Press Conference
“MAHLE Expands Powertrain Capabilities”

June 30, 2005, 10.30 to 2.00 pm
MAHLE ranks amongst the 50 largest independent industrial groups in Germany and, as a systems supplier with global dimensions to the automotive industry, it is one of the 30 largest parts suppliers worldwide

- with 70 production plants on four continents,
- about 38,000 employees and
Historical Site Development
1920
Historical Site Development
1970
Historical Site Development
1980
Acquisition Cosworth Technology Group
Locations World-wide
Product Lines

<table>
<thead>
<tr>
<th>R &amp; D</th>
<th>Sales</th>
<th>Procurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group Management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Piston Systems</td>
<td>Cylinder Components</td>
<td>Valve Train Systems</td>
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<tr>
<td>Air Management Systems</td>
<td>Liquid Management Systems</td>
<td></td>
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</tbody>
</table>
Profit Centers

Group Management

- Aftermarket
- Small Engine Components
- Large Engine Components
- Motorsports
- Industrial Filtration
- Engineering Services
~ 2,000 R&D, product development and application engineers
~ 100 Hot engine test cells, 7 full size vehicle roller test rigs
Sales Trend in billion Euros

<table>
<thead>
<tr>
<th>Year</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>Plan 2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>2.39</td>
<td>2.82</td>
<td>3.07</td>
<td>3.25</td>
<td>3.76</td>
<td>4.00</td>
</tr>
</tbody>
</table>

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Sales Trend by Region

2.39 billion EUR (2000)

Europe
66%

Asia and ROW
2%

America
32%

(2004) 3.76 billion EUR

Europe
59%

Asia and ROW
16%

America
25%
Product Range

- Air mass sensor
- Oil-mist separator
- Tappet (cam follower, rocker arm)
- Camshaft
- Fuel filter with return heating
- Intake manifold (air charge distribution)
- Swirl flap controller
- Exhaust gas recirculation-line
- Eco-oil filter module
- Cylinder liner
- Connecting rod
- Bearings

- Blow-by return line
- Air filter module
- Valve guide
- Valve
- Valve seat insert
- Al-engine block
- Piston rings
- Piston with pin bore bushing
- Piston pin, Piston pin circlip
Power Cell Module

- Piston
- Piston pin
- Cylinder liner
- Conrod
- Conrod bearing
- 1st Compression ring
- 2nd Compression ring
- Oil control ring
Cylinder Head with Fully Assembled Valve Train

- Cylinder head
- Roller-type cam follower
- Hydraulic element
- Assembled camshaft
- Valve spring cap
- Valve spring
- Valve spring seat
- Valve seat insert
- Valve
- Valve guide
Air Intake Module

- Control valve for fuel preheating
- Reinforcing and mounting frame
- Hydraulic fluid reservoir
- Exhaust gas recirculation mixing plenum
- Decoupling element
- Plastic intake manifold
- Fuel filter
- Damper in swirl duct
- Filler port
- Exhaust gas recirculation with integrated cooling
- Electrical actuator for dampers
Oil Filter Module

- Plastic oil filter
- Oil mist separator and pressure control valve
- Oil/water heat exchanger with bypass
- Base plate
- Oil temperature sensor
- Diesel fuel/water heat exchanger
First All-MAHLE Engine
Rationale for Acquiring Cosworth Technology

- Customer expectation for „Turn Key“ system solutions
- Intent to increase the product range of engine hardware with engineering services
- Requirements for future powertrain/engine system development
- Offering a complete cylinder head module
Future Prospects

- Cosworth Technology becomes MAHLE Powertrain as of July 1st
- Potential customer interest in services and products of MAHLE Powertrain
- MAHLE Powertrain benefits from MAHLE’s global sales and engineering network and global customer base
- Acquisition by MAHLE leads to independence from OEM
Thank you for your attention!
MAHLE Powertrain Status

- **January 1\(^{st}\), 2005:** MAHLE GmbH acquired Cosworth Technology Group from AUDI AG.
- **July 1\(^{st}\), 2005:** Cosworth Technology Ltd. will be renamed to MAHLE Powertrain Ltd.
  Cosworth Technology, Inc. will be renamed to MAHLE Powertrain, Inc.
### MAHLE Powertrain Milestones

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1958</td>
<td>Northampton founded by Mike Costin and Keith Duckworth</td>
</tr>
<tr>
<td>1979</td>
<td>Foundry established at Worcester</td>
</tr>
<tr>
<td>1984</td>
<td>Manufacturing plant established at Wellingborough</td>
</tr>
<tr>
<td>1995</td>
<td>Acquisition of Intelligent Controls Inc., Novi/USA</td>
</tr>
<tr>
<td>1996</td>
<td>New foundry opened in Worcester, new Emissions and Driveability Centre opened in Northampton</td>
</tr>
<tr>
<td>1998</td>
<td>Cosworth Technology Ltd. and Cosworth Technology, Inc. formed</td>
</tr>
<tr>
<td>2000</td>
<td>New Vehicle Workshop built in Northampton</td>
</tr>
<tr>
<td>2002</td>
<td>New Logistics Facility opened in Wellingborough</td>
</tr>
<tr>
<td>2003</td>
<td>Offices extended in Novi/USA, new manufacturing site opened in Wellingborough</td>
</tr>
<tr>
<td>2005</td>
<td>MAHLE acquired Cosworth Technology Ltd. and Cosworth Technology, Inc. MAHLE Powertrain formed</td>
</tr>
</tbody>
</table>
MAHLE Powertrain
Structure

MAHLE Powertrain

Northampton/UK Engineering
Worcester/UK Castings
Wellingborough/UK Manufacturing
Novi/USA Engineering
MAHLE Powertrain
R&D and Manufacturing Centres

Novi, Michigan (USA)
Founded: 1995
Activity: Engineering

Northampton (UK)
Founded: 1958
Activity: Engineering

Worcester (UK)
Founded: 1979
Activity: Casting

Wellingborough (UK)
Founded: 1984
Activity: Manufacturing and Assembly
MAHLE Powertrain
Site Certification

Quality:
– ISO 9001 (Novi)
– Ford Q1 Award (Northampton, Wellingborough, Novi)

Environmental:
– ISO 14001 (Northampton, Wellingborough, Worcester, Novi)
– Eco-Management and Audit Scheme – EMAS (Northampton, Wellingborough, Worcester)
MAHLE Powertrain Capabilities

MAHLE Powertrain is the only **Integrated Powertrain Solutions** supplier, with complete and proven capabilities in the total powertrain supply and development chain:

- Concept
- Design and Analysis
- Development and Calibration
- Validation
- Casting (Aluminium)
- Machining and Manufacture
- SOP Support
- Post SOP and Aftermarket Support
MAHLE Powertrain
Engineering - Powertrain

- Development of series engines from design to SOP
- Concept engines from initial design stage to running prototype
- Analysis – performance prediction, kinematics, CFD
- Development of high performance engines based on high-volume series production
- Powertrain design, development and calibration
- Vehicle installation/integration/validation
- NVH analysis and predictions
- Fleet service
- Resident engineers
MAHLE Powertrain
Engineering - Electronics

- Diagnostic engineering and software implementation
- Fleet support/telematics/EOL test
- Dealership, manufacturing, aftermarket
- Electronics products:
  - Visual Authoring Tool – software application allowing rapid development of unique programs
  - Secondary Controller – controls alternative fuel system hardware on dual fuel delivery systems vehicles
  - eCATS Project (Electronic Configuration And Test System) – complete end-of-line, repair bay system including fixed, portable and rolling road
  - i3000® – detects, captures and logs intermittent faults data for diagnosis
  - IDAA (Integrated Data Acquisition and Analysis) – objective measure of data headroom
MAHLE Powertrain
Powertrain Supply Solutions (PSS)

Engineering:

- Lead or assist optimum powertrain selection process
- CAD based package feasibility study to assess ideal powertrain (MAHLE Powertrain has full OEM CAD data access and supports most systems)
- Design and analysis of client specific powertrain components (Flywheel/Adaptor plates etc.)
- Cooling and AC system design and development to satisfy engine and vehicle manufacturer sign-off requirements
- In field extreme climate territory testing (organised by MAHLE Powertrain or support only)
- NVH and drive by noise optimisation
MAHLE Powertrain
Powertrain Supply Solutions (PSS)

Engineering:
- Fuel system design and optimisation including EVAP systems
- Design and optimisation of vehicle electrical architecture
- Engine management system integration (ECU, TCU and Immobiliser as fitted to donor vehicle, very limited recalibration)
- (Or) Replace and recalibrate engine management system with vehicle manufacturer preferred system
- Gateway module design to link different electronic architectures (ABS, EMS, TCU, Instrument Cluster)
- Emission certification USA and Europe
MAHLE Powertrain
Past Examples
MAHLE Powertrain Motorsport
Integrate MAHLE Powertrain into the worldwide MAHLE R&D network (Stuttgart, Detroit, São Paulo, Tokyo, Shanghai - as from end of 2005) with focus on complete engines, systems and electronics

Increase marketing of MAHLE Powertrain products and services through presence in selected MAHLE locations

Enhance MAHLE’s profile as a system provider (system integrator) through MAHLE Powertrain know-how

Further develop MAHLE Powertrain’s capabilities in diesel, hybrid and hydrogen technologies
Thank you for your attention!
MAHLE Powertrain
Manufacturing Capabilities

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MAHLE Powertrain Milestones

- From Race to Road
- Excitement and Innovation
- Powertrain supply solutions
MAHLE Powertrain
UK Manufacturing Locations

Wellingborough Facility

Worcester Facility

Worcester
Casting since 1979

Wellingborough
Manufacturing since 1984
MAHLE Powertrain
Previous Product Developments

Wellingborough facility first established on Park Farm in 1984 to support Mercedes and Ford.

Products:
- V6 and 4 cylinder engines supplied for Ford Cosworth
- V8 and V6 Bi-Turbo engines supplied to Audi for RS6 and RS4
- 16V cylinder head assemblies supplied to Mercedes 190 2.3l and 2.5l
- 2.0l 16V cylinder heads supplied to GM Opel for Astra and Calibra
- C.I. cylinder heads supplied to Perkins 3 and 4
- V8 engines supplied to Rolls-Royce
- 2.9l and 4.0l V6 iron heads for Ford Cologne and Livonia
MAHLE Powertrain
Current Product Developments

- New 4 and 6 litre diesel engines
- Machining of cast iron cylinder head and engine block then assembled with bedplate
- For various JCB vehicles in off-highway construction equipment sector
- 2.8l V6 VW Group engine assembly
- Ford 2.3l Balanceshaft oil pan assembly
MAHLE Powertrain
Foundry Operations
MAHLE Powertrain
Manufacturing Machining and Assembly Facilities

- 25,000 square metre site owned outright
- 9,500 square metre manufacturing area
- 1,750 square metre logistics (off site - lease)
- 2 engine assembly lines (up to 100 engines per day)
- 60+ CNC machining centres
- 6 hot engine test stands and 3 dynos
- 5 co-ordinate measuring machines (CMMs)
MAHLE Powertrain
Manufacturing Casting Facilities

- 6,000 square metre site owned outright
- 2,500 square metre Manufacturing
- 60 staff
- 1 low to medium volume production plant – up to 20,000 units per annum
- Specialised/prototype development unit up to 2,000 per annum
- Dedicated tool room for development projects
- Multi-alloy casting facility
- Full measurement facilities
MAHLE Powertrain
Manufacturing Implementation

- Fast and flexible processes
- Shorter production lead-times
- Flexible volume capability
- Economy of scale approach to meet product requirement
- Engine assembly based on cost effective combination of capital and labour
- Process traceability
- Continuous improvement approach
- Close co-operation with customers on facility and process development
MAHLE Powertrain
Manufacturing Casting Process

- Problems experienced with racing engine castings
  - Porosity
  - Random dimensional errors
  - Early fatigue failures

- Engine design, performance and reliability limited by
  - Casting dimensional capability
  - Casting material capability
MAHLE Powertrain
Manufacturing Casting Process

- The Casting Process provides:
  - An elegant and robust sand casting process
  - Casting with high dimensional accuracy and integrity
  - Racing castings that can last many seasons
  - Equally applicable to road engine casting applications
MAHLE Powertrain
Manufacturing Supply Chain

- Global automotive supplier base
  - 277 suppliers in Europe, USA and Japan
- Local and central purchasing team
- Full logistics capability
- Strategic partnerships with logistics service providers
- Integrated MRPII operation
- SAP Business Management System
- Supplier approval
  - System/process audits
- Sub-contractor approval
  - Health and safety pre-tender agreement
  - Compliance with health, safety and environmental guidelines
MAHLE Powertrain Manufacturing

- Comprehensive powertrain manufacturing
- ISO /TS 16949 approved
- Broad customer base - proven track record
- Flexibility and experience
- Achieving challenging lead times and aggressive targets
- Delivering to customers expectations
Thank you for your attention!