

ACCELERATED PAVEMENT TESTING

**ISAP International Workshop
COLD AND WARM ASPHALT MIXTURE DESIGN/
CHARACTERIZATION AND PAVEMENT DESIGN**

**Fortaleza
October 5-6, 2009**

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CEDEX Transport Research Center**

Definition of APT

- **ALT** ~ Accelerated Load Testing (of pavements)
- **APT** ~ Accelerated Pavement Testing

Controlled application of a prototype wheel loading, at or above the appropriate legal load limit to a prototype or actual, layered, structural pavement system to determine **pavement response and performance** under a **controlled, accelerated, accumulation of damage** in a **compressed time period**.

(NCHRP Synthesis 235, 1996)

Controlled application of wheel loading to pavement structures for the purpose of **simulating** the effects of **long-term** in-service loading conditions in a **compressed time period**.

(NCHRP Synthesis 325, 2004)

Types of Facilities



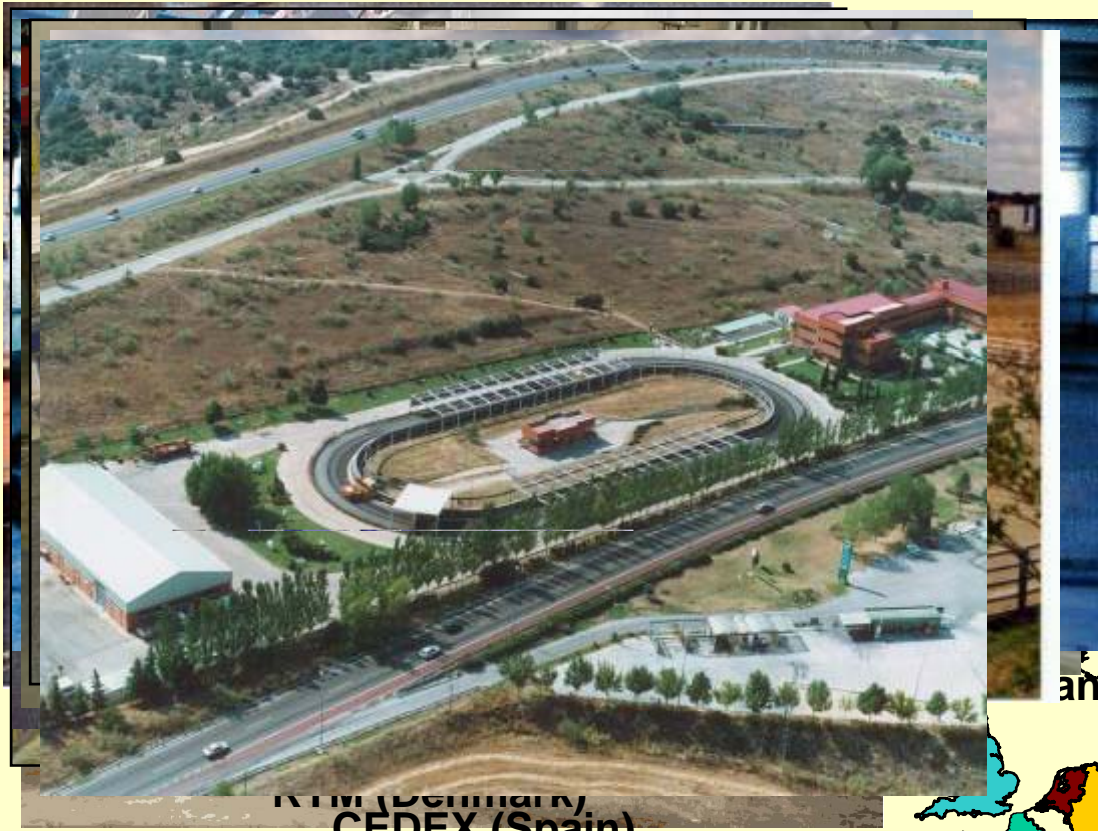
...but there are also mobile



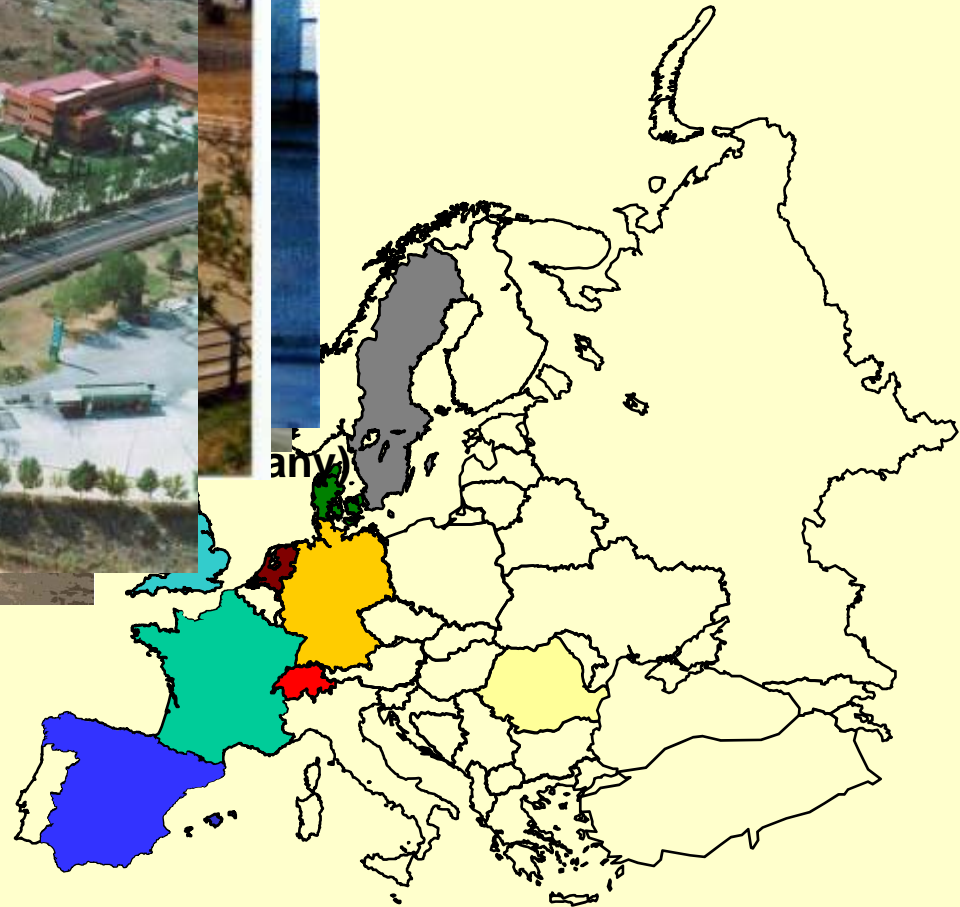
Traffic Simulation



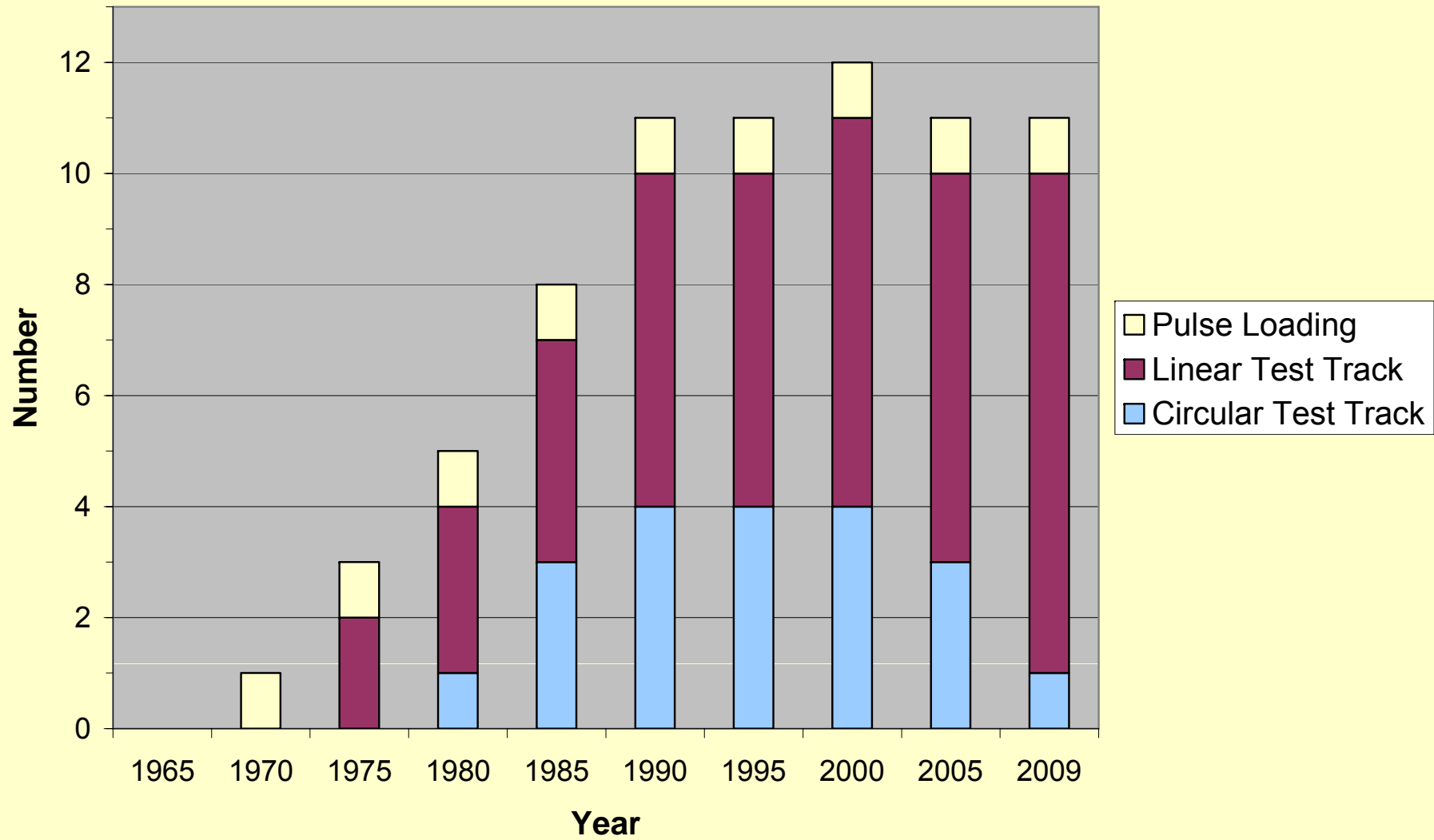
European APT Facilities



PTF (Great Britain)
CEDEX (Spain)



European APT Facilities



Introduction to APT

Active APT Programs in the World (2009)



● 38 Consolidated Programs

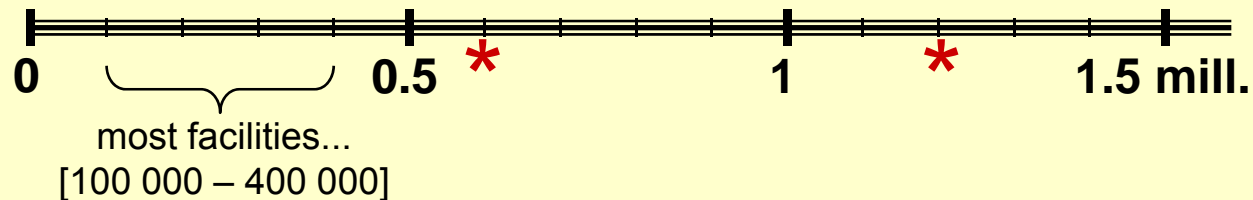
● 5 New Programs

Why APT for WMA ?

✓ **Rapid evaluation of pavement performance**

- months instead of years -

Practical output
(loads per month)



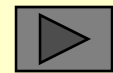
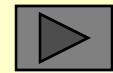
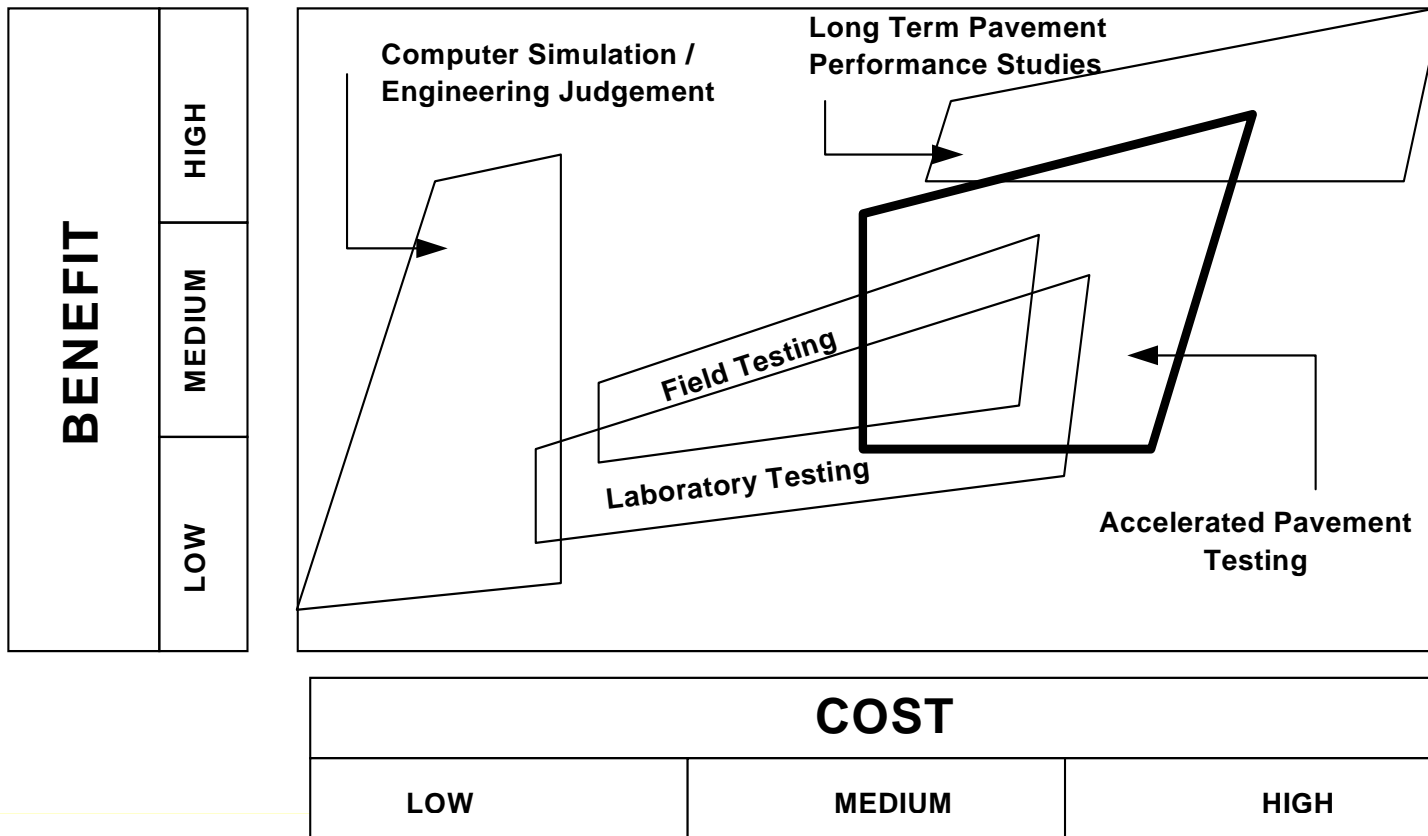
✓ **No risk from failure of in-service pavements**

✓ **“Almost” real materials in “almost” real pavements**

Why APT for WMA ?

✓ Improved understanding of WMA performance

✓ A



Potential Applications

✓ Implementation in M-E designs methods

- because has to be focused on distress mechanisms
- because distresses from in-service pavements...
 - are difficult to evaluate
 - interact to each other
 - depends on many input random variables
- because models calibration require structural response inputs

✓ Comparative testing

- because different WMA production technologies exist
- does WMA improve HMA performance?

✓ Climatic considerations

- because WMA suitability could depend on climatic conditions
- because experiences from 1 site could be extrapolated

✓ Laboratory testing protocol

- because lab. fundamental tests can be related to short-medium term pavement performance
- because a WMA design methodology has to be developed

3rd Intl. Conf. on APT

3rd International Conference



www.cedex.es/apt2008

"Impacts and Benefits from APT Programs"

- ✓ WMA research referenced at...
 - MnROAD mainline, 5 sections, built in 2008
 - University of California (UCPRC), 4 sections, tested in 2007-08

- ✓ Sargand et al. "*Testing of Perpetual Pavement with Warm Asphalt Concrete Surface Mixes in the **Ohio APLF***"
2x4 sections, tested in 2006

Conclusions

- ✓ APT can pave the gap from WMA Lab. testing to field performance in in-service pavements
- ✓ An important APT network exists throughout the world
- ✓ There are many advantages in using APT, but two strengths must be remarked for WMA:
 - Improved understanding of WMA performance
 - Ability to control load & environmental variables
- ✓ There are some interesting applications:
 - Implementation in M-E designs methods
 - Comparative testing
 - Climatic considerations
 - Laboratory testing protocol
- ✓ Still, long-term performance will be an issue....

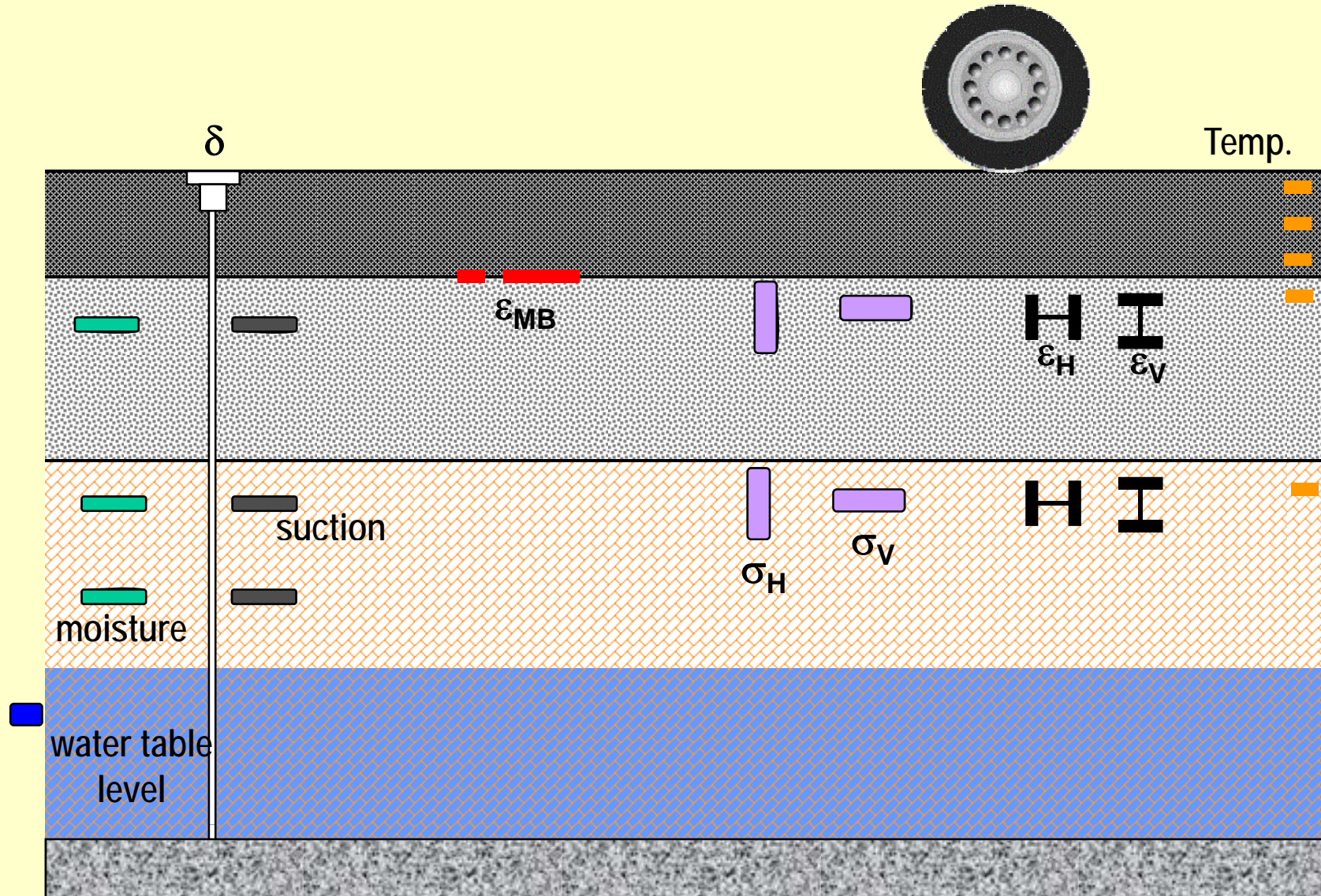
Thanks for your attention!



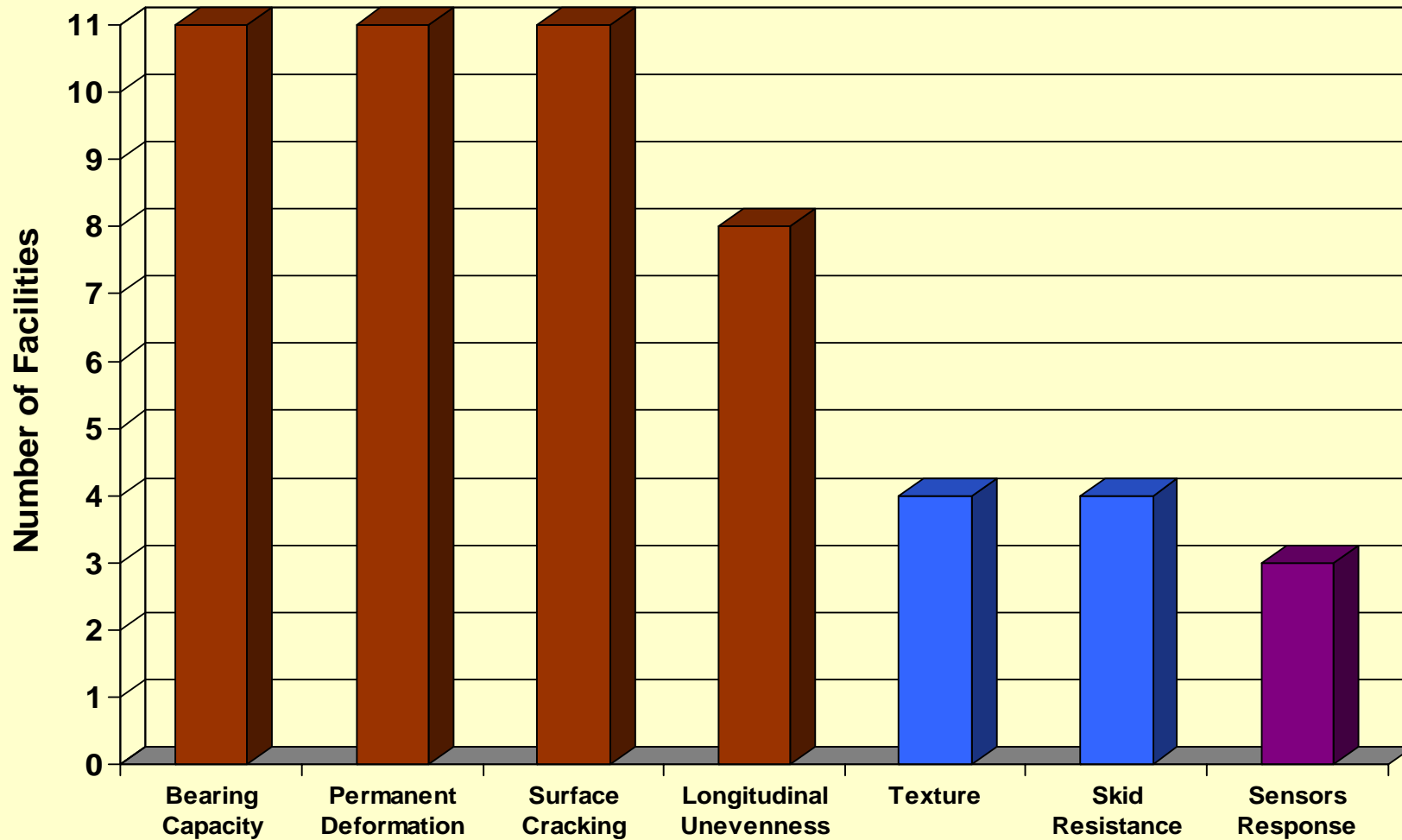
Viva su pasión

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Feasibilities of APT Testing - Monitored Structural Response -



Feasibilities of APT Testing - Evaluation of Pavement Performance -



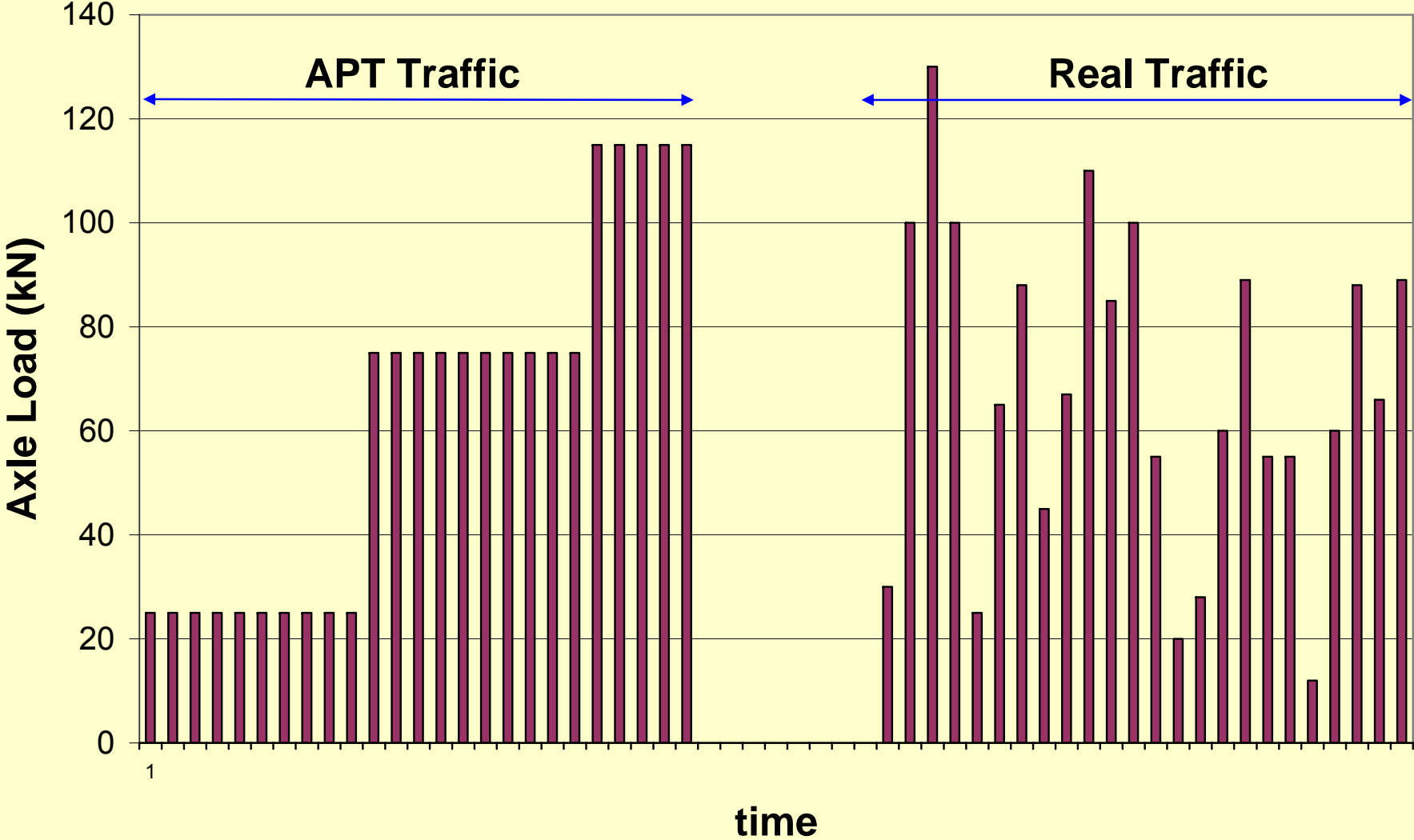
Feasibilities of APT Testing

- Load-related Variables -

- ✓ Load level..... **ok**
 - ✓ Wheel type (single or dual) **ok**
 - ✓ Tire type **ok**
 - ✓ Tire inflation pressure..... **ok**
 - ✓ Transverse position **ok**
 - ✓ Axle type **?**
- ...but not random distribution*

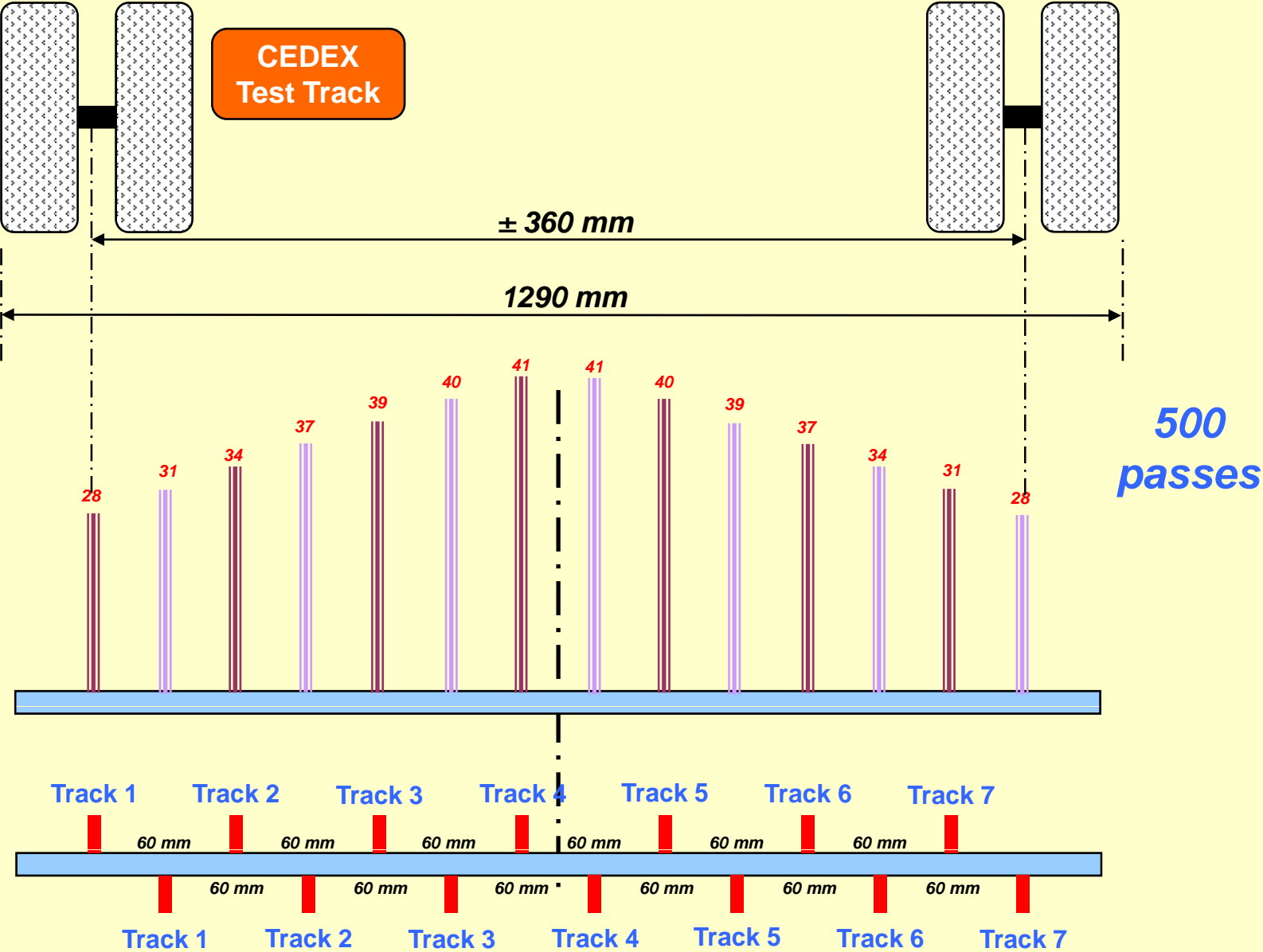
Feasibilities of APT Testing

- Load-related Variables -



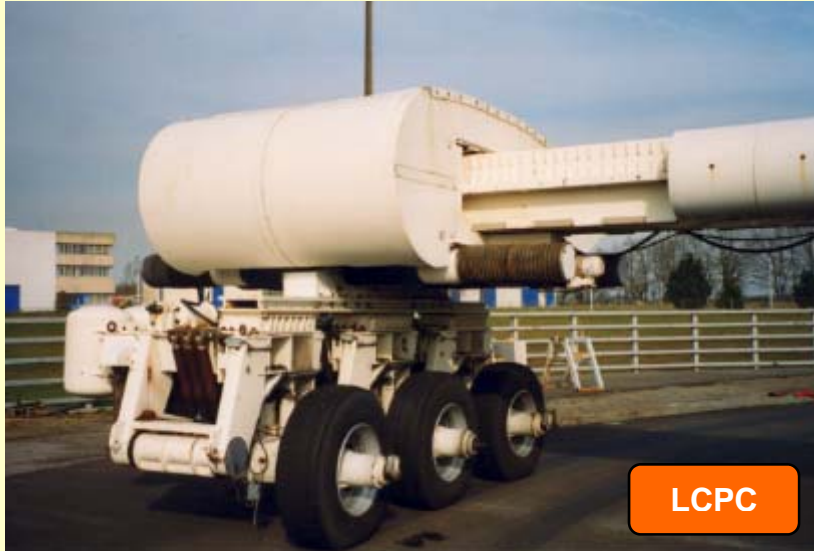
Feasibilities of APT Testing

- Load-related Variables -



Feasibilities of APT Testing

- Load-related Variables -



LCPC

Axle Type can be Reproduced in Only a Few Test Tracks



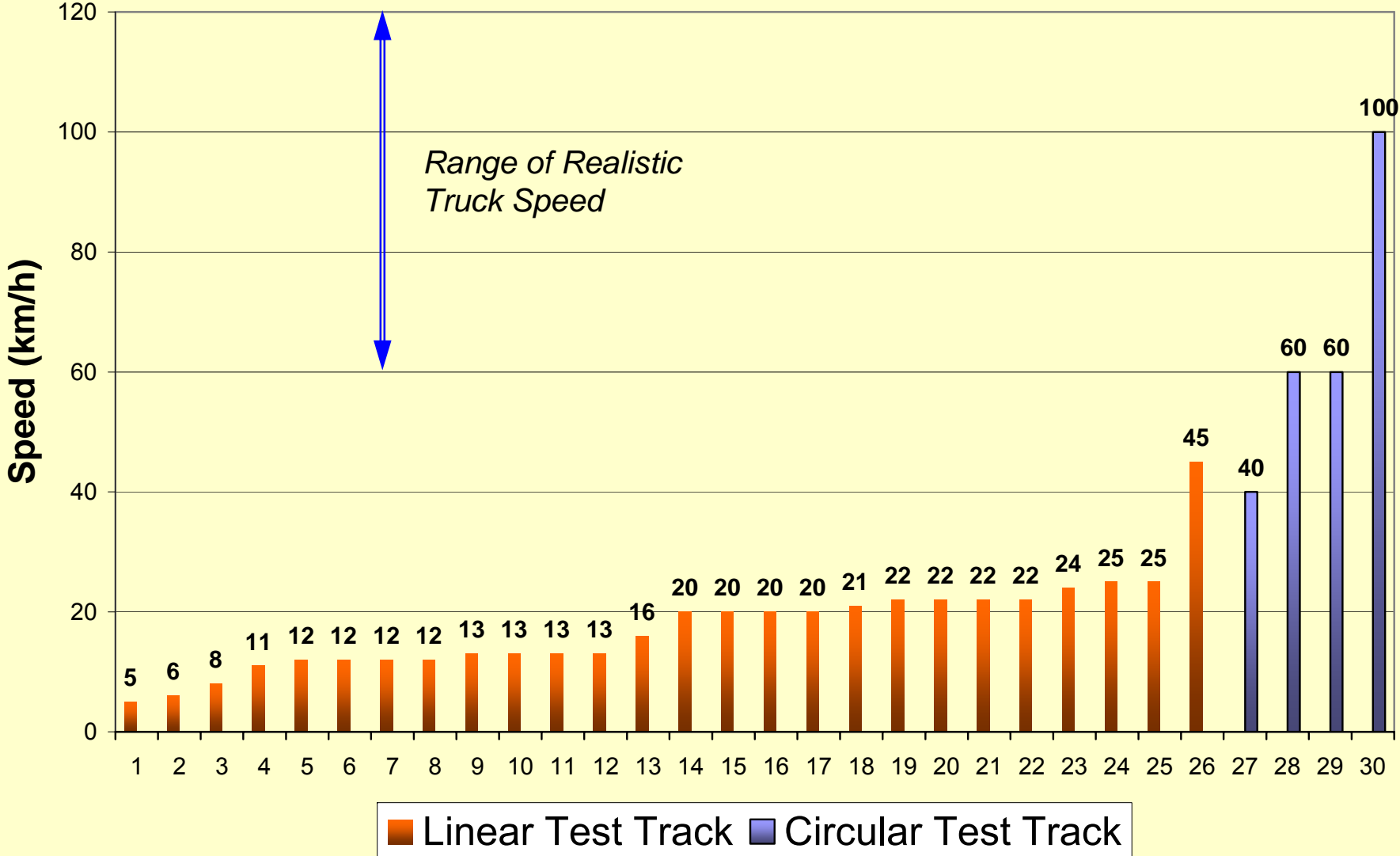
ALF



Kansas State Univ.



Feasibilities of APT Testing - Load-related Variables -



Source: 30 Full-Scale Test Tracks around the world



Feasibilities of APT Testing - Environmental Variables



LAVOC



FAA



BASt

**air temperature can
be controlled in any
indoor facility**

Feasibilities of APT Testing - Environmental Variables



**a test pit allows
water table control**

**... and homogeneous
support throughout
tests**

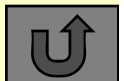


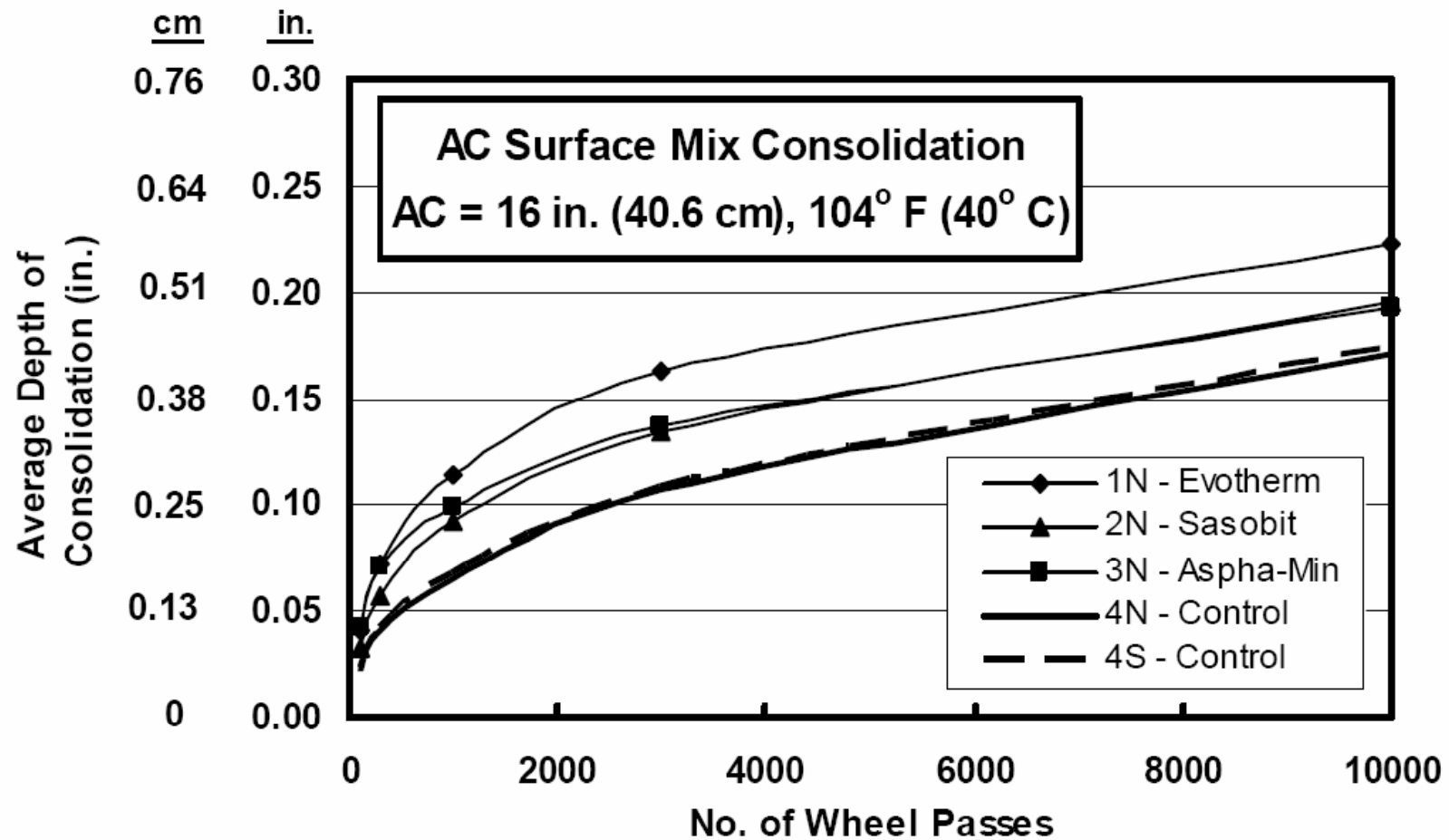
Feasibilities of APT Testing - Environmental Variables

**some facilities are
housed in special
climatic chambers**



**... where most
environment variables
can be controlled**

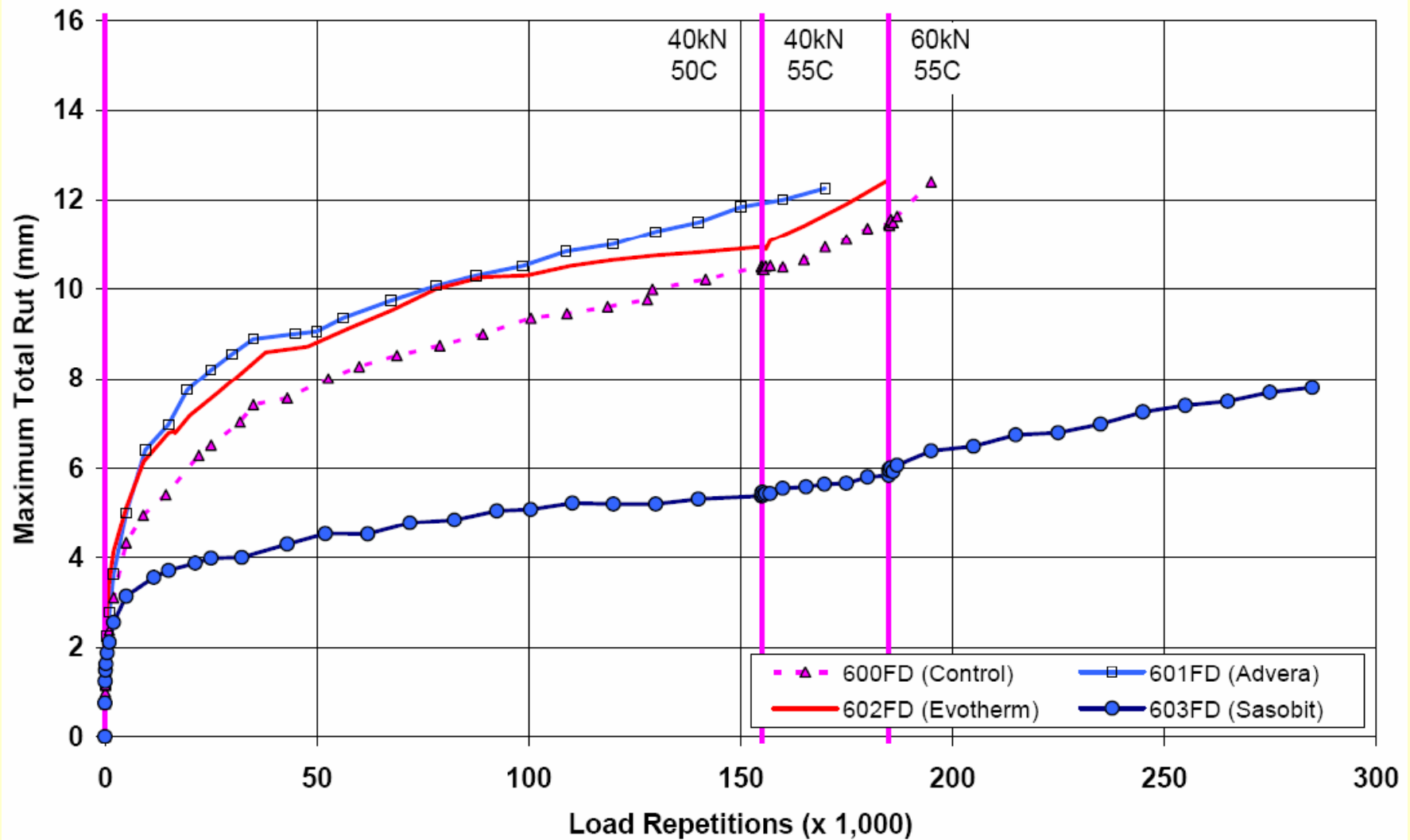




Temp. 4.4 / 21.1 / 40.0 °C

Wheel Load: 40.0 kN at 8 km/h
 (dual wheel)

32 mm wearing course
 total: 400 mm AC



Temp. 50 / 55 °C

120 mm WMA (DGAC)

Wheel Load: 40-60 kN at 12 km/h
(dual wheel)