BIOGAS AS A CO-FIRING FUEL IN THERMAL PROCESSING INDUSTRIES: IMPLEMENTATION IN A GLASS MELTING FURNACE

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Objectives:

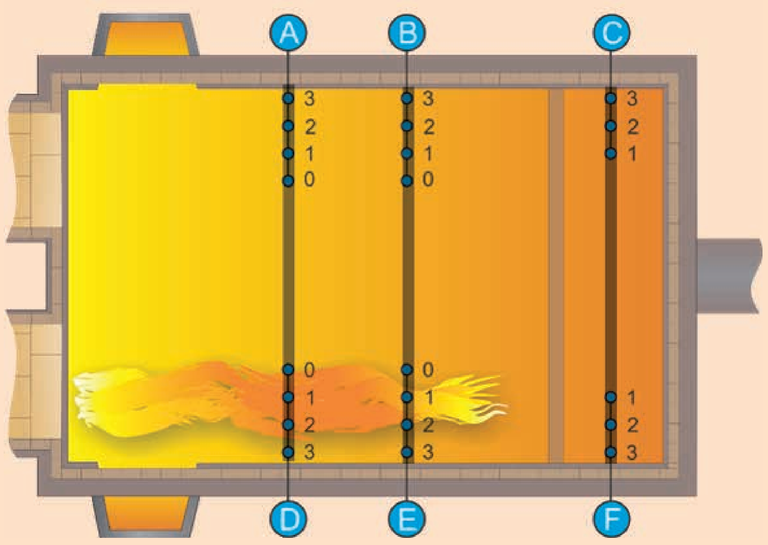
Based on the promising results of the first project on a semi-industrial scale, testing commenced in the follow-up project to assess the feasibility of biogas co-firing in a full-size industrial glass melting furnace. Questions of interest were how the change in the fuel would affect combustion characteristics and heat transfer, but also refractory properties (and thus furnace lifetime) and, most importantly, glass quality.

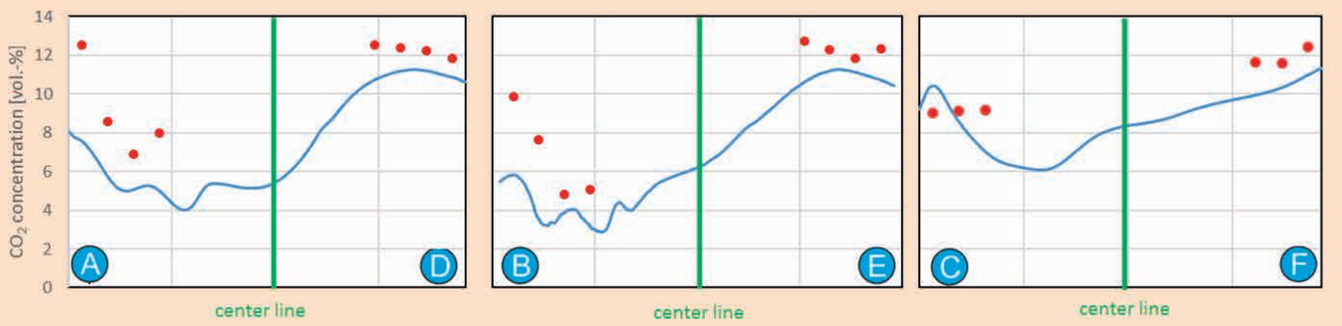
Biogas:

- Renewable fuel gas produced with fermentation process of biomass (e.g. agricultural waste: corn silage, Mash from grapes, pomace from fruits,…)
- Type of biogas used in the investigation:
  CH_4 content: 50 – 65 vol.-%, CO_2 content: 44 – 49 vol.-%, roughly cleaned, traces of H_2S, daily fluctuations of composition

Furnace:

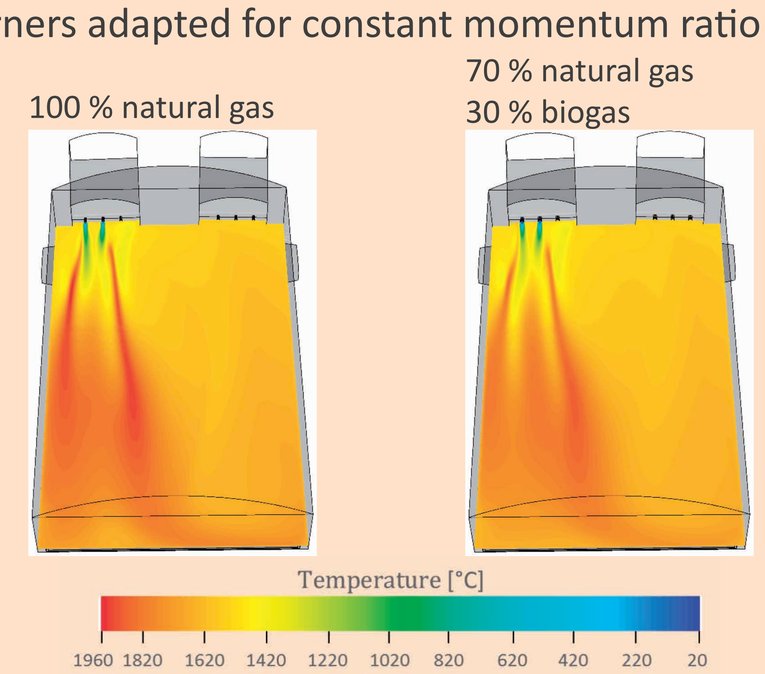
- Regenerative horse shoe-fired glass melting furnace
- Firing rate: 11 MW, air ratio 1.05
- Fuel gases: natural gas (H) + biogas
- (8%, 17% and 30 % biogas by energy input respectively)
- Glass: flint and light green container glass
- Tonnage: 84-98 % of maximum load during measuring periods
- Total amount of cullets: ≈ 68 wt.%
- Investigation by means of measurements and CFD simulations





CFD Simulations:

Burners adapted for constant momentum ratio



Results:

- No influence on glass quality
- No problems with refractory materials (6 months use of biogas in total)
- Burners have to be adapted to the changing fuel gas properties
- Significant reduction of fossil CO_2 emissions
- Due to the currently low costs for fuel (natural gas) and for CO_2-certificates the use of biogas is not economically viable at the moment

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