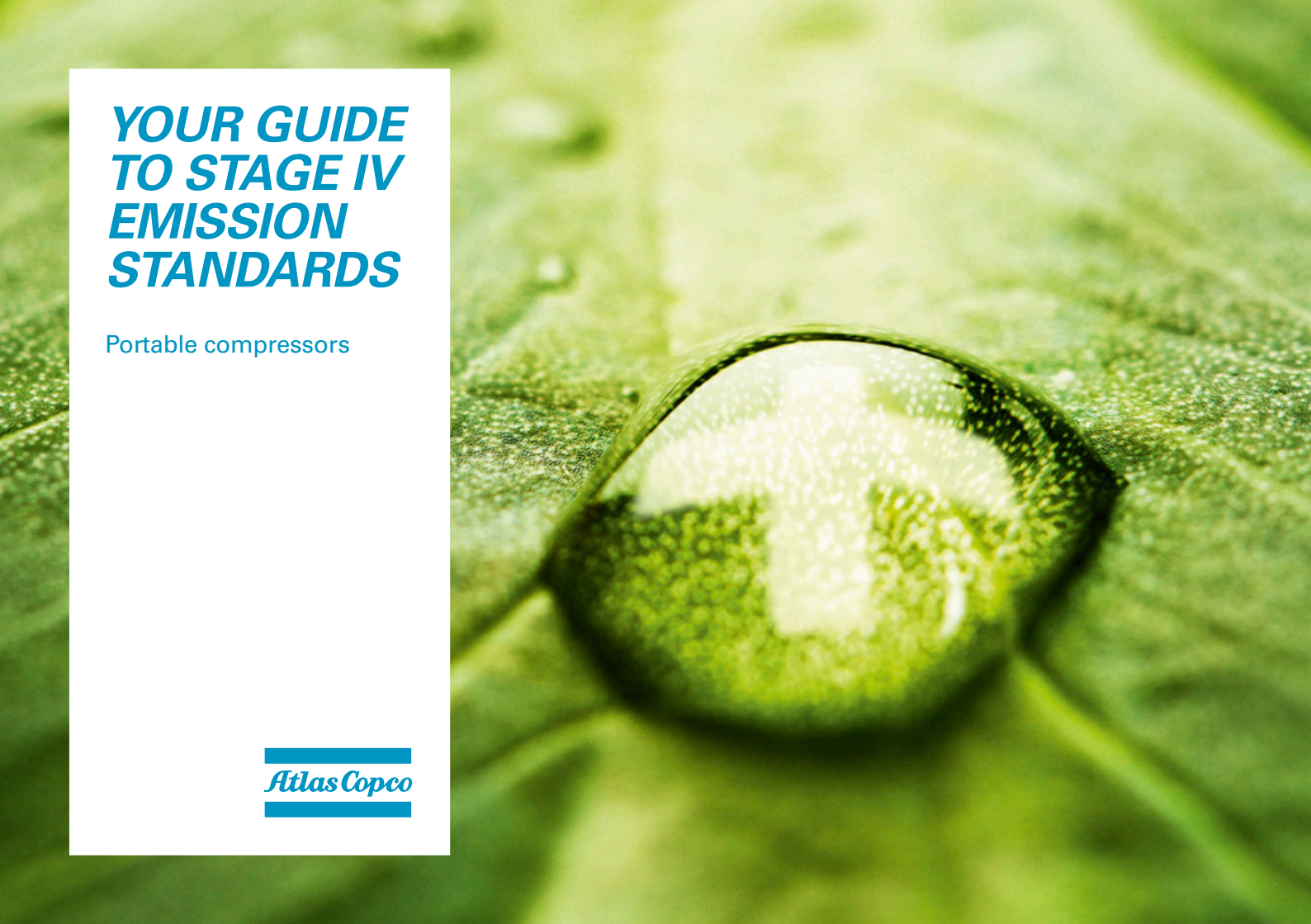


YOUR GUIDE TO STAGE IV EMISSION STANDARDS

Portable compressors

Atlas Copco


Tier 4 Final
Stage IV
Tier 4 Final
Japan
South Korea

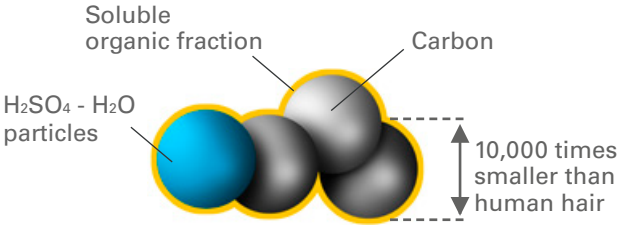
The future of **PORTABLE COMPRESSORS**

Stage IV and Final Tier 4 emission standards impact all non-road engines. The standards aim to IMPROVE AIR QUALITY BY SIGNIFICANTLY DECREASING PARTICULATE MATTER AND NO_X DISCHARGES TO **NEAR-ZERO LEVELS**.

These standards apply to portable compressors and are mandatory for all of the European Union, as well as a number of additional countries. Roll-out will take place over the coming years for all compressor power categories.

Atlas Copco welcomes these clean air initiatives and is ready to help you reach full compliancy.

1 REDUCE PARTICULATE MATTER



2 REDUCE NO_x

Nitrogen dioxide
NO_2

Nitric oxide
NO

The importance of **LOWERING EMISSIONS**

WHAT IS PARTICULATE MATTER?

Particulate matter (PM) is formed by diesel engine combustion. PM is composed of carboneous soot particles, soluble organic fraction and sulfates. Sulfates are formed by the combustion of the sulfur present in diesel fuel and lube oil.[1]

WHY IS PARTICULATE MATTER DANGEROUS?

PM can get deep into your lungs and bloodstream, and can cause heart attacks, asthma, decreased lung function, irritation of the airways, coughing and breathing difficulties.[1]

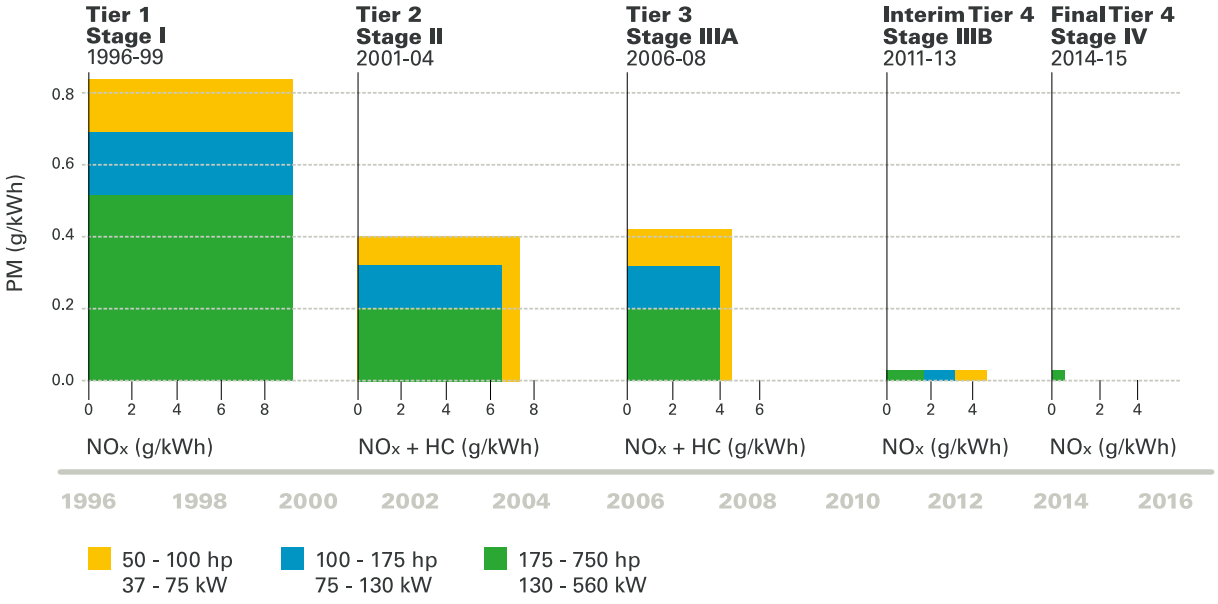
WHAT IS NO_X?

NO_x is a generic term for Nitrogen oxide (NO) and nitrogen dioxide (NO_2), which are formed during high-temperature diesel combustion from reactions of N_2 and O_2.[1]

WHY IS NO_X DANGEROUS?

NO_2 reacts with water to form smog, which penetrates deep into lung tissue. This can cause emphysema, lung tissue damage and heart disease.[1]

Timeline for **COMPLIANCE**



Stage IV
IMPLICATIONS

ENVIRONMENT

Non-road engines account for 10% of emissions. Therefore, the purchase and use of new, cleaner equipment contributes to protecting the environment and public health.

LEGISLATIVE

Since January 2014, all new diesel driven compressors (75 kW – 560 kW) sold in Europe have to be Stage IV compliant.*

Non-compliant equipment can still be used in Europe. However, public projects and environmentally conscious customers increasingly require Stage IV equipment.

DAILY OPERATION

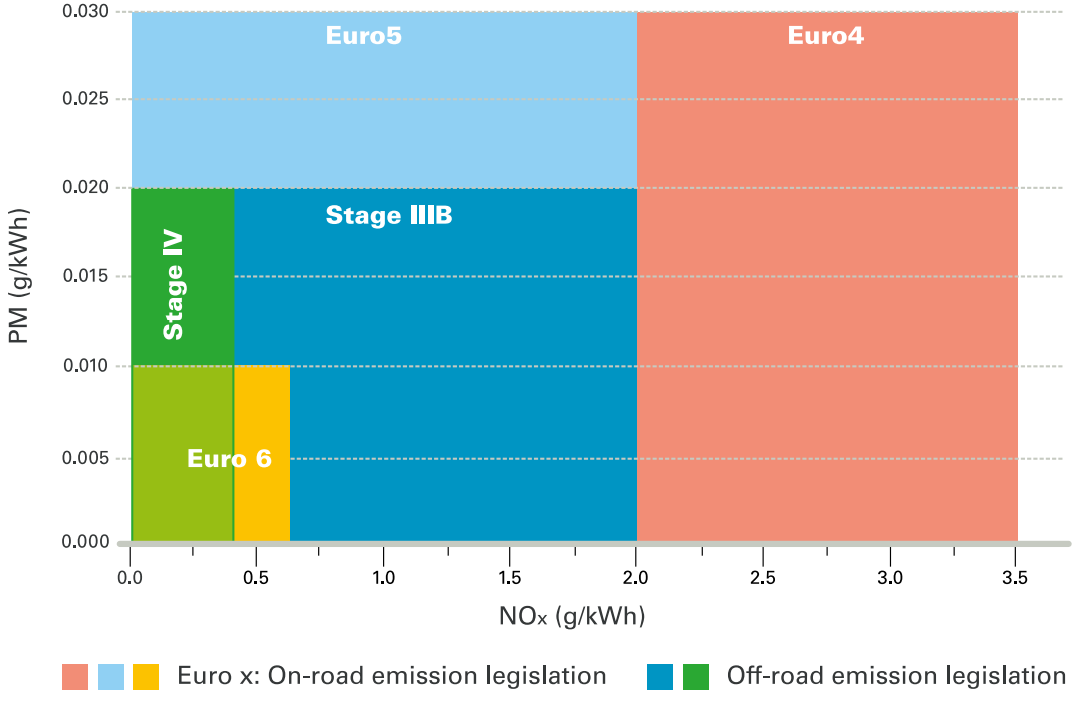
Ultra-low sulfur diesel fuel and low ash engine oils are required.

AdBlue® Machines using Selective Catalytic Reduction (SCR) technology must be equipped with an extra tank for Diesel Exhaust Fluid (DEF), which is also known as AdBlue.

If the after-treatment includes particulate filters, the filter must be serviced regularly, usually every 4,500 working hours.

** The only exceptions are for stock engines and engines under the flexibility program.*

On-road and off-road
EMISSION REQUIREMENTS



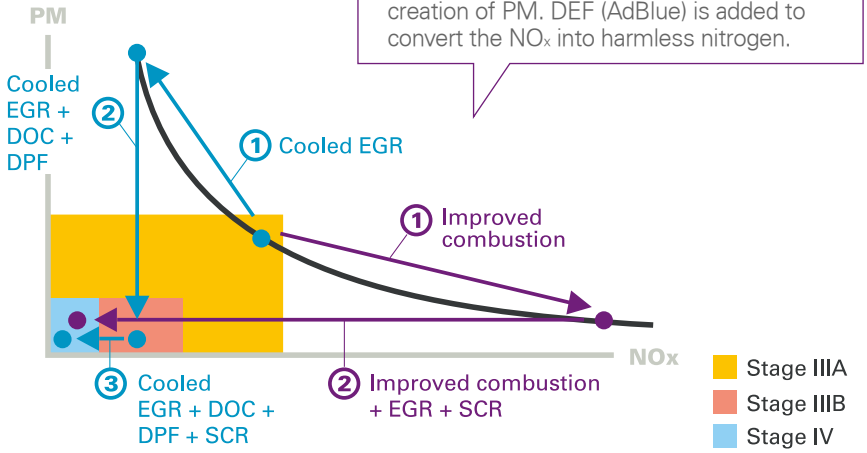

STREAMLINE
SCANIA
EHJ 937

Stage IV
ALTERNATIVE TECHNOLOGIES

There are number of ways of combining the available technologies available to reach Stage IV compliance. The two most common solutions used for Stage IV are:

1 Lower combustion temperature and filters
(blue line in the graph)
This technology requires cooled EGR, a Diesel Oxidation Catalyst (DOC) & Diesel Particulate Filter (DPF) and SCR. Cooled EGR lowers the peak combustion temperature so NO_x is not formed. The PM is then filtered out with a DPF. DEF is added to convert the remaining NO_x into harmless nitrogen.

2 Improved combustion and catalytic reduction
(purple line in the graph)
This solution implies a higher injection pressure, cooled EGR and SCR. It works by optimizing combustion to reduce the creation of PM. DEF (AdBlue) is added to convert the NO_x into harmless nitrogen.

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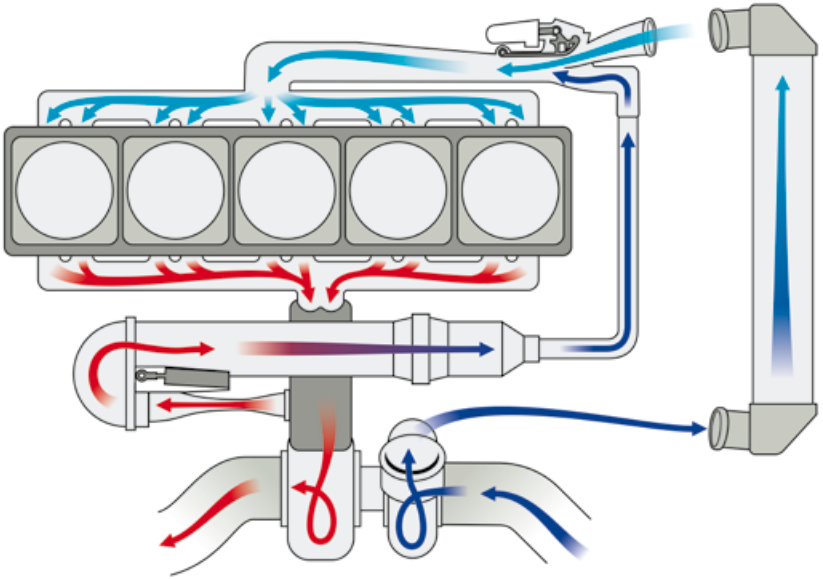
EXHAUST GAS RECIRCULATION (EGR)

Cooled EGR, unlike non-cooled EGR, allows the introduction of a greater mass of recirculated exhaust gas. This lowers peak combustion temperature, generating less NO_x.

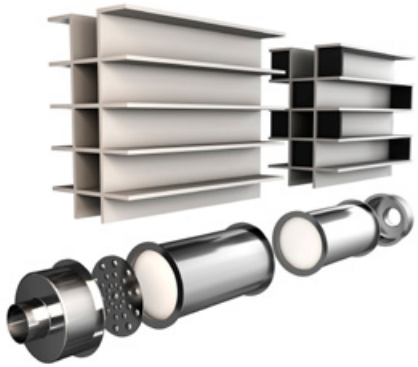


After-treatment
DOC & DPF

To remove excess PM from the exhaust gas, a Diesel Particulate Filter (DPF) is used. This system consists of a Diesel Oxidation Catalyst (DOC) and a filter module.

PM left in the filter system is burned in a process called regeneration. Extending the filter's lifespan, it converts the PM into CO_2 and ash.

Any additives in the lube oil that do not combust during regeneration turn into ash that must be removed manually. The typical service interval is 4,500 working hours.

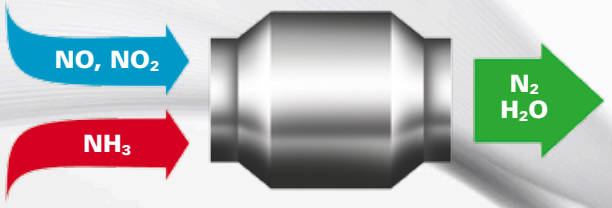


After-treatment
SCR

In the Selective Catalytic Reduction (SCR) process, a catalyst is used to chemically reduce NO_x to nitrogen and water vapor.

DEF (AdBlue) is injected into the catalyst where it reacts with the water vapor to form ammonia. The ammonia causes the harmful NO_x to convert into harmless nitrogen and water vapor.

This technology requires a dedicated DEF (AdBlue) tank.




SCANIA

Stage IV
BENEFITS

ENVIRONMENT AND SOCIETY

- Less smog in cities;
- Reduced respiratory diseases in future generations;
- Boost for clean emission technologies.

OPERATIONS

- Increased project opportunities in residential and environmentally-sensitive areas and for socially-responsible customers;
- Higher equipment residual value reduces depreciation expenses;
- Lower fuel consumption.

ABBREVIATIONS

CO_2: carbon dioxide, **DEF:** Diesel Exhaust Fluid (also known as AdBlue), **DOC:** Diesel Oxidation Catalyst, **DPF:** Diesel Particulate Filter, **EGR:** Exhaust Gas Recirculation, **NO:** Nitrogen oxide, **NO_2:** Nitrogen dioxide, **NO_x:** Generic term for mono-nitrogen oxides NO and NO_2, **PM:** particulate matter, **SCR:** Selective Catalytic Reduction

REFERENCE [1]

Gui Xinqun, Danan Dou, and Richard Winsor. 2010. Non-Road Diesel Engine Emissions and Technology Options for Meeting Them. ASABE Distinguished Lecture #34, pp. 1-24. Agricultural Equipment Technology Conference, 10-13 January 2010, Orlando, Florida, USA. Copyright 2010 American Society of Agricultural and Biological Engineers. ASABE Publication Number 913C0110

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