TAR GUIDELINE

Jacob H.A. Kiel

Energy research Centre of the Netherlands (ECN)
ECN Biomass

P.O. Box 1, 1755 ZG Petten The Netherlands
Tel. +31 224 564590, Fax +31 224 568487, E-mail: kiel@ecn.nl
www.ecn.nl / www.tarweb.net

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest ,16-17 October 2003

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Introduction

- Problem: tar handling is a major challenge in biomass gasification, but ….
  confusion with respect to definition and measurement

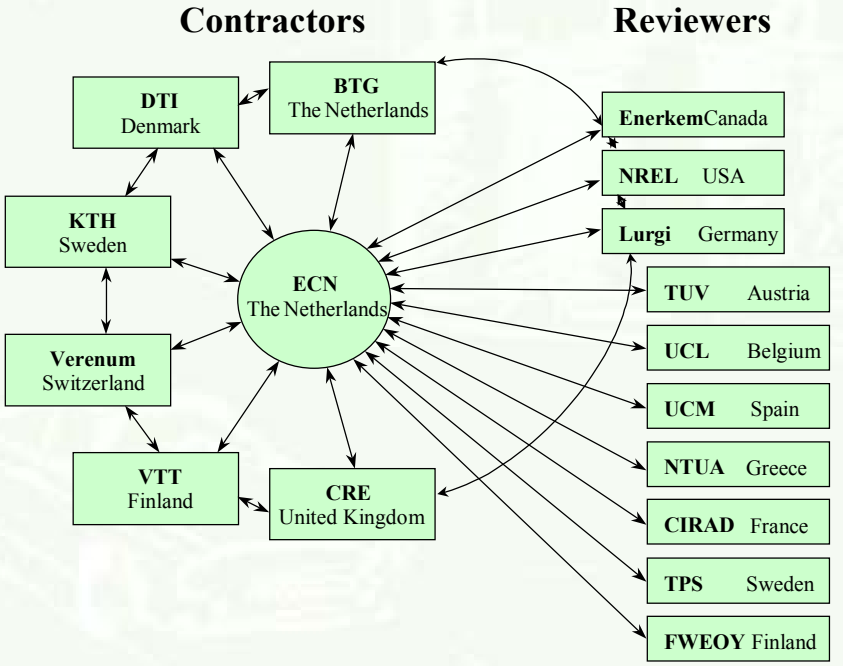
- Definition of tar:
  - Accept that tar is an ambiguous term
  - Measure using own definition, but report in detail what/how you measure
  - Use one method for comparison (‘mother method’)

- First attempt: 2 Protocols by 2 international working groups presented in Würzburg in 1998

Introduction

- Aim: Development of a general, widely-accepted method (Guideline) for sampling and analysis of tars and particulates from biomass gasification gases

- 17 partners from Europe and North-America

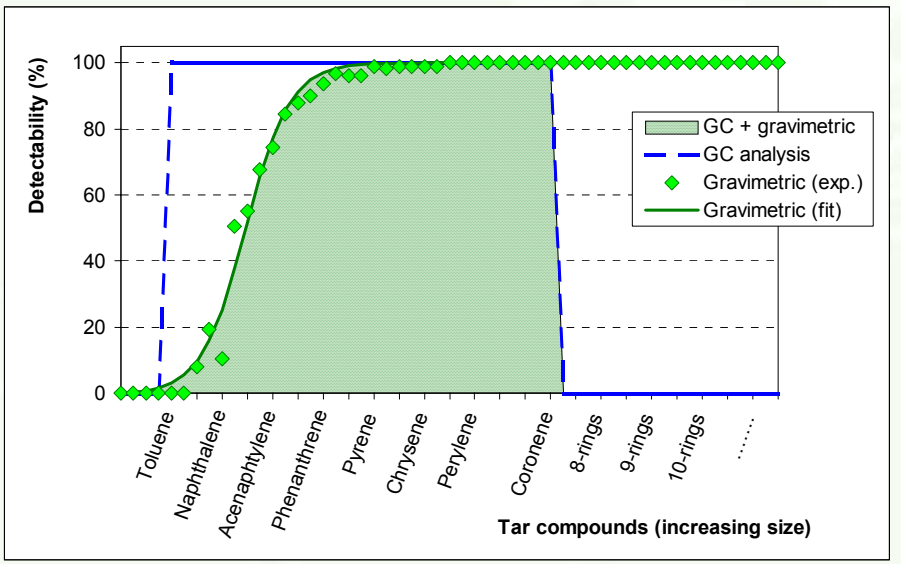


Introduction

- The Guideline should:
  - Describe necessary equipment and procedures for sampling, post-sampling and analysis of tar
  - Be suitable for tar measurement at different types of gasifiers (updraft, downdraft, fluidised-bed), and at a wide range of conditions (0 - 900 °C, 0.9 - 60 bar) and concentrations (1 mg/m^3_n - 100 g/m^3_n)
  - Allow for simultaneous measurement of particulates and soot

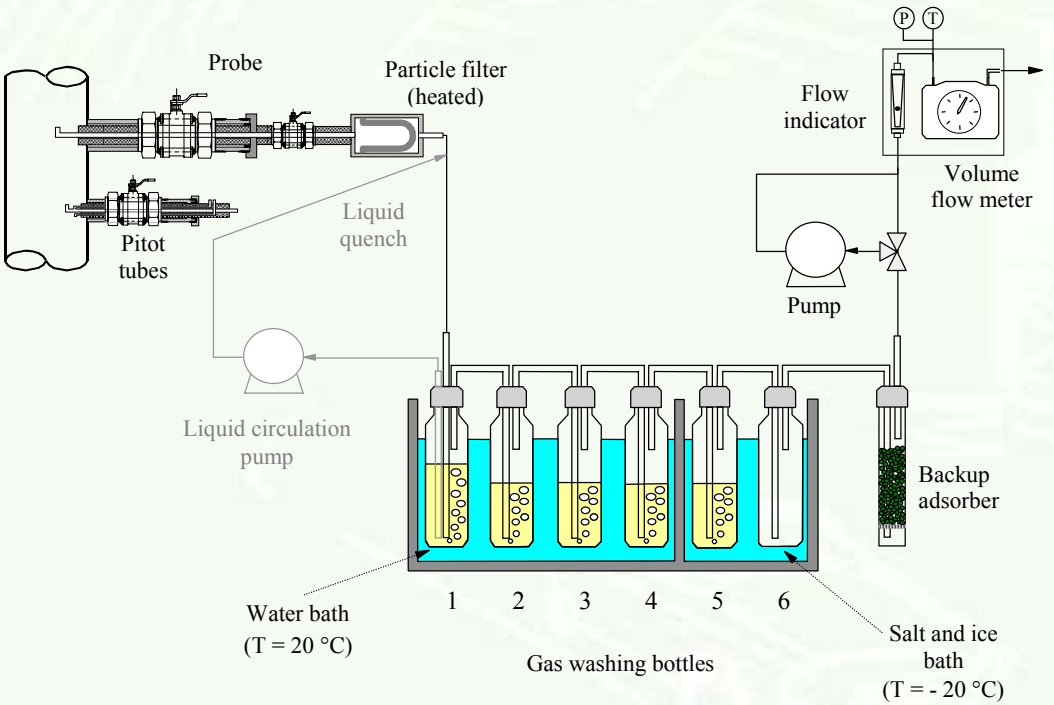
Outline of the Guideline

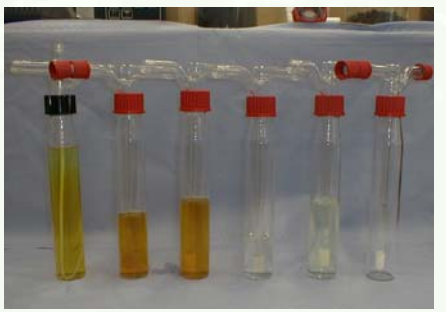
- Key elements:
  - Sampling: isokinetic, high-temperature particulate filtration, tar absorption in a solvent (iso-propanol)
  - Analysis: concentration of **gravimetric tar** from evaporation residue at standard conditions (T, P and t)
  - Analysis: concentration of **individual tar compounds** from GC analysis



Outline of the Guideline

- Tar and particulates sampling in a modular set-up





Application

- Comparison of tar measurement data between developers of gasification technology
- ‘Mother method’ for valuation/validation of other tar measurement methods
- Allow manufacturers of gasifiers, gas cleaning systems and gas engine or turbine generator sets to better specify the technical performance of these subsystems and to better define tolerances
- Thus, indirectly, the Guideline allows to give better guarantees to end users concerning overall system performance, system life time, etc. (reduction of non-technical risks)

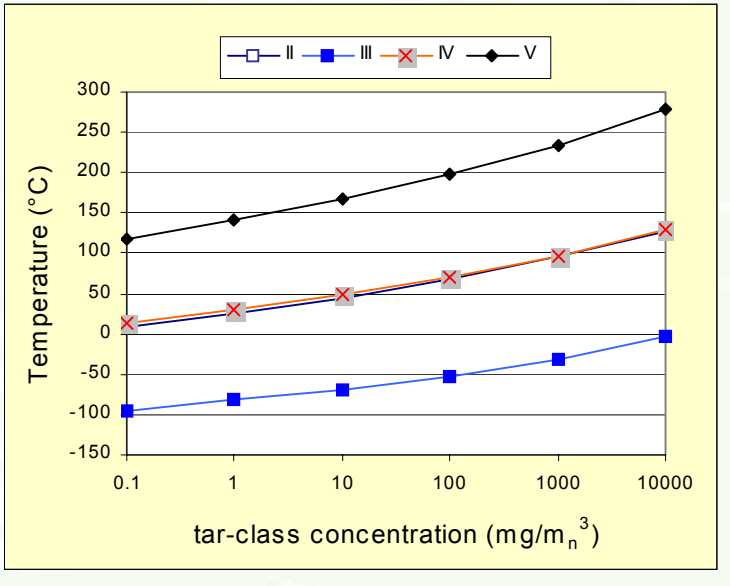
Application - a practical example

- Translate measurement data into condensation and water solubility behaviour

Tar classification

- Class I: Heavy GC undetectable Tars
- Class II: Heterocylic compounds (phenol, cresol)
- Class III: Aromatic compounds (toluene, xylenes, **not benzene!)**
- Class IV: Light Polyaromatic compounds (2-3 rings, naphthalene, indene)
- Class V: Heavy Polyaromatic compounds (4-7 rings, fluoranthene, pyrene)

Tar dewpoints
(as calculated by ECN tar dewpoint calculation programme)



Conclusions

- Guideline for sampling and analysis of tar and particulates available (see www.tarweb.net)
- Many institutes use the Guideline already (ECN, VTT, IVD, Umsicht, Verenum, DTI, BTG, ……)
- Use the Guideline when appropriate, else use (simpler) method that has been compared with the Guideline (e.g., SPA)
- Standardisation (e.g., CEN/ISO) will further strengthen the method as a widely-accepted 'mother method'

Acknowledgement

- The following organisations are acknowledged for their financial support:

European Commission

Netherlands agency for energy and the environment (NOVEM)

Swiss Federal Office of Education and Science

US Department of Energy

National Resources Canada