Holzverstromung Nidwalden GSMA

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structure

- background
- Holzverstromung Nidwalden
- process description
- gas sampling, measurement and analysis
    - volume
    - composition
    - O_2
    - CO

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BR Engineering GmbH
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CH-6006 Luzern
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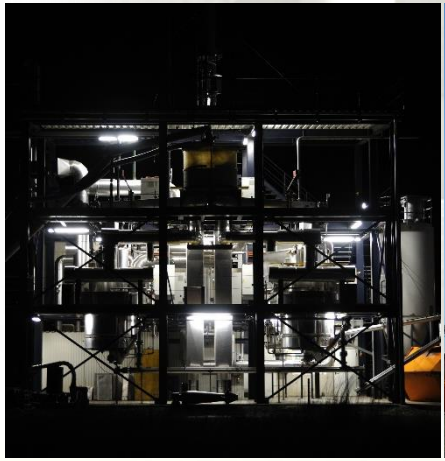
Switzerland

development

1993 – 1995: Labor scale

1996 - 2007: Pilot Plant, 120 kWel

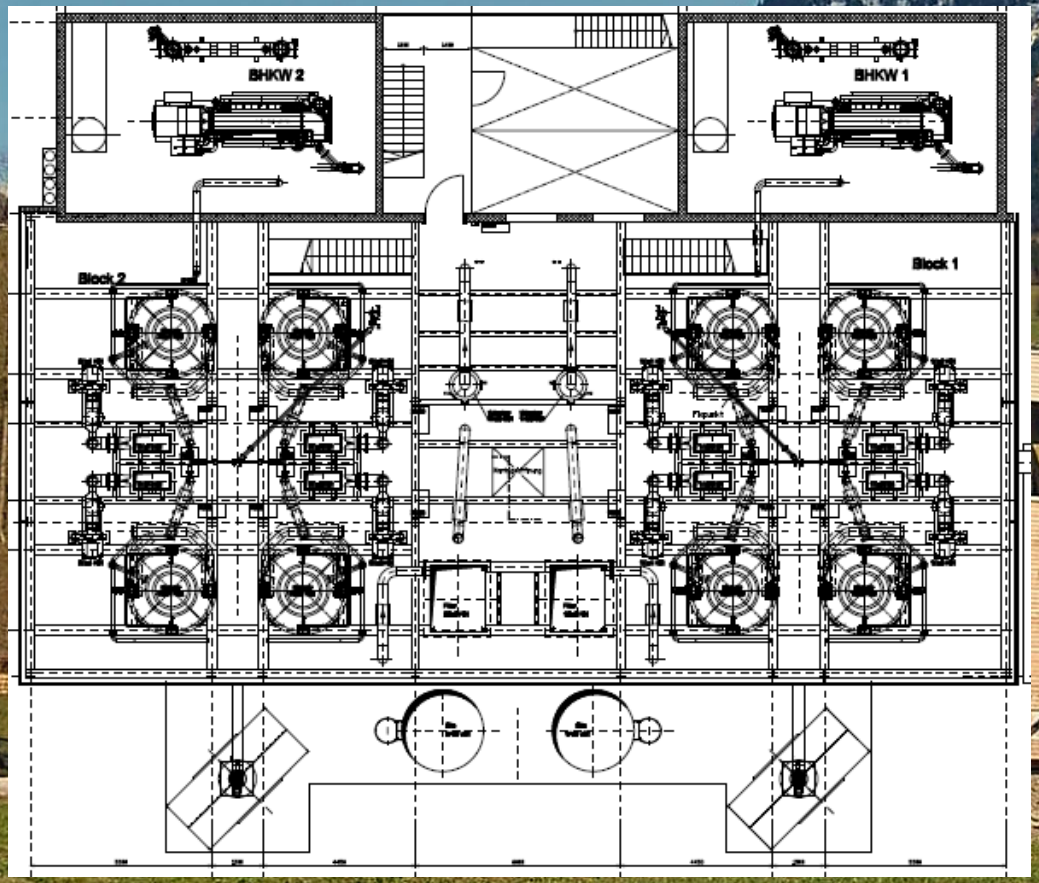


2007: Demonstration Plant, 300 kWel

2008: 1st industrial plant, 1 MWel

background

gasification plant 1000 kWel



heat grid

Pilatus Flugzeugwerke

Rieden Süd

Bund MFH Breiten

Allmedhuisli

Swissint

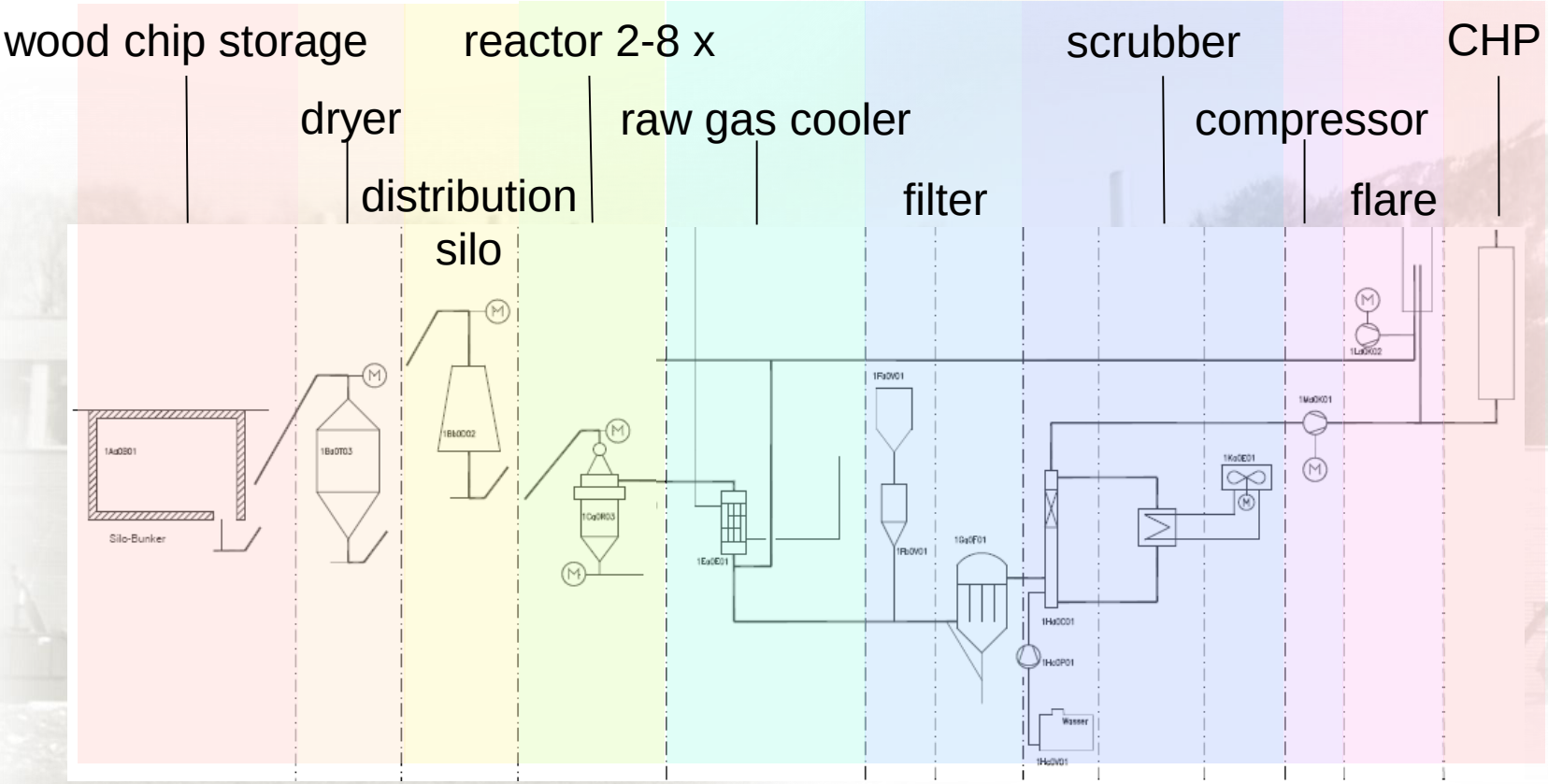
Plant HVNW

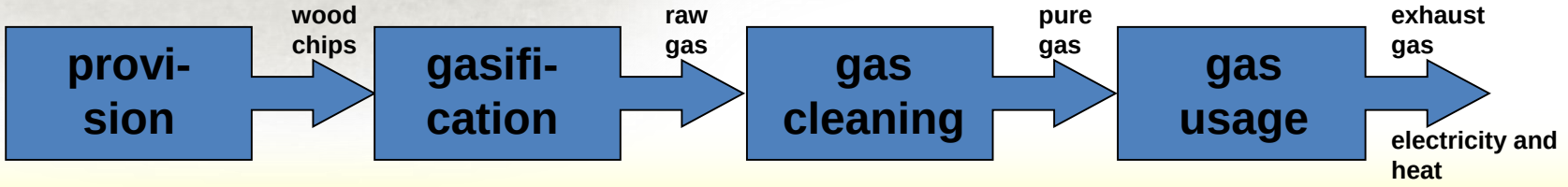
Kanton Kreuzstrasse

fuel source: demolition wood

Treatment: Coarse shredder → iron separation → fine shredder → non-iron separation → screening fine/medium/coarse

flowsheet

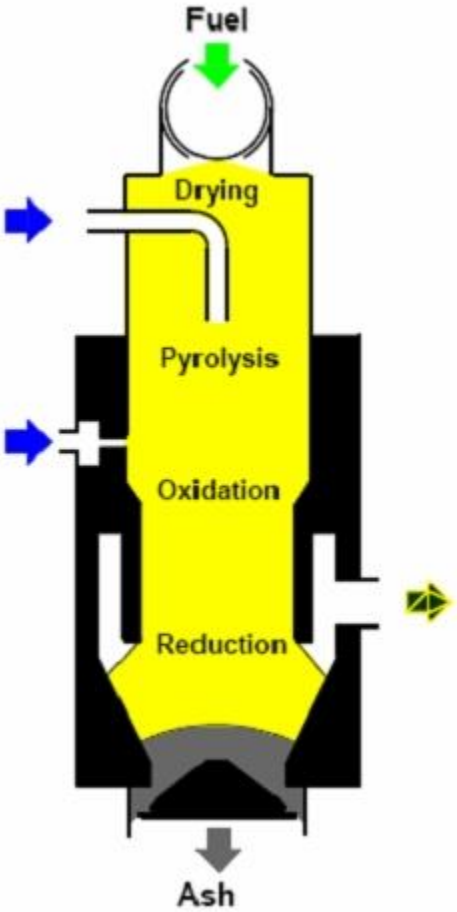


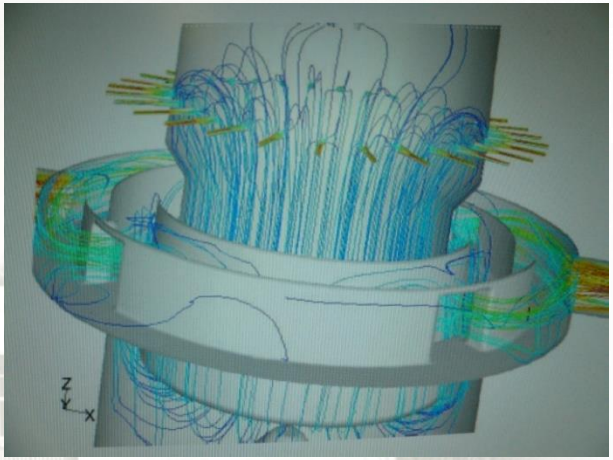


process description

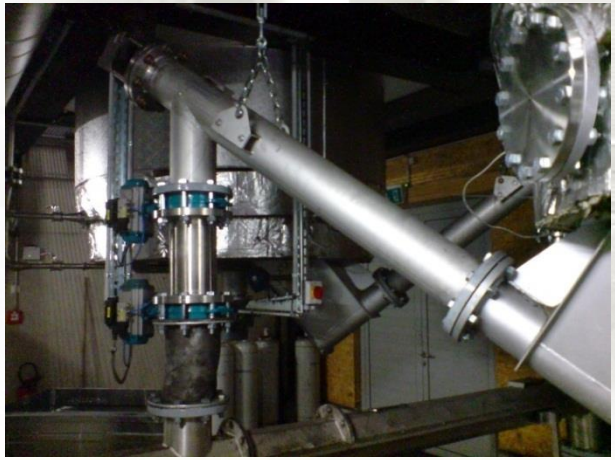
reactor 3rd generation

reactor head





fluid dynamics (CFD)

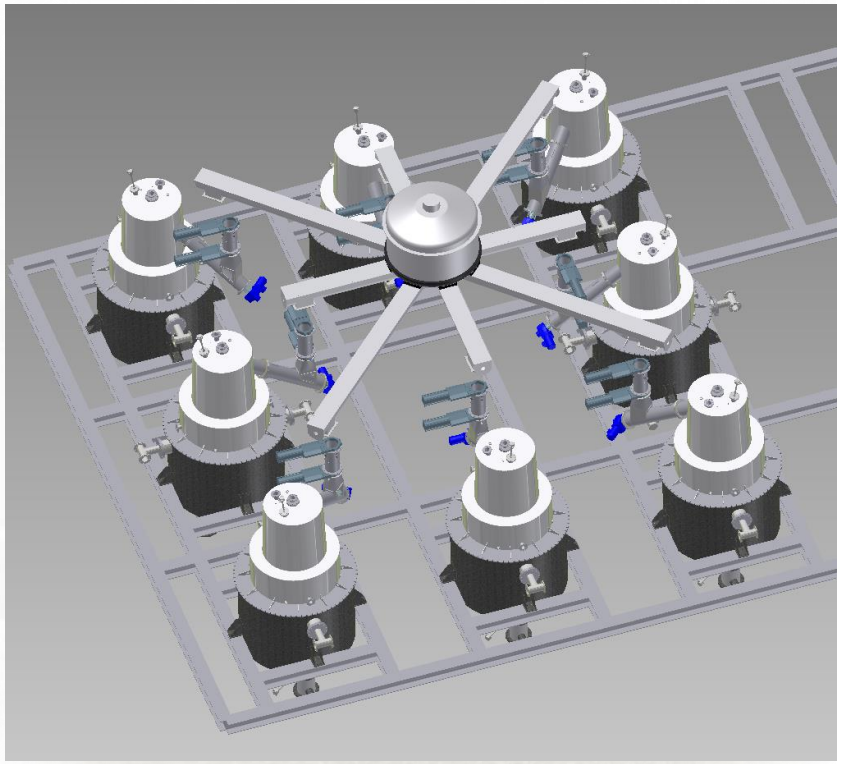


ash screw conveyor + valves

ash (grate air active)

process description

SIRION: modular arrangement



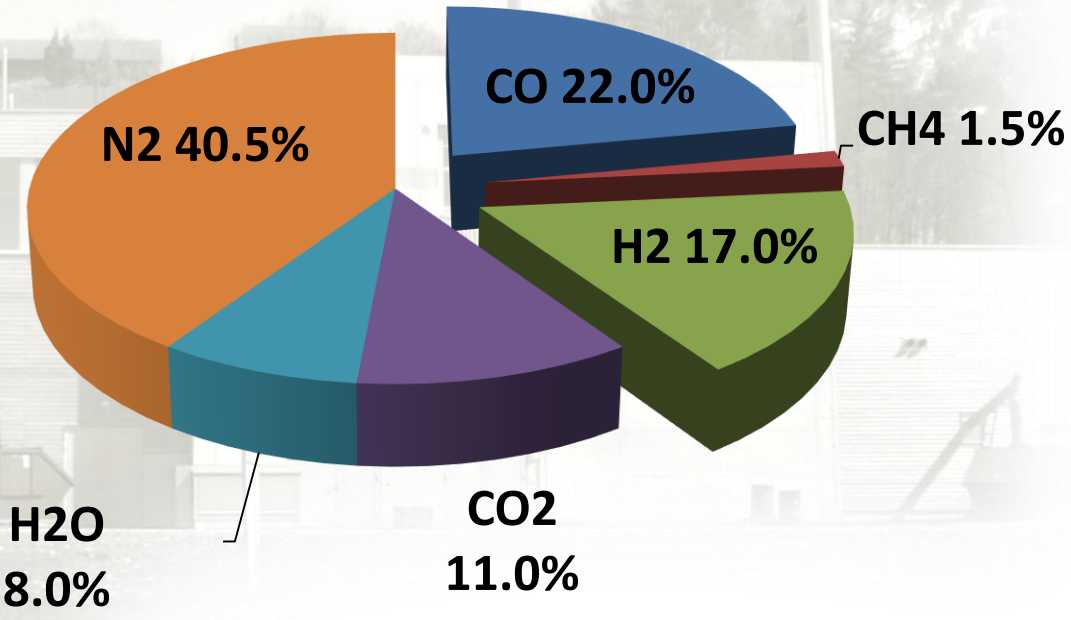
Benefits of the multi-reactor plant:

- Up to 8 reactors in one block
  - Max. 1,4 MWel / block
- Redundant gas production
  - By using several reactors in one block the gas production has an extremely high availability
  - if one reactor is offline, the others keep working
    - ➢ No shutdown of the whole plant, only a reduction of the power output
    - ➢ Maintenance can be done in the regular shift without any work peak
- One service reactor in addition
  - Full gas production even during the annual reactor revision

gas composition

gas composition

element	content
CO	**22,0%**
CH_4	**1,5%**
H_2	**17,0%**
CO_2	**11,0%**
H_2O	**8,0%**
N_2	**40,5%**
heat value	**1,43 kW/Nm³**



gas cleaning system

gas cooler

lime dosage

gas filter

PTFE filter bag

scrubber

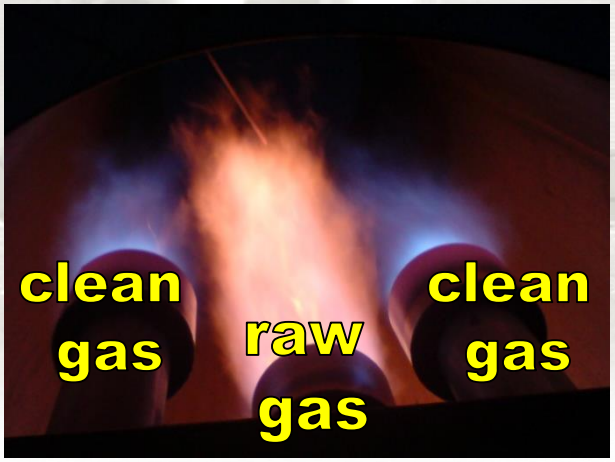
recirculation pump

gas analysis

Root´s compressor

CHP / flare

CHP: GEJ 320

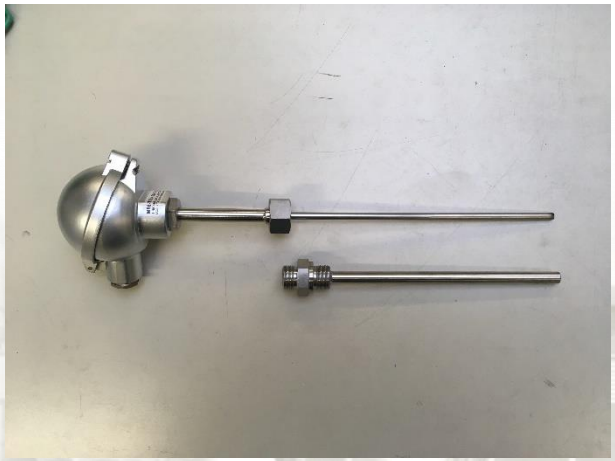


flare

oil change every 3000 operating hours
with oil tank extension (1500 without)

process description

indication of gas volume



temperature sensor

pressure sensor

Air mass flow meter

Gas volume

- No direct measurement of the volume
- Speed of the blower indicates the total gas volume
- The combination of the values of gas exit temperature, suction pressure and gasification air mass indicates the actual production of a single reactor
- Additional: speed of primary air blower

rotary piston compressor

GSMA

measurement of gas composition

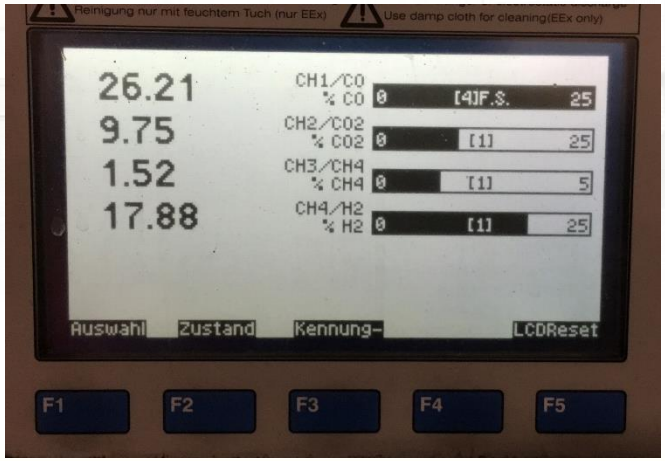
heated extraction unit

blower, dryer, filter

4 channel analysis module

Gas composition

- Measurement principle NDIR / UV
- Gas has to be free of particles and condensate
- Daily maintenance
- Heated extraction unit seems to work better than heated extraction pipe
- Back pressure regulation for constant gas flow



display at analysis module

measurement of oxygen

blower, dryer, filter

O2 analysis module

redundant O2 analysis module

Oxygen content

- Measurement principles
  - Paramagnetic (PO_2)
  - Electrochemical (EO_2)
- Gas has to be free of particles and condensate
- Daily/weekly maintenance

display for redundant analysis module

CO detection

gas analysis

CO monitor

Root´s compressor located next to the CHP

portable CO monitor

Safety first!

- Reactors and gas cleaning system are working under negative pressure
  - No toxic gas can leak from the system, only air can break in
  - Entrapped air is immediately detected by an redundant 0_2 monitoring system
  - LEL at 4%, shutdown at 2% O_2
  - No ATEX-equipment necessary
- Only the CHP room contains pressured gas pipes
  - Secured by CO monitoring and automatic ventilation systems
- Additional operator protection by portable CO monitor

end of presentation

Thanks to

- **the Genossenkorporation Stans as the operating company of the cogeneration plant „Holzverstromung Nidwalden“ for the constructive cooperation and much more**
- **the audience for your attention**
- **questions?**