



# Endogreen™

Environment-friendly endogas generator



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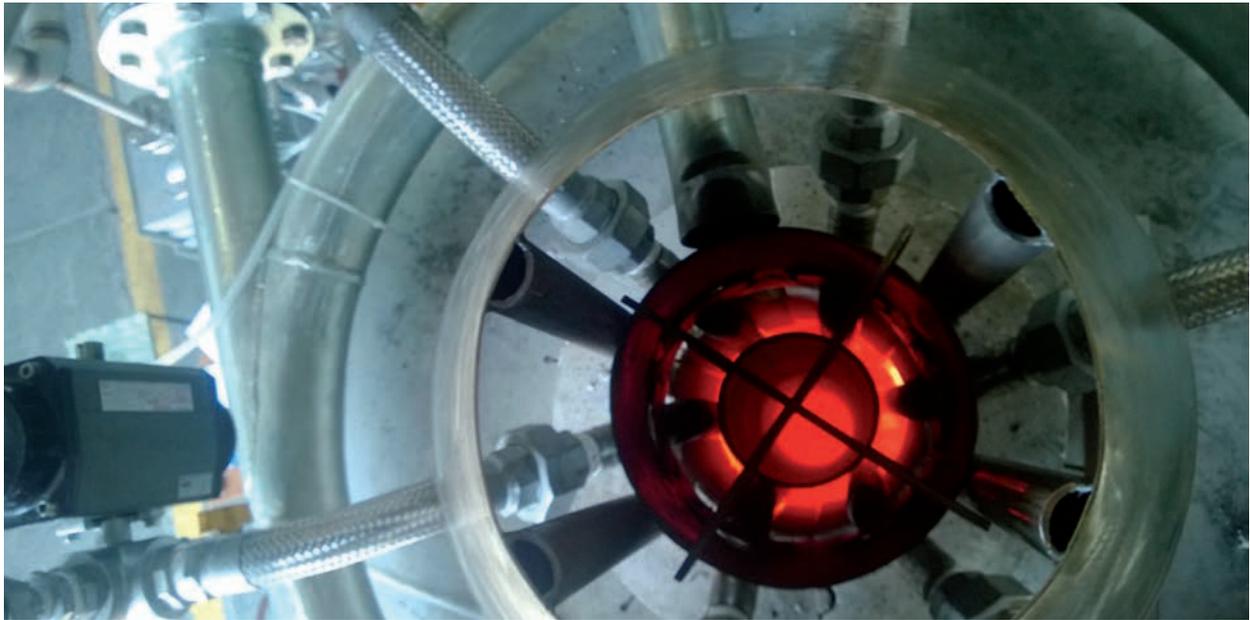
## Environment-friendly endogas generator

**Endogreen™** is the ideal solution as a replacement for traditional endothermic gas generators, since it embodies all the risk mitigation and prevention features set out in Legislative Decree 81/2008 and the amendments and additional requirements provided for in L.D. 106/2009.

- **The first environmental friendly endogas generator.**
- **Noble metal based catalyst safe for human health.**
- **Modular design for maximum operational versatility.**
- **No coolants required.**
- **Dew point control and adjustment by means of  $\lambda$  probe.**

**Endogreen™** does not use nickel based catalysts that contain nickel monoxide, a product labelled with risk phrase R49 "may cause cancer by inhalation". It uses instead a catalyst based on noble metal oxides, inert agents and with patented composition. Its action is a hundred times more efficient than that of a nickel based catalyst, but has none of its harmful effects. Catalyst regeneration is a thing of the past, as the efficiency of the reaction makes it unnecessary.

Through a catalytic endothermic reaction, **Endogreen™** produces an endogas mixture, also commonly referred to as 40-40-20, from methane and air. This mixture is suitable for a wide range of heat treatments, including case hardening, carbonitriding, hardening/tempering, sintering, and, in general, all treatments requiring that the carbon potential of the gas be in equilibrium with the carbon content of the steel treated. Treatments that do not call for particularly concentrated atmospheres can be carried out effectively and economically through prior dilution with inert gases, thanks to the high  $H_2/H_2O$  and  $CO/CO_2$  ratios arising from the design of this apparatus.



Thanks to the patented modular design of its reaction and cooling chambers, **Endogreen™** can produce an endogas mixture whose composition remains truly constant regardless of overall flow. This is ensured by the velocity at which the reactants travel through the catalyst, which remains unaltered irrespective of variations in the flow generated.

**Endogreen™** uses retorts of simple design, all the same shape and size, making for simplified, cheaper maintenance.

Accordingly, **Endogreen™** can feed several furnaces, adapting to the needs of the heat treating department, without the atmosphere produced being affected in the least. Variable flow makes the generator adaptable to specific manufacturing process requirements. By the same token, endogas is produced in the required amount, doing away with waste and pollution. Adjusting the dew point of the gas generated by means of a  $\lambda$  probe makes it possible to compensate for small variations in natural gas composition and ambient air moisture content.

**Endogreen™** doesn't use water but a high efficiency air to air heat exchanger.

Nippon Gases offers customised rental programs for its **Endogreen™** gas generators, including scheduled and extraordinary maintenance services, as well as replacement and disposal of exhausted catalysts.

**Endogreen™ is an exclusive Nippon Gases patent.**

Nippon Gases is a historic company, among the first in Italy to operate in the industrial gases sector. Established in 1920, it is now part of Nippon Gases Europe, a company owned by Taiyo Nippon Sanso Corporation, an international leader with more than 100 years' experience in the gas industry.

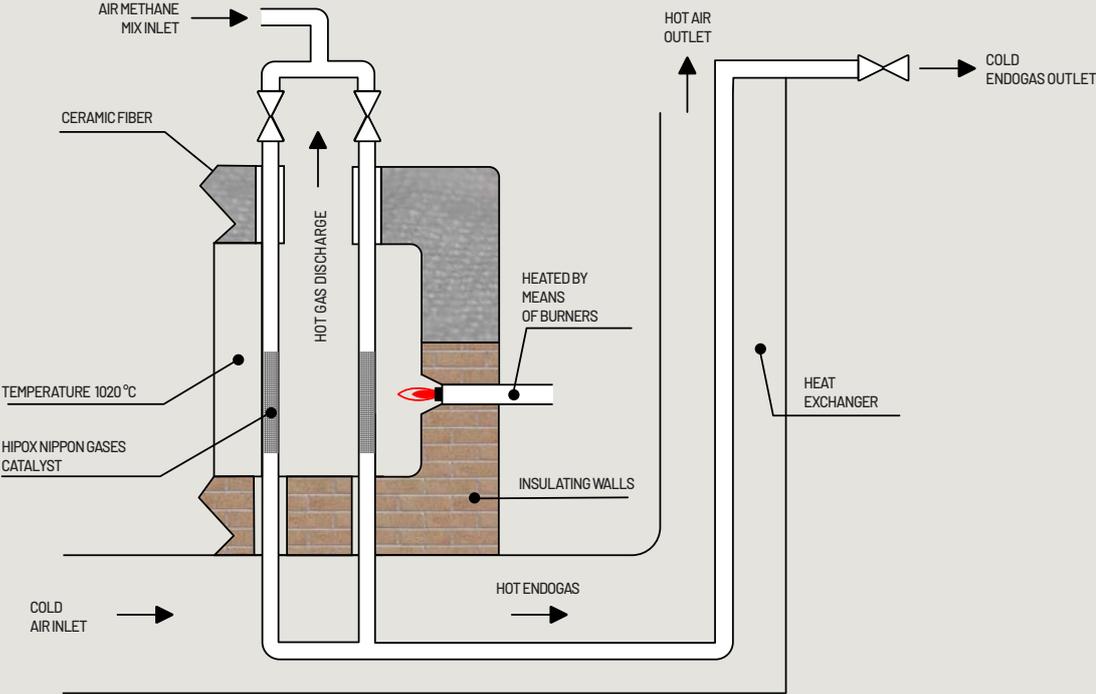
TNSC provides total support to a number of industrial sectors, including steel, chemicals, electronics, automobiles, construction, shipbuilding and food/ beverages, with a major presence in Japan, Southeast Asia, Canada, the U.S., Australia and Europe.

From the on-going exchange of information across this global network, in a constant process of innovation, come the most advanced solutions that enable an ever greater number of customers to achieve their quality improvement, production, profit and sustainability goals.

With its products – Oxygen, Nitrogen, Argon, Carbon Dioxide, Helium, rare gases, pure gases, specialty gases, medical gases, refrigerants and dry ice –, its technologies and its long-standing experience, Nippon Gases works with its customers as a partner to create added value.

Endogreen™ technical data sheet			
	Lo-Dew	"Traditional" endogas	Endogreen™
Typical atmosphere composition	CO 17.3%, H <sub>2</sub> 20.7%, N <sub>2</sub> 62%	CO 19.8%, H <sub>2</sub> 39.6%, N <sub>2</sub> 40.3%	CO 19.8%, H <sub>2</sub> 39.6%, N <sub>2</sub> 40.3%
Adjustment	FIXED	LIMITED (70 TO 100%)	COMPLETE (15 TO 100%)
Cooling by	WATER	WATER/AIR	AIR
Average methane consumption (m <sup>3</sup> ) per cubic metre of reformed gas atmosphere	0.172	0.250	< 0.230
Type of catalyst installed	Nichel	Nichel	Noble Metals - patented
Catalyst	Toxic/Carcinogenic	Toxic/Carcinogenic	Inert
Generator operation and maintenance	VERY DEMANDING	DEMANDING	EASY
Retort and catalyst replacement costs	HIGH	HIGH	BY NIPPON GASES
Periodic catalyst regeneration	YES	YES	NO

Principle diagram





Typical example of Endogreen™ installations on battery



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