



Asphalt-Rubber Binder
applications in Poland
From local roads to motorways

Ing. Igor Ruttmar, PhD

WE CARE ABOUT OUR PLANET



STRABAG
WORK ON PROGRESS

TIRE COMPOSITION



**NATURAL
RUBBER**



POLYBUTADIEN



SULPHUR



**SYNTHETIC
RUBBER**



TIRE COMPOSITION



NATURAL RUBBER



SULPHUR



POLYBUTADIEN



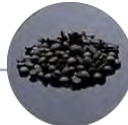
SYNTHETIC RUBBER



ACTIVATOR



ACCELERANT



ANTIOXIDANT



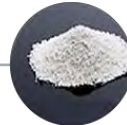
CARBON BLACK



STEARIC ACID



SILICA



ZINC OXIDE



WAX



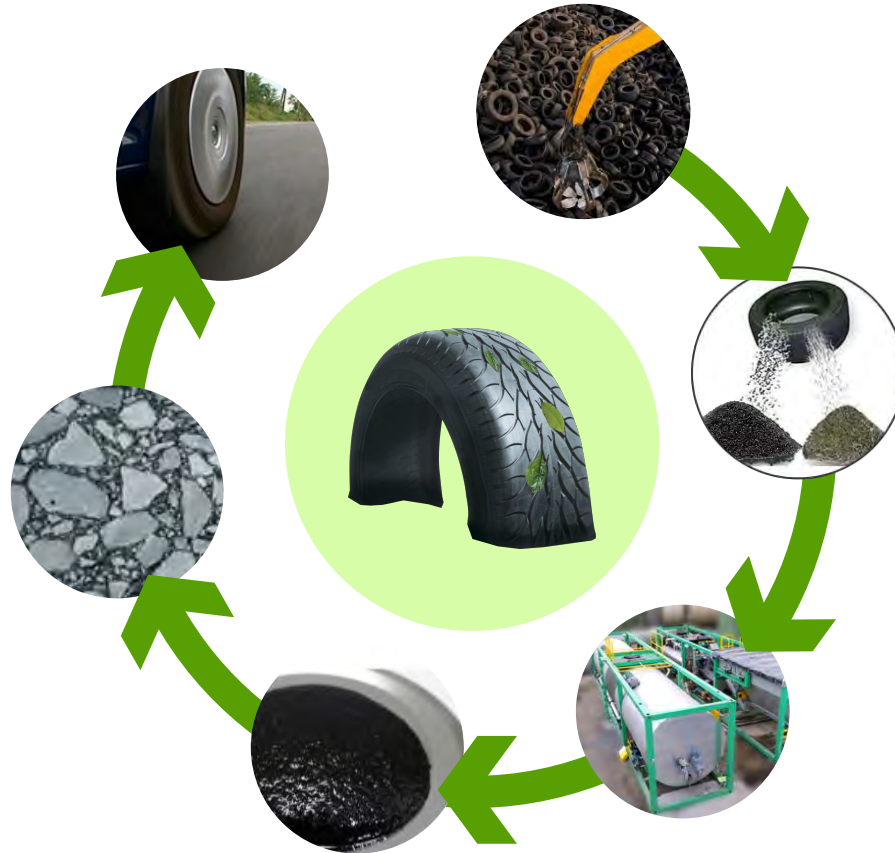
MINERAL OIL



CANOLA OIL



GIVE TIRES A SECOND LIFE

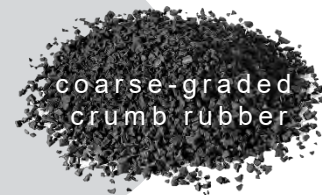


METHODS OF INTRODUCTION OF A ‚RUBBER’ INTO HMA



„DRY” PROCESS

adding **crumb rubber** directly to the mixer as replacement of fine **aggregates**
(max **3%** of HMA)



„WET” PROCESS

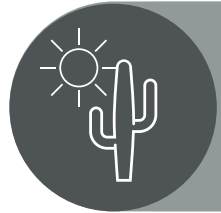
blending, heating and co-reacting of hot binder and **fine crumb rubber**
(reaction time min. **45 min**)

„**Field Blend**”
(min. **15%** of binder by weight)

„**Terminal Blending**”
(**4÷10%** of binder by weight)

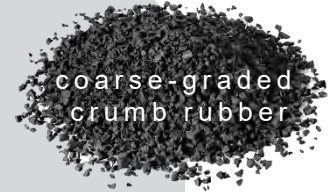


DRY PROCESS METHOD



„DRY”
PROCESS

adding **crumb rubber** directly to the mixer as
replacement of fine **aggregates**
(max 3% of HMA)



coarse-graded
crumb rubber



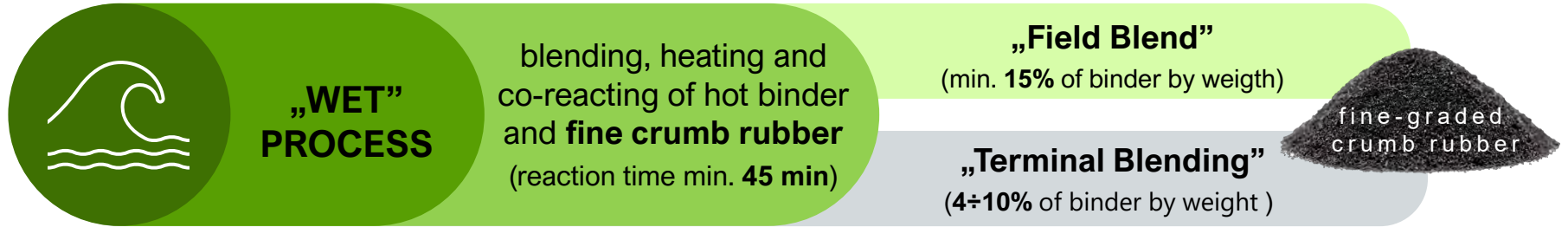
2003

DK* 12
JARACZEWO



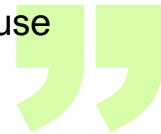
* National Road

WET PROCESS METHOD



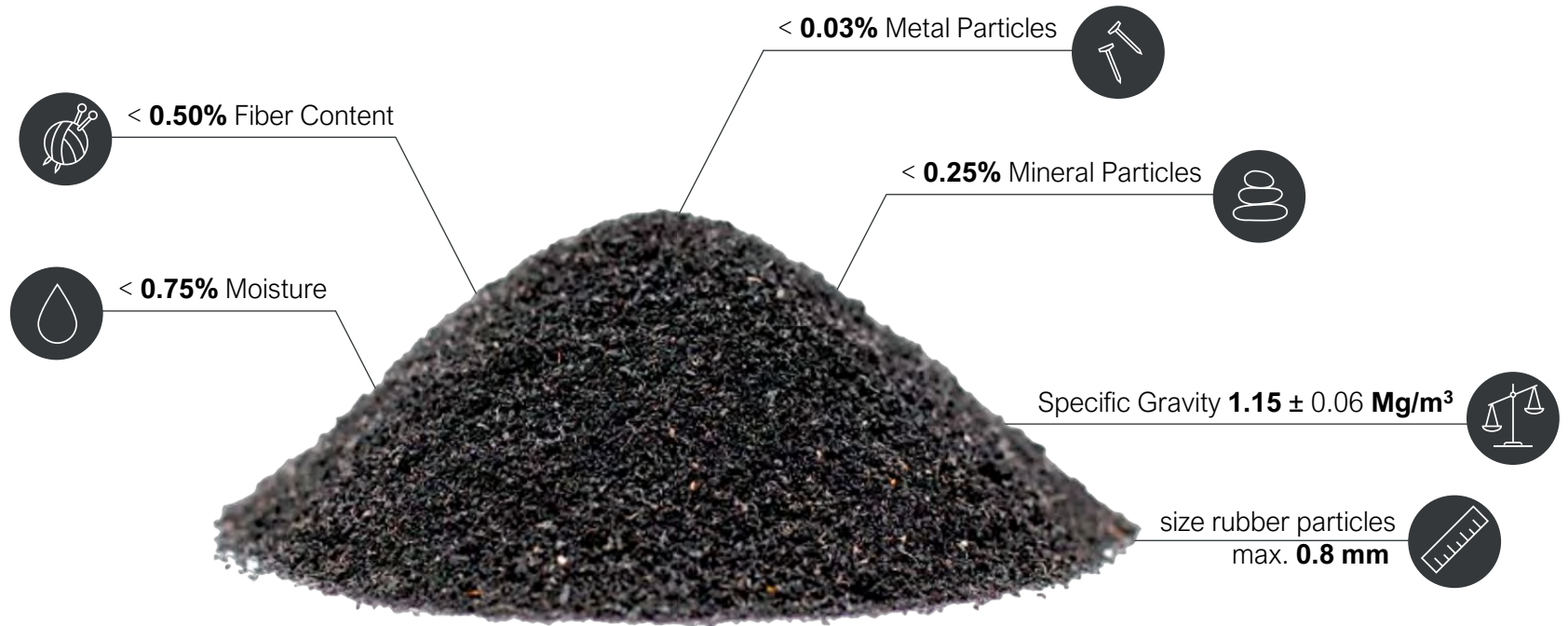
ASPHALT-RUBBER BINDER (ARB)

is a blend of ‚asphalt cement’, reclaimed tire rubber, and certain additives in which the rubber component is **at least 15% by weight** of the total blend and has reacted in the hot asphalt cement sufficiently to cause swelling of the rubber particles.



Definition acc.to ASTM D8

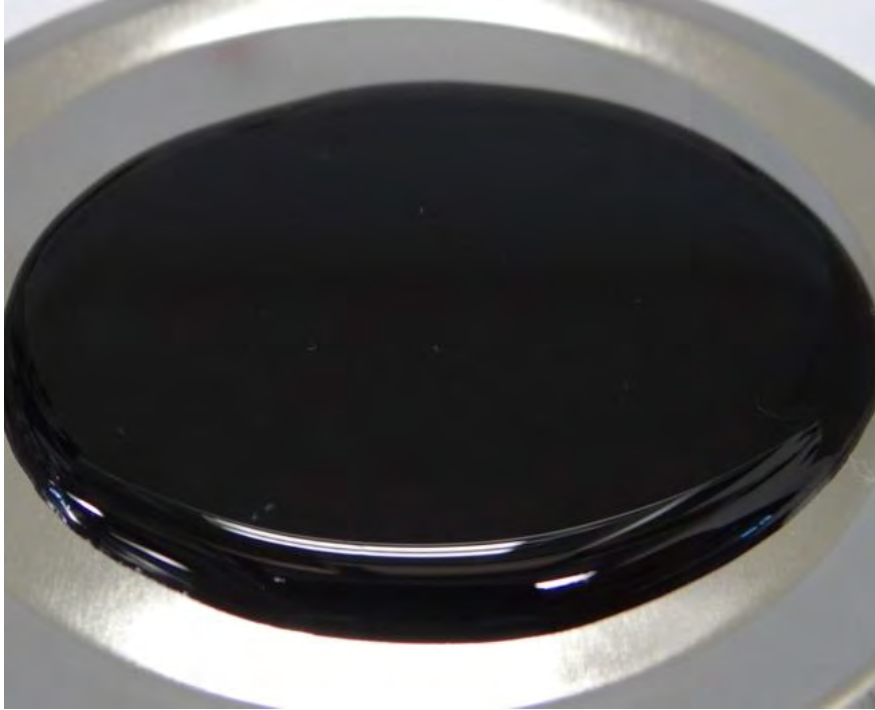
REQUIREMENTS ON GROUND TIRE RUBBER



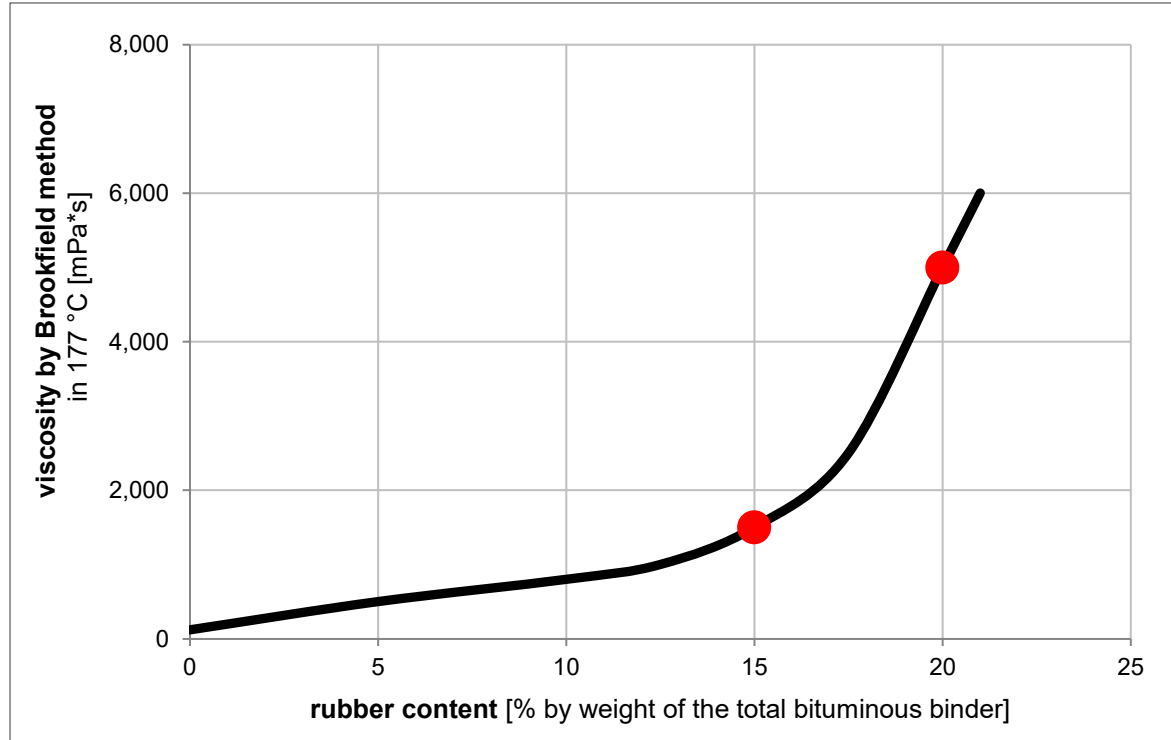
Ground Tire Rubber obtained by mechanical grinding of scrap tires



PMB VS ARB



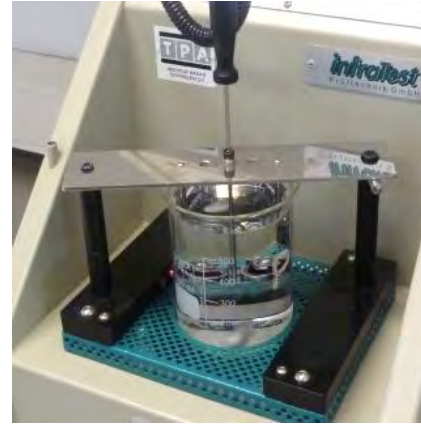
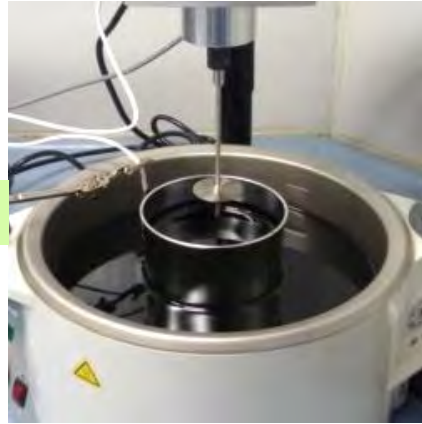
BINDER VISCOSITY VS ,RUBBER' CONTENT



TESTS AND REQUIREMENTS ON ARB

dynamic viscosity (177°C)
PN-EN 13302

1500÷5000 mPa · s

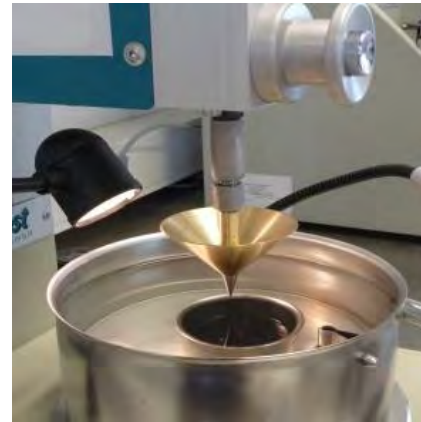


softening point
Ring and Ball method
PN-EN 1427

min. 55 °C

recovery (resilience at 25°C)
PN-EN 13880-3

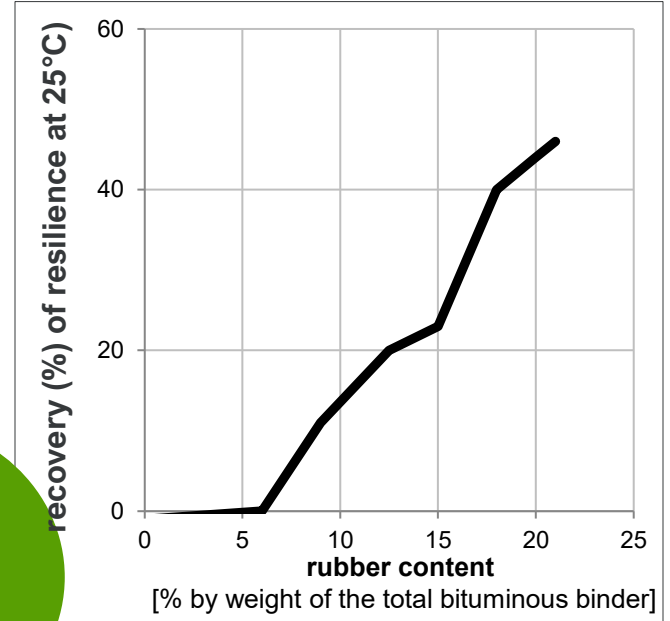
min. 18% resilience



cone penetration (25°C)
PN-EN 13880-2

25÷70 × 0.1 mm

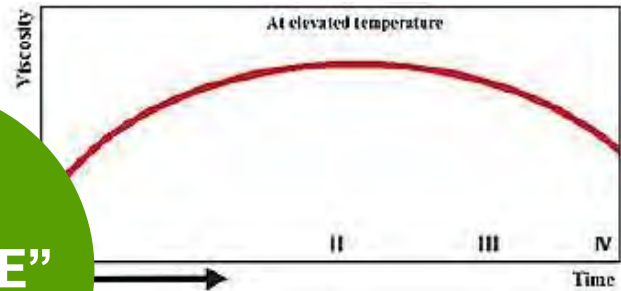
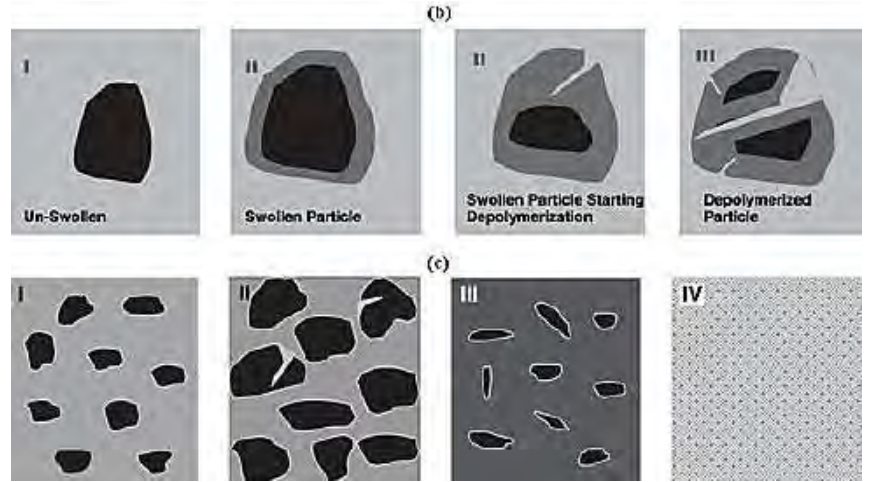
A-R BINDER RECOVERY (RESILIENCE) PN-EN 13880-3



ARB
35%

PMB 45/80-55: **24%** resilience
PMB 45/80-80 (HiMA): **30%** resilience

ASPHALT RUBBER BINDER - „WET PROCESS”



„AL DENTE”

PERFORMANCE PMB 45/80-55 VS ARB (RUBBERBIT®)

HMA PARAMETERS	SMA 11 PMB 45/80-55	SMA 11 ARB
Binder content, %	6,6	7,0
Air voids, % PN-EN 12697-8:2005	2,9	3,5
VMA, % PN-EN 12697-8:2005	17,7	18,8
VFB, % PN-EN 12697-8:2005	83,7	81,3
ITSR, % PN-EN 12697-12:2008	93	96
PRD_{AIR}, % PN-EN 12697-22:2008	6,9	5,2
WTS_{AIR}, % PN-EN 12697-22:2008	0,06	0,04
Binder drainage, % PN-EN 12697-18:2007	0,2	0,1
TSRST, C° PN-EN 12697-46	-26,1	-29,5

**HIGH
QUALITY**

ASPHALT-RUBBER BINDER MODIFICATION UNIT



LUCY
2017



MARY
2019

PRUSZKÓW, PARZNIIEWSKA STREET (TEST SECTIONS)



Politechnika
Warszawska

UNIA EUROPEJSKA
EUROPEJSKI FUNDUSZ
ROZWOJU REGIONALNEGO



2013

2023



4 pavement structures, 6 layers:
**SMA 11, BBTM 8A, AC 5 AF,
AC 16 W, SAMI + AC 16 TD**

phot. TPA

phot. TPA



0.585 km

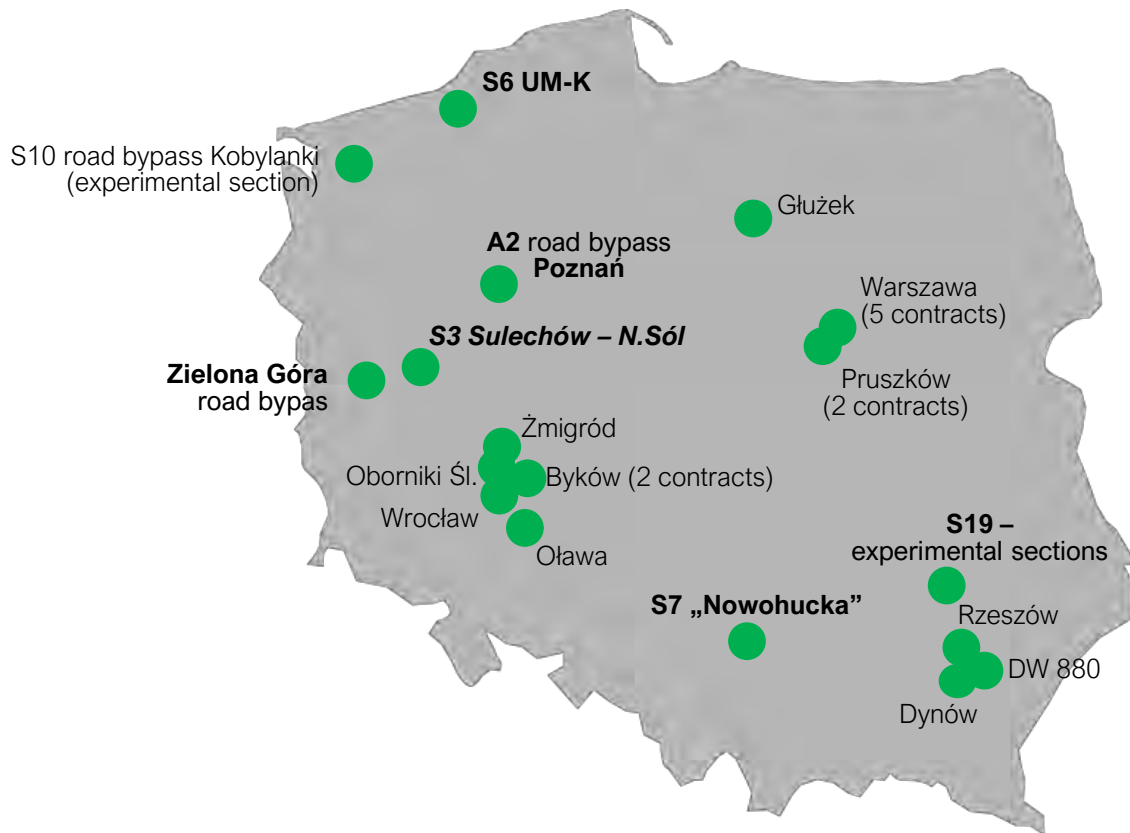


597 t



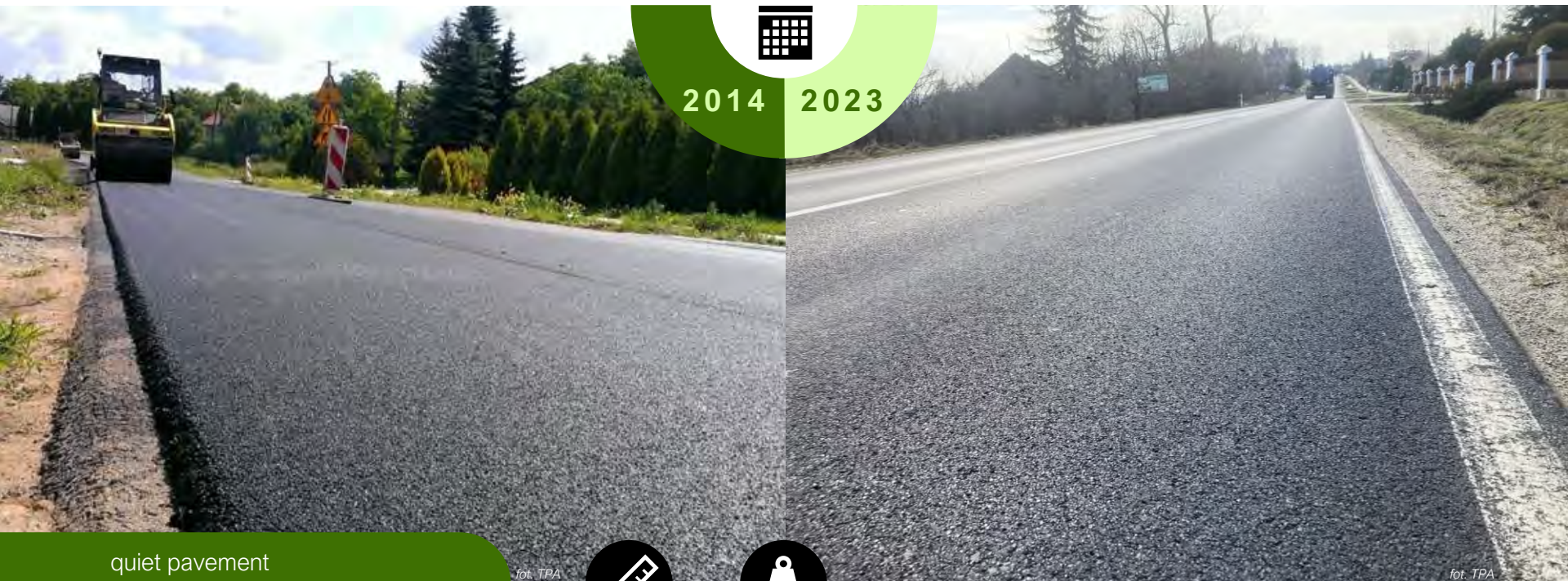
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REALIZATION OF HMA USING RUBBERBIT® 2013-2023



more
than
250 000
Mg

PROVINCIAL ROAD 880 JAROSŁAW-PRUCHNIK



2014

2023

quiet pavement
SMA 5 ARB

for. TPA



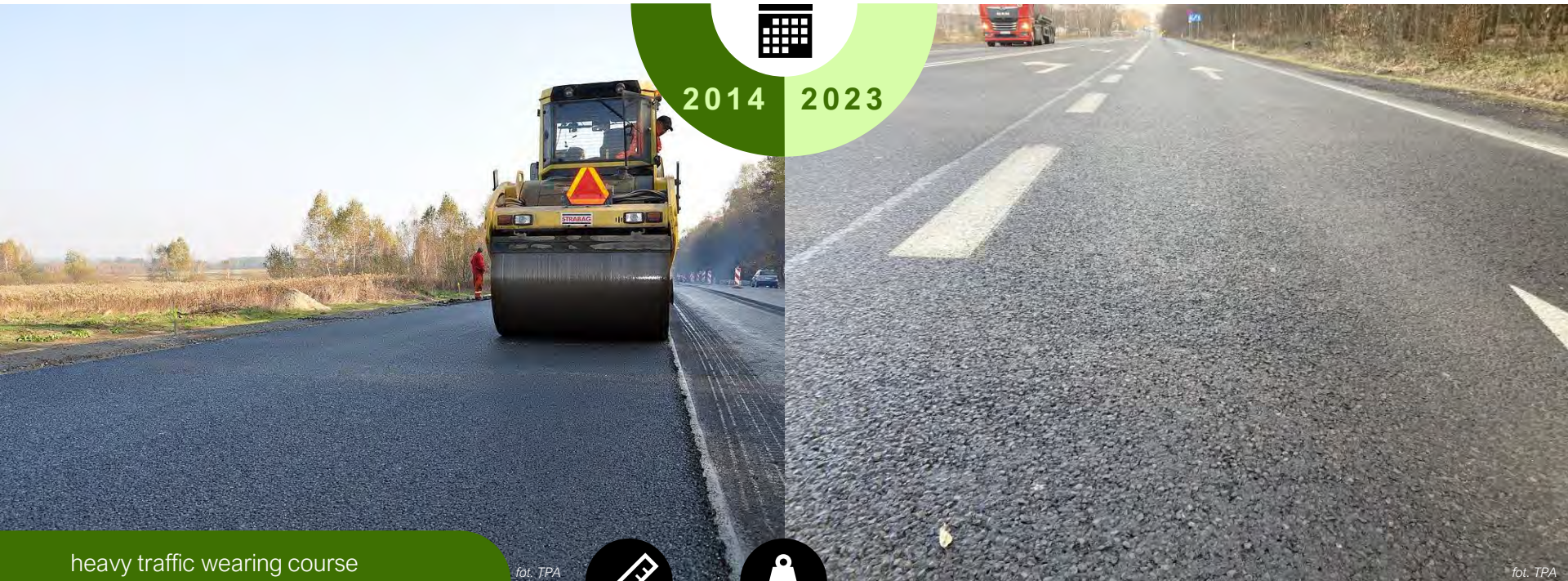
14.0 km



6 600 t

for. TPA

NATIONAL ROAD 4 (LOGISTICS CENTRE KORCZOWA)



2014 2023

heavy traffic wearing course
SMA 11 ARB

fol. TPA



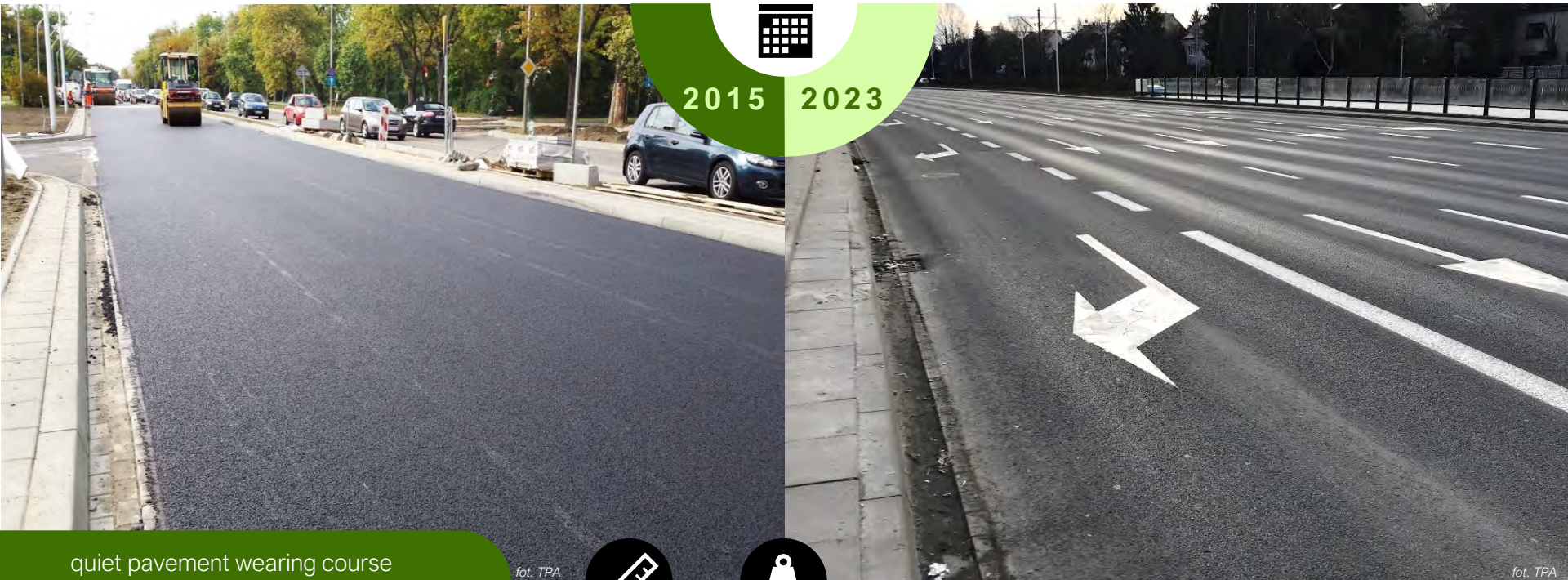
0.6 km



600 t

fol. TPA

WARSZAWA CITY, WOŁOSKA STREET



quiet pavement wearing course

BBTM 8A | 8B

fol. TPA



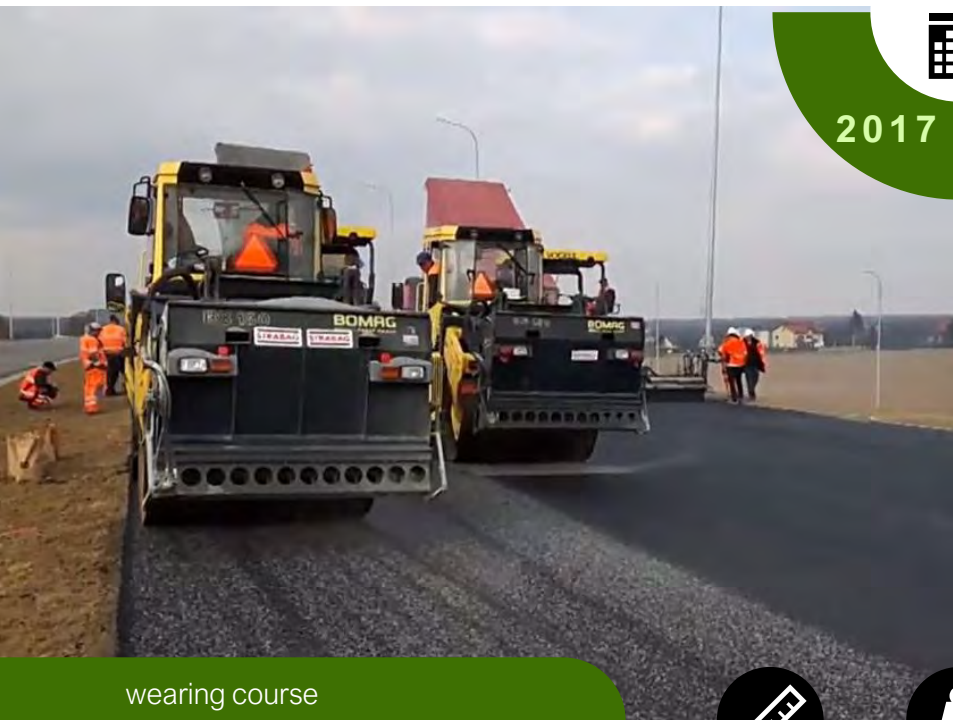
3.0 km



3 500 t

fol. TPA

EXPRESSWAY S7 „NOWOHUCKA”



for. GDDKiA/TPA

wearing course
SMA 8 ARB



4.5 km



13 744 t

EXPRESSWAY S3 SULECHÓW – ZIELONA GÓRA



wearing + binder course

SMA 11 ARB
AC 16 W ARB

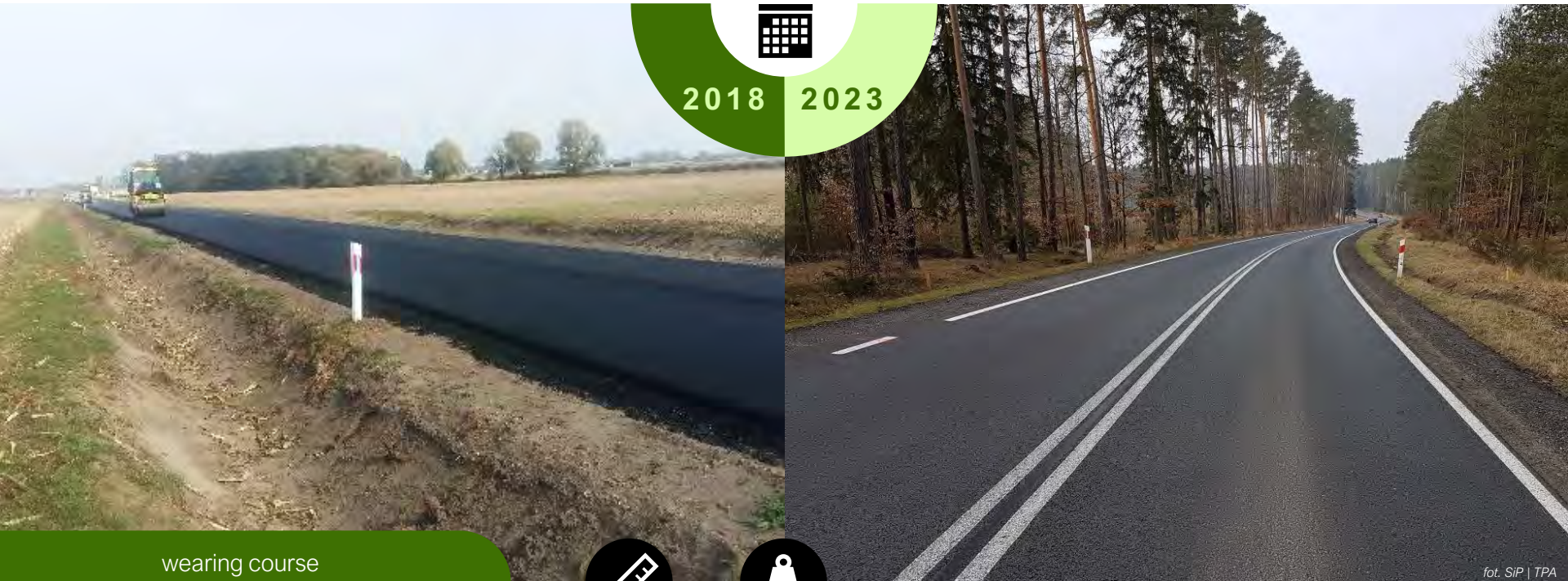


13.4 km



41 987t

PROVINCIAL ROAD OBORNIKI ŚLĄSKIE - ŻMIGRÓD



2018

2023

wearing course
SMA JENA 16 ARB



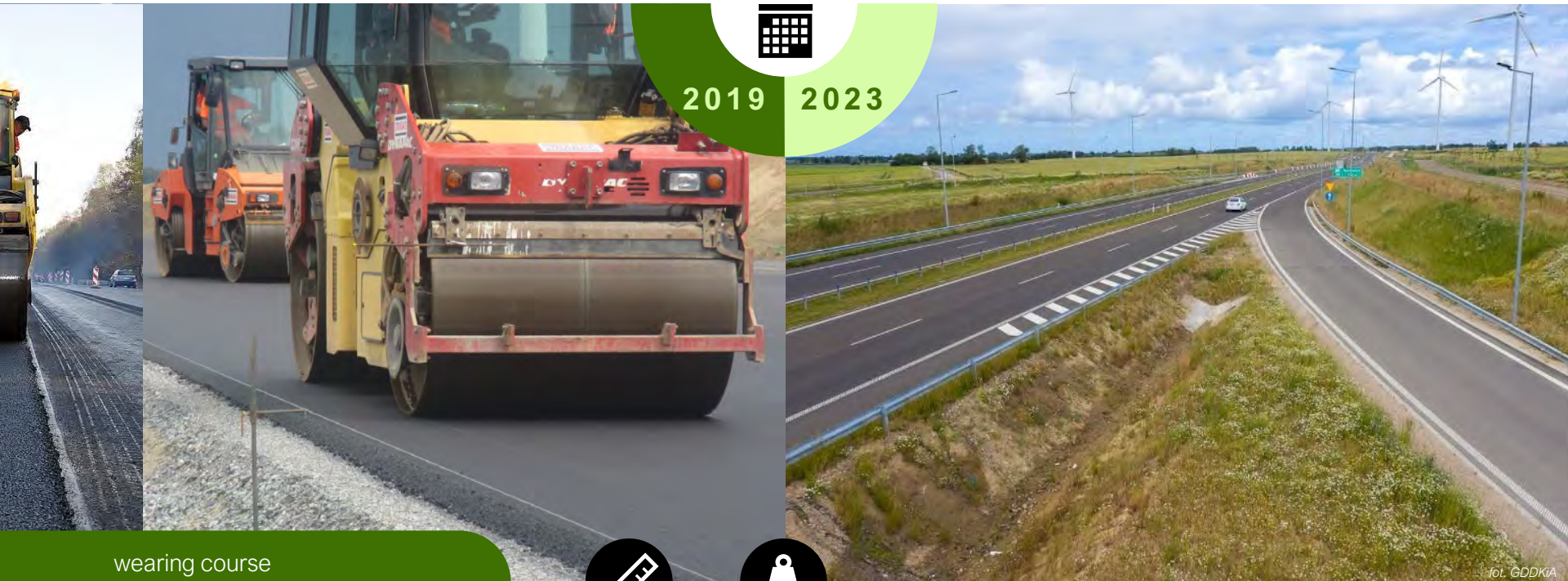
25.8 km



20 426t

fol. SIP | TPA

EXPRESSWAY S6 KOSZALIN – USTRONIE MORSKIE



2019 2023

wearing course
SMA 8 ARB



24.1 km



38 557 t

A2 MOTORWAY REHABILITATION (BY-PASS POZNAN)



2019

2023

wearing + binder course

SMA 8 ARB
AC 16 W ARB

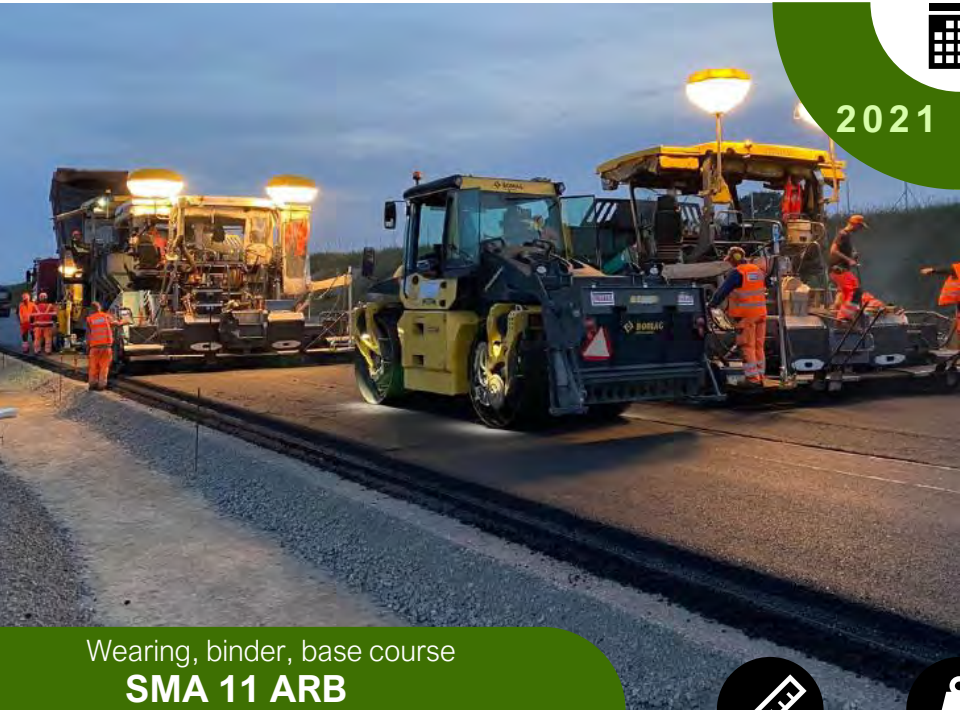


15.7 km



84 550 t

EXPRESSWAY S19 – EXPERIMENTAL SECTIONS



fot. na zlecenie TPA

Wearing, binder, base course

SMA 11 ARB
AC 16 W ARB
AC AF 11 ARB



0.8 km



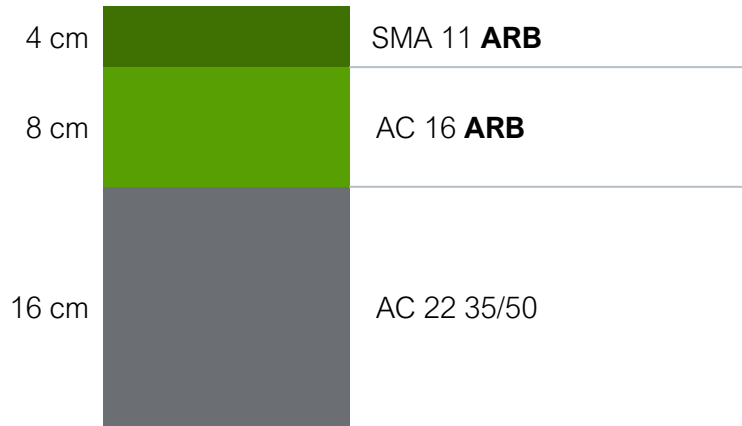
3 771 t

S19 PAVEMENT STRUCTURES

STRUCTURE NO. 1B

RUBBER BINDER COURSE

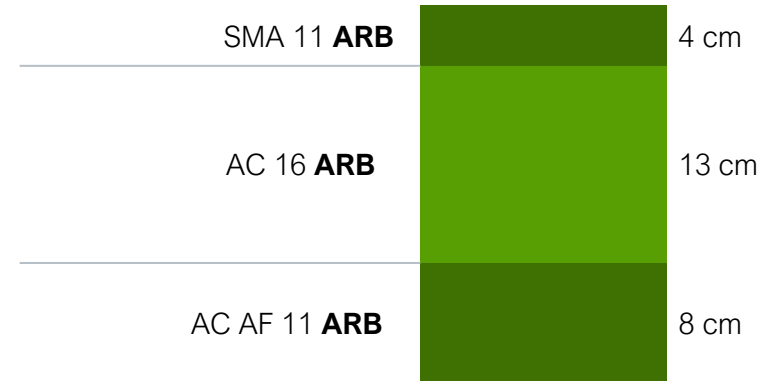
changing PMB to ARB



STRUCTURE NR 2

„FULL DEPTH RUBBER”

„PERPETUAL RUBBER PAVEMENT”



S3 BY-PASS ZIELONA GÓRA GDDKIA ZIELONA GÓRA



SMA 11 ARB

3×E

EFFECTIVE



- improved durability
- improved crack resistance
- improved resistance to thermal cracks
- improved aging resistance
- shorter braking distance

ECOLOGICAL



- reuse of scrap tires
- reduction of the carbon footprint
- less use of new materials
- improved noise reduction when used in quiet pavements

1200
TIRES
per
1 km, 1 line

ECONOMIC



- longer pavement life
- lower costs for maintenance and repairs
- alternative to PMB



pavements with ARB achieve better results in LCCA analyses



STRABAG
WORK ON PROGRESS

WE CARE ABOUT SUSTAINABILITY

Rubber modified asphalt mixtures
durable, safe and environmentally friendly.