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Exhaust Gas Diluters

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Introduction

Nett exhaust gas diluters mix engine exhaust gases with quantities of ambient air before they are discharged from the vehicle. The exhaust gases are diluted, cooled, and projected away from their source. Diluters are commonly used to lower the local concentrations of pollutants to meet applicable occupational health standards. They also provide a simple method of cooling exhaust gases whenever the maximum exhaust temperature is regulated by safety regulations.

The exhaust gas diluters are used on all types of engines, such as diesel, LPG and gasoline engines. Typical applications include underground mining and material handling. They are also used on stationary engines, which are operated in populated areas, to reduce exhaust odors and the black diesel smoke.

The following benefits may be achieved by the application of Nett exhaust gas diluters:

- The concentrations of exhaust pollutants are lowered due to the dilution. Thus, the vehicle operator and crew working in the proximity are not exposed to harmful levels of toxic gases.
- Diesel smoke opacity (visible smoke) is reduced.
- Low exhaust temperatures reduce the risk of igniting inflammable materials, as well as the safety hazards for humans.
- The exhaust gas diluter may be installed to project the exhaust gases from the vehicle in a desired direction. This can be advantageous for vehicles used inside containers, in tunnels or warehouses.

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How the Exhaust Gas Diluter Works

Engine exhaust gases enter the circular manifold of the exhaust gas diluter, as shown in Figure 1. The gases are released from the manifold into the diffuser tube through an annular gap. The exhaust gases flow alongside the curved inside surface of the device, inducing quantities of ambient air into the diluter. This mechanism of air induction is known as the Coanda effect.

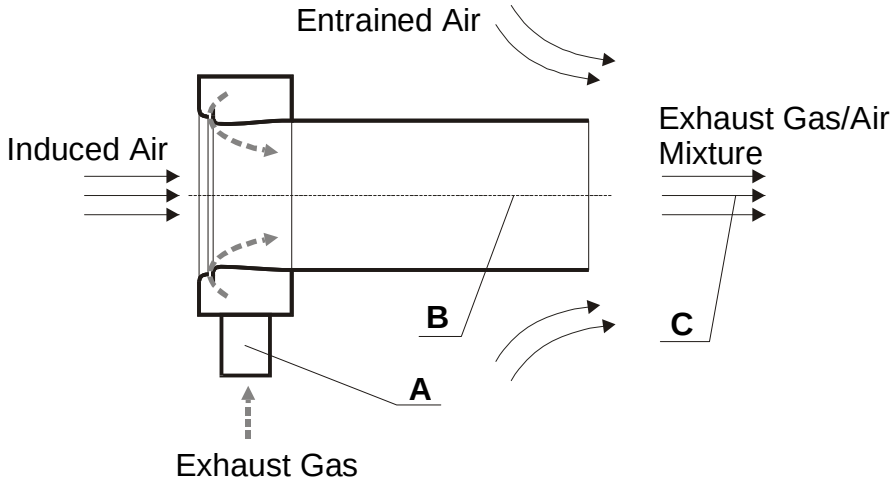

Figure 1. Gas Flow in the Exhaust Gas Diluter

The primary air-gas mixture enters the diffuser, where mixing of gases occurs. After the gas is discharged from the diffuser, an additional stream of air is entrained and further mixing and dilution occur.

Nett exhaust gas diluters for large engines, which have more than one gap, are designed differently. Instead of the annular manifold they include a central hub with 3 to 6 gaps, which is placed inside the diffuser tube. The working principle and performance of the multi-gap diluters is the same as in the single gap design.

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Performance and Pressure Drop

A typical performance of the Nett exhaust gas diluter is presented in Figure 2. The emissions and temperatures are sampled at three points, A, B, and C. The points represent the undiluted exhaust (A), the gases at the outlet from the diffuser tube (B), and gasses at 1m distance after the diluter (C, compare Figure 1).

The emissions are expressed in ppm of a pollutant. The same concentration reductions apply to all emissions, including carbon monoxide (CO), hydrocarbons (HC), and nitrogen oxides (NO_X).

The temperature is expressed in degrees Celsius. For example, the exhaust gas diluter can typically lower the exhaust temperature from 450°C to 70-80°C, measured at the gas discharge point, and to about 50°C measured 1 m after the vehicle.

Both the emission dilutions and the exhaust cooling effect depend on the exhaust gas diluter gap setting. Smaller gaps produce higher exhaust gas velocities, higher dilutions and better cooling effects. However, they also result in a higher exhaust gas

pressure drop in the diluter. Typical dilutions, as shown in Figure 2, are realized with the standard factory gap setting. The corresponding exhaust gas pressure drop is typically 5-7 kPa (20-28 in. H_2O). The gaps can be easily adjusted to change the dilutions and pressure losses by installing variable thickness shims underneath the diluter header.

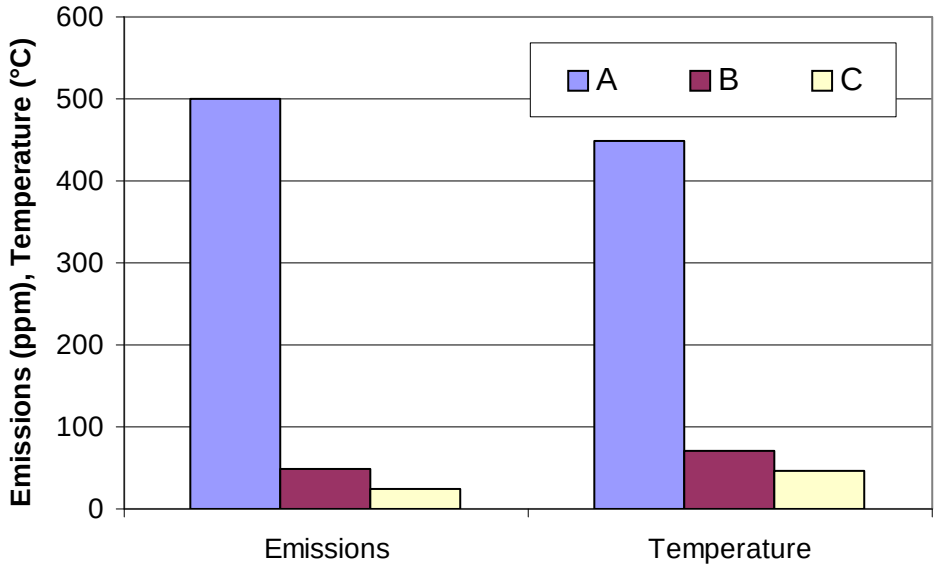

Figure 2. Typical Dilutions and Exhaust Gas Cooling Effects
(A – raw exhaust; B - diffuser tube; C – after the diluter)

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Standard Models

Standard models of Nett exhaust gas diluters are listed in the following table. The dimensions and maximum engine power ratings are only approximate. Please contact Nett Technologies for exact product specifications.

Model	Total Length, mm	Max. Diameter, mm	Max. Engine Power KW	Max. Engine Power HP
Nett 10	279	174	45	60
Nett 15	368	225	70	90
Nett 20	603	301	90	120
Nett MG3	610	419	175	235
Nett MG4	610	419	225	300
Nett MG5	610	419	300	400
Nett MG6	610	419	375	500
Nett MG3x3			525	700
Nett MG4x3			675	900
Nett MG5x3			900	1200
Nett MG6x3			1125	1500
Nett MG6x4			1500	2000
Nett MG6x5			1850	2500
Nett MG6x6			2225	3000

Units for larger engines, as well as custom designed configurations are also available.

Nett Technologies Inc. has a corporate policy of continuous product development. Specifications are subject to change without notice.

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