ggENOx / enhanced combustion technology for end-port furnaces

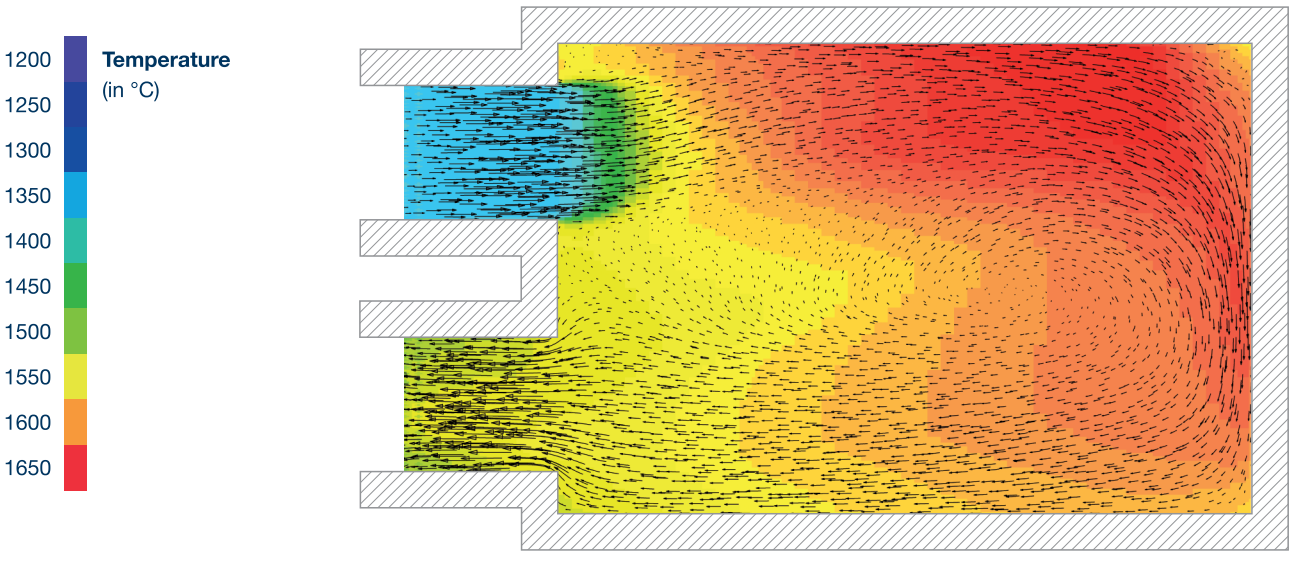
glassglobal
Engineering

glassglobal Engineering / innovative and unique sytems

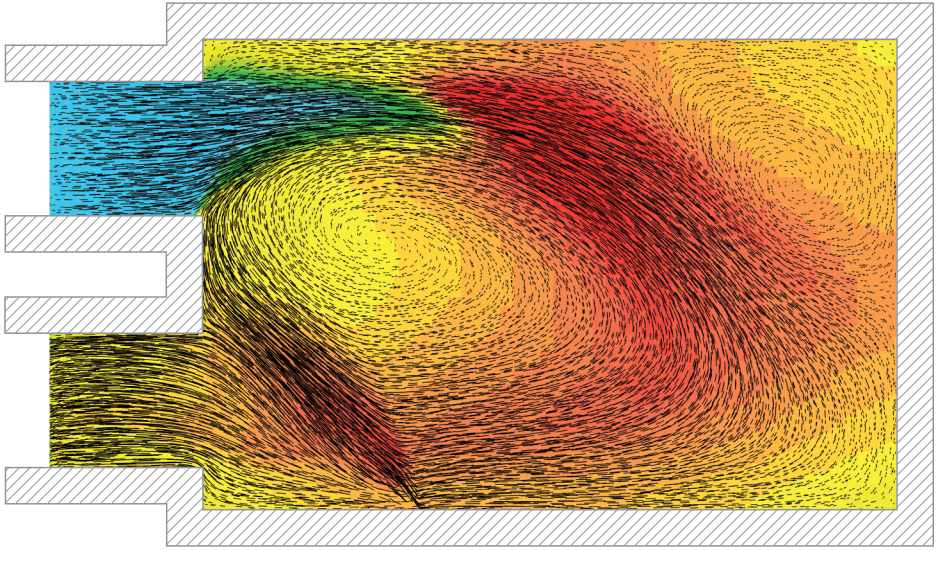
glassglobal Engineering is a division of the **glassglobal Group**. Our engineering team researches and develops innovative and unique systems like the **ggENOx** and **ggDAS** to reduce energy costs, critical pollutants (with NO_x in particular) and/or to enhance glass quality to increase production with a focus on primary measures.

ggENOx is a patent filed system using various type of media such as compressed air, fuel or oxygen. A small amount of media, injected into the furnace, supports the internal flue gas recirculation to reduce peak temperatures and concentrations. The proven concept is easy to apply and operate and can be installed at any End-Port furnace.

without **ggENOx**



with **ggENOx**



» NO_x reduction of 55 to 60 % and values below 500 mg/Nm³ have been reached

» fuel reduction of 2 to 3 % or pull increase of 2.5 to 8 %

» quality increase

» no negative effect on glass quality, pull, temperature profile, CO concentration etc.

» more homogenous combustion

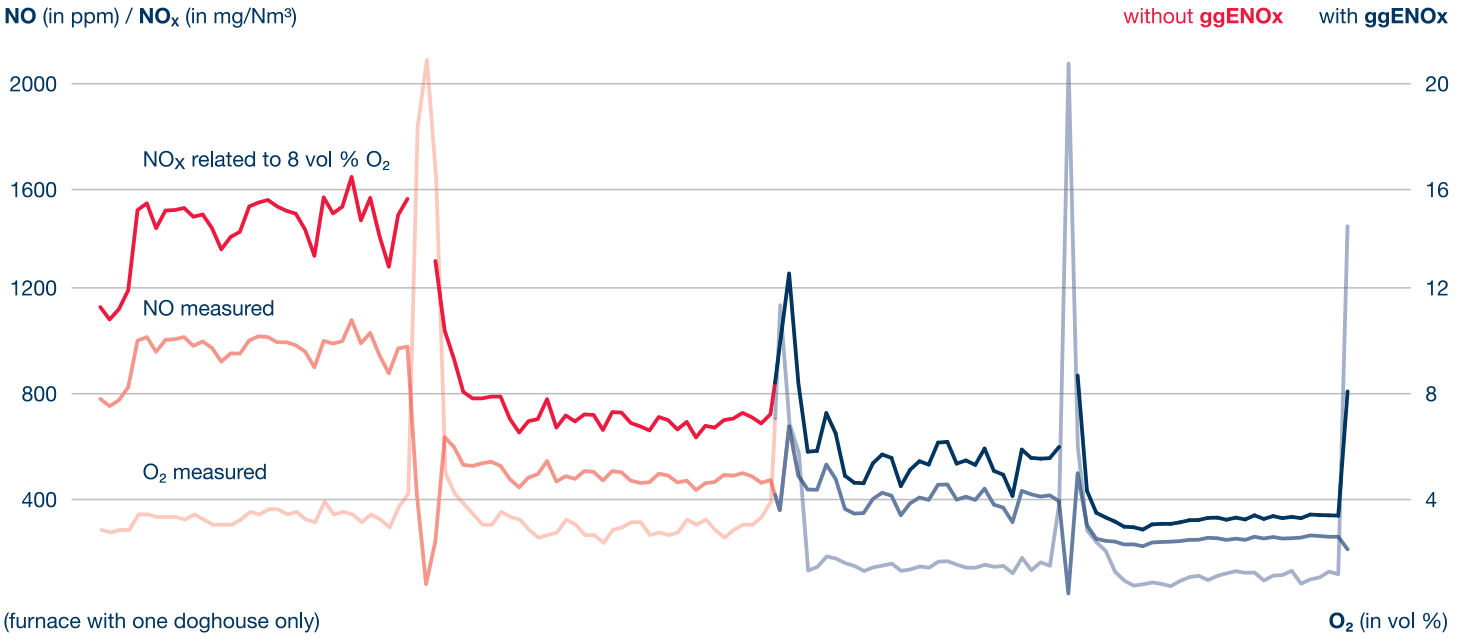
» low investment and operating costs

Flue Gas Analysis / various positive effects

The following graphic shows a flue gas analysis sample for two left and right firing periods when installing **ggENOx**.

ggENOx significantly reduces the NO_x emissions but also reduces the variation of the NO_x measuring data, an indicator for a more stable combustion.

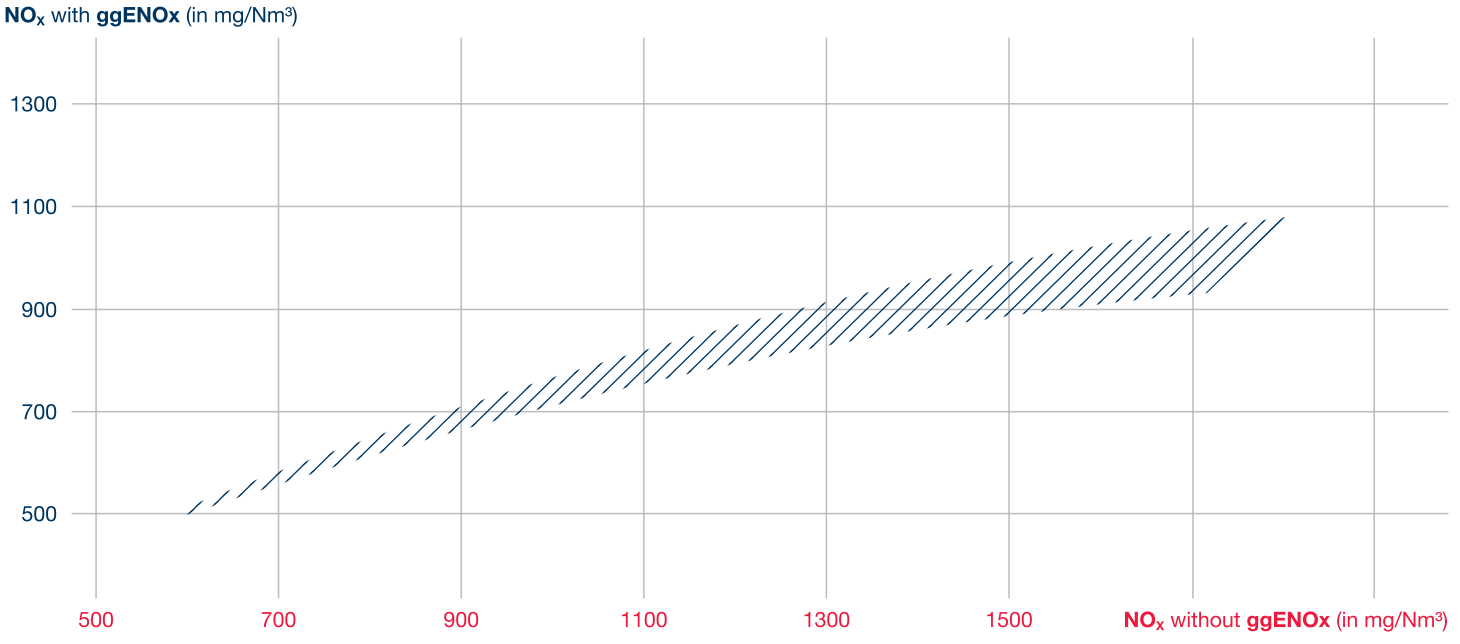
The additional effects are a reduction of the O_2 concentration in the flue gas by 0.2 to 0.5 %, an increase of the flue gas temperatures, a possible reduction of the hotspot temperatures, 4 to 10 % increase of the effective heat transfer in the melting zone and a significant retraction of the batch line.


NO (in ppm) / NOx (in mg/Nm³)
without ggENOx
with ggENOx
2000
1600
1200
800
400
20
16
12
8
4
NOx related to 8 vol % O2
NO measured
O2 measured
(furnace with one doghouse only)
O2 (in vol %)

Emissions / NO_X reduction

As being said, **ggENOx** significantly reduces the NO_X emissions. The NO_X reduction depends on the base values, production and glass specifics. E.g. form 1200 mg/Nm³ related to 8 vol % of oxygen we typically reach 800 to 850 mg/Nm³.

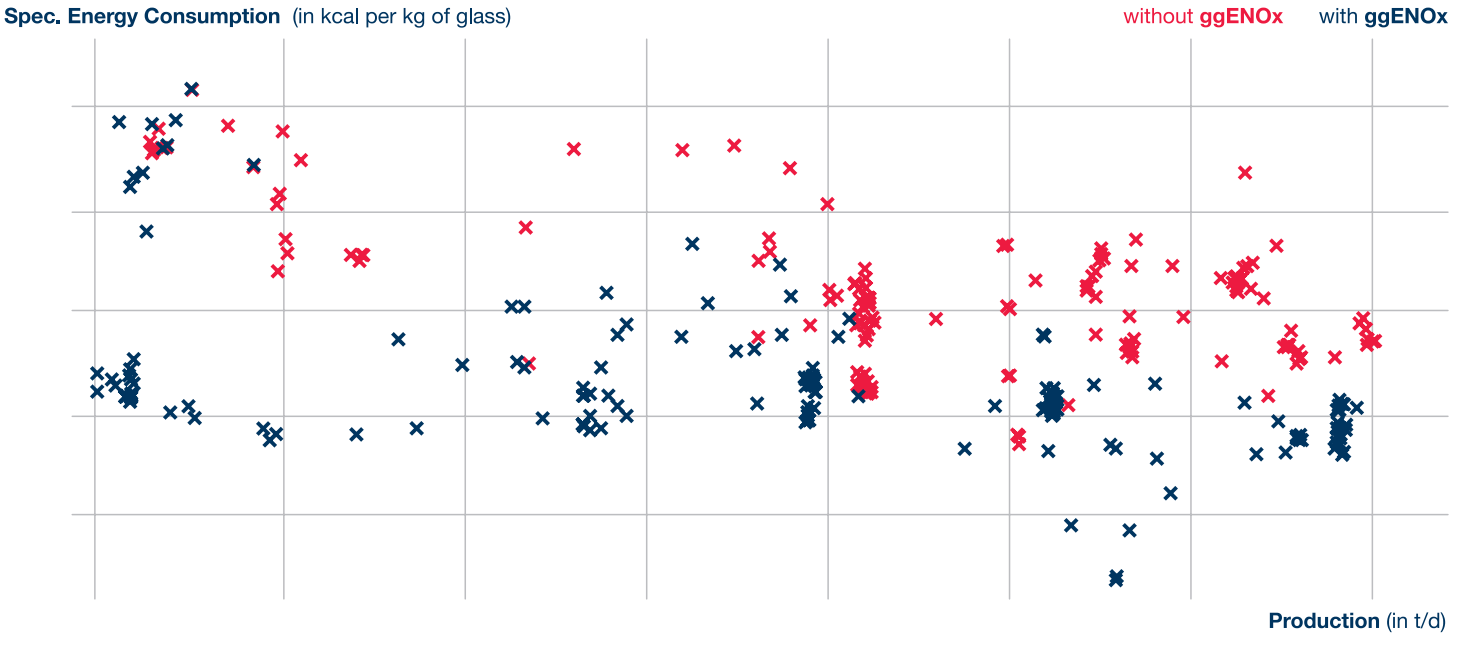
The next graphic shows what NO_X values related to 8 vol % of oxygen will be reached depending on the base values.


NOx with ggENOx (in mg/Nm³)
1300
1100
900
700
500
500
700
900
1100
1300
1500
NOx without ggENOx (in mg/Nm³)

Production / reduction of the Spec. Energy Consumption & more

According to the mentioned effects and in addition to the NO_X reduction, **ggENOx** can help to reduce energy costs and/or to enhance glass quality and/or to increase production.

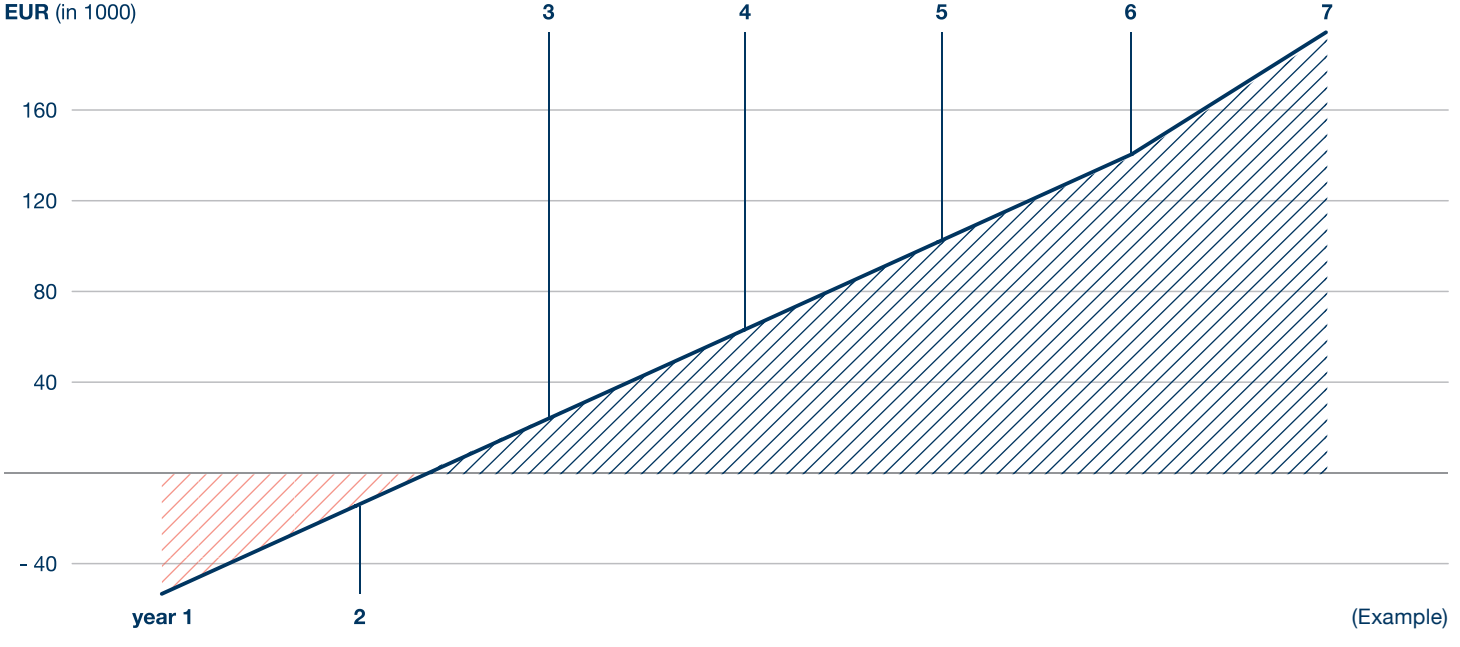
The following graphic shows an installation sample and indicates an energy consumption reduction on average of approx. 3 %.


Spec. Energy Consumption (in kcal per kg of glass)
without ggENOx
with ggENOx
Production (in t/d)

Payback / low investment and operating costs

The following graphic illustrates a typical payback time of approx. 2.5 years taking an energy cost reduction of 3 % into account. This payback time while increasing the production is much better, typically 0.5 years.

Even when a »deNOx« system, and »SCR« in particular, is already installed, **ggENOx** significantly reduces the »deNOx« operating costs whereas the payback time can reach 3 years as well.


EUR (in 1000)
3
4
5
6
7
160
120
80
40
- 40
year 1
2
(Example)

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