XYLOWATT sa

NOTAR® Technology

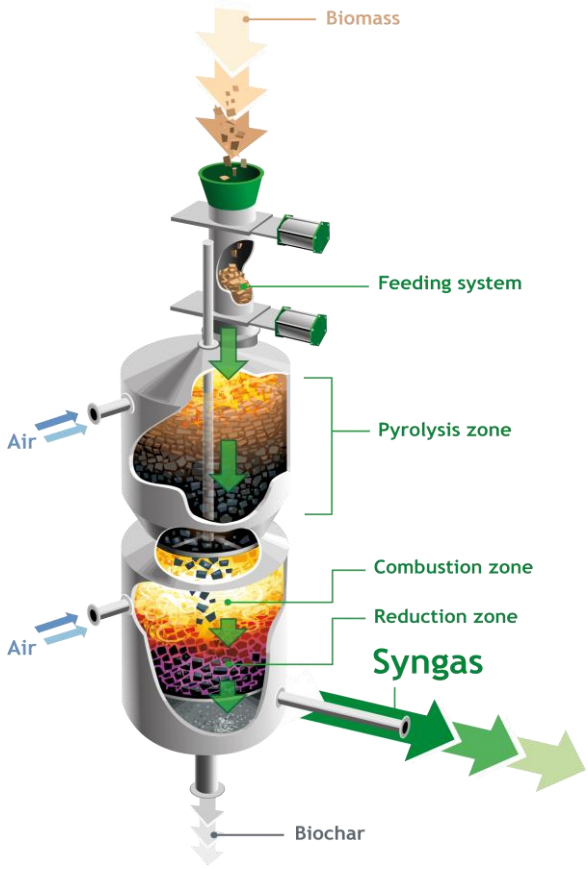
Converting biomass into clean syngas

NOTAR® : Clean syngas without Tar

The NOTAR® principle lies on the physical separation of the gasification reaction zones. This design leads to accurate control of the critical parameters.

Pyrolysis ⇨ Combustion ⇨ Reduction

Integration of the separate reaction zones in the **NOTAR® compact reactor** makes it the sole industrial gasifier producing a clean syngas at the outlet of the process.



NOTAR® GASIFICATION REACTOR

Step 1- Pyrolysis : production of Tar Free char

Heat is used to break down the fresh solid fuel into Char (C) and into Pyrolysis gases (a mixture of light gases and Tar).

Biomass + Heat → Char + Pyrolysis Gases & Tar

Key advantages of the NOTAR® Technology

- ✓ **Autothermic Pyrolysis:** Heat needed for the pyrolysis is developed by partial combustion of the raw biomass within the pyrolyser.
- ✓ **Complete Pyrolysis:** The physical separation of the pyrolysis zone from the other reaction zones offers a precise control of the various reaction parameters (residence time, temperature).

Products of the pyrolysis:

- **« Tar Free » char** is perfectly pyrolyzed, it does not contain Tar.
- **Pyrolysis gases**: Tar from pyrolysis gases is mainly primary Tar, easily destructed in the combustion zone.

NOTAR® GASIFICATION REACTOR

Step 2 - Combustion: destruction of pyrolysis tar

Air is injected in the combustion zone in order to burn the pyrolysis gases. Combustion zone releases the heat and the gaseous reactants (CO_2 and H_2O) of the reduction zone.

Air + Pyrolysis Gases & Tar $\longrightarrow$ $CO_2 + H_2O$

Key advantages of the NOTAR® Technology

- ✓ Combustion takes place in gaseous phase
  - Air doesn't enter in contact with the char, avoiding the creation of clinkers.
  - Tar from the pyrolysis gases are destroyed by oxidation and thermal cracking; producing Tar Free combustion gases.
- ✓ Accurate design of the combustion zone (improved air/gas mixture, accurate residence time)
- ✓ Accurate control of the combustion parameters (temperature)

NOTAR® GASIFICATION REACTOR

Step 3 - Reduction: production of clean syngas

In the reduction zone, the Tar Free char (C) reacts with the Tar Free flue gases from the oxidation zone (CO_2, H_2O). The clean syngas is produced through the following reactions:

$$Char + CO_2 \rightleftharpoons 2CO$$
$$Char + H_2O \rightleftharpoons CO + H_2$$
$$CO + H_2O \rightleftharpoons CO_2 + H_2$$

SYNGAS

Key advantages of the NOTAR® Technology

- ✓ The reactants of the reduction (CO_2, H_2O, C) being Tar Free, thus the syngas doesn't contain Tar.

NOTAR means NO – TAR in the raw syngas

- ✓ Maximum syngas Temperature at the outlet of the gasifier is 750°C, metallic compounds condense in biochar and thus do not pollute the syngas.

Compact integration of the 3 reactions

REDUCTION ZONE

Pyrolysis

Biomass + Heat → Char + Pyrolysis Gases & Tar

CH_yO_x + Heat → Char + Lg + C_nH_m

Combustion

Air + Pyrolysis Gases & Tar → CO_2 + H_2O

O_2 + Lg → CO_2 + H_2O
O_2 + C_nH_m → CO_2 + H_2O

Reduction

Clean syngas production

Char + CO_2 ⇌ 2CO
Char + H_2O ⇌ CO + H_2
CO + H_2O ⇌ CO_2 + H_2

TECHNOLOGICAL ADVANTAGE

Accurate control of operating parameters:

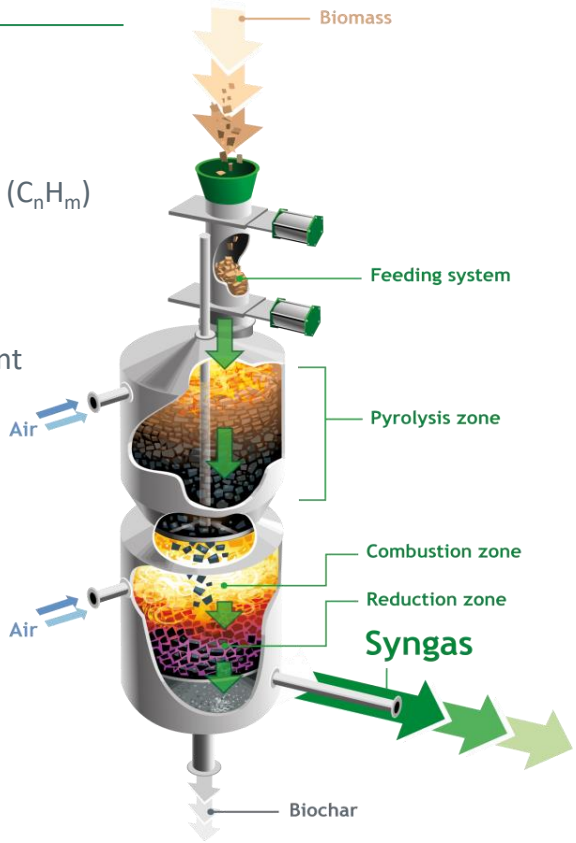
- ✓ Tar Free Char (Char)
- ✓ Light Pyrolysis Gases (Lg)
- ✓ Primary Tar concentrated in pyrolysis gases (C_nH_m)

Combustion in gaseous phase:

- ✓ Destruction of Pyrolysis Tar
- ✓ Conversion of biomass with high ash content
- ✓ Power range from 0.1 to 2 MW

Reduction is fed with Tar Free products:

- ✓ Production of a Tar Free syngas
- ✓ Maximum Gas Temperature of 750°C
- ✓ Metallic Compounds condensed in biochar



NOTAR® Technology is the integration of three independently designed and controlled reactors in a **compact** way. The technology produces clean syngas from different types of **biomass**.

XYLOWATT s.a.

Avenue Jean Monnet, 1
1348 Louvain-la-Neuve
Belgium

info@xylowatt.com
www.xylowatt.com