
30.út 50+000-50+500	1994	2,0	0,9	1,1
50.út 50+000-50+500	1998	2,0	1,0	1,0
75.út 59+700-60+200	2002	2,2	1,8	0,4
44.út 105+000-105+500	2004	1,9	1,4	0,5
89.út 8+900-9+400	2004	2,6	1,5	1,1
8.út 117+000-117+500	2005	2,1	1,2	0,9
1113.út 15+000-15+500	2005	3,0	1,3	1,7
5606.út 0+000-0+500	2009	3,5	0,6	2,9
Mean value		2,6	1,2	1,4

4. Effect of pavement rehabilitation VIII.

Section	Year of strengthening	Initial rut depth (mm)	New rut depth (mm)	Reduction of rut depth (mm)
63.út 28+000-28+500	2000	10,0	2,0	8,0
63.út 28+000-28+500	2010	8,2	4,2	4,0
33.út 71+000-71+500	1999	12,6	1,5	11,1
47.út 90+000-90+500	1996	6,1	3,0	3,1
61.út 40+000-40+500	1997	5,0	2,2	2,8
3401.út 15+000-15+500	1995	1,5	1,0	0,5
53107.út 2+000-2+500	2001	7,5	3,5	4,0
6.út 234+000-234+500	1992	2,4	1,5	0,9
33.út 20+000-20+500	1997	6,8	3,1	3,7
3.út 9104+100-104+600	1995	4,8	2,1	2,7
4.út 172+000-172+500	1997	14,8	2,0	12,8
11.út 53+000-53+500	2000	6,6	2,0	2,6
30.út 50+000-50+500	1994	5,3	1,9	3,4
50.út 50+000-50+500	1998	6,6	2,0	4,6
75.út 49+700-60+200	2002	6,6	5,1	1,5
4.út 59+000-59+500	2004	8,3	1,9	6,4
44.út 105+000-105+500	2004	7,0	2,0	5,0
89.út 8+900-9+400	2004	5,9	1,9	4,0
4407.út 2+000-2+500	2004	8,0	2,0	6,0
8.út 117+000-117+500	2005	13,7	1,7	12,0
1113.út 15+000-15+500	2005	4,3	2,0	2,3
5606. út 0+000-0+500	2009	8,0	1,0	7,0
Mean value		7,0	2,2	4,8

4. Effect of pavement rehabilitation VIII.

Section	Year of surface dressing	Initial macro roughness	New macro roughness	Changing in macro roughness
32.út 7+000-7+500	1994	0,21	0,99	**0,78**
5606.út 0+000-0+500	2000	0,18	0,34	**0,16**
5702.út 18+000-18+500	2000	0,43	0,51	**0,08**
1113.út 15+000-15+500	2000	0,10	0,27	**0,09**
3102.út 3+000-3+500	1995	0,21	0,31	**0,10**
31106.út 0+000-0+500	1995	0,53	0,96	**0,43**
87.út 45+400-45+900	1993	0,22	0,46	**0,24**
87.út 45+400-45+900	1999	0,46	0,42	**-0,04**
48.út 25+000-25+500	1993	0,34	0,37	**0,03**
89.út 11+800-12+300	1994	0,34	0,47	**0,13**
88.út 5+000-5+500	1993	0,20	0,47	**0,27**

5. Concluding remarks

Long-term monitoring of trial sections results in pavement performance models.

Problems with bearing capacity models („yearly" factors)

Rehabiltation of trial sections can provide useful information on the general road practice of a country.

Actual rehabilitation: after intervention limit („financial life cycle")

Improvement: with high variability.

New life cycle: similar to the former one.

Results can be used in the further development of PMS.

Thank you for
your
kind attention!