KEY TECHNOLOGIES FOR THE REDUCTION OF EMISSION AND CONSUMPTION.

1. Enhanced common rail injection
   We have been using common rail systems successfully for over 20 years now. Our systems capability means we're able to exploit potential during the combustion process to help make engines especially clean and economical.

2. Two-Stage Turbocharging
   Turbocharging enables our engines to achieve low fuel consumption, lowest emissions and high power output across a wider speed range. Turbochargers are finely adjusted to suit the demands on the engine in terms of cost-effectiveness, performance, dynamic response and service life. Space-saving integration of turbochargers into the engine brings the customer the added benefits of compact design.

3. Enhanced common rail injection
   We have been using common rail systems successfully for over 20 years now. Our systems capability means we're able to exploit potential during the combustion process to help make engines especially clean and economical.

4. Selective Catalytic Reduction (SCR)
   The SCR system can remove more than 90% of nitrogen oxides from exhaust gas. A low space requirement for SCR components is demanded to keep the customer satisfied.

5. Diesel Particulate Filter (DPF)
   Our Diesel Particulate Filters are capable of lowering soot emissions to levels that in some cases are well below the statutory limits. Particles filtered from the exhaust gas can also be used as a raw material.

### Engine technology

<table>
<thead>
<tr>
<th>Engine model</th>
<th>Exhaust Gas Aftertreatment</th>
<th>Internal Emission Technology</th>
<th>SCR</th>
<th>DPF</th>
<th>EGR</th>
<th>2st Turbocharging</th>
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</thead>
<tbody>
<tr>
<td>Railcar Series 1600</td>
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<td>Railcar Series 1800</td>
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**Rolls-Royce Group**

www.mtu-solutions.com

**Rail**

POWERPACK SERIES
1600 – 1800 EU STAGE V
SERIES 4000 EU STAGE V
Under challenging circumstances like these, it pays to have a strong partner by your side—a partner who thinks ahead and focuses on achieving sustainable success for your business above all else. By presenting our green drive solutions portfolio as EU-Stage-V-ready, we take the next logical step. Not only are all new MTU PowerPacks available as Hybrid solutions, but our modular strategy sets the stage for continuous improvements without alterations to the MTU PowerPack footprint. The Series 4000 is our masterpiece for the locomotive segment. This engine is always one step ahead of the future: the first engine in its class with EU Stage IIIB certification in 2012—and now EU-Stage-V-ready. Available in 12V and 16V cylinder configurations, this engine provides clean power and pure profitability in all conditions. All drive solutions are ready to repower your equipment, helping you extend the life of your investment.

With increasingly stringent emission standards the rail industry is facing major challenges. Vehicle manufacturers, rail operators and other players are having to respond ever more quickly, and with ever-increasing agility, to emissions- and noise-sensitive environments, while at the same time maximizing equipment availability.

Under challenging circumstances the Railway industry needs a strong partner by your side—a partner who thinks ahead and focuses on achieving sustainable success for your business above all else. By presenting our green drive solutions portfolio as EU-Stage-V-ready, we take the next logical step. Not only are all new MTU PowerPacks available as Hybrid solutions, but our modular strategy sets the stage for continuous improvements without alterations to the MTU PowerPack footprint. Every MTU PowerPack can be individually configured, including hybridisation. The drive system itself, as well as MTU EnergyPacks, are designed for underfloor/roof installation, and are characterized by their particular flexibility. We supply all types of power transfer: diesel-electric, diesel-mechanical, diesel-hydraulic and hybrid solutions. Every MTU PowerPack can be individually configured.

PowerPacks for underfloor/roof mounting - Series 4000 for engine room installation

The Series 4000 R04:
Always one step ahead of the future. The Series 4000 was the first engine in its class to be certified to EU Stage V in 2012 —and now EU-Stage-V-ready. With its unique hybrid system, it is known for its exceptional performance, efficiency and reliability. A compact, highly cost-effective powerhouse that really goes the distance. The Series 4000 has proven itself thousands of times over, and like its predecessors, the latest edition is a force to be reckoned with.

Series 4000 key benefits at a glance:
- EU-Stage-V-ready
- Reliable performance: in all conditions
- Clean power - pure profitability
- Identical footprint to the previous model (EU Stage IIIB)
- Ready for repowering projects: extend the life of your investment

Series 4000 key benefits at a glance:
- Low operating costs
- Low fuel consumption
- Low emissions
- High level of availability
- Simple maintenance
- High level of availability thanks to plug & play design
- Ready for repowering projects: extend the life of your investment

The MTU PowerPack is an innovative solution that seamlessly combines all individual system elements into a single, functional unit mounted on a supporting frame. All our modular MTU PowerPacks in the future will be Stage V-ready – allowing for continuous development and improvement without alterations to the footprint. Every MTU PowerPack can be individually configured, including hybridisation. The drive system itself, as well as MTU EnergyPacks, are designed for underfloor/roof installation, and are characterized by their particular flexibility. We supply all types of power transfer: diesel-electric, diesel-mechanical, diesel-hydraulic and hybrid solutions. Every MTU PowerPack can be individually configured.

PowerPack key benefits at a glance:
- Scope for individual configuration; flexible and standardized interface solutions
- Continuous development and improvement without alterations to the footprint
- Low operating costs
- Fuel-efficient: the Series 4000 has proven itself thousands of times over, and like its predecessors, the latest edition is a force to be reckoned with.
- High level of availability thanks to plug & play design
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ENGINES AND POWERPACKS TO DRIVE YOUR FUTURE: OUR SOLUTIONS FOR EU STAGE V

With increasingly stringent emission standards the rail industry is facing major challenges. Vehicle manufacturers, rail operators and other players are having to respond ever more quickly, and with ever-increasing agility, to emissions- and noise-sensitive environments, while at the same time maximizing equipment availability.
## KEY TECHNOLOGIES FOR THE REDUCTION OF EMISSION AND CONSUMPTION.

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4. **Selective Catalytic Reduction (SCR)**
   - The SCR system can remove more than 90% of nitrogen oxides from exhaust gas. We have focused on low space requirement for SCR components. We have access to 35 years of experience in SCR development and to several generations of SCR components.

5. **Diesel Particulate Filter (DPF)**
   - Our Diesel Particulate Filters are capable of burning soot emissions to levels that in some cases are well below the statutory limits. Valuable filters from part of the emissions concept.