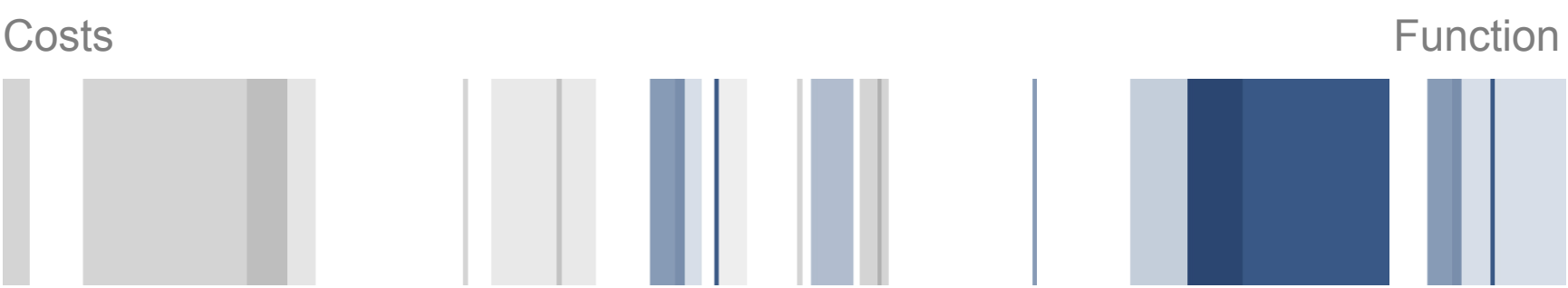
Craig Grant – Bosch Rexroth Ltd

Diesel Hydraulic Control

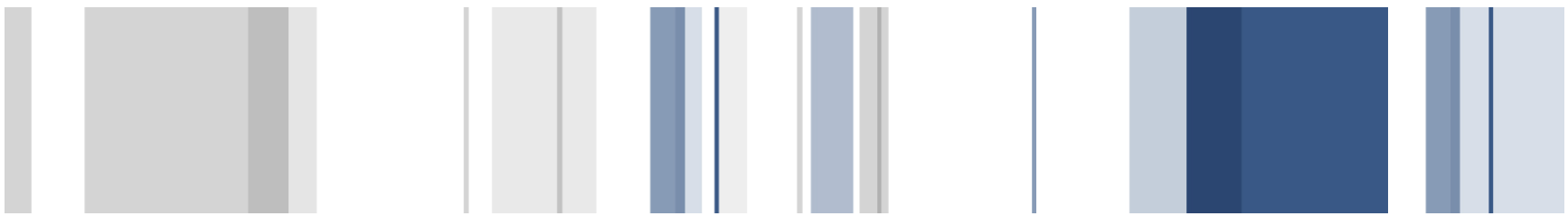
Downsizing



DHC – Diesel Hydraulic Control

Costs

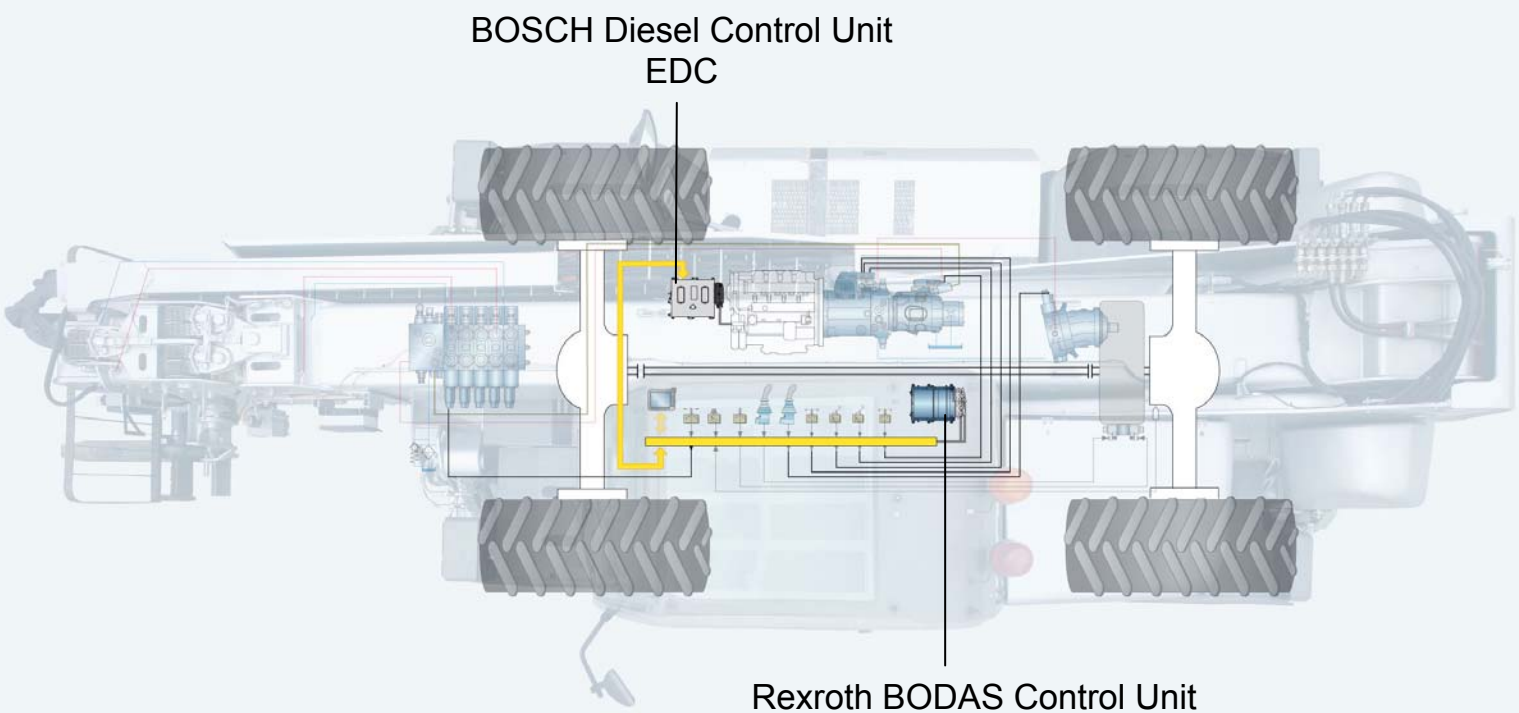
Function



© Bosch Rexroth AG 2009
All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights.

Rexroth
Bosch Group

System Design



© Bosch Rexroth AG 2009
All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights.

Dynamic Optimisation

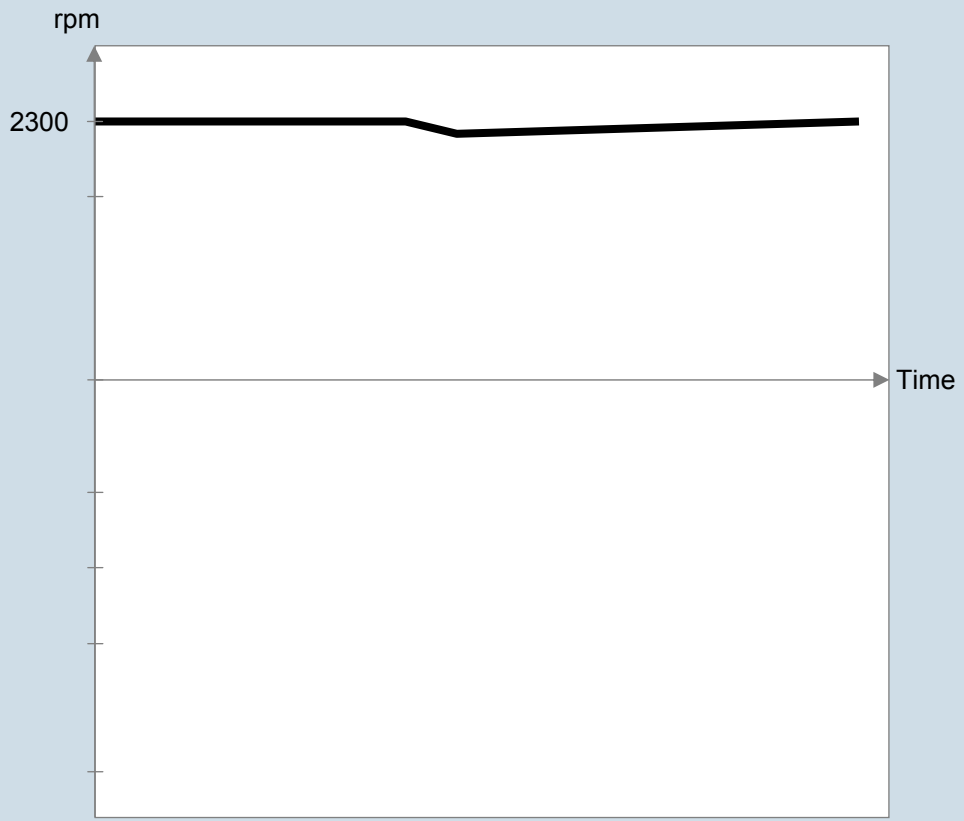
DHC



off

on

1st driving cycle
n = 2300 nominal speed
100 % diesel power



© Bosch Rexroth AG 2009
All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights.

Rexroth
Bosch Group

Dynamic Optimisation

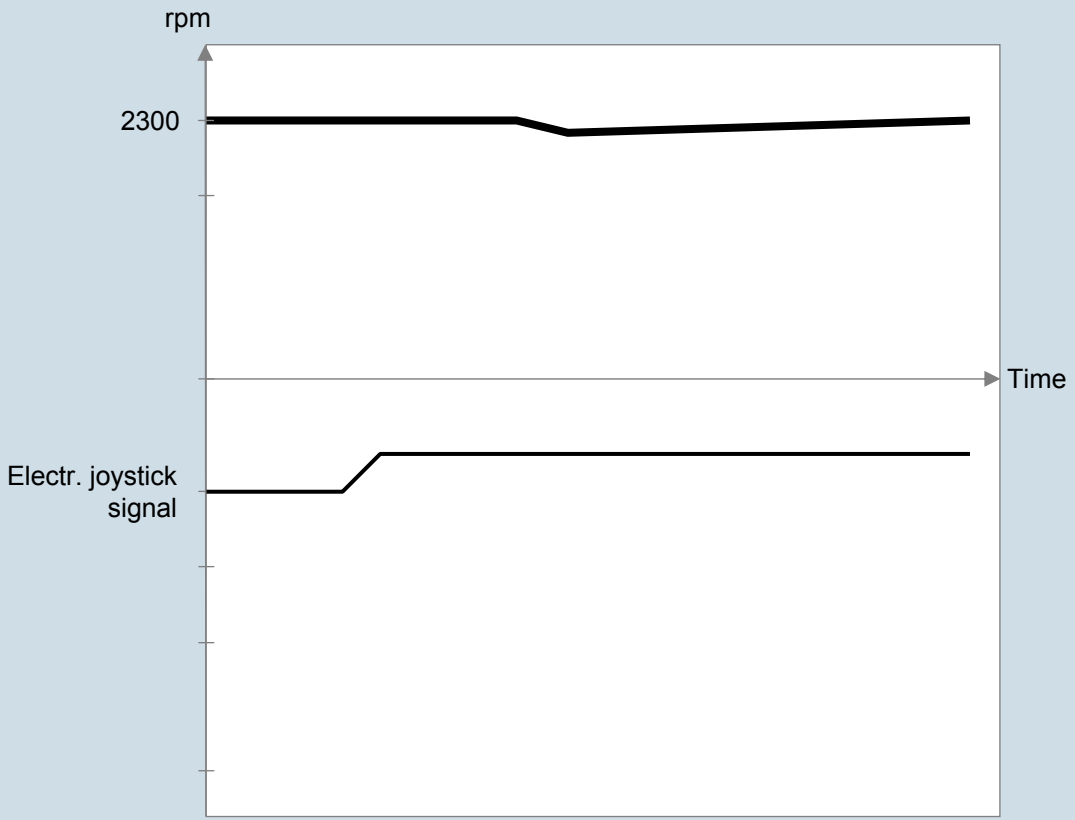
DHC



off

on

1st driving cycle
n = 2300 nominal speed
100 % diesel power



© Bosch Rexroth AG 2009
All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights.

Rexroth
Bosch Group

Dynamic Optimisation

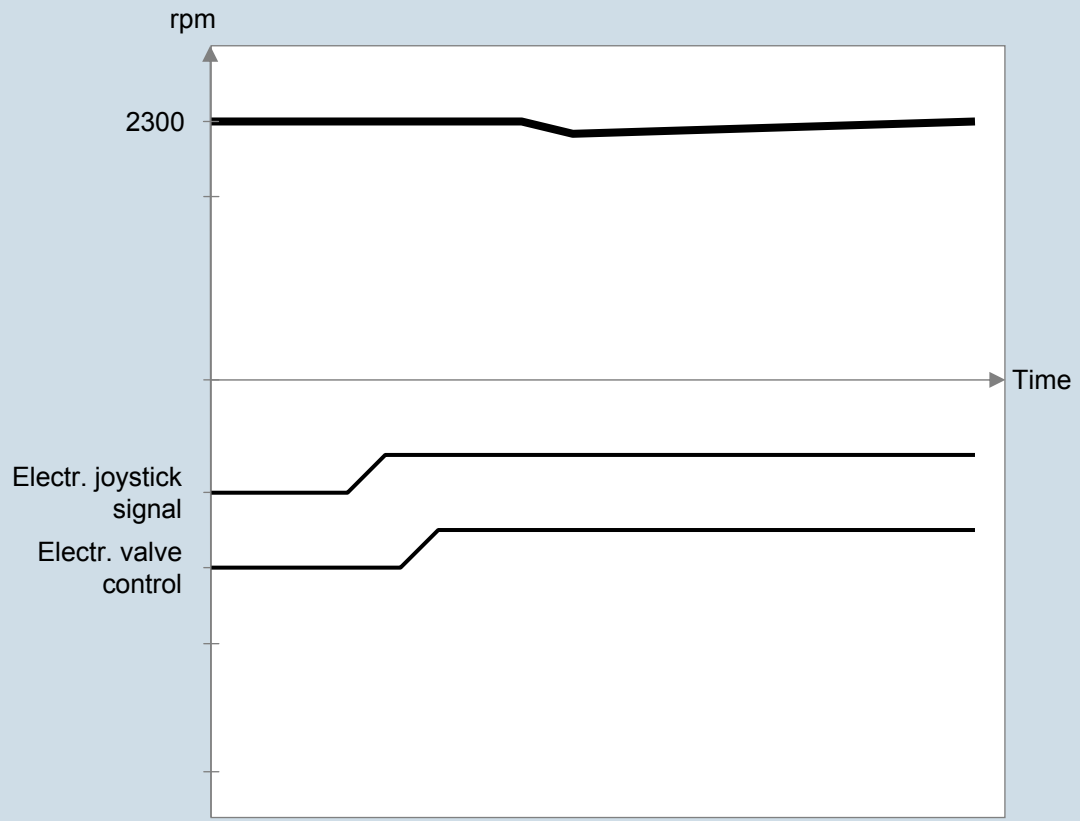
DHC



off

on

1st driving cycle
n = 2300 nominal speed
100 % diesel power



© Bosch Rexroth AG 2009
All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights.

Rexroth
Bosch Group

Dynamic Optimisation

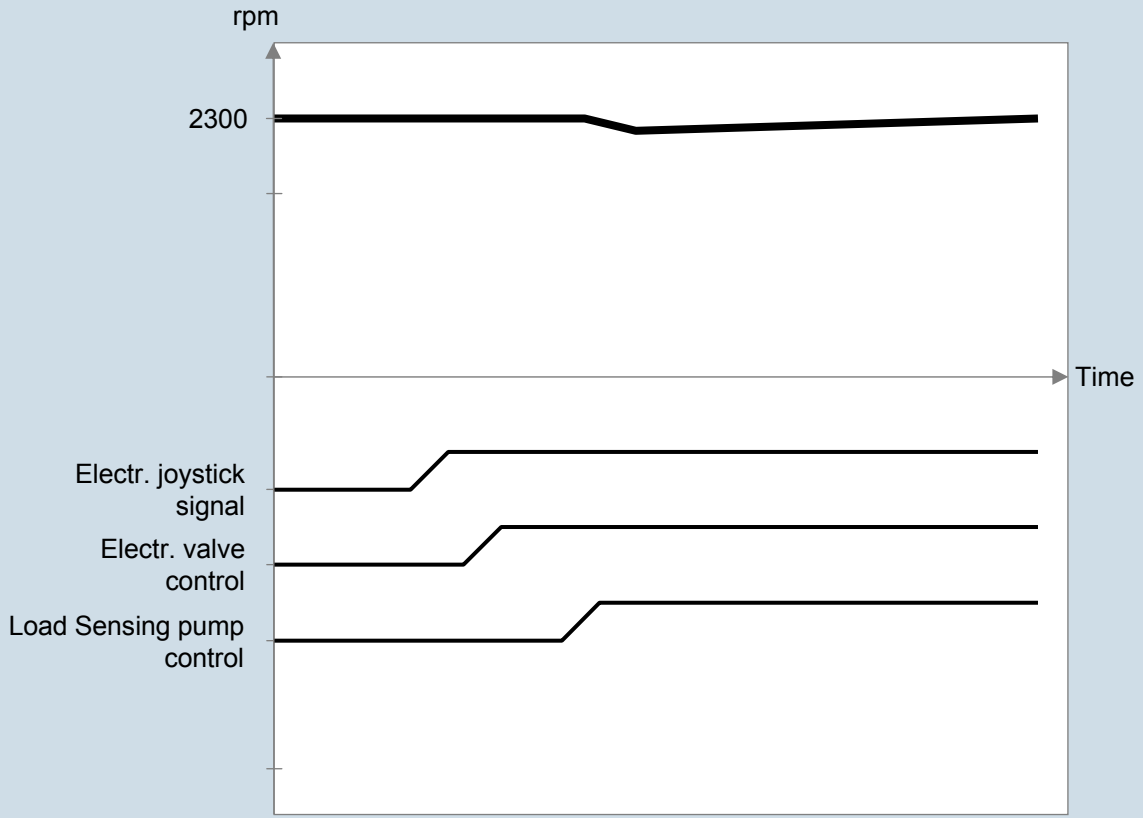
DHC



off

on

1st driving cycle
n = 2300 nominal speed
100 % diesel power



© Bosch Rexroth AG 2009
All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights.

Rexroth
Bosch Group

Dynamic Optimisation

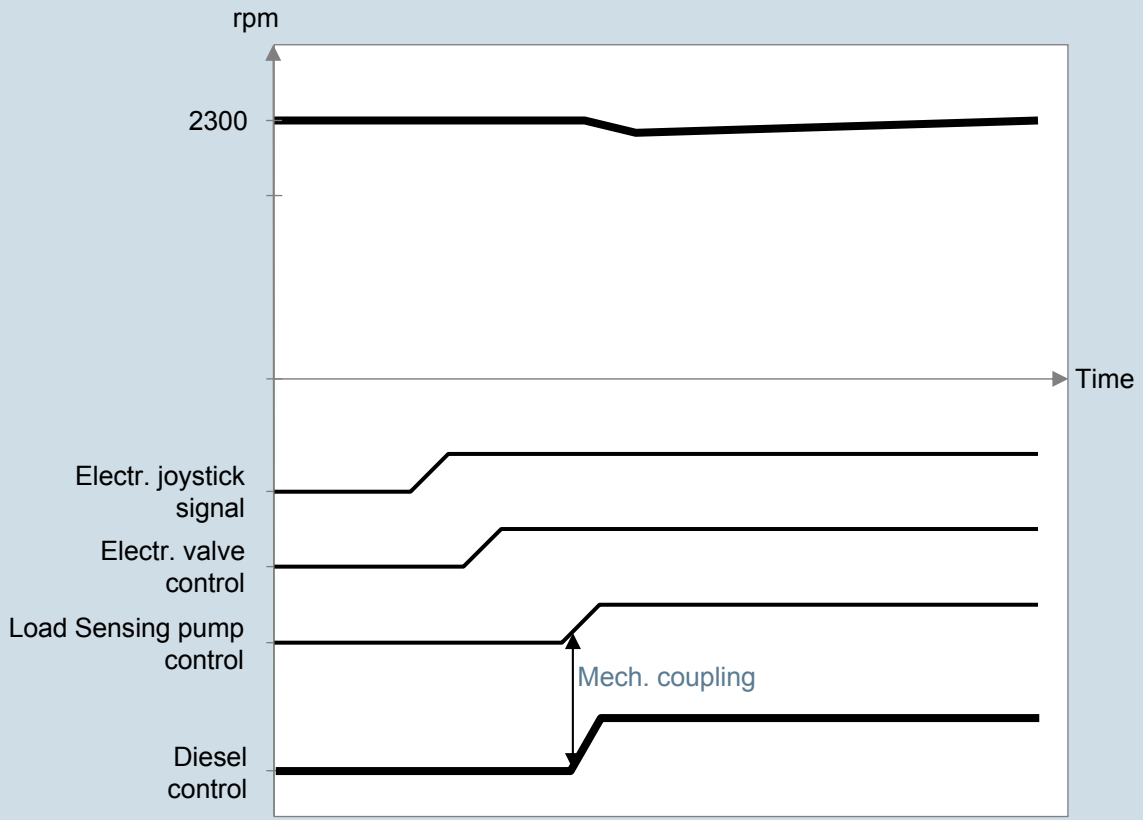
DHC



off

on

1st driving cycle
n = 2300 nominal speed
100 % diesel power



© Bosch Rexroth AG 2009
All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights.

Rexroth
Bosch Group

Dynamic Optimisation

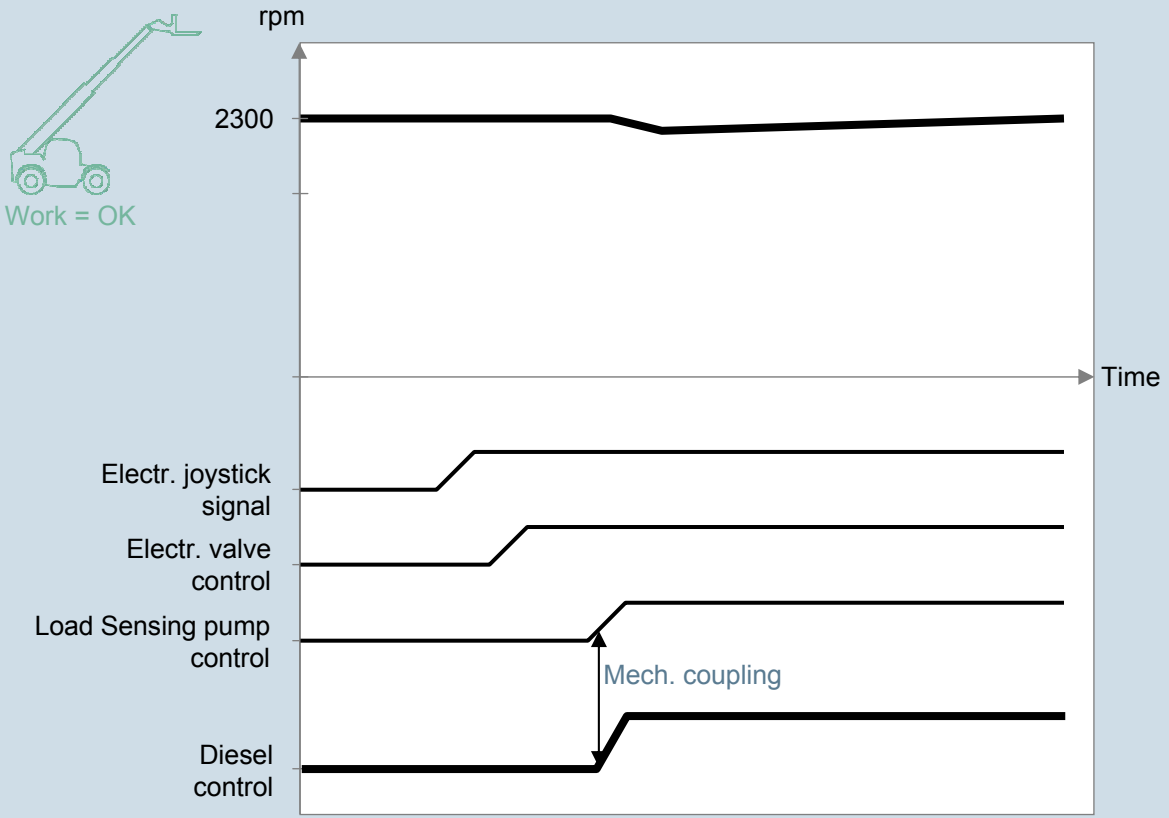
DHC



off

on

1st driving cycle
n = 2300 nominal speed
100 % diesel power



© Bosch Rexroth AG 2009
All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights.

Rexroth
Bosch Group

Dynamic Optimisation

DHC

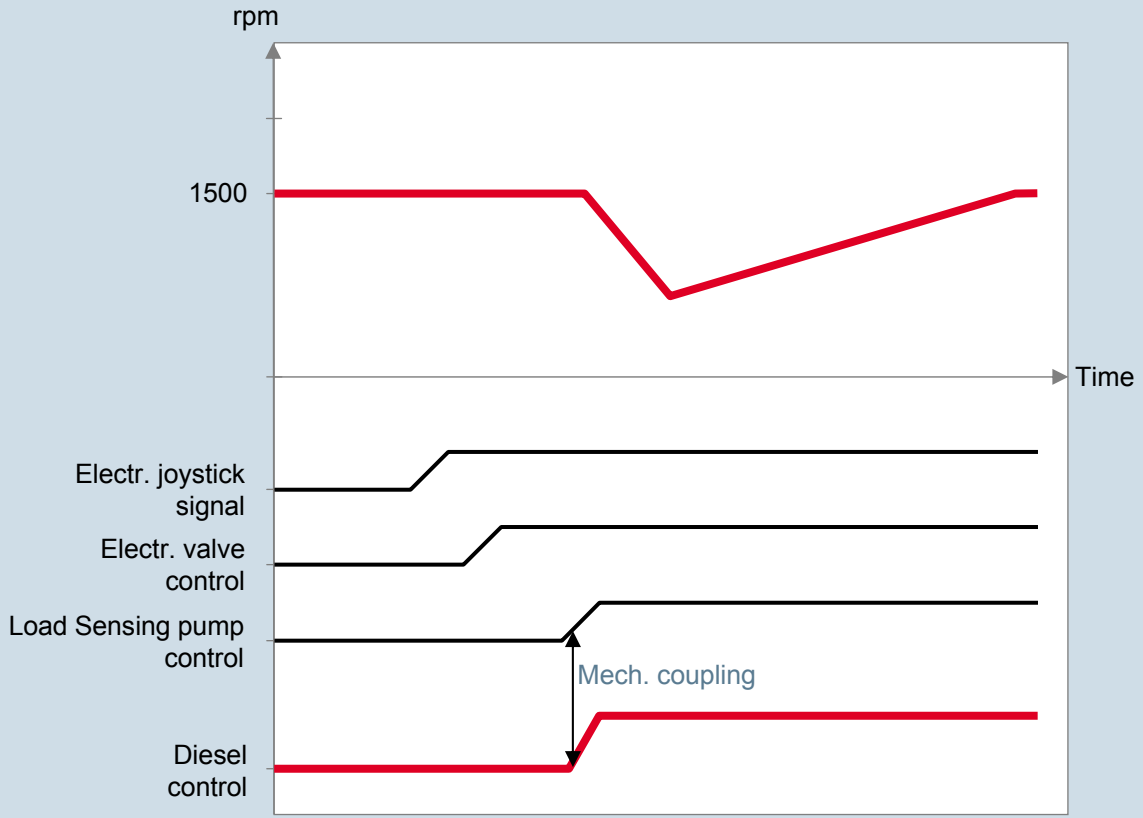


off

on

1st driving cycle
n = 2300 nominal speed
100 % diesel power

2nd driving cycle
n = 1500 diesel speed
< 100 % diesel power



© Bosch Rexroth AG 2009
All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights.

Rexroth
Bosch Group

Dynamic Optimisation

DHC

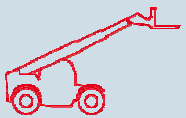


off

on

1st driving cycle
n = 2300 nominal speed
100 % diesel power

2nd driving cycle
n = 1500 diesel speed
< 100 % diesel power



Work = nOK

© Bosch Rexroth AG 2009
All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights.

Rexroth
Bosch Group

Dynamic Optimisation

DHC



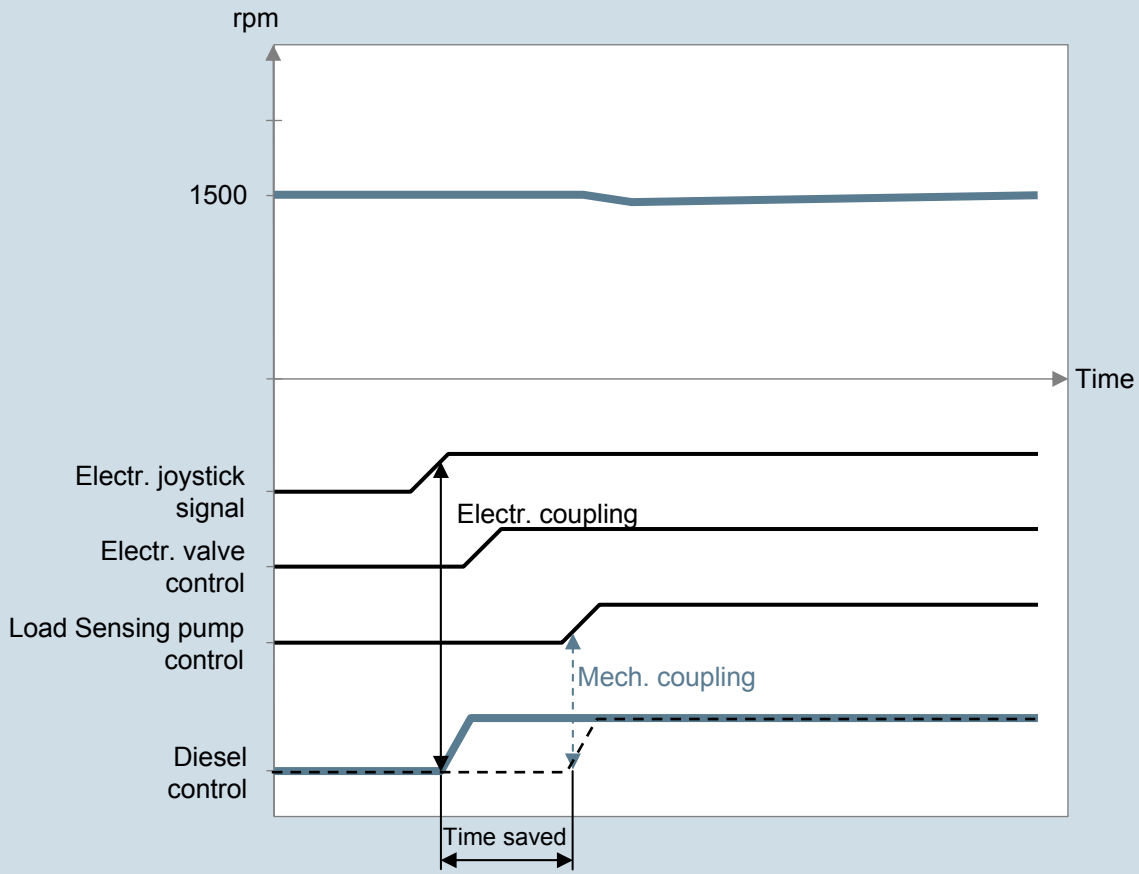
off

on

1st driving cycle
n = 2300 nominal speed
100 % diesel power

2nd driving cycle
n = 1500 diesel speed
< 100 % diesel power

3rd driving cycle
n = 1500 diesel speed
< 100 % diesel power



© Bosch Rexroth AG 2009
All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights.

Rexroth
Bosch Group

Dynamic Optimisation

DHC



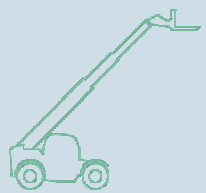
off

on

1st driving cycle
n = 2300 nominal speed
100 % diesel power

2nd driving cycle
n = 1500 diesel speed
< 100 % diesel power

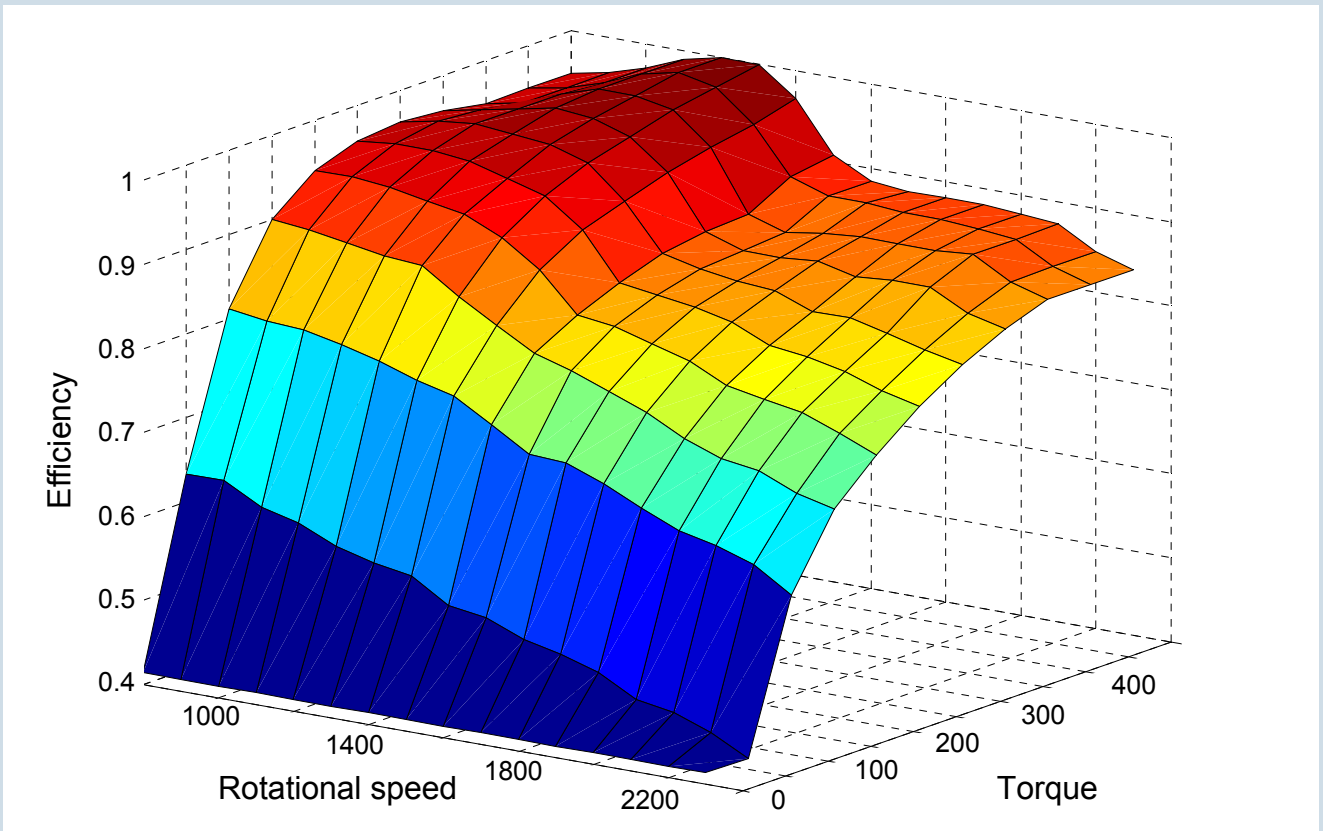
3rd driving cycle
n = 1500 diesel speed
< 100 % diesel power



© Bosch Rexroth AG 2009
All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights.

Rexroth
Bosch Group

Efficiency Optimisation

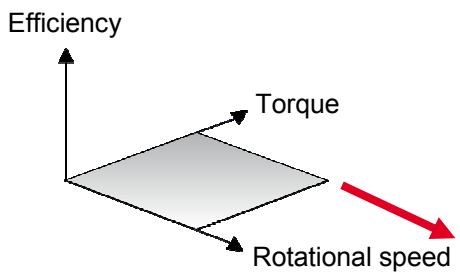


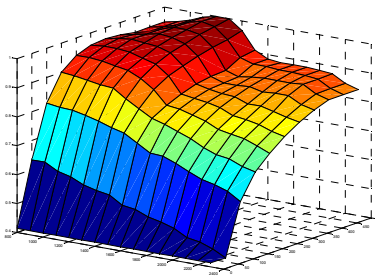
© Bosch Rexroth AG 2009
All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights.

Rexroth
Bosch Group

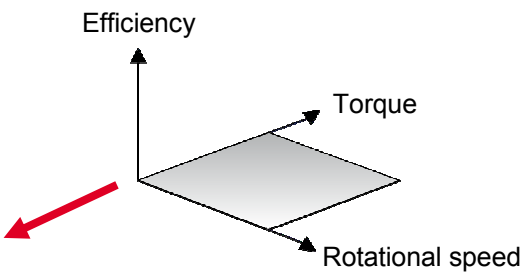
Efficiency Optimisation

Hydraulics characteristic field





Diesel characteristic field



Balancing and optimisation of the complete system (improvement of efficiency)

DHC combines Rexroth and Bosch expertise with optimal system control.
DHC saves energy and reduces exhaust gas and noise emissions.

© Bosch Rexroth AG 2009
All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights.

Summary

Improved interaction of control electronics for driving and working hydraulics and control electronics of the combustion engine:

- Lower fuel consumption
- Reduction of emissions
- Optimised machine performance
- Improved system dynamics



4EE ENERGY EFFICIENCY

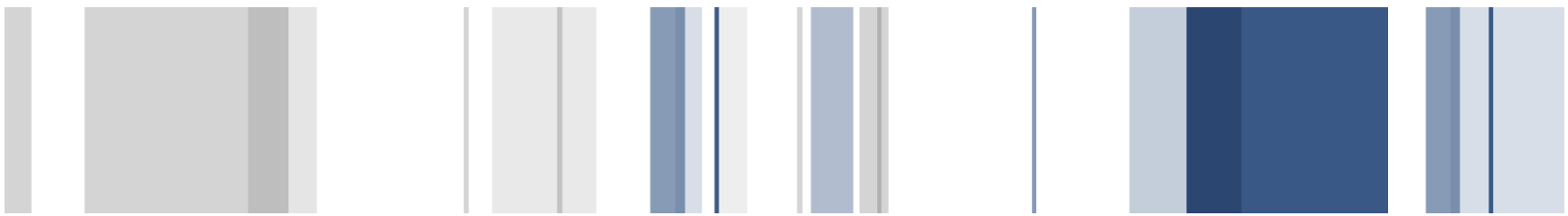
© Bosch Rexroth AG 2009
All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights.

Rexroth Bosch Group

Downsizing

Costs

Function



© Bosch Rexroth AG 2009
All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights.

Rexroth
Bosch Group

Downsize Engine from net 68 kW to 55 kW

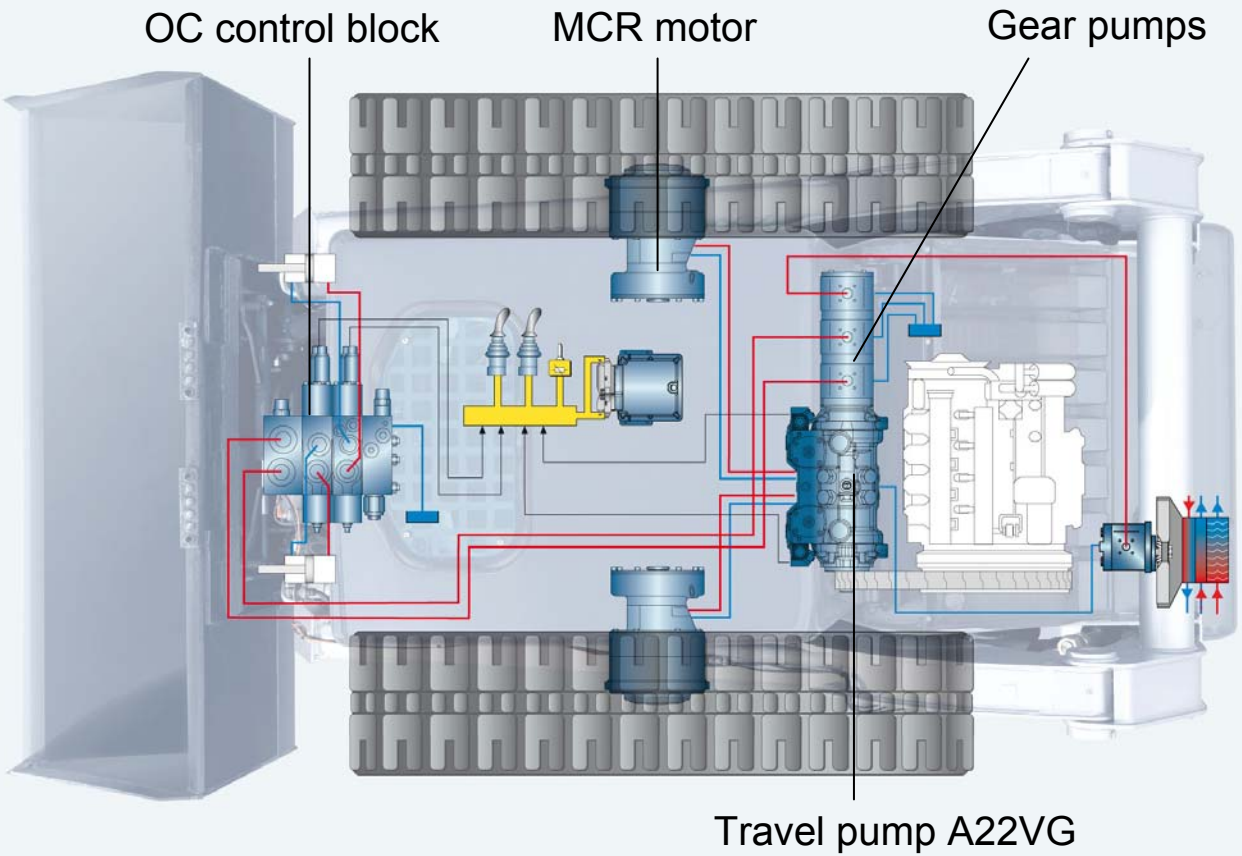
- Reproduce performance levels
  - Hydraulic efficiency
  - More efficient use of energy
- Modifications considered
  - Travel drive
  - Implement hydraulics
  - Electronics management

→ Total system approach



© Bosch Rexroth AG 2009
All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights.

Original System



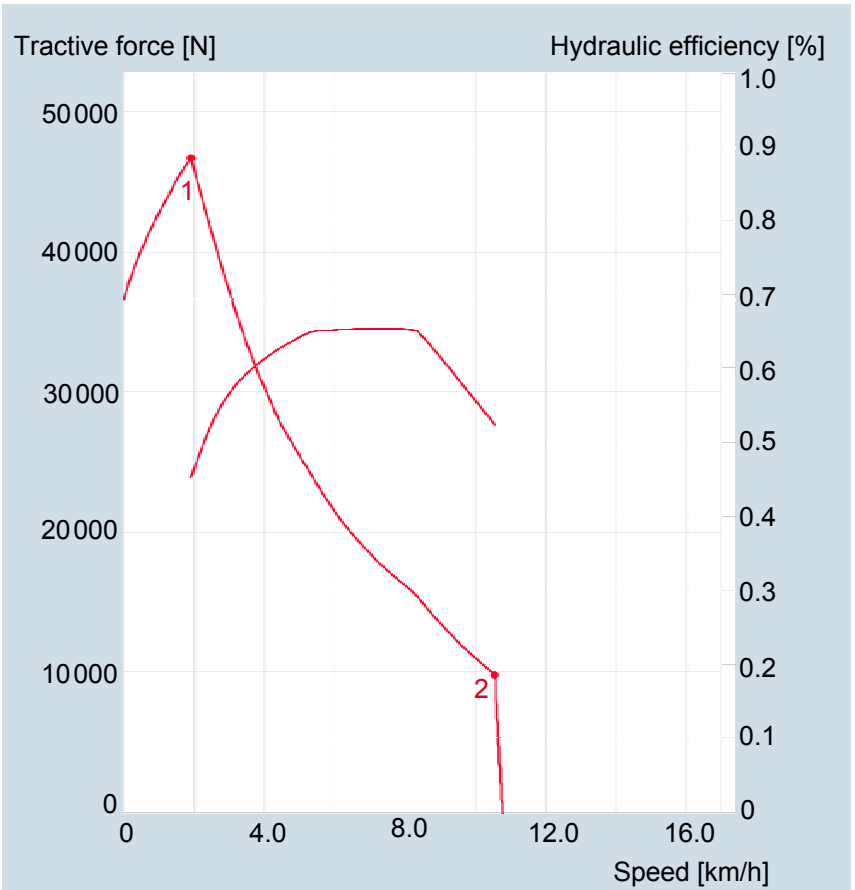
© Bosch Rexroth AG 2009
All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights.

Rexroth
Bosch Group

Original System

- System design
  - Medium pressure pump 350 bar
  - Radial piston motor
  - Open center control block
  - Gear pump supply

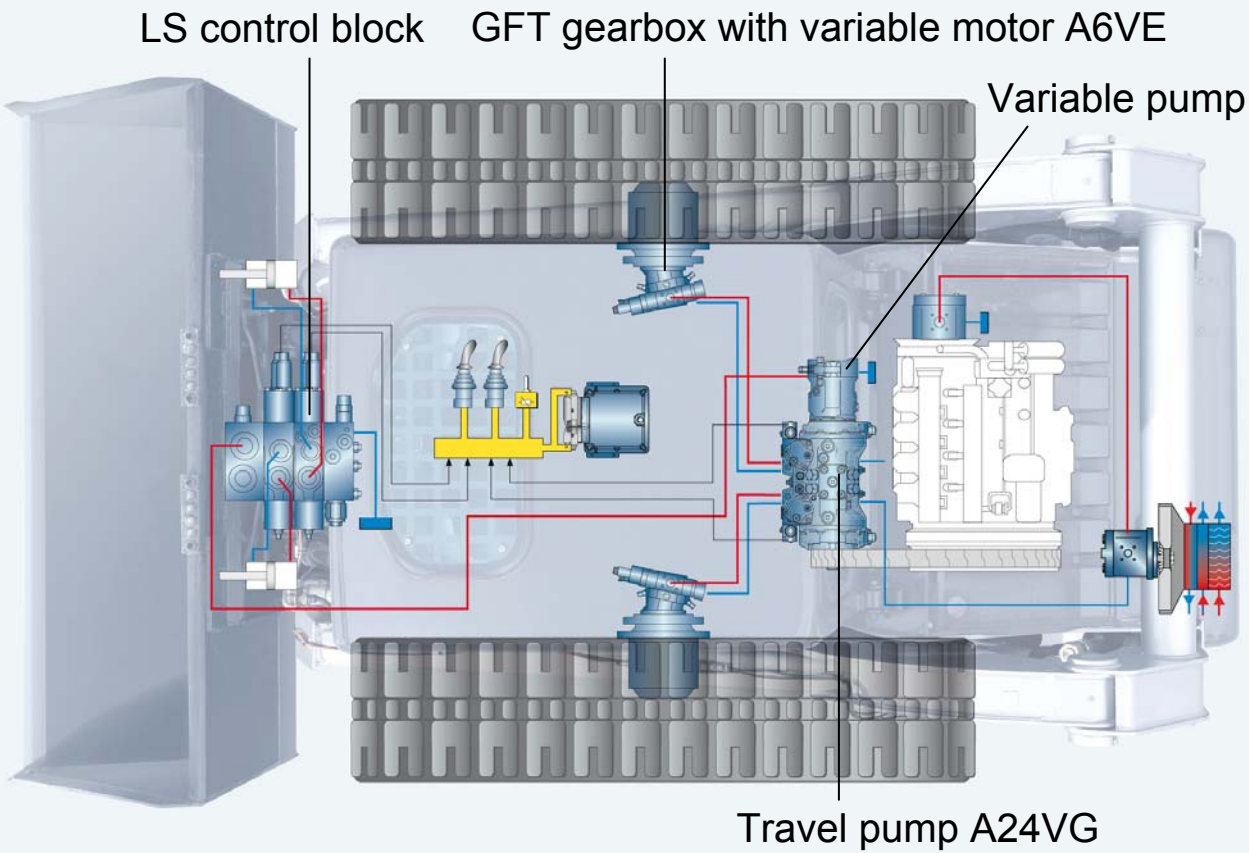
→Peak efficiency around 63 %



© Bosch Rexroth AG 2009
All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights.

Rexroth
Bosch Group

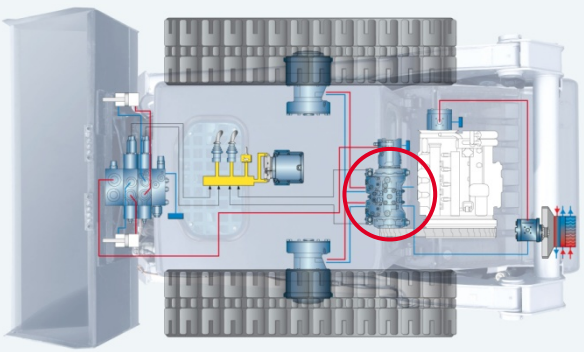
Downsized System



© Bosch Rexroth AG 2009
All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights.

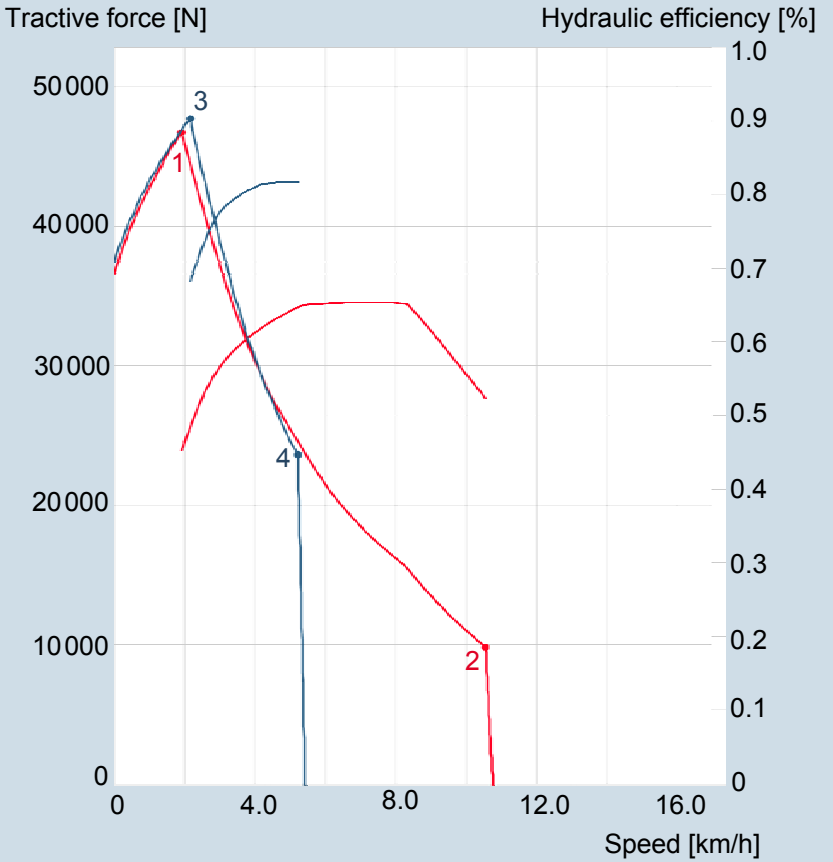
Rexroth
Bosch Group

Downsized System



- **400 bar high pressure pump**
- System pressure 350 bar

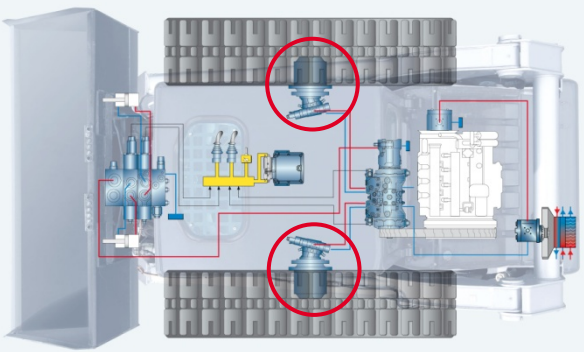
→ **Efficiency gain of up to 17 %**



© Bosch Rexroth AG 2009
All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights.

Rexroth
Bosch Group

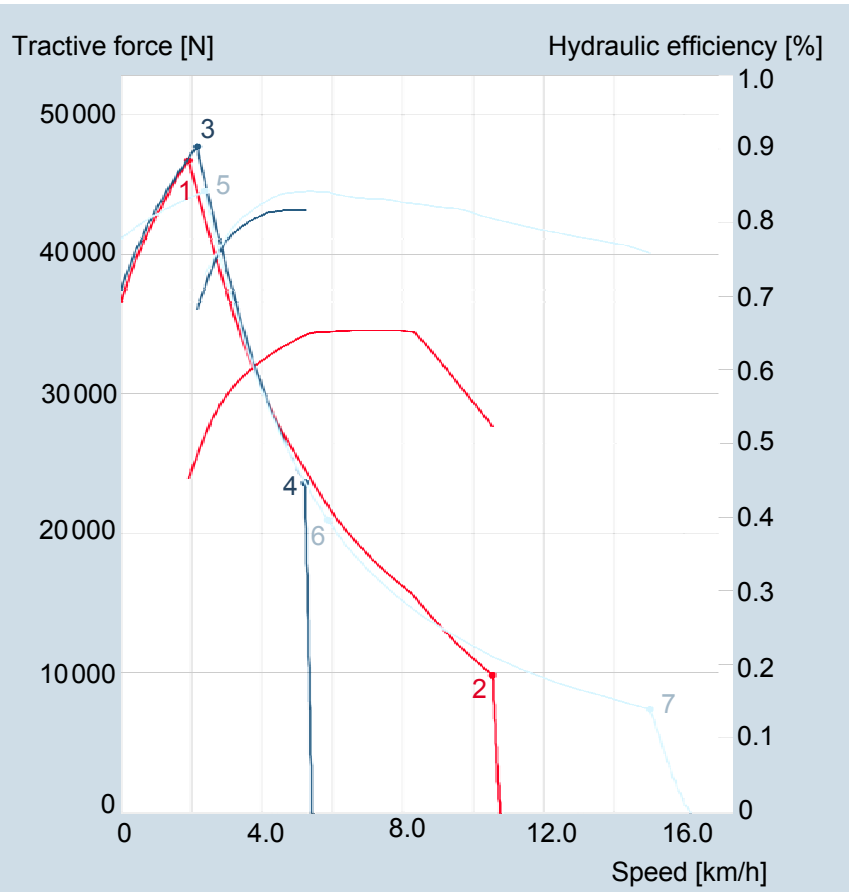
Downsized System



- 400 bar high pressure pump
- **Variable motor + gearbox**
- System pressure 350 bar

→ Efficiency gain up to 17 %

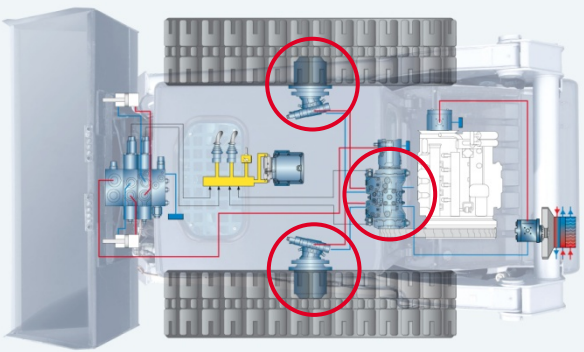
→ **Efficiency gain of up to 4 %**



© Bosch Rexroth AG 2009
All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights.

Rexroth
Bosch Group

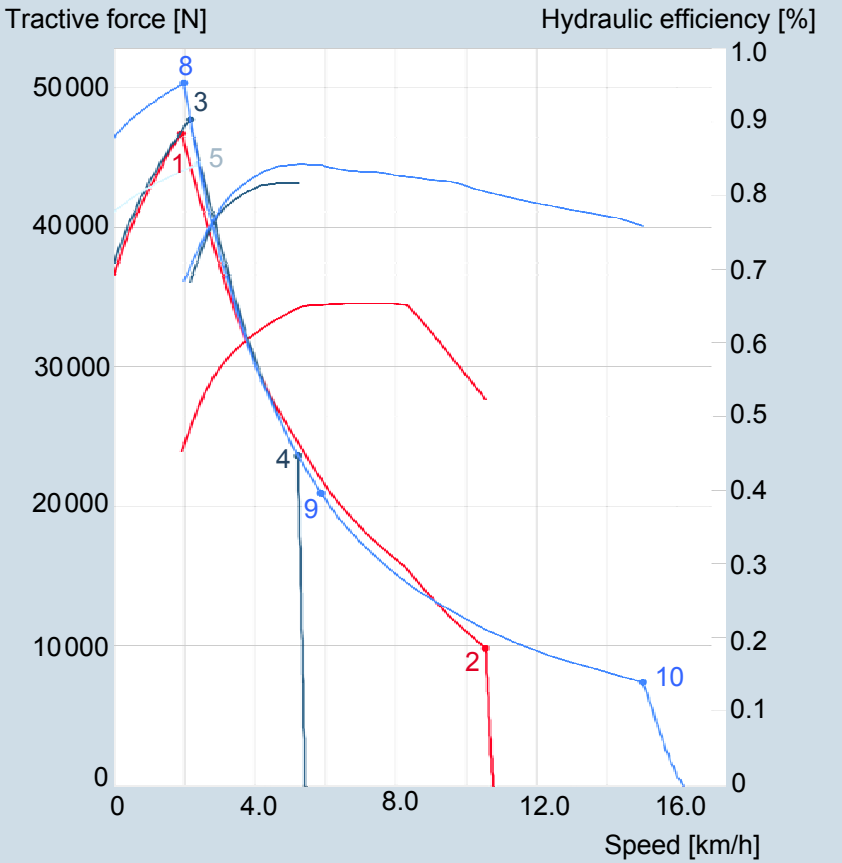
Downsized System



- 400 bar high pressure pump
- Variable motor + gearbox
- **System pressure 400 bar**

→ **Increased tractive force by 19 %**

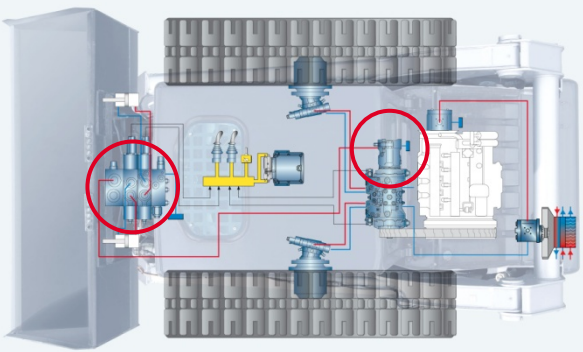
→ **Total efficiency gain up to 21 %**

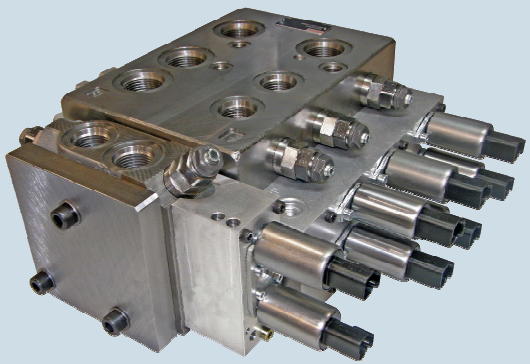


© Bosch Rexroth AG 2009
All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights.

Rexroth
Bosch Group

Downsized System





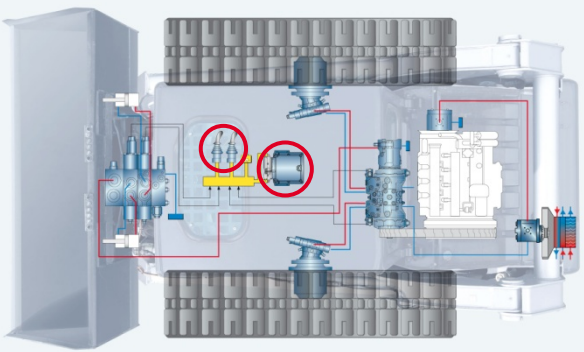
- **Closed center LS control block**
- **Open loop compensating pump**

→ Optimized working function

© Bosch Rexroth AG 2009
All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights.

Rexroth
Bosch Group

Downsized System





- Closed center LS control block
- Open loop compensating pump
- **Electronic management**

→ Optimized working function

→ **Optimized transfer of available power to the ground drive and management of working functions**

© Bosch Rexroth AG 2009
All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights.

Rexroth
Bosch Group

Efficient System – Summary

- System design
  - High pressure pump 400 bar
  - Variable motor + gearbox
  - Closed center LS control block
  - Open loop compensating pump
  - Electronic management





© Bosch Rexroth AG 2009
All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights.

Questions ?

Thank You

© Bosch Rexroth AG 2009
All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights.

Rexroth
Bosch Group