

# **DRY GAS CLEANING**

A regenerative tar-condensing heat exchanger

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**BIO-ENERGY  
ENLARGED PERSPECTIVES**

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# **The overall objectives of the Dry gas cleaning project**

**To produce a gas that can meet the  
specification for gas engine through  
reliable, up-scalable and cost-effective  
operation of a gasifier through tar  
elimination and no waste water  
treatment**

# Project summary

- **The Partnership**
  - CIRAD as research organization for modeling, optimization and test (France)
  - TKE complete unit supplier (Denmark)
  - DKT technical assistance for process development (Denmark)
- **The budget** 1.2 M€ with 50% EU support
- **The immediate objectives**
  - To perform a rough gas cleaning in a hot cyclone
  - To condense the tar in a gas-air heat exchanger.
  - To change side and direction in the heat exchanger and evaporate the captured tars and send them back into the gasifier.

## The downdraft gasifier with dry gas cleaning system view



## Main conclusions

Very low tar content observed and related low efficiency of the dry gas system

Dry gas system useless with appropriate gasifier design

Long test operation with engine without problems

# PROJECT ACHEIVMENT

## → SCIENTIFIC

- Dry gas cleaning unit conception :
  - Regenerative heat exchanger design and assessment
  - Very little problems with the cyclone for 1100 hours (cleaning)
- Tar behaviour study :
  - Gas sampling line conception (associated to Tar protocole)
  - Condensation observed with high tar concentration
  - Tentative model for tar condensation

## → INDUSTRIAL

- High temperature cleaning system construction :
  - Ceramic candle filter not adapted for small scale
  - Multicyclone construction
  - Heat exchanger construction but emphasis on gasifier design
  - Severe problems of corrosion in hot gascoolers
- Complete small CHP plant test and proven for 500 hours

# PROJECT ACHEIVMENT (2)

- **Long term collaboration between partners**
- **Demo plant under construction (gasifier on 2,3 mw sold to Gjøl chp plant)**
- **Gasifier on 150 kw sold to Hitachi, japan**
- **Licence sold to Kanara Engineering, india**
- **New strep project enlarge consortium for SOFC fuel cell integration**



# COMMERCIAL RESULTS

TK Energi is presently negotiating 4 gasification projects ranging from 1,2 to 7 MW.