Welcome to this presentation about braketesting in Belgium (2013)

GOCA !

- Non-profit organisation.
- Established in **1938**.
- Association of **10** companies authorised by the Belgian governement to carry out **periodic inspection**.
  - 77 vehicle inspection stations.
  - 32 driving licence test centers
- Staff +/- 40 !

GOCA !

Technical Periodical Inspection	
657 100	N2/N3
226 000	O2/O3/O4
2 695 000	M1

Content

- Study comparison of different brake tests (1999-2000)
- Issues with implementation of brake test according to 2009/40/EC:
  - Political issues
  - Calculation: Development of RD method
  - Minimum 2 bars Cylinder Pressure
  - Cylinder Pressure taping point
  - Communication
  - After implementation : unbalance

Study comparison of different brake tests (1999-2000)

Study comparison of different brake tests (1999-2000)

Test with

- Decelerometer & Roller Brake tester

Conditions

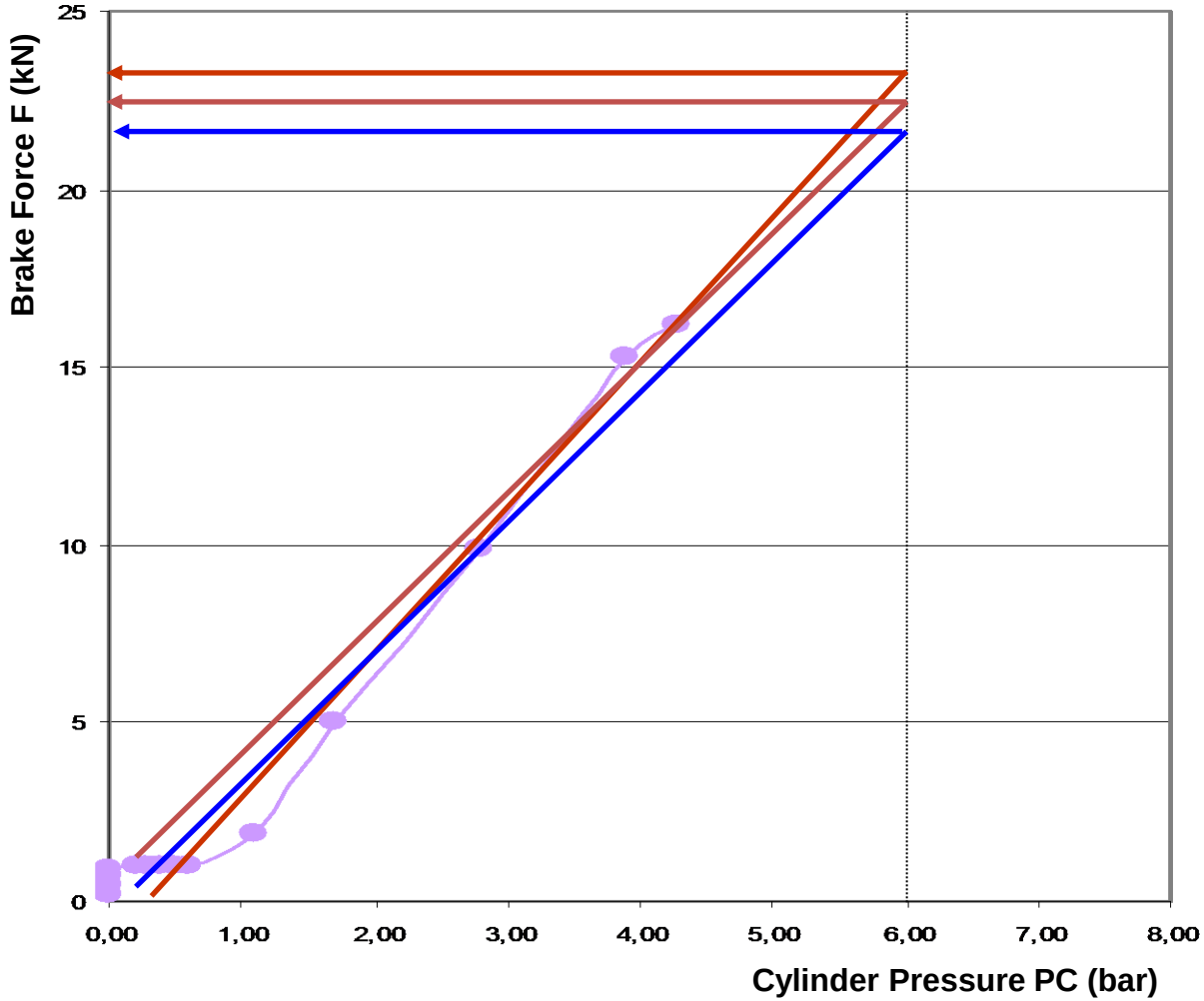
- Laden - Empty - Empty with load simulation

Extrapolations for empty vehicles

- 1 point extrapolation;
- 2 point extrapolation;
- OLS : Ordinary Least Square;

Study comparison of different brake tests (1999-2000)

Extrapolation methods



1-pt [NL]

2-pt [D]

OLS [Fin]

Study comparison of different brake tests (1999-2000)

Vehicle types (15)

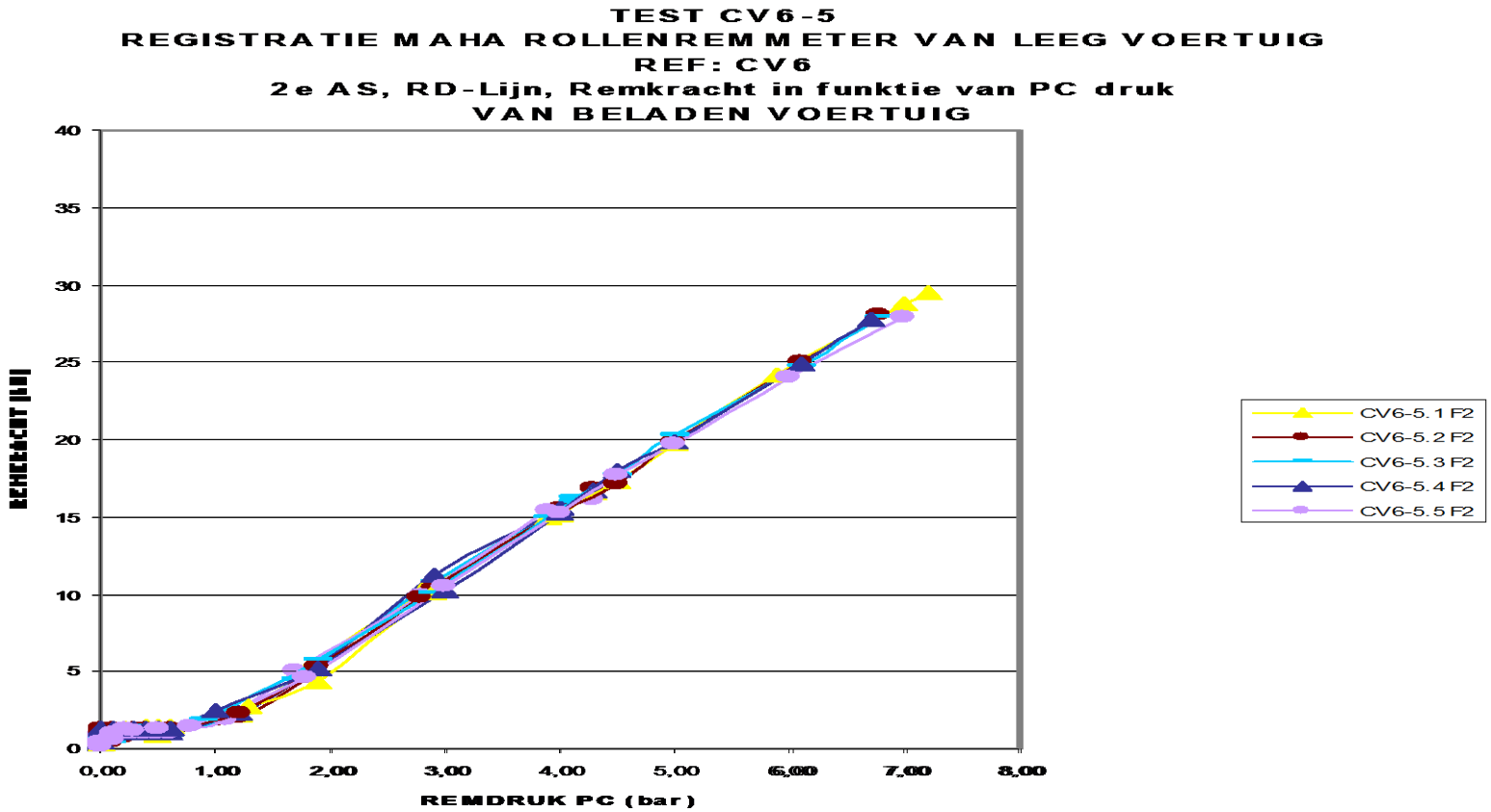
- Trucks
- Tractor
- Trailer
- Semi-trailer
- Bus

Condition vehicles

- With different maximum load
- In used vehicles

Study comparison of different brake tests (1999-2000)

Condition Empty - Laden



Study comparison of different brake tests (1999-2000)

Load simulation

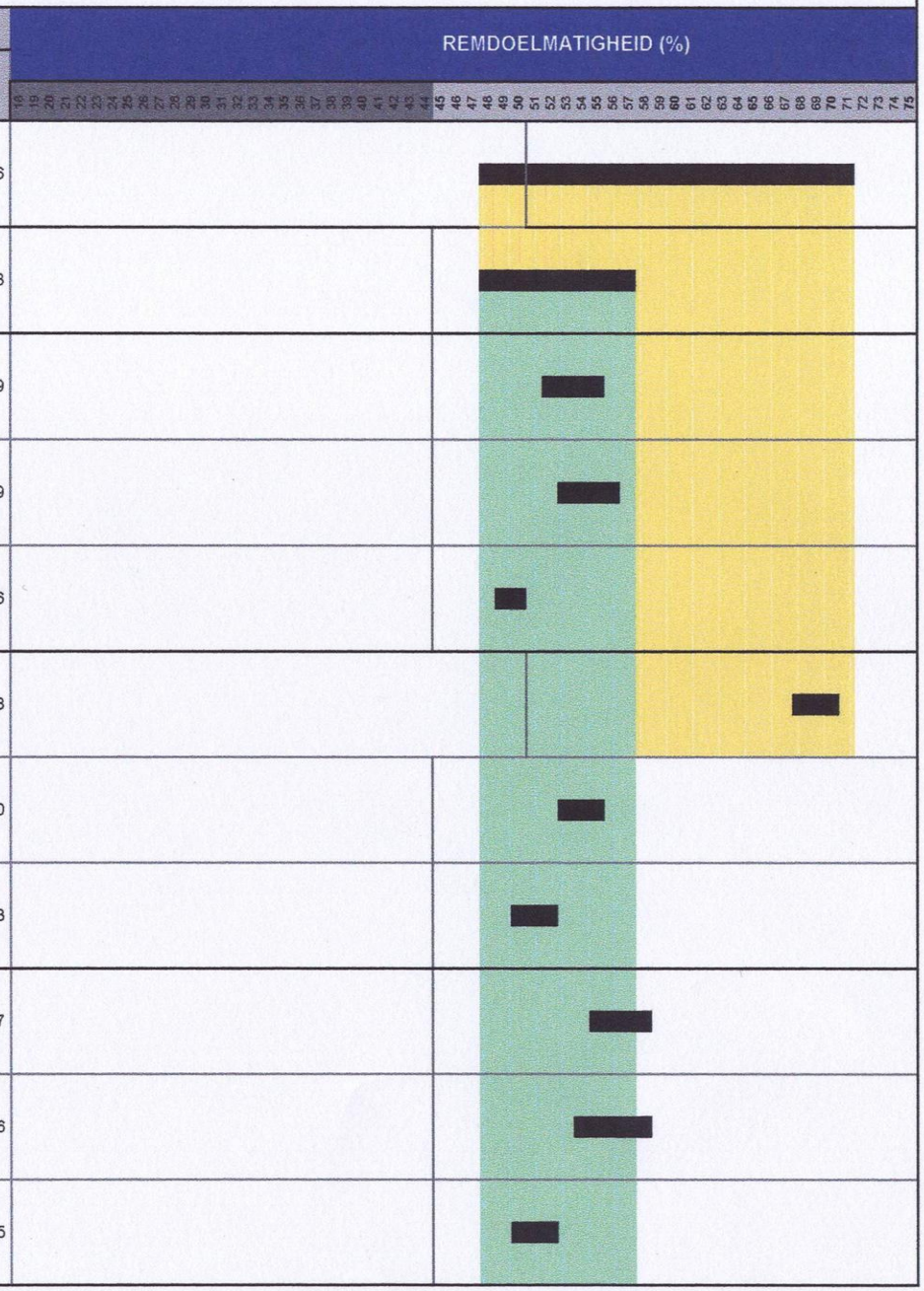
- **Pulling on the axle**
- **Lifting the axle**

Study comparison of different brake tests (1999-2000)

Test results

REMDOELMATIGHEID CV5 MERCEDES 814 (

CV5 BELADEN, LEEG & ASLASTSIMULATIES	MIN	MAX
REF Leeg op de weg	48,93	71,36
REF Beladen op de weg	48,93	57,08
Beladen **MAHA** EFF massa	52,72	55,29
Beladen **MAHA** 1pt-extra	53,22	56,89
Beladen **MAHA** OLS	49,89	50,86
Leeg **MAHA** EFF massa	68,63	70,68
Leeg **MAHA** 1pt-extra	53,17	55,80
Leeg **MAHA** OLS	50,39	52,03
Leeg, Trekken **MAHA** EFF massa	55,66	58,47
Leeg, Trekken **MAHA** 1pt-extra	54,51	58,76
Leeg, Trekken **MAHA** OLS	50,98	52,15



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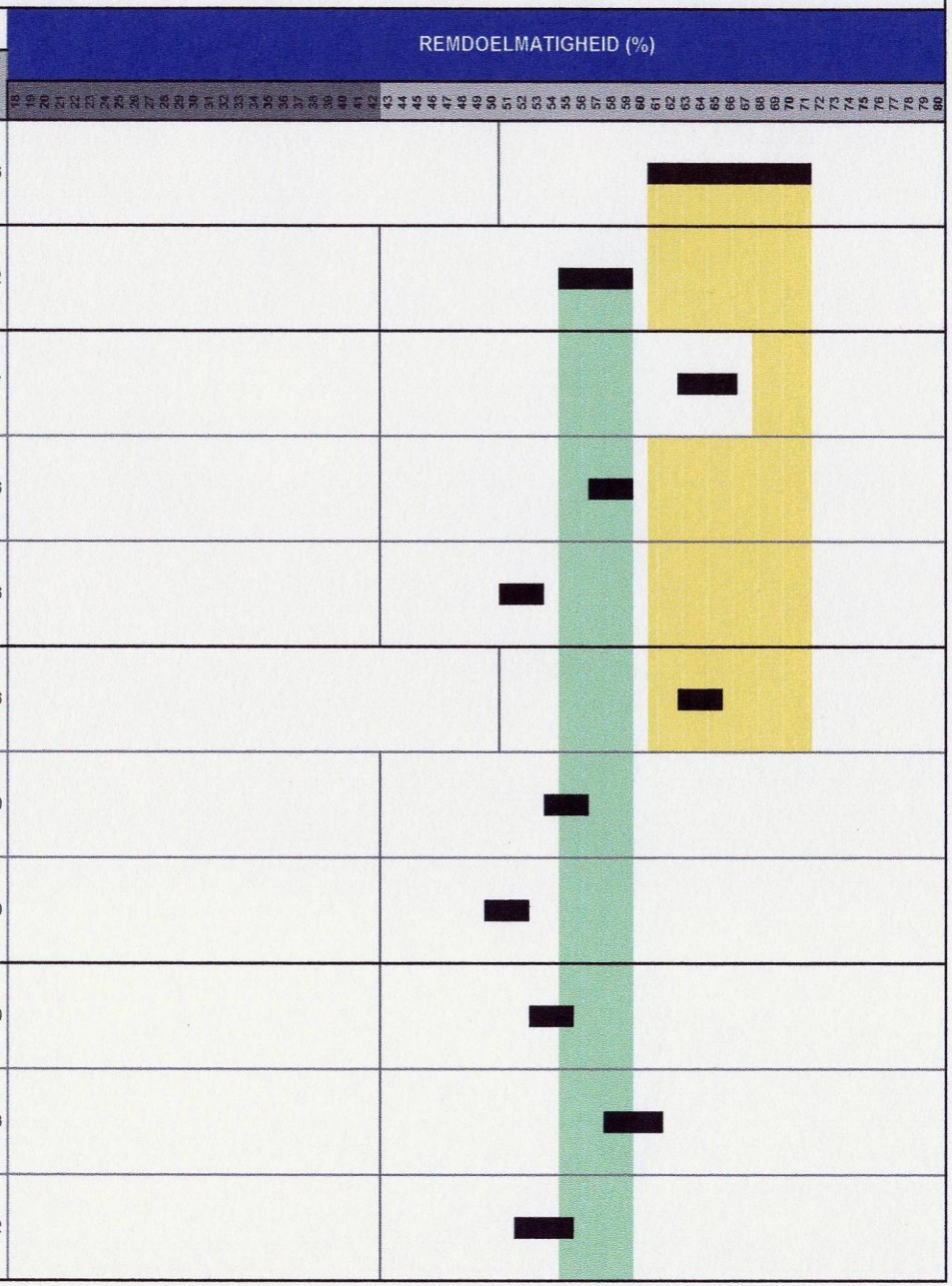
REMDOELMATIGHEID CV6 MERCEDES 1114

CV6 BELADEN, LEEG & ASLASTSIMULATIES	MIN	MAX
REF Leeg op de weg	61,16	71,36
REF Beladen op de weg	55,05	59,12
Beladen **MAHA** EFF massa	63,78	66,37
Beladen **MAHA** 1pt-extra	57,02	59,46
Beladen **MAHA** OLS	51,51	53,76
Leeg **MAHA** EFF massa	63,92	65,36
Leeg **MAHA** 1pt-extra	54,31	56,40
Leeg **MAHA** OLS	50,32	52,40
Leeg, Trekken **MAHA** EFF massa	53,17	55,10
Leeg, Trekken **MAHA** 1pt-extra	58,16	61,33
Leeg, Trekken **MAHA** OLS	52,87	55,02



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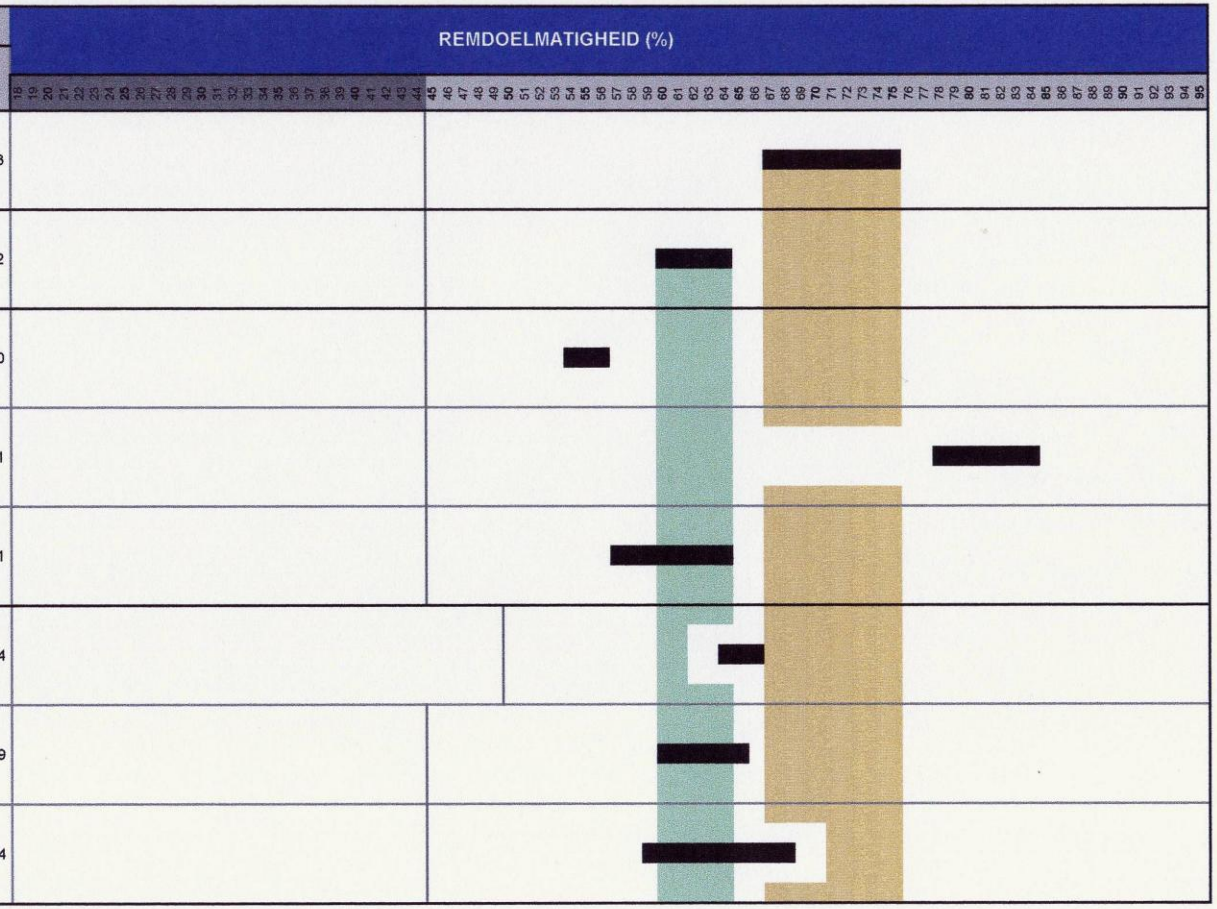
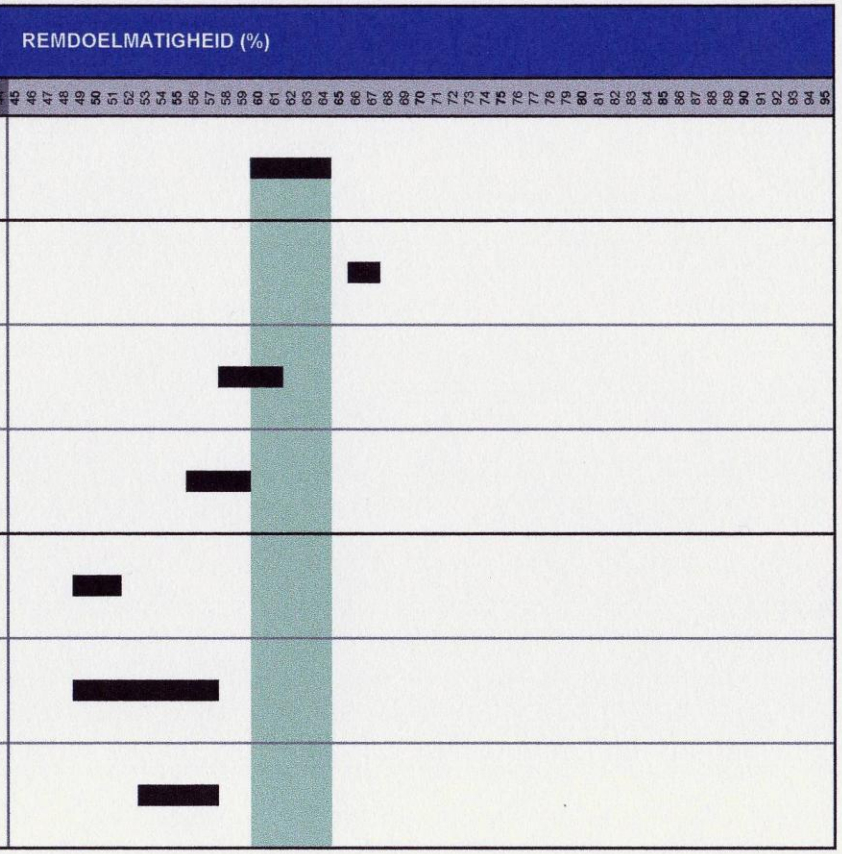
REMDOELMATIGHEID CV1 MERCEDES 1317

CV1 BELADEN & LEEG	MIN	MAX
REF Leeg op de weg	67,28	75,43
REF Beladen op de weg	60,14	64,22
Beladen VLT EFF massa	54,02	57,00
Beladen VLT 1pt-extra	78,44	84,21
Beladen VLT OLS	57,40	64,21
Leeg VLT EFF massa	64,94	66,04
Leeg VLT 1pt-extra	60,38	65,79
Leeg VLT OLS	59,60	68,14



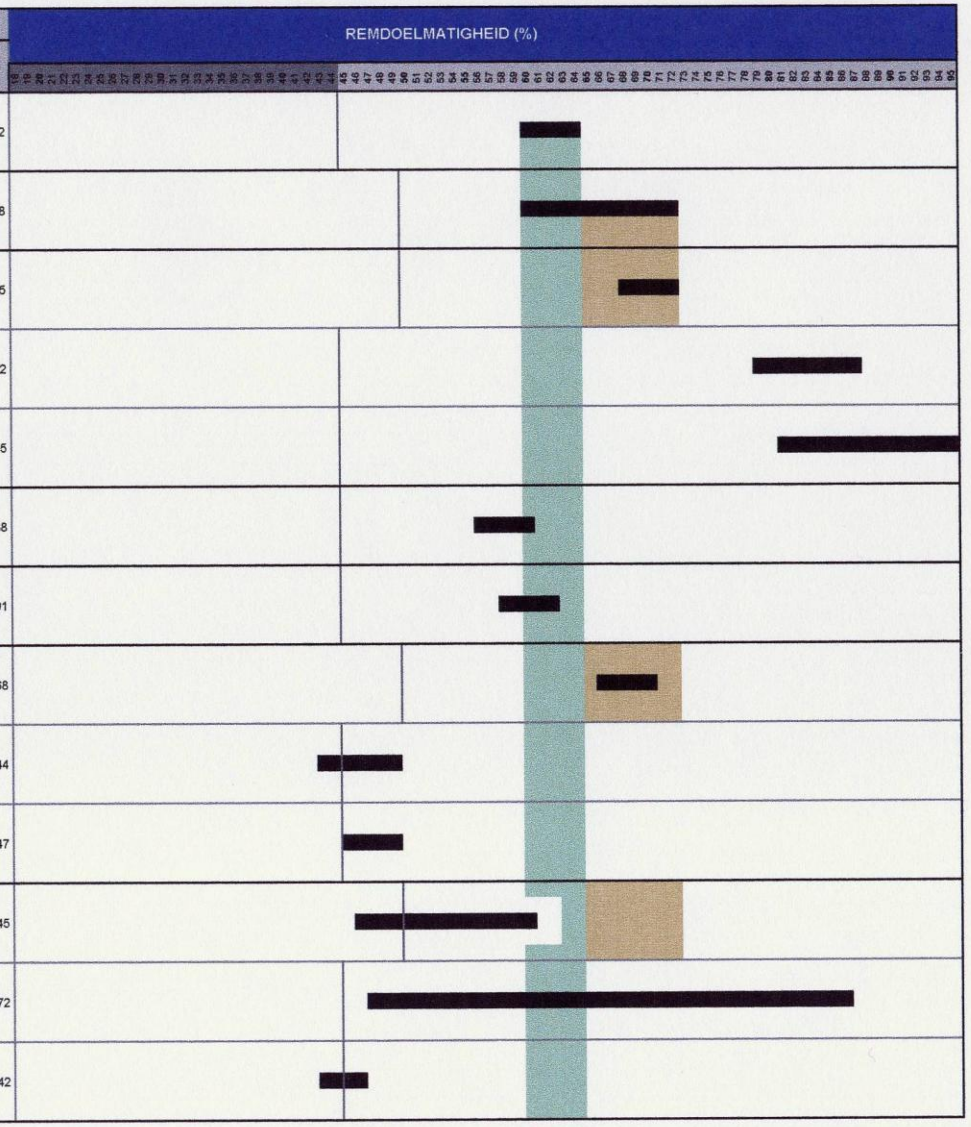
REMDOELMATIGHEID VO VOLVO

VO BELADEN	MIN	MAX
REF Beladen op de weg Ontkoppeld	60,14	64,22
Beladen **VLT** EFF massa	66,34	67,81
Beladen **VLT** 1pt-extra	58,07	61,11
Beladen **VLT** OLS	56,38	59,94
Beladen **BM** EFF massa	49,22	51,15
Beladen **BM** 1pt-extra	49,26	57,32
Beladen **BM** OLS	53,47	57,32



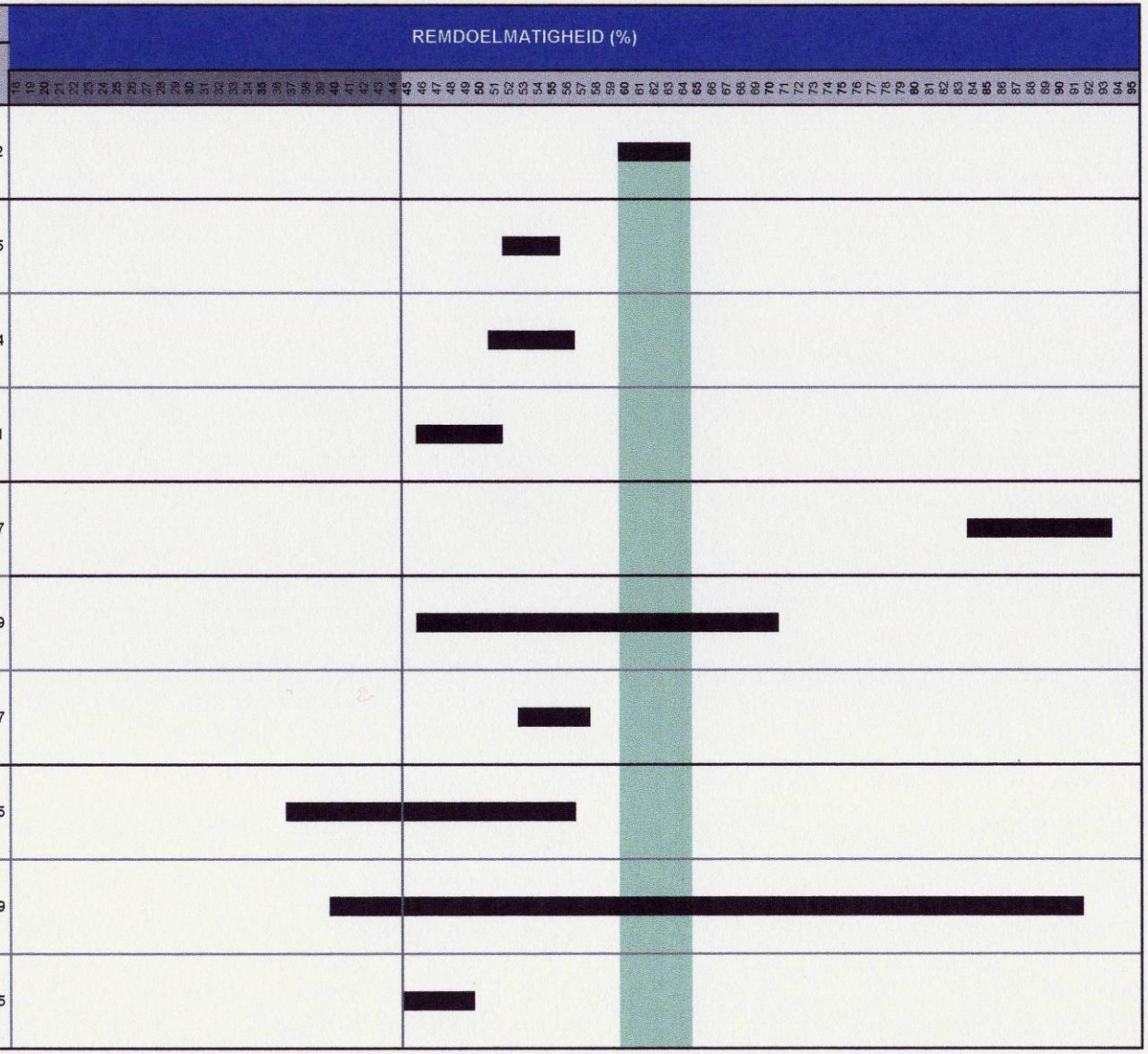
REMDOELMATIGHEID VO VOLVO

VO LEEG	MIN	MAX
REF Beladen op de weg Ontkoppeld	60,14	64,22
REF Leeg op de weg Ontkoppeld	60,14	72,38
Leeg **VLT** EFF massa	68,25	72,35
Leeg **VLT** 1pt-extra	79,80	87,32
Leeg **VLT** OLS	81,05	96,75
Leeg **VLT** 1pt-extra p2=2,5 DK	56,40	60,88
Leeg **VLT** 1pt-extra d=3	58,21	62,91
Leeg **BM** EFF massa	66,52	70,68
Leeg **BM** 1pt-extra	43,67	49,44
Leeg **BM** OLS	45,89	49,47
Leeg **MAHA** EFF massa	46,40	60,45
Leeg **MAHA** 1pt-extra	47,79	86,72
Leeg **MAHA** OLS	43,84	46,42



REMDOELMATIGHEID VO VOLVO

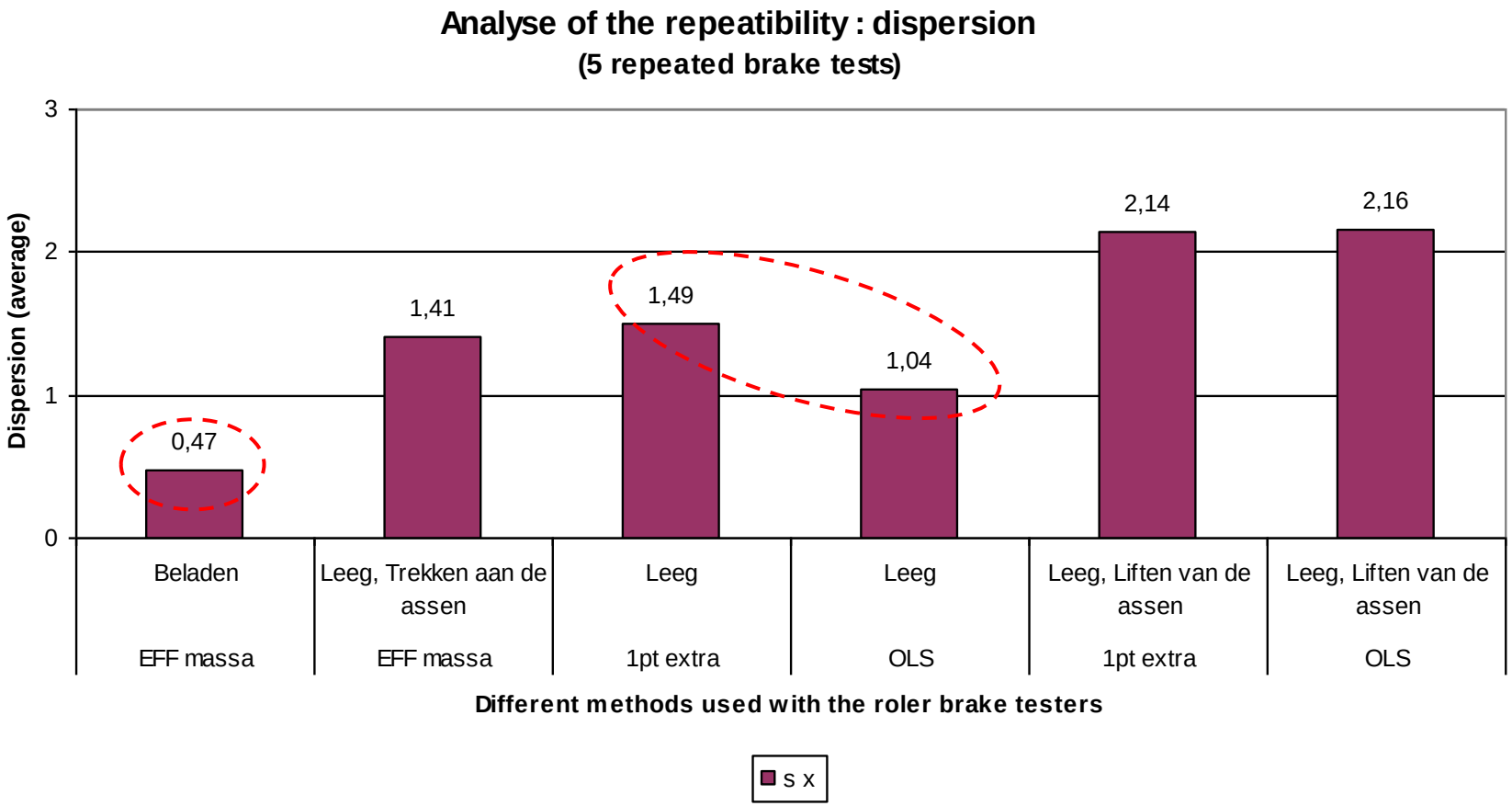
VO ASLASTSIMULATIES	MIN	MAX
REF Beladen op de weg Ontkoppeld	60,14	64,22
Leeg, Trekken aan de assen **VLT** EFF massa	52,90	55,85
Leeg, Trekken aan de assen **VLT** 1pt-extra	51,91	56,64
Leeg, Trekken aan de assen **VLT** OLS	46,75	51,31
Leeg, Liften van de assen **VLT** EFF massa	84,09	93,87
Leeg, Liften van de assen **VLT** 1 pt-extra	46,51	70,69
Leeg, Liften van de assen **VLT** OLS	53,35	57,07
Leeg, Trekken aan de assen **MAHA** EFF massa	37,32	56,75
Leeg, Trekken aan de assen **MAHA** 1pt-extra	40,20	91,59
Leeg, Trekken aan de assen **MAHA** OLS	45,47	49,95



GOCA - 7-10-2002 - UBIA VO VOLVO - LEEG (aslastsimulaties)

Study comparison of different brake tests (1999-2000)

Test results



Study comparison of different brake tests (1999-2000)

Test results

No extrapolation method is better on

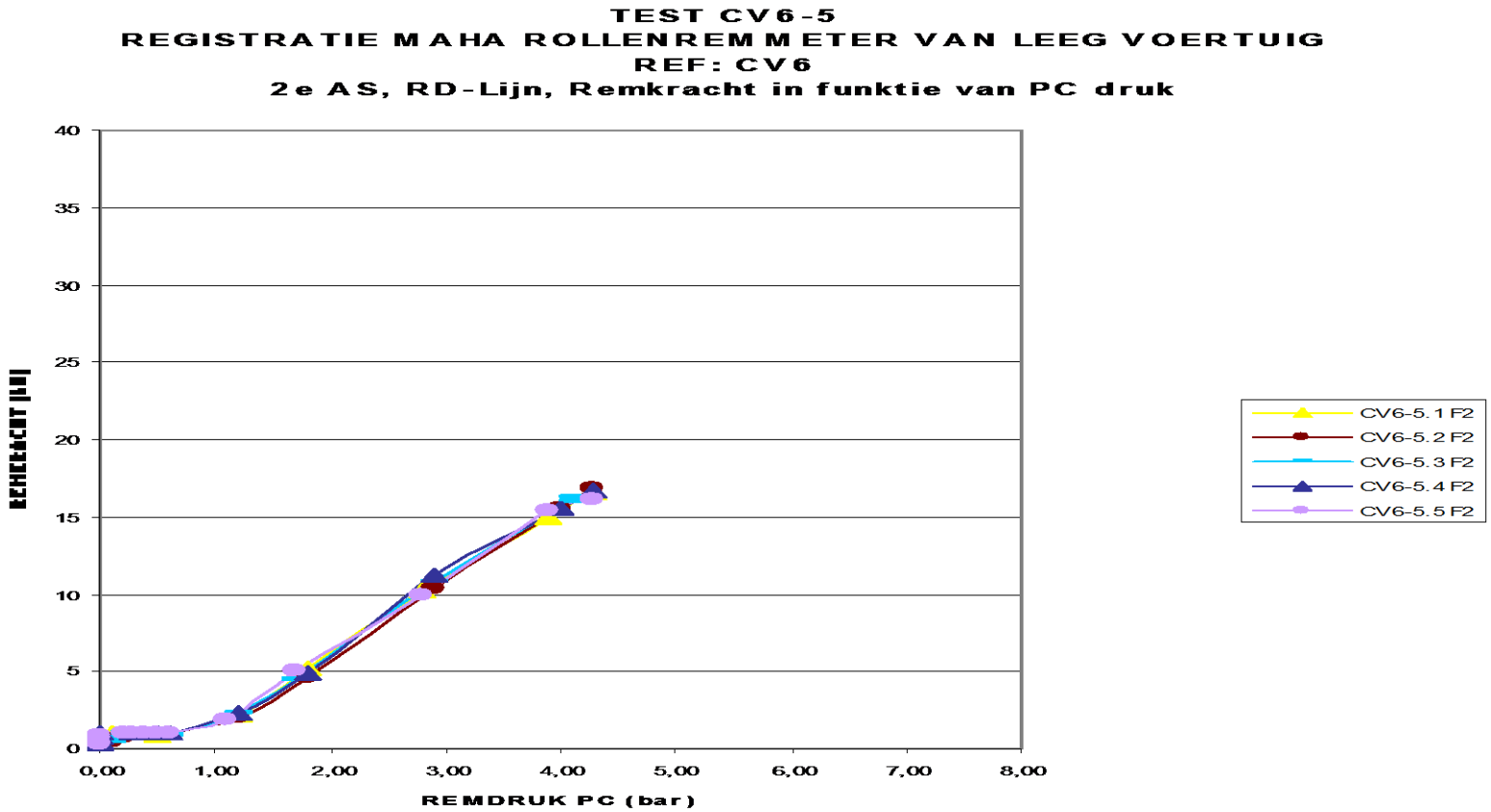
- Quality
- Repeatability

But

Repeatability of the graphs on itself is good

Study comparison of different brake tests (1999-2000)

Repeatability graphs



Political Issues

Political Issues

Political Stakeholders

- Belgian Ministry
- Transport Federations (4)
- GOCA & PTI inspection centres

Fist Announcement by Ministry

- Brake test will be done like in France : on a fully laden vehicle

→ transport federations : did not accept this proposal

Political Issues

Conclusion Royal Degree 17.03.2003

Starting date **01.10.2005** & client may **choose** :

Brake test in laden condition

(present vehicle 2x)

Brake test in empty condition

Political Issues

Brake test in laden condition

- Mass > 2/3 of maximum authorised mass
- Transport of persons (busses and coaches)

Brake test in empty condition

•Mass empty ≤ 2/3 Max authorised mass

•Obligatory: vehicles who may not be laden tested in inspection centres for reasons of hygiene and dangerous goods (vehicles before > 01.10.1981)

Remarks: 2 bar

• by partial load (mass ≤ ½ Max authorised Mass)

• by simulation of load

Political Issues

AD-HOC WERKGROEP GRRF (PTI)

ECE R13:

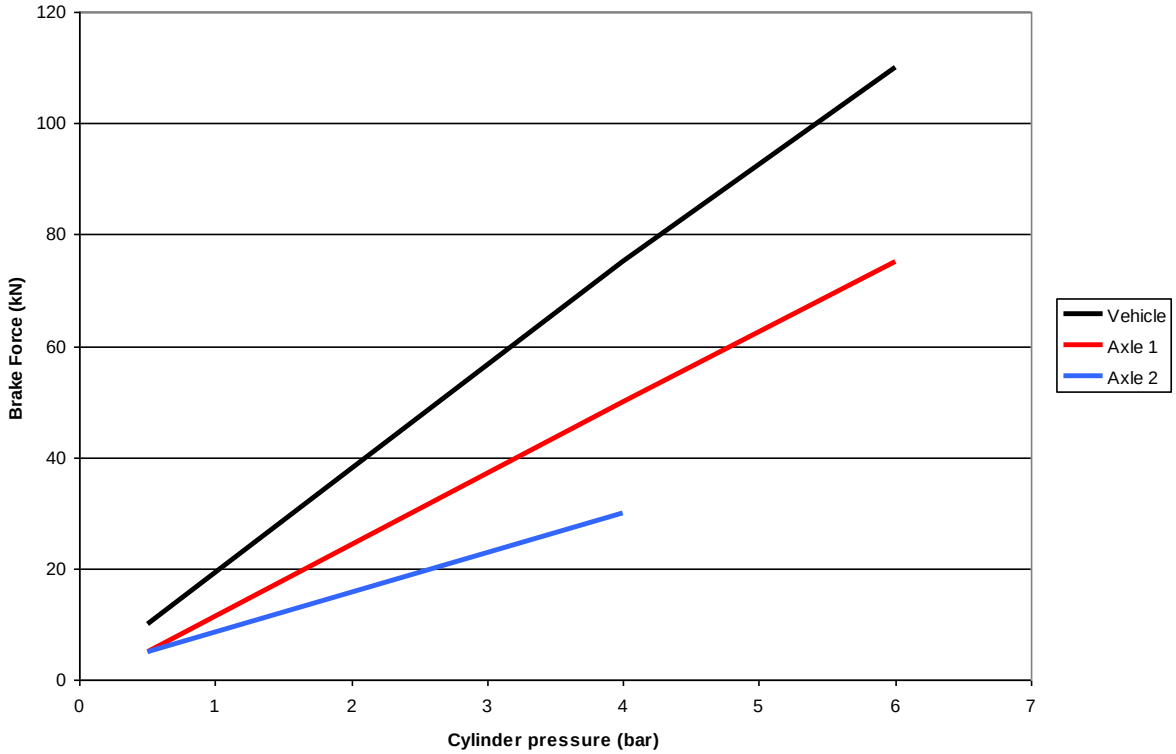
2.30 «REFERENCE BRAKING FORCES» means the braking forces of one axle generated at the circumference of the tyre on a roller brake tester, relative to brake actuator pressure and declared at time of type approval.

5.1.4.6. upto 5.1.4.7.1. Reference braking forces

Political Issues

AD-HOC WERKGROEP GRRF (PTI)

ECE R13:



Calculation Issues: Development of RD method

Calculation Issues: Development of RD method

Starting point for development RD method

No assumption (extrapolation)

but

Measured values !

Calculation Issues: Development of RD method

New developed method is

- **Based on linear interpolation of the acceptance criterion in the graph brake force / cylinder pressure**
- **Based on European Directive 96/96/EG (now 2009/40/EG)**
- **Based on homologation Directive for Brakes 71/320/EEG, last adaptation 98/12/EG.**

Calculation Issues: Development of RD method

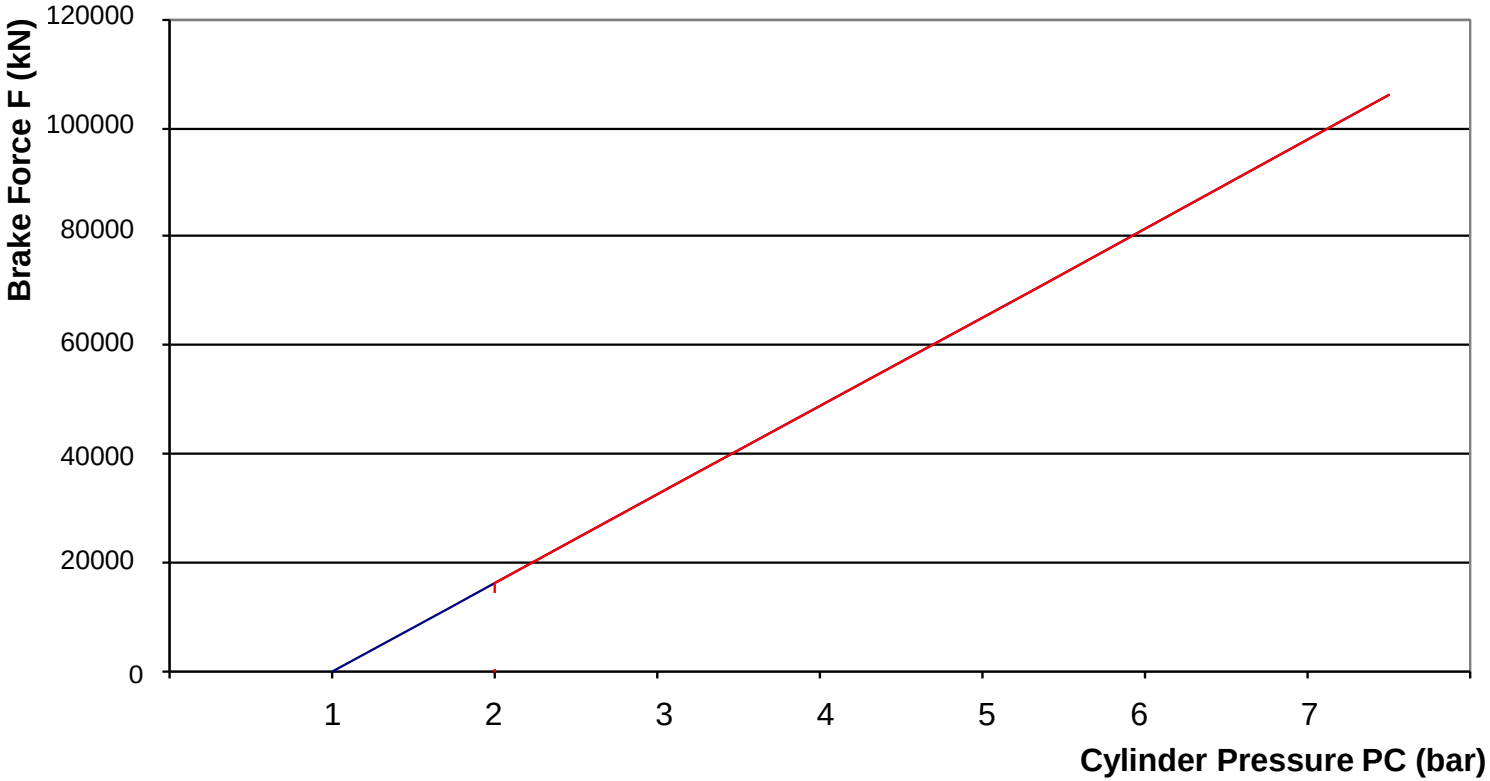
Evaluation of the vehicle

Baseline

- Vehicle -> min brake efficiency (directive)
- -> Required brake force at minimum garanteed pressure PC.
- Brake should develop a certain brake force at 1 bar PC.

Calculation Issues: Development of RD method

Evaluation of the vehicle



Calculation Issues: Development of RD method

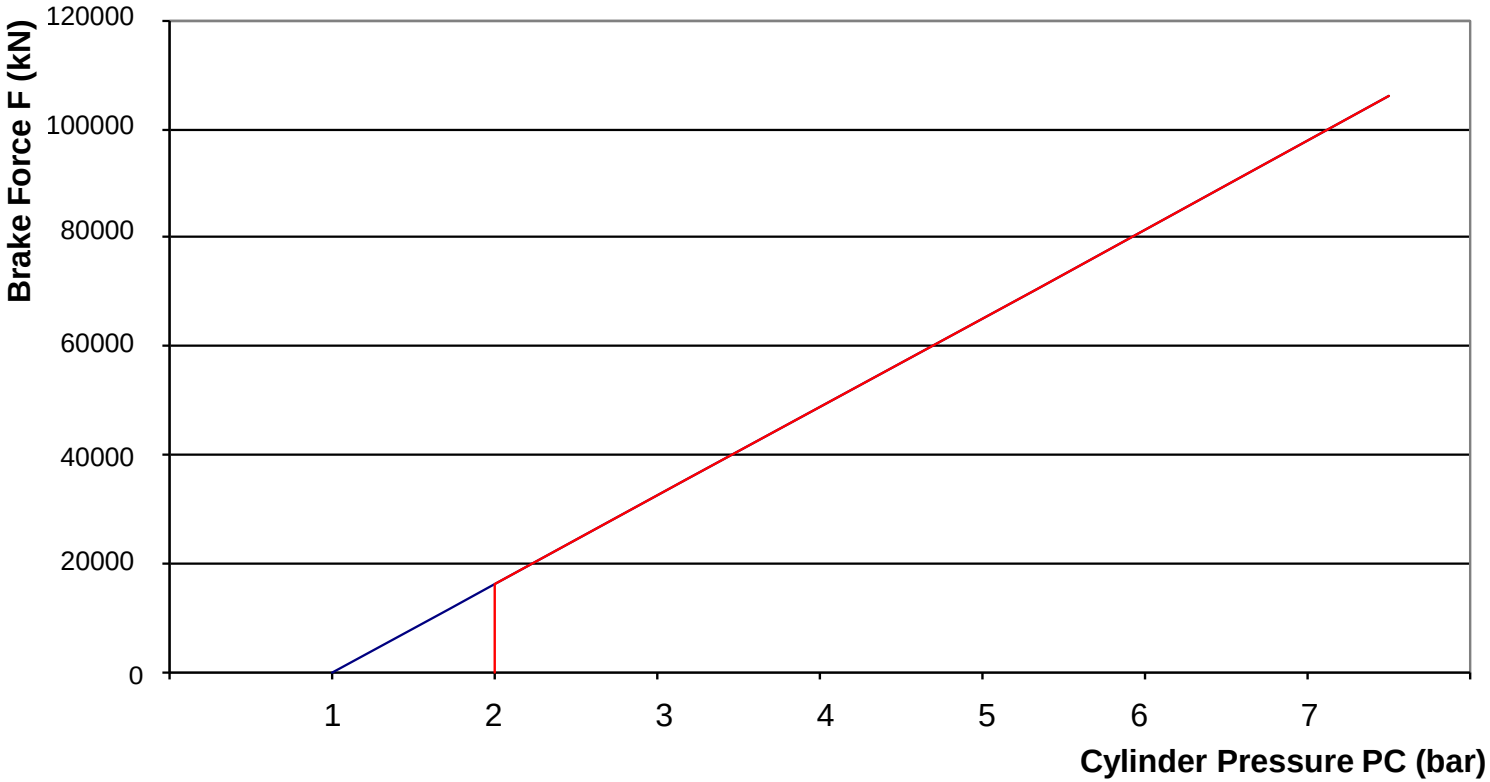
Evaluation of the vehicle

Restriction line

71/320/EEC: it is not necessary that there should be proportionality between the braking rate and the control line pressure as measured at the coupling head for a break efficiency beneath 10%.

Calculation Issues: Development of RD method

Evaluation of the vehicle



Calculation Issues: Development of RD method

Evaluation of an axle

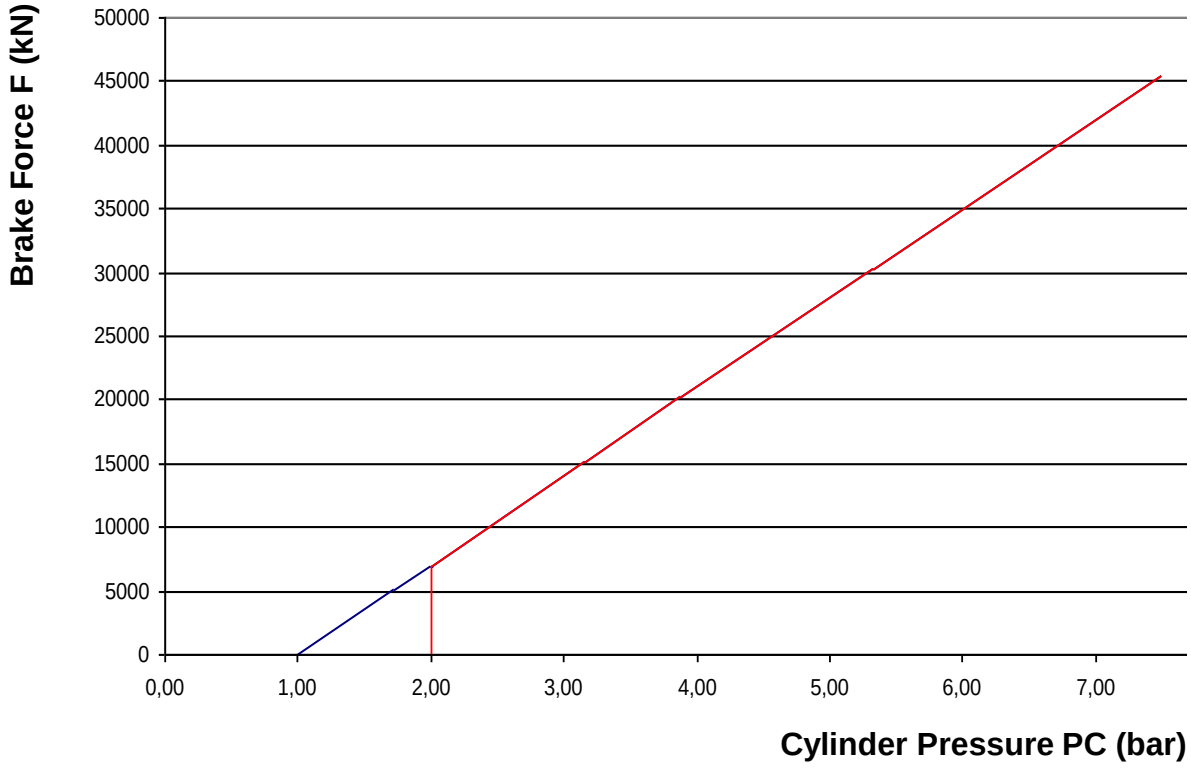
Baseline

- **Same calculation as for the vehicle but with maximal authorised axle mass instead of vehicle mass**

Restriction line

Calculation Issues: Development of RD method

Evaluation of an axle



Calculation Issues: Development of RD method

Evaluation of an axle

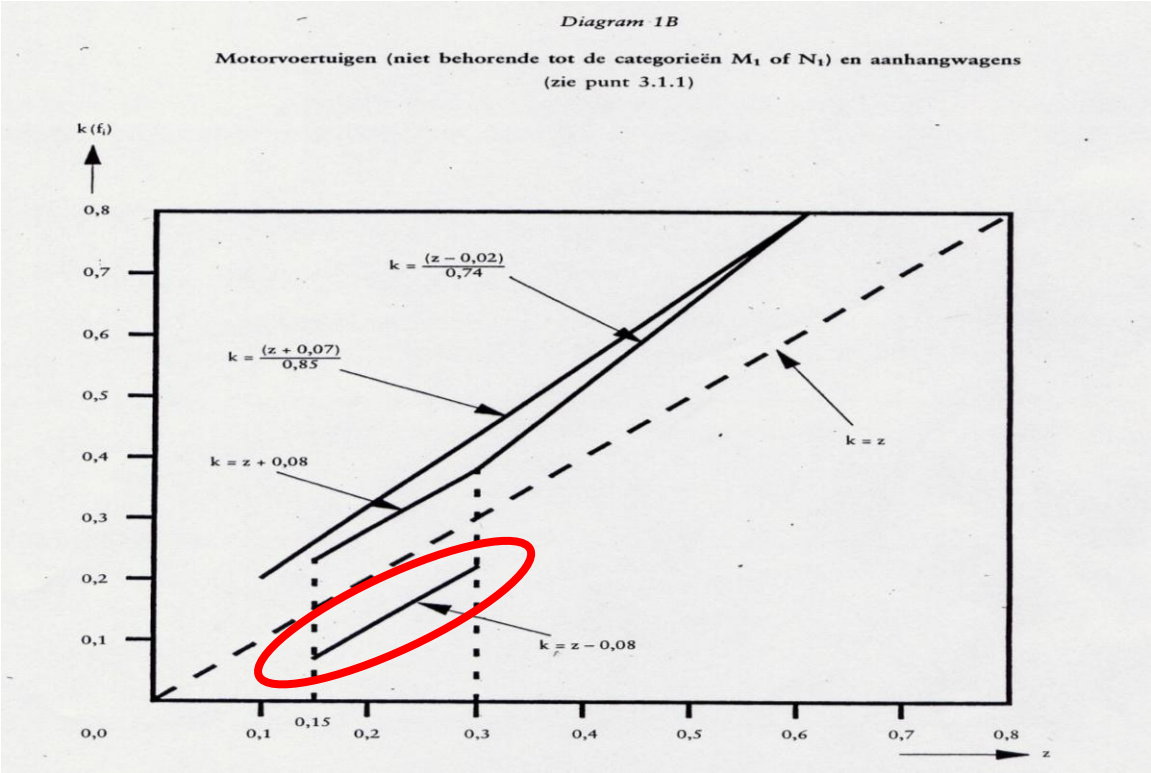
Adapted axle baseline

71/320/EEC: Appendix of ANNEX II (Braking Tests and performance of braking systems) : Distribution of braking effort among vehicle axles

Calculation Issues: Development of RD method

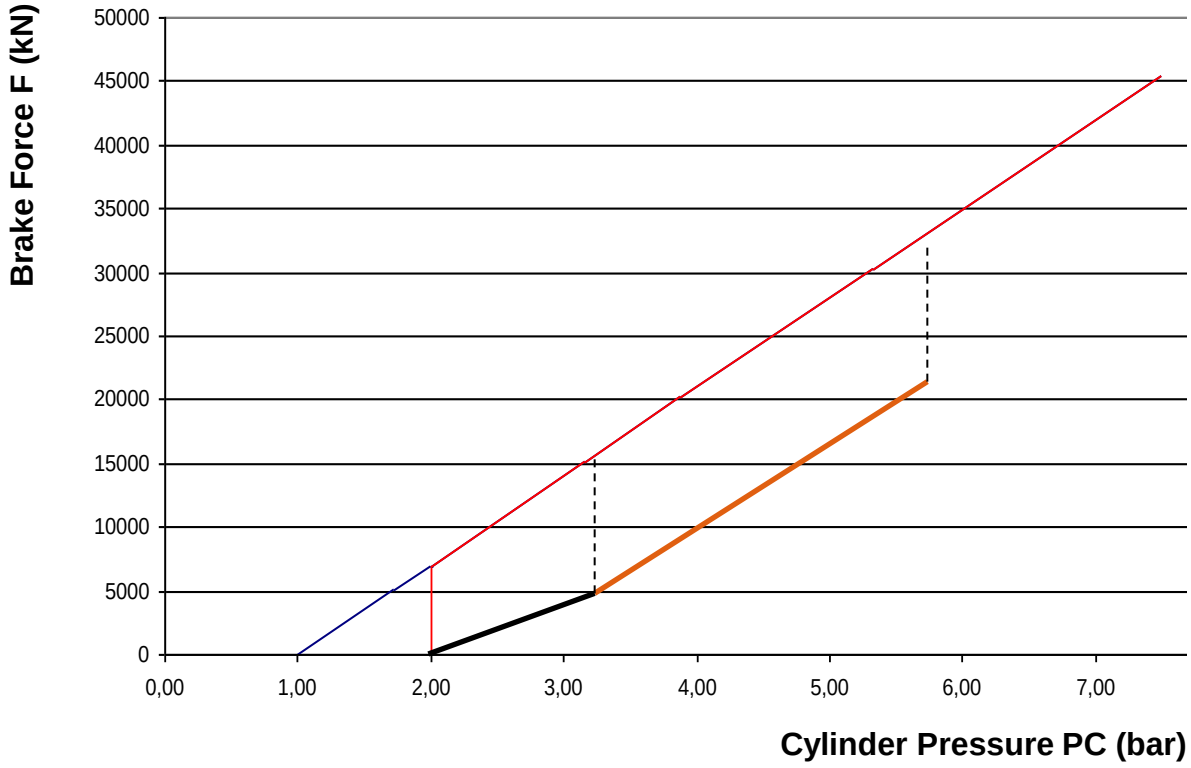
Evaluation of an axle

Adapted axle baseline



Calculation Issues: Development of RD method

Evaluation of an axle



Calculation Issues: Development of RD method

RD method – a practice case

1. Connection of the air pressure manometers

RD method – a practice case

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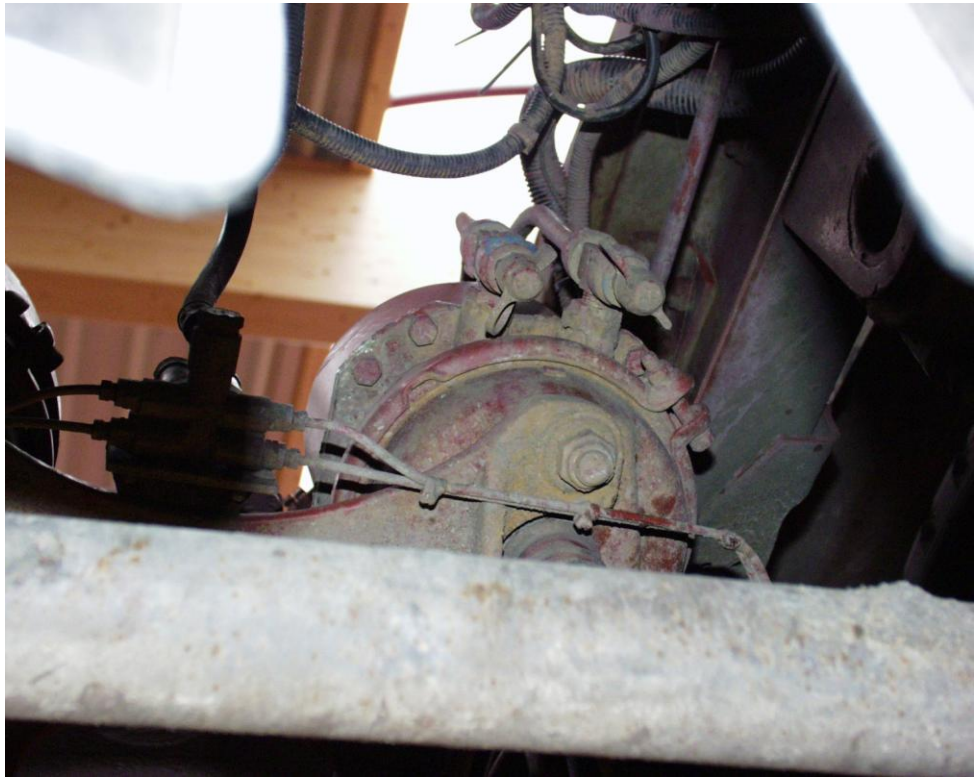
RD method – a practice case

1. Connection of the air pressure manometers



RD method – a practice case

1. Connection of the air pressure manometers

Calculation Issues: Development of RD method

RD method – a practice case

2. Introduce the necessary elements for the calculation (automatic)

Calculation Issues: Development of RD method

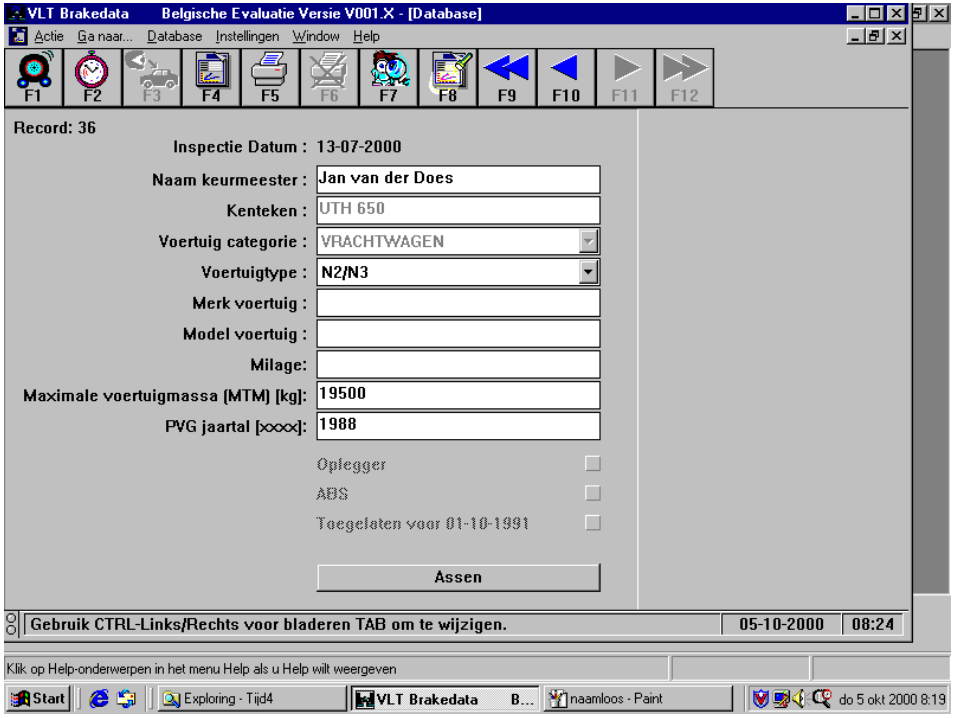
RD method – a practice case

2. Introduce the necessary elements for the calculation (automatic)

Calculation Issues: Development of RD method

RD method – a practice case

2. Introduce the necessary elements for the calculation (automatic)



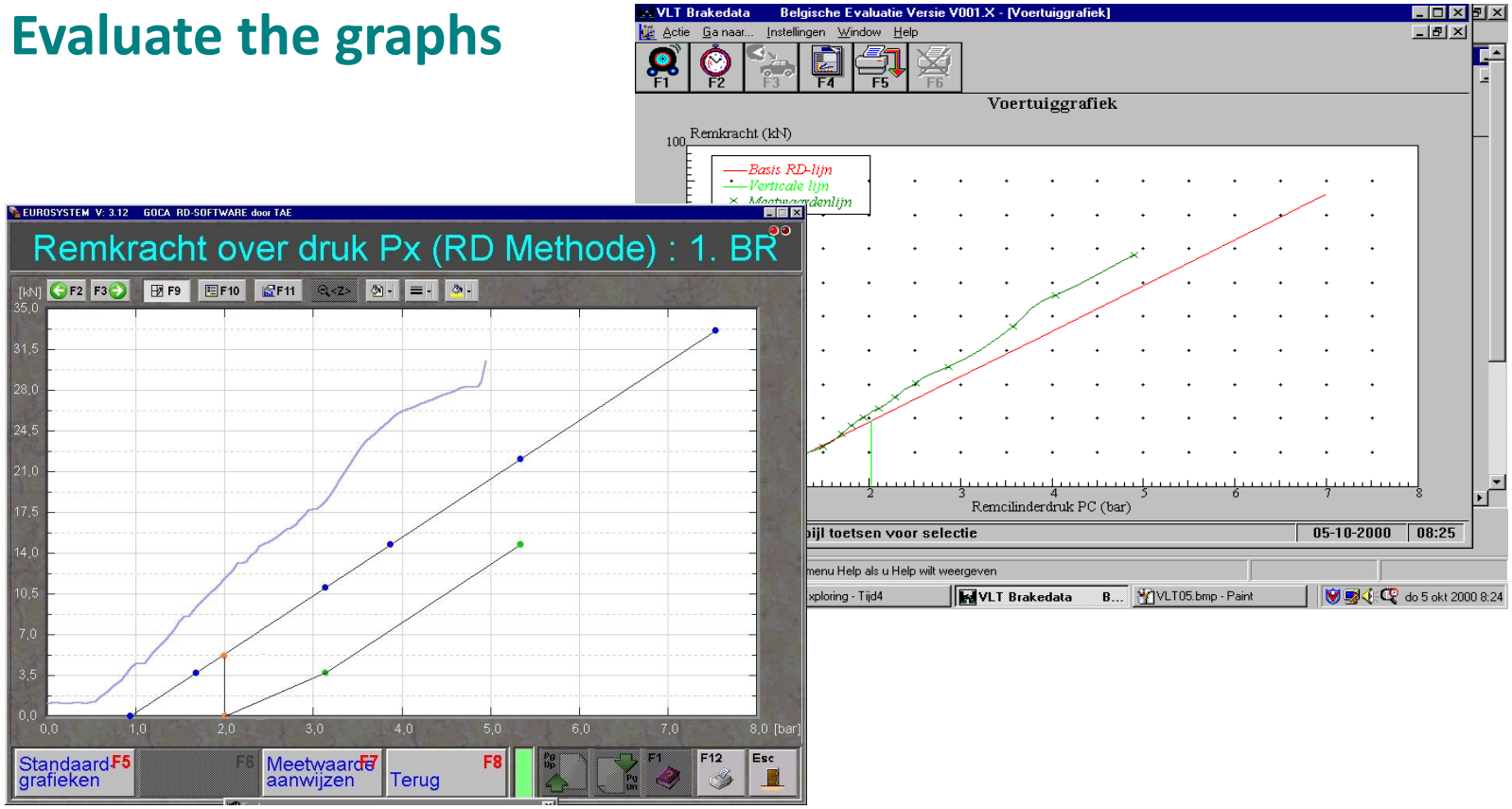
RD method – a practice case

3. Conduct a brake test

Calculation Issues: Development of RD method

RD method – a practice case

4. Evaluate the graphs



RD method – a practice case

5. Disconnect the manometers

Issues : Minimum 2 bars cylinder pressure

Issues : Minimum 2 bars cylinder pressure

Study in 2004 shows 38% of vehicles do not reach in the empty condition the 2 bars

Vehicle	Reach 2 bar cylinder pressure	% vehicle (tested sample)	% transformed to Belgian vehicle parc
Lorry	NOK	13,11%	5,78%
Semi-trailer	NOK	73,95%	**23,82%**
Trailer	NOK	33,33%	1,77%
Tractor	NOK	38,71%	7,13%
Totaal	OK		61,50%
	NOK		**38,50%**

Issues : Minimum 2 bars cylinder pressure

How to get higher cylinder pressure during brake test?

1. Present the vehicle with a partial load (<1/2 Max authorised Mass)
2. Open the LSV valve
3. Pulling on the chassis
4. Pulling on the axle
5. Lifting the axle
6. Raise/Lower Valve blocked in lowest position (in case of “Dutch” air suspension scheme)

Issues : Minimum 2 bars cylinder pressure

Partial load

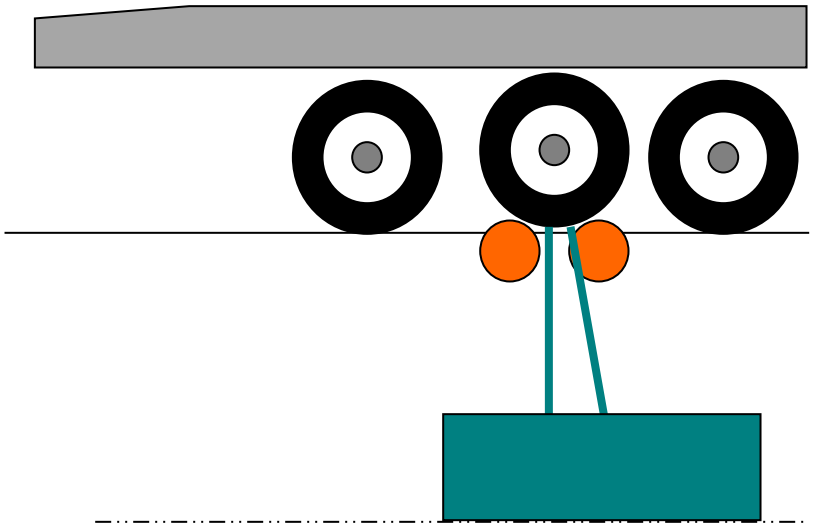
Issues : Minimum 2 bars cylinder pressure

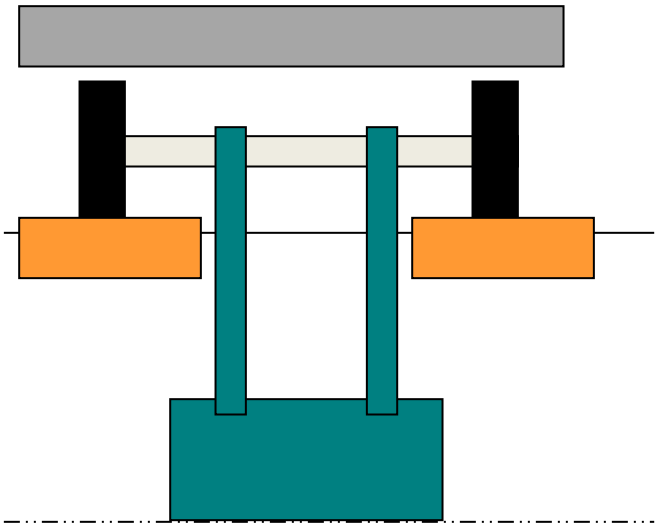
Partial load

Study comparison of different brake tests (1999-2000)

Load simulation

- **Pulling on the axle**

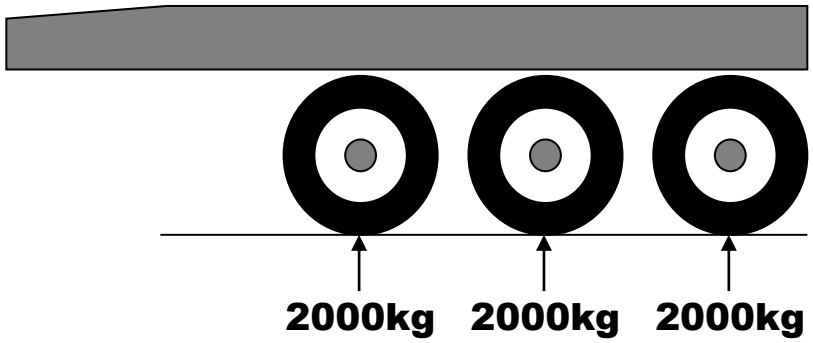


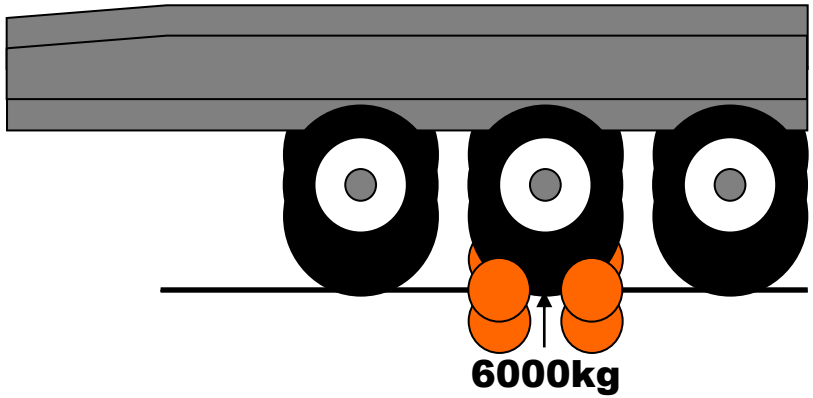


Study comparison of different brake tests (1999-2000)

Load simulation

- **Lifting the axle**





Study comparison of different brake tests (1999-2000)

Load simulation

- **Lifting the axle**

Study comparison of different brake tests (1999-2000)

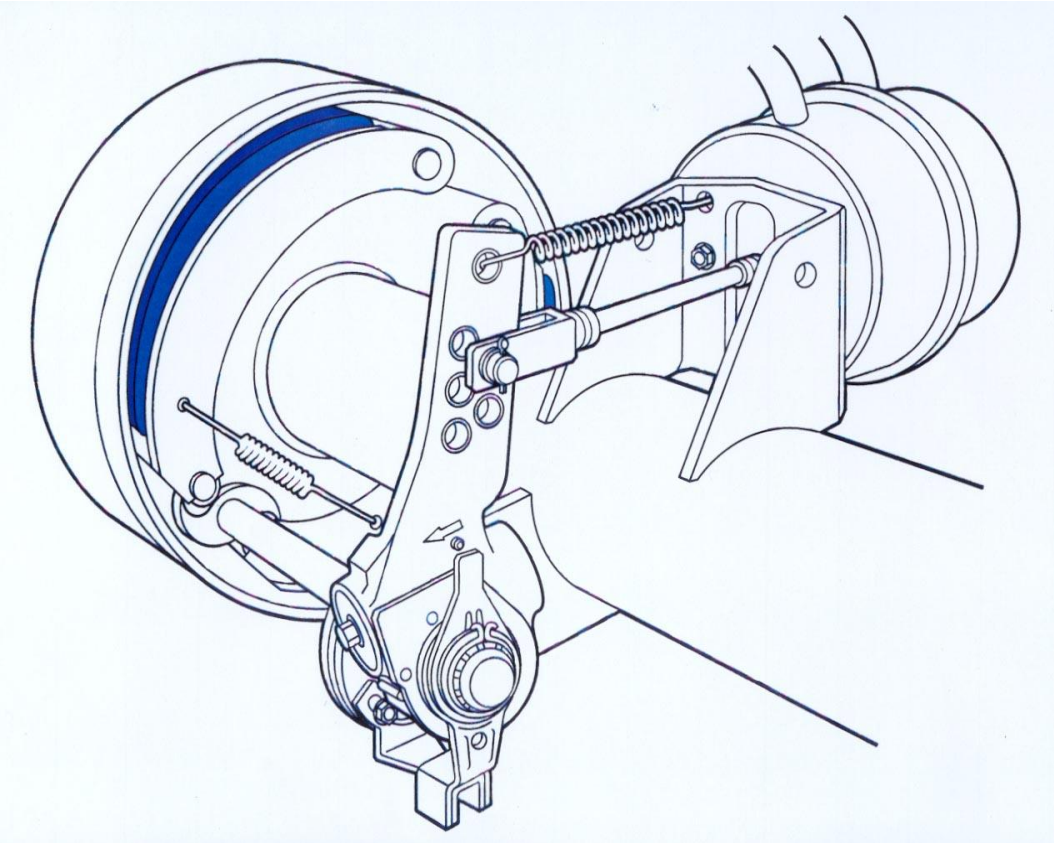
Load simulation

- **Lifting the axle**

Study comparison of different brake tests (1999-2000)

Load simulation

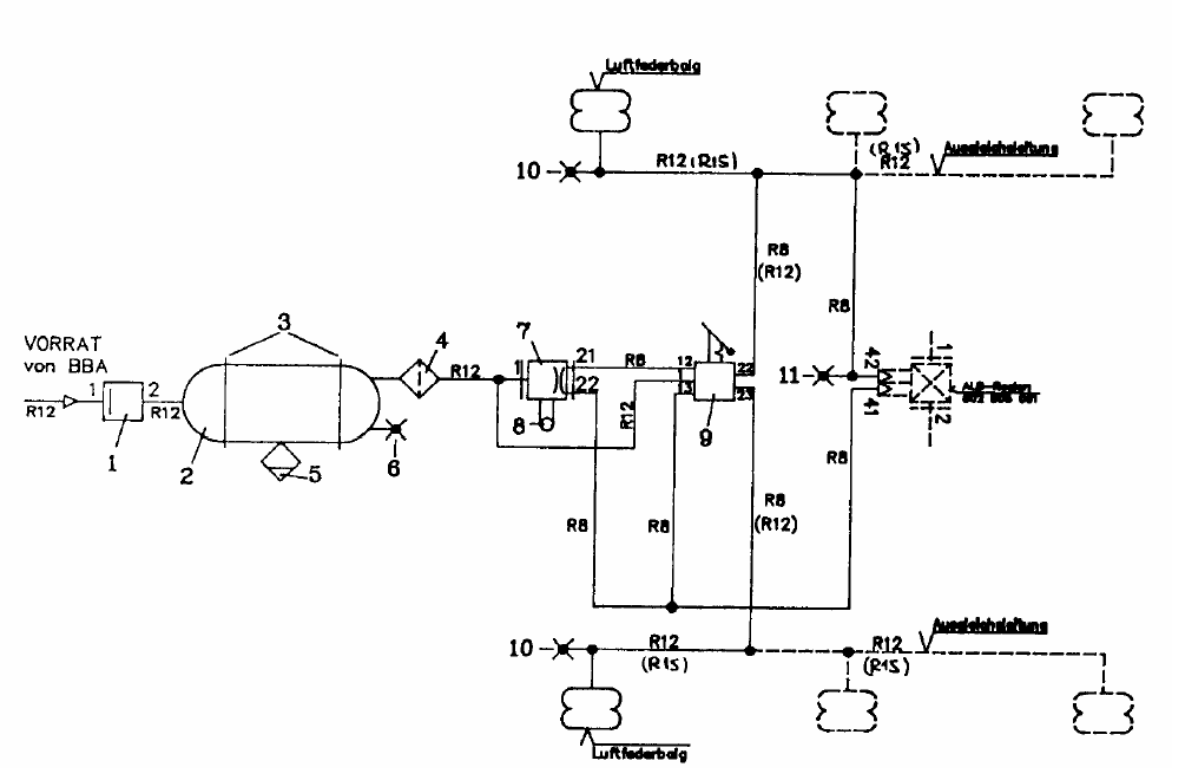
- **Raise/lower valve**



Study comparison of different brake tests (1999-2000)

Load simulation

- **Raise/lower valve**



Issues : Cylinder pressure tapping point

Issues : Cylinder pressure tapping point

Issues : Cylinder pressure tapping point

- Tapping point could be **dirty**
- Before the test they are not frequently used
- Time consuming
- Safety/security inspector

→**tapping point should be doubled**

- **Temporary**
- **Permanent**

Issues : Cylinder pressure tapping point

→If tapping point is not easily accessible from the working floor : **it may be doubled**

→If tapping point is not easily accessible from the inspection pit : **it should be doubled**

INSENTIVE : price reduction

Issues : Cylinder pressure tapping point

INSENTIVE : price reduction

Price for vehicle with 2 axles (€)	
Laden condition	**13,5**
Brake test without a connection or servive beneath the vehicle	**8,0**
Brake test with a connection or servive beneath the vehicle	**29,0**
Price is raised with €6 for each complementairy tested axle	

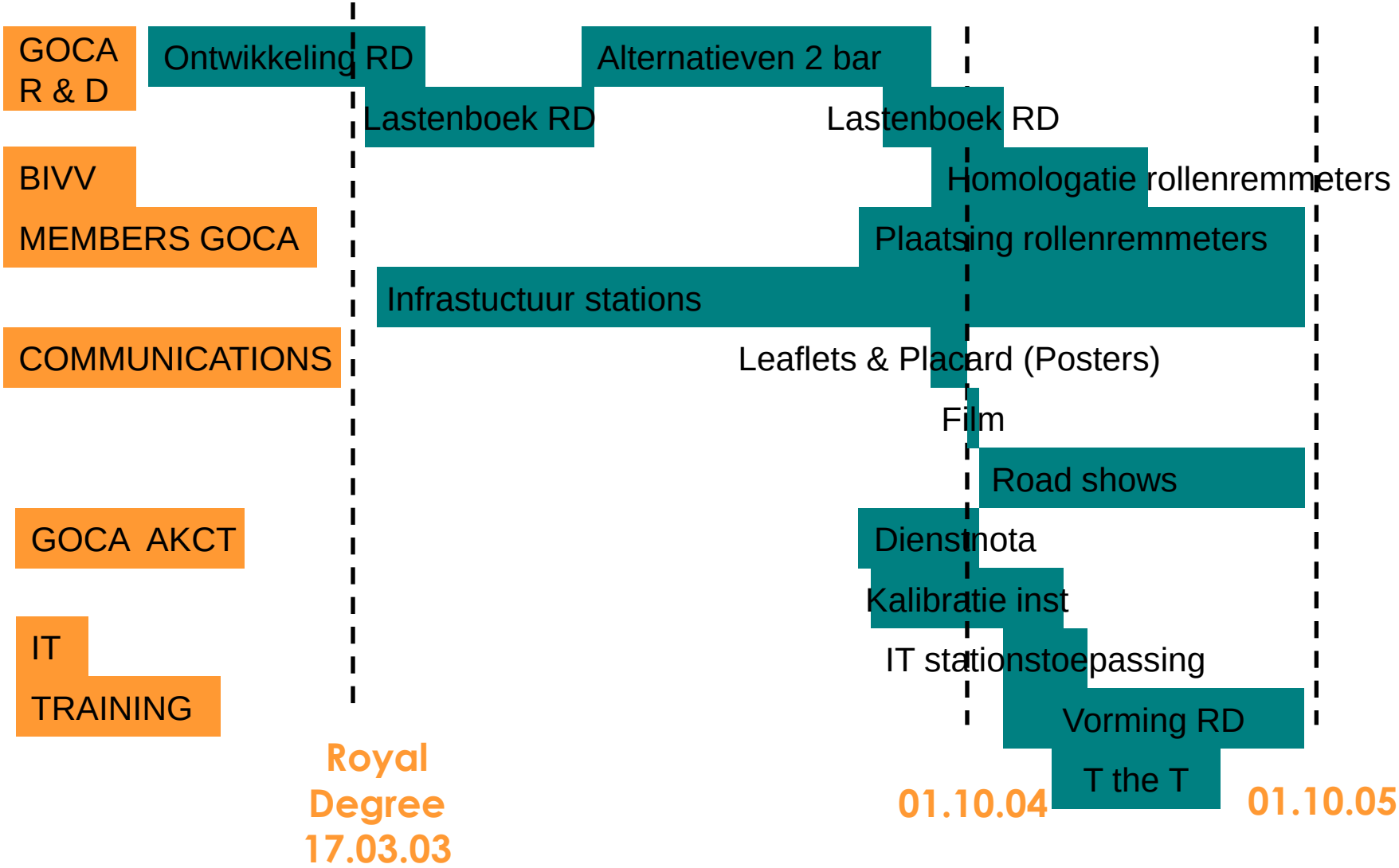
Issues : Communication

Issues : Communication

The whole project was managed with project management technique with accents to

- **Planning**
- **Communication**

Issues : Communication



Issues : Communication

- Communication

- Leaflets
- Placards and Posters
- Film
- Road shows

Thank you for your attention