TECHNOLOGY TRENDS
Automated Manual Transmissions

An Insight Journey
on
Longterm Development and it's Returns

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National Service Manager
CablePrice NZ LTD

Automated Manual Gearbox Philosophy

Evolution not Revolution !

Driven by

- Market Needs
- Fuel Consumption/Emissions
- Comfort
- Forward modular thinking
- Vision

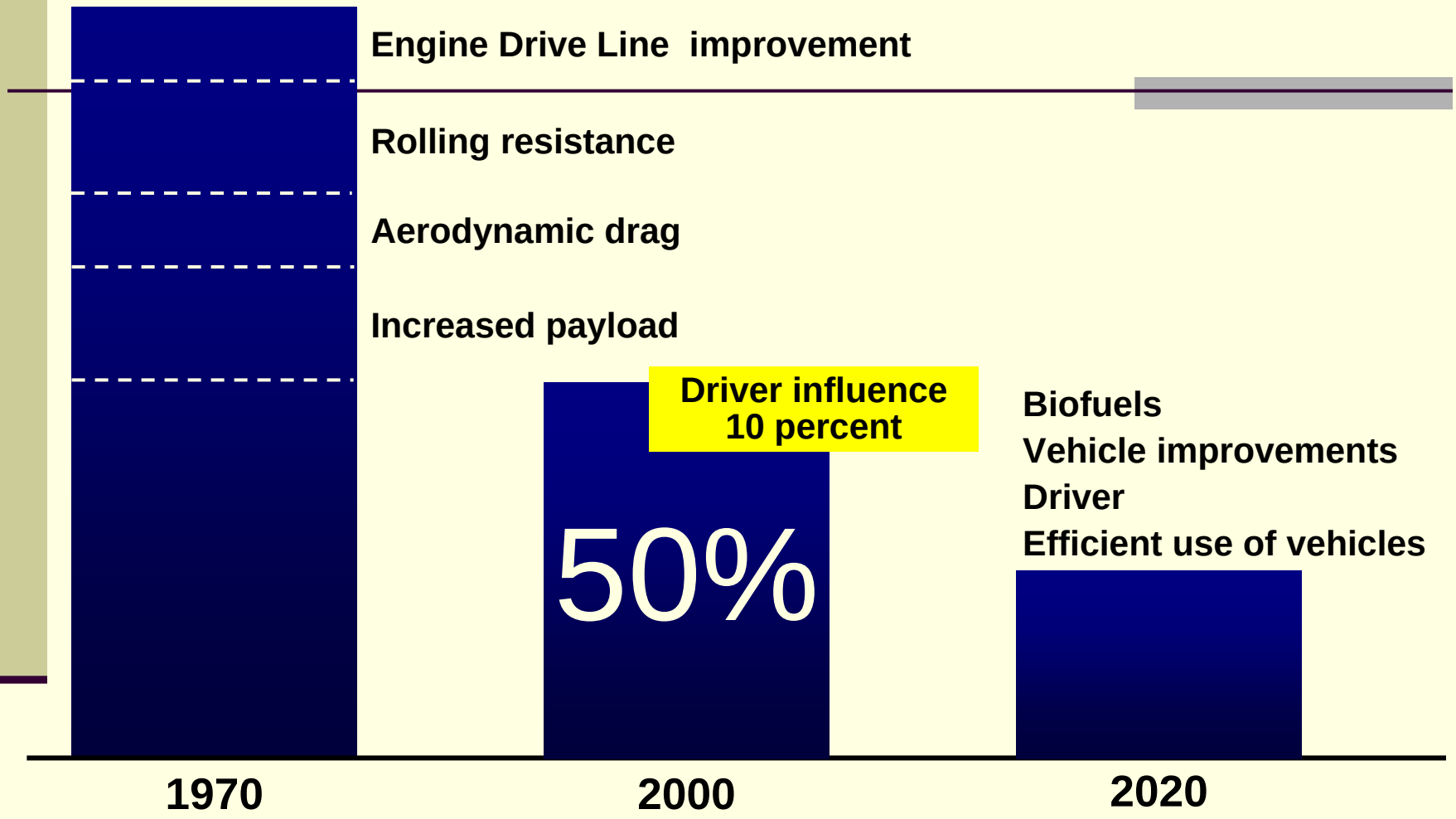
Achieved by

- Finding optimal and

cost efficient technical solutions

Philosophical Reasoning for Opticruise
REASONS WHY ?

Time Increases Demand for Technical Solutions



Fuel consumed per tonne-km (= CO_2 emissions)

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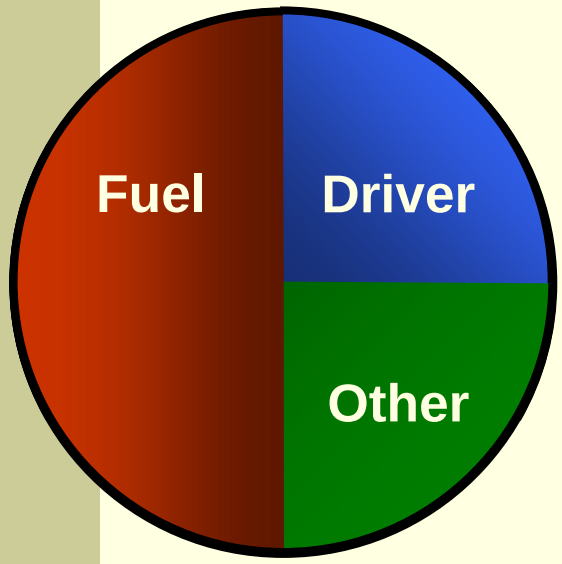
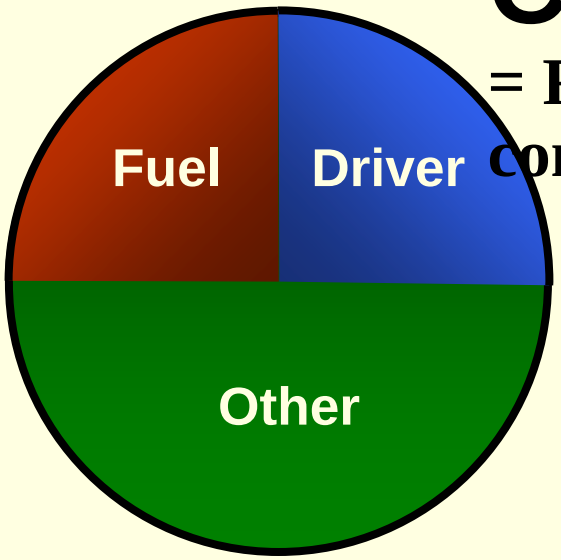
Drivers and challenges

Long-haulage

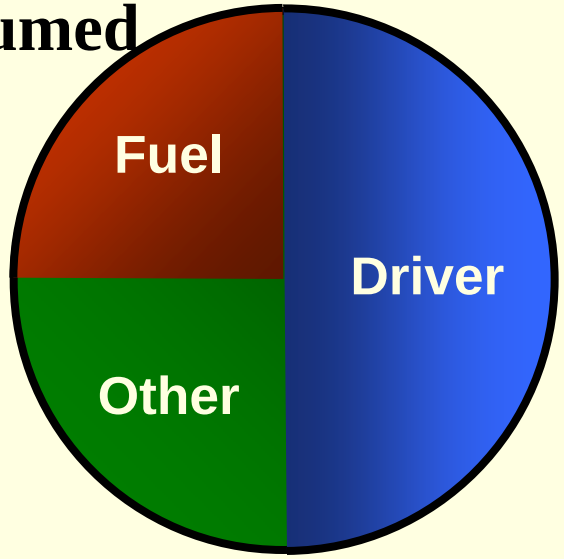


Construction



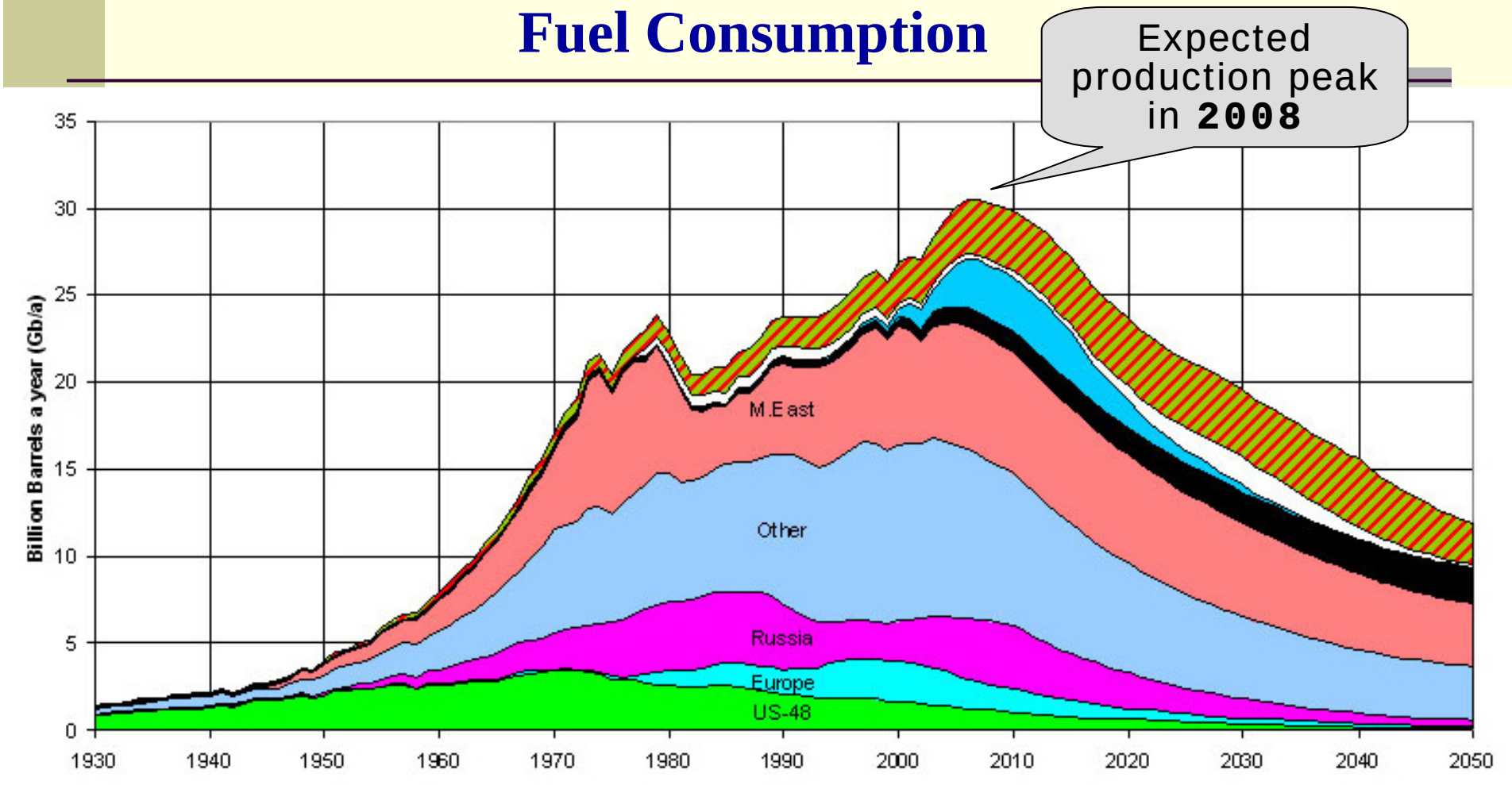
CO_2 = = Fuel consumed

Distribution



How to give the customer the lowest operating cost?

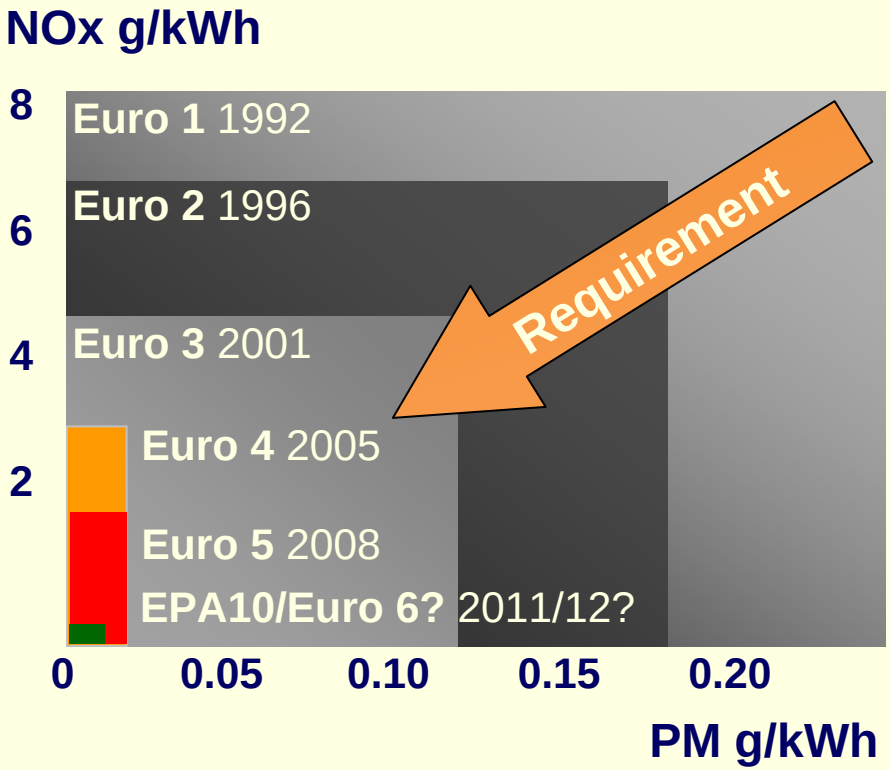
Cost of Oil places serious emphasis on Fuel Consumption



Source: Uppsala Hydrocarbon Depletion Study Group, Oil and gas liquids 2004 Scenario, Updated by Colin J. Campbell, 15 May 2004

Drivers and Emission challenges

Emission legislation



NOx

PM

CO_2 =
= Fuel consumed

CablePrice

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Powered by Control Instruments

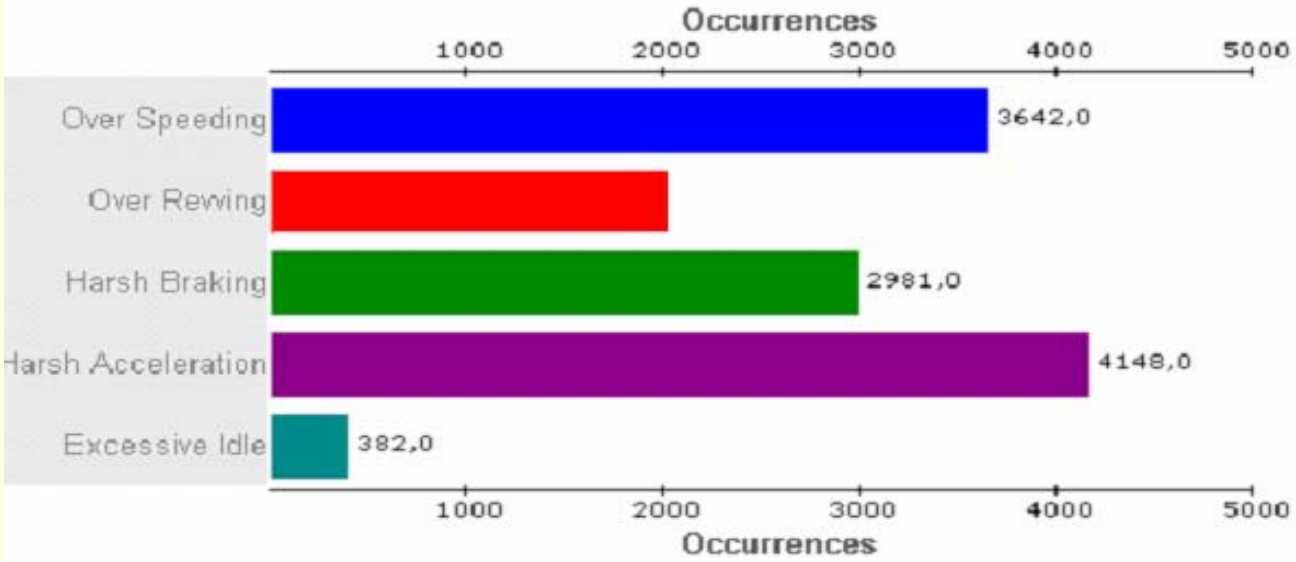
Helpdesk or Recoveries: 0860 103 834

My Account | Web Admin | Vehicles | Drivers

Driver Errors Graph

Driver Performance Manual Transmisson

Generated: 20 januari 2005 12:05:06
Organisation: Scania R&M - Vicva Logistics
Site: Vicva Logistics
Vehicle: Scania 480 NRB38232 (29) (3542857)
Selected Period: 21 december 2004 to 20 januari 2005



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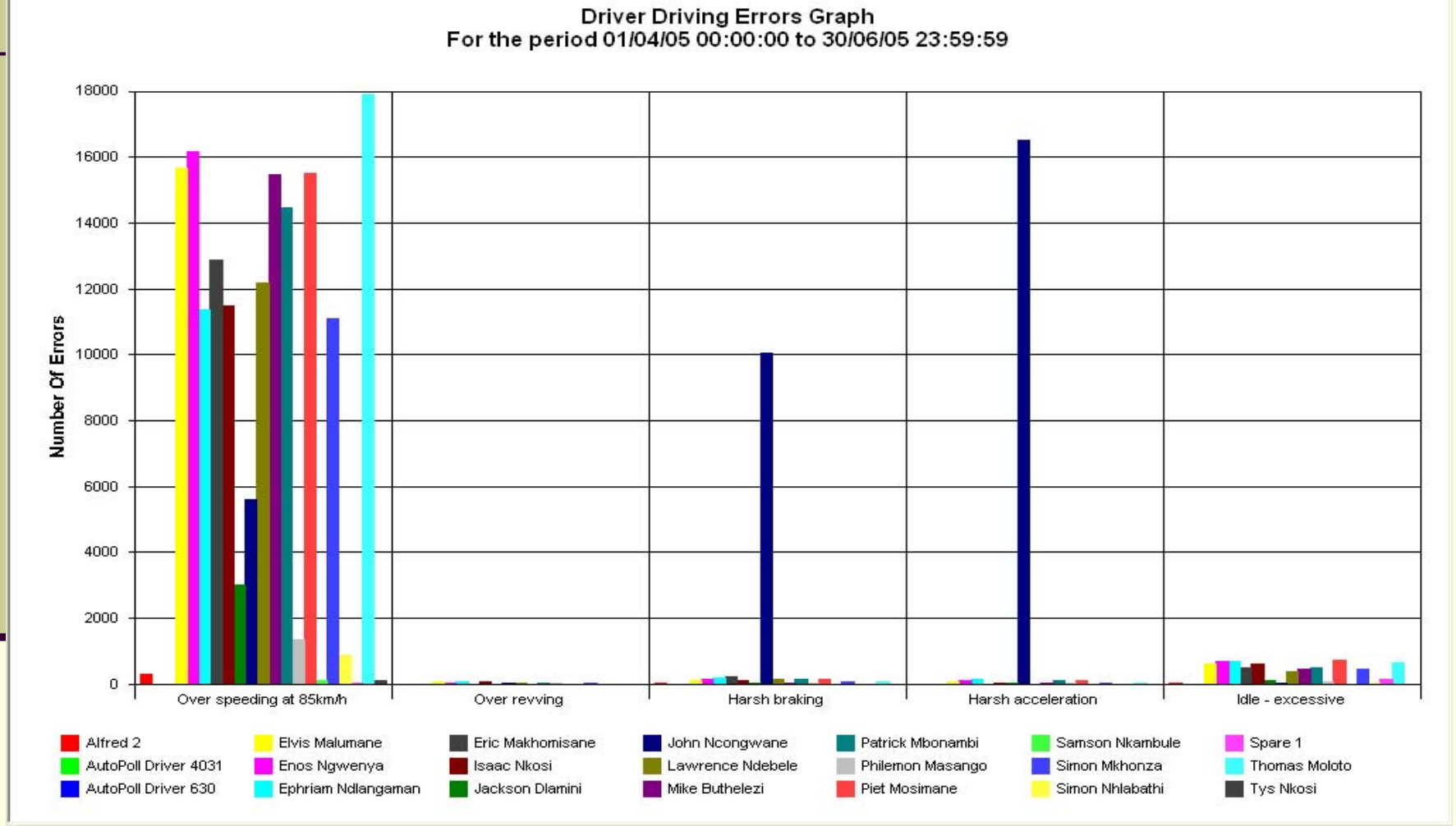
CablePrice

Driver Driving Errors Graph- Demo Copy - NOT FOR RESALE - Control Instruments Development (Pty) Ltd

File Edit View Tools Help



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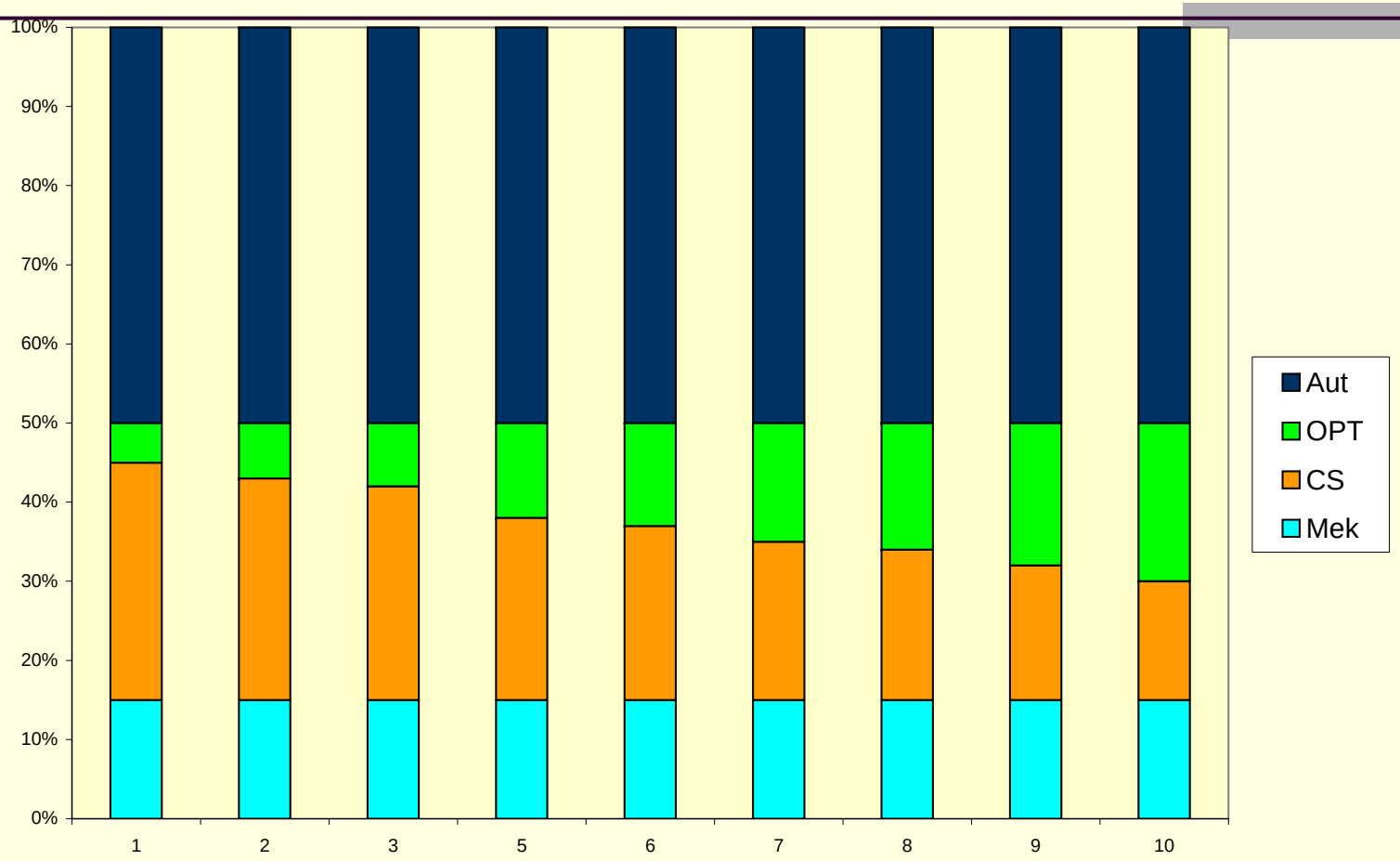
Gearbox type uptake over the years
(BUSES- ALL)



Improved drivers environment with combined opticruise and retarder lever

Opticruise Development Outline

- History
- System overview
- Driver interface
- Hardware
- Input/output
- Gear shifting principle

Power Control Milestones criticical to Gearbox Design !

1984 **CAG (Computer Aided Gear shifting)**
1985 **Automatic gearboxes with integrated retarder**
1987 Bosch-Scania EDC-system (M7) (Partners)
1990 **CAG 2 / Comfort Shift / E Gas 2**
1993 **Scania Retarder**
1995 First Opticruise
1995 Bosch-Scania MS5 (EDC) – partners
1996 Bosch-Scania MS6 (First PDE-system)– partners.
2000 Scania S6 (HPI-EDC) - first in-house engine control system
2004 Scania S6 for all engines
2004 New CAN-architecture in the vehicle
2004 Greatly improved Opticruise available for all /trucks/buses in all applications
2006 New Opticruise adapted for New gearbox program

Some OBJECTIVES for the DESIGN Manual Automated Transmission (OptiCruise)

- Increased Road Safety (as traffic congestion increases)
- Increased Driver Attention Alertness
- Stress Reduction (OSH etc)
- Driver Retention thru optimal comfort levels
- A Non Gender biased Transmission (Enhances Recruitment)
- **Cost effective** solution required to the Full Power Shift Transmission (Weight /Cost/Fuel Consumption)
- Increased Fuel Economy
- Less Emissions (Noise and Exhaust)
- FAIL SAFE
- Reduced Engine and Driveline Wear (Reduction of R&M Cost)
- Meeting most type of application Demands
- Monitor vehicle performance (Reduction of total costs)
- Determining driver performance (Reduction of total costs)

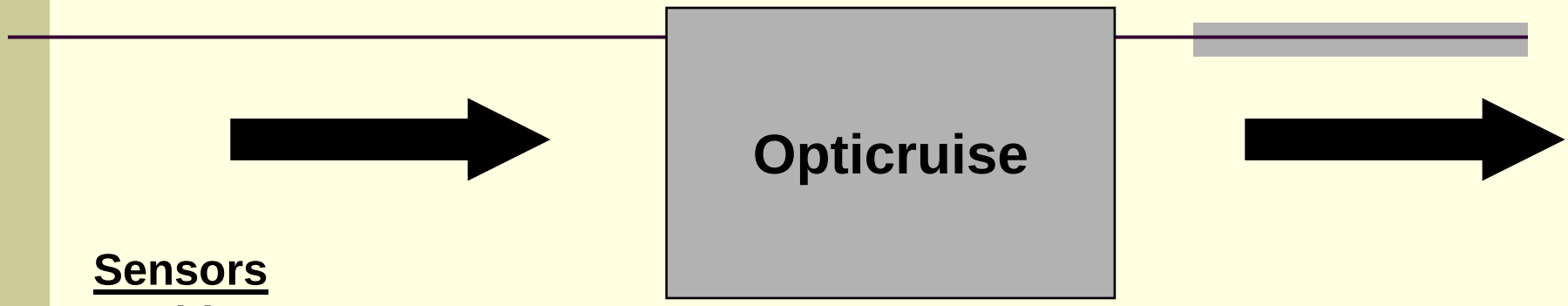
System Overview

- Mechanical gearbox (same as manual)
- Automatic maneuvering
- **Gear shift by engine control !**
  Not just an automatic clutch
- Automatic gear selection strategy based on
  - **Fuel economy**
  - **Emissions**
  - **Safety**
  - **Driveability**
- Normal/Performance/Hill mode

Driver Interface

- Button for automatic/manual mode
- Control ring for normal/performance mode and reverse
- **Sequential manual gear shifting**
  - **Single or multiple steps**
- Lever integrated with retarder control

Input/Output



Sensors
Position sensors
Propeller shaft speed

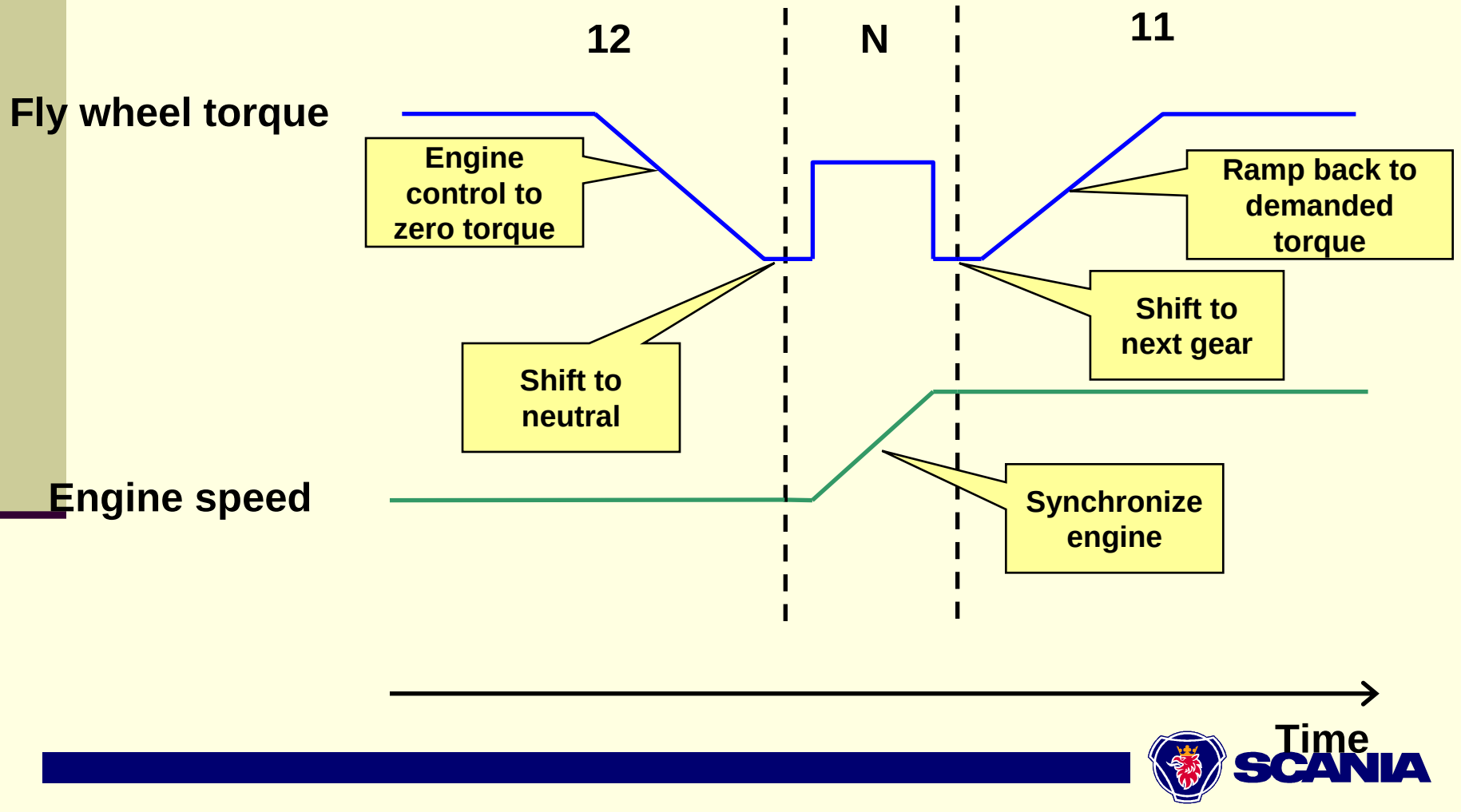
Important CAN-signals
Engine speed
Position of pedals
Brake system information
Engine torque
PTO information
Gear lever information
Suspension etc…

Actuators
Solenoid valves for gearbox maneuvering

Important CAN-signals
Engine torque control
Exhaust brake control
Gear information
etc…

Gear Shifting Principle

- to lower gear



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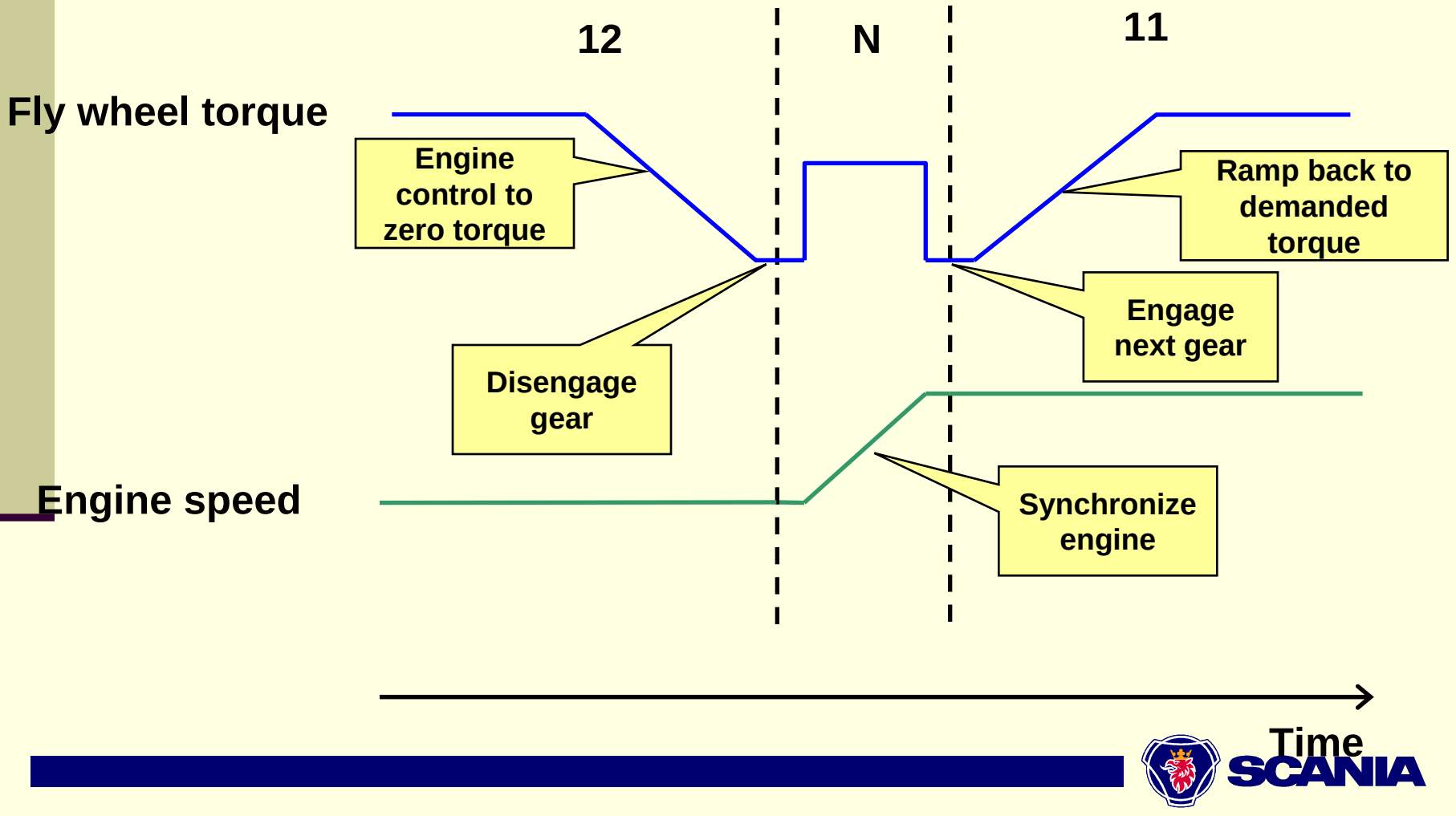

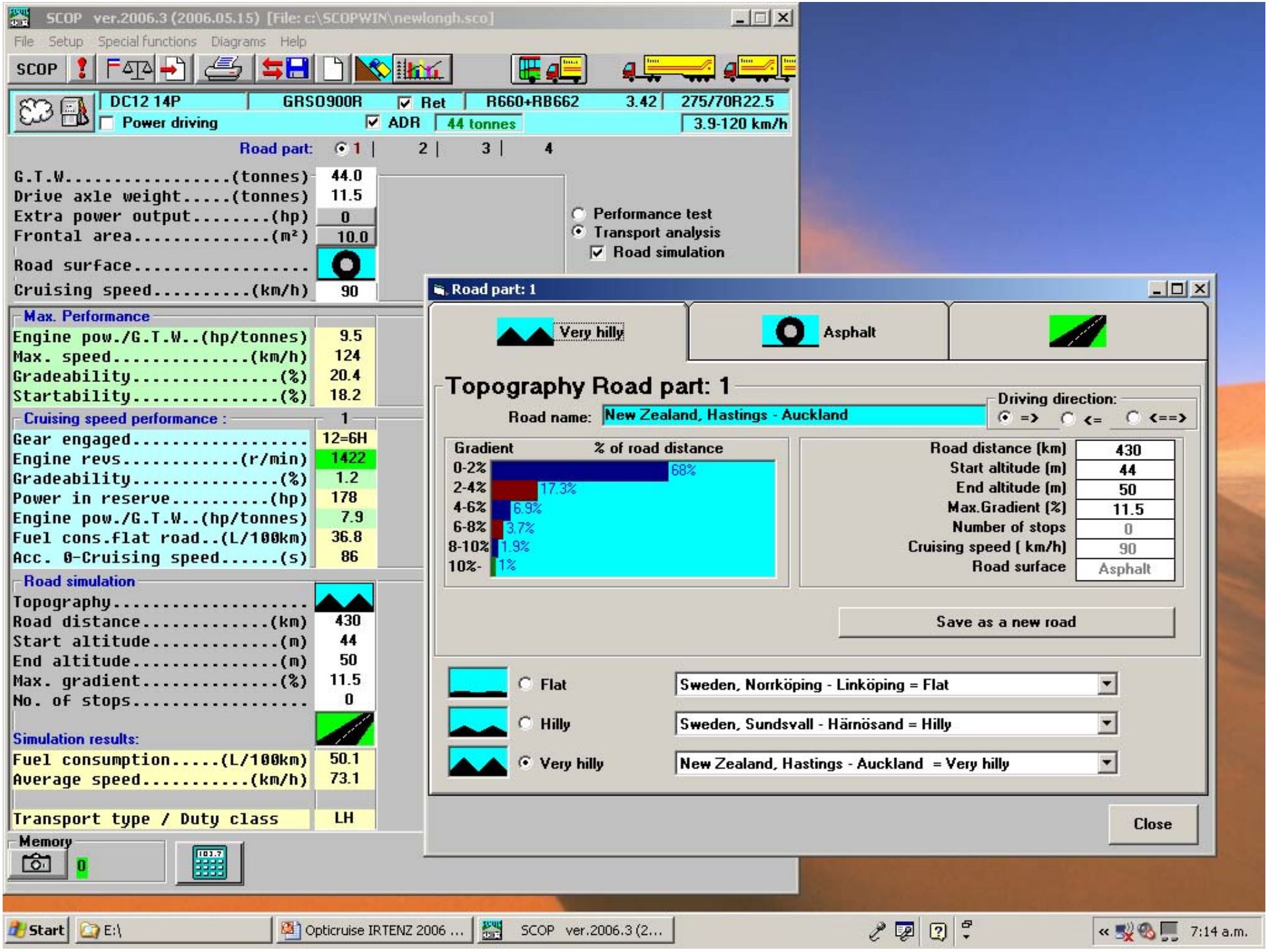
SCOP ver.2006.3 (2006.05.15) [File: c:\SCOPWIN\newlongh.sco]
File Setup Special functions Diagrams Help
SCOP
DC12 14P
GRSO900R
Ret
R660+RB662
3.42
275/70R22.5
Power driving
ADR
44 tonnes
3.9-120 km/h
Road part: 1 2 3 4
G.T.W.....(tonnes) 44.0
Drive axle weight.....(tonnes) 11.5
Extra power output.....(hp) 0
Frontal area.....(m²) 10.0
Road surface.....
Cruising speed.....(km/h) 90
Performance test
Transport analysis
Road simulation
Max. Performance
Engine pow./G.T.W..(hp/tonnes) 9.5
Max. speed.....(km/h) 124
Gradeability.....(%) 20.4
Startability.....(%) 18.2
Cruising speed performance : 1
Gear engaged..... 12=6H
Engine revs.....(r/min) 1422
Gradeability.....(%) 1.2
Power in reserve.....(hp) 178
Engine pow./G.T.W..(hp/tonnes) 7.9
Fuel cons.flat road..(L/100km) 36.8
Acc. 0-Cruising speed.....(s) 86
Road simulation
Topography.....
Road distance.....(km) 430
Start altitude.....(m) 44
End altitude.....(m) 50
Max. gradient.....(%) 11.5
No. of stops..... 0
Simulation results:
Fuel consumption.....(L/100km) 50.1
Average speed.....(km/h) 73.1
Transport type / Duty class LH
Memory
0
Road part: 1
Very hilly
Asphalt
Topography Road part: 1
Road name: New Zealand, Hastings - Auckland
Driving direction: => <= <==>
Gradient % of road distance
0-2% 68%
2-4% 17.3%
4-6% 6.9%
6-8% 3.7%
8-10% 1.9%
10%- 1%
Road distance (km) 430
Start altitude (m) 44
End altitude (m) 50
Max.Gradient (%) 11.5
Number of stops 0
Cruising speed (km/h) 90
Road surface Asphalt
Save as a new road
Flat
Sweden, Norrköping - Linköping = Flat
Hilly
Sweden, Sundsvall - Härnösand = Hilly
Very hilly
New Zealand, Hastings - Auckland = Very hilly
Close
Start
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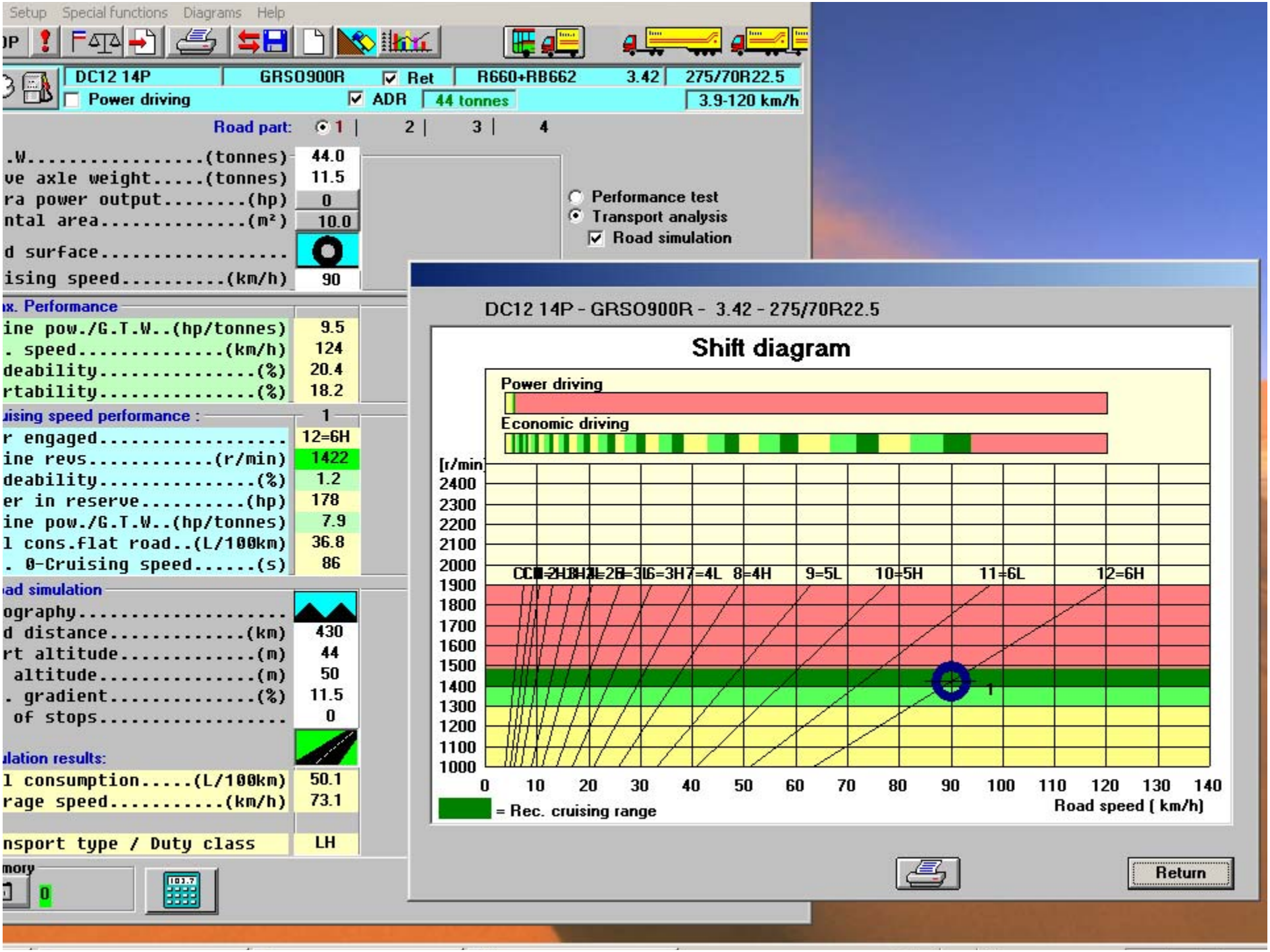
Opticruise IRTENZ 2006 ...
SCOP ver.2006.3 (2...
7:14 a.m.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Diagrams
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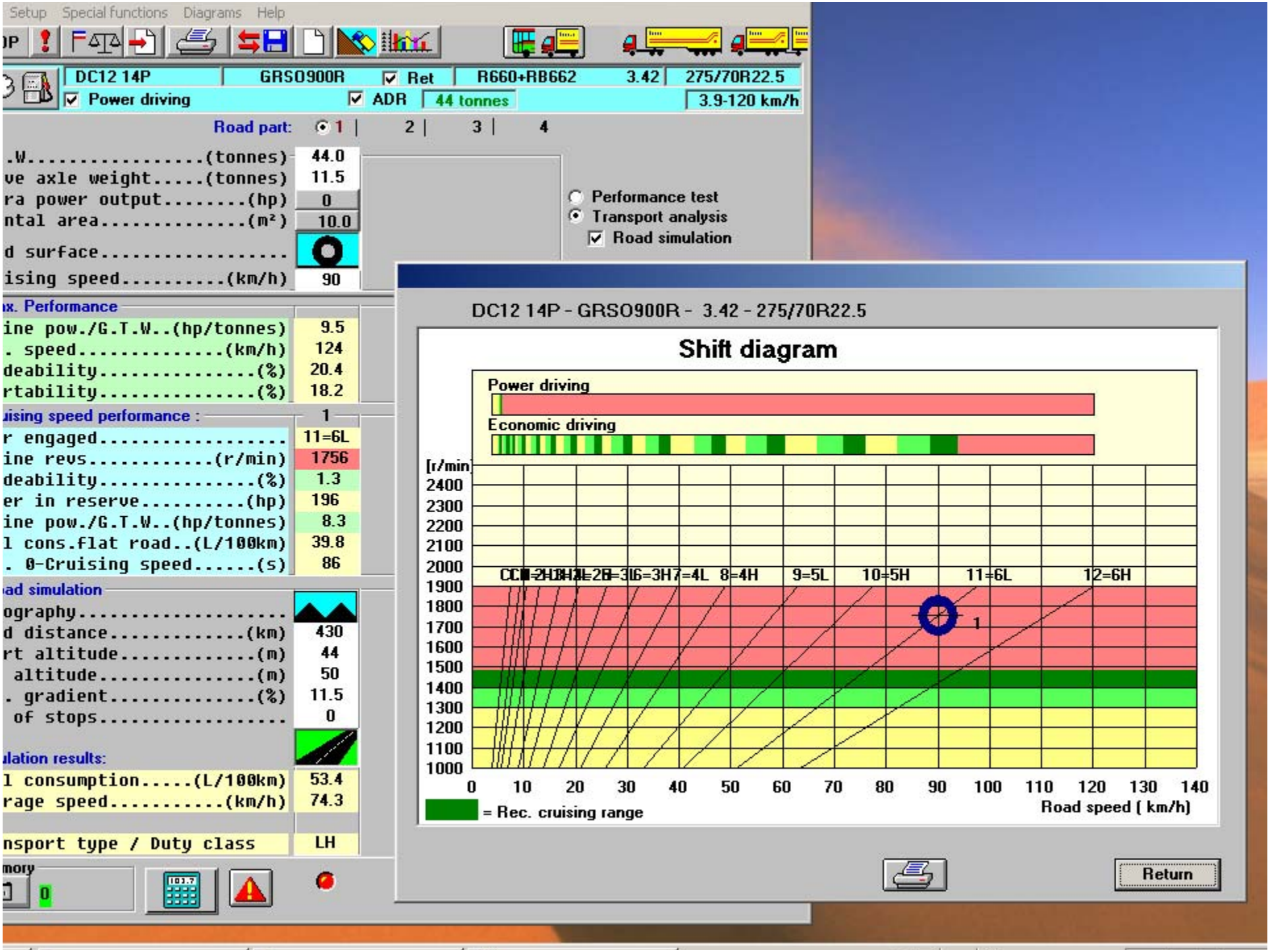
nsport type / Duty class LH
mory
0
DC12 14P - GRSO900R - 3.42 - 275/70R22.5
Shift diagram
Power driving
Economic driving
[r/min]
2400
2300
2200
2100
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
8=4H
9=5L
10=5H
11=6L
12=6H
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
Road speed (km/h)
= Rec. cruising range
Return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deability.....(%) 20.4
rtability.....(%) 18.2
ising speed performance : 1
r engaged..... 11=6L
ine revs.....(r/min) 1756
deability.....(%) 1.3
er in reserve.....(hp) 196
ine pow./G.T.W..(hp/tonnes) 8.3
l cons.flat road..(L/100km) 39.8
. 0-Cruising speed.....(s) 86
ad simulation
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altitude.....(m) 50
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of stops..... 0
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l consumption.....(L/100km) 53.4
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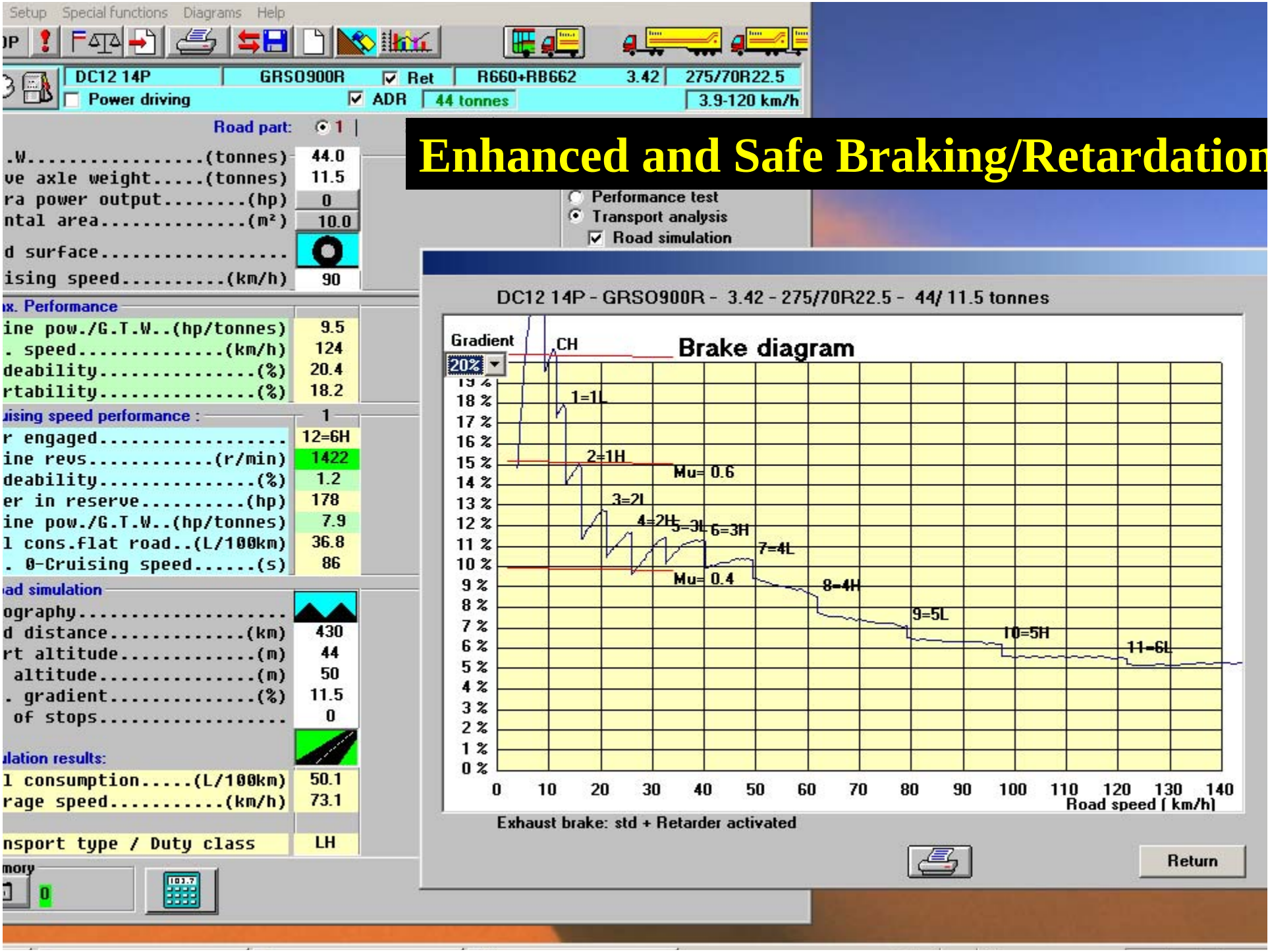
mory
DC12 14P - GRSO900R - 3.42 - 275/70R22.5
Shift diagram
Power driving
Economic driving
[r/min]
2400
2300
2200
2100
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
8=4H
9=5L
10=5H
11=6L
12=6H
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140
Road speed (km/h)
= Rec. cruising range
Return


Setup
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Help
DC12 14P
GRSO900R
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R660+RB662
3.42
275/70R22.5
Power driving
ADR
44 tonnes
3.9-120 km/h
Road part: 1
Enhanced and Safe Braking/Retardation
Performance test
Transport analysis
Road simulation
DC12 14P - GRSO900R - 3.42 - 275/70R22.5 - 44/ 11.5 tonnes
Gradient
20%
CH
Brake diagram
1=1L
2=1H
Mu= 0.6
3=2L
4=2H
5=3L
6=3H
7=4L
Mu= 0.4
8=4H
9=5L
10=5H
11=6L
0 %
1 %
2 %
3 %
4 %
5 %
6 %
7 %
8 %
9 %
10 %
11 %
12 %
13 %
14 %
15 %
16 %
17 %
18 %
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
Road speed (km/h)
Exhaust brake: std + Retarder activated
Return

Opticruise (Automate Manual Transmission)

The Benefits are Clear

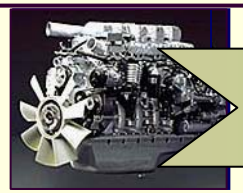
LongTerm Investments gives Returns

THANK YOU

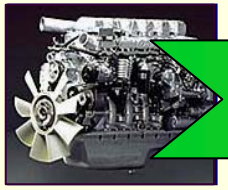
QUESTION AND ANSWERS ?

One combustion chamber Engine technology

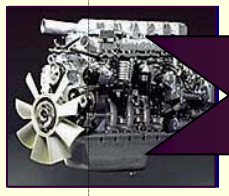
1995 2000 2005



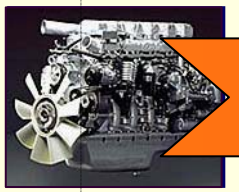
9-litre 230 270 310



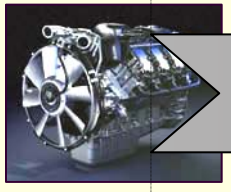
11-litre 330 340 380



12-litre 340 360 380 400 420



DT 12-litre 420 470 420 Euro 4



16-litre V8 500 580

400,000 cylinders per year

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Total Operating Cost

Customer

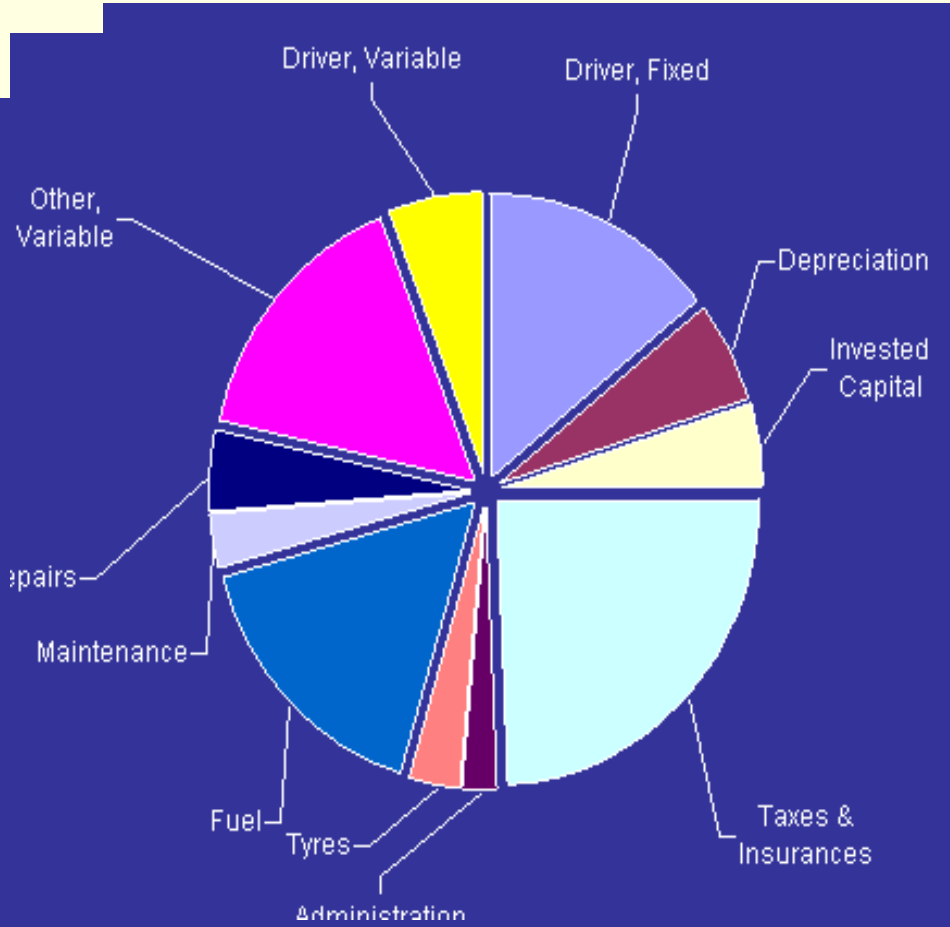
Mr Happy Bus Operator

Vehicle

SCANIA K 124 (example only)

Annual cost

Driver, Fixed	60,000	14%
Depreciation	23,914	6%
Invested Capital	20,000	5%
Taxes & Insurances	99,996	24%
Administration	9,000	2%
Tyres	12,667	3%
Fuel	67,600	16%
Maintenance	12,000	3%
Repairs	20,000	5%
Other, Variable	66,000	16%
Driver, Variable	24,000	6%
	415,177	**100%**



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