

Tuesday 13 November 2012

Site tour to Tecnimont KT membrane reforming pilot plant at Chieti

Bus drive from Rome to Chieti for two hours each way, free time in the evening



Wednesday 14 November 2012

8:30 Session B: Membrane Implementation & Operation

B1. Simulation and modelling of membrane unit

- 8:30-8:55 - *Criteria for Membrane Reactor Design: Thermal Effects, Autothermal Design and Radial Gradients* (Moshe Sheintuch, Technion. Israel)
- 8:55-9:20 - *Membrane reactor simulator developed in CACHET-II* (John Morud, SINTEF. Norway)

B2. Process integration and technoeconomics

- 9:20- 9:45 - *Membranes in Solar Steam reforming* (Alberto Giaconia, ENEA. Italy)
- 9:45-10:10 - *Techno-economic assessment of CO2 capture in IGCC plants via Pd-based membranes* (Matteo Gazzani, Politecnico di Milano. Italy)
- 10:10- 10:35- *CACHET II - Process integration and technoeconomics of pre-combustion carbon capture natural gas fired combined cycles employing hydrogen selective membranes* (Aggelos Doukelis, NTUA. Greece)

10:35 – 11:00 coffee break

B3. Membrane stability and robustness under long-term operation in industrial environment

- 11:00-11:25 - *Membrane development for H2 separation at Shell* (Arian Nijmeijer, Shell. The Netherlands)
- 11:25-11:50- *Long term testing results of different membrane suppliers* (Barbara Cucchiella, Processi Innovativi Srl. Italy)
- 11:50-12:15 - *CACHET-II stability test results* (Andreas Goldbach, DICP. China)

B4. Start-up/shut-down/maintenance requirements

- 12:15-12:40 - *Membrane reforming pilot testing: Tecnimont KT experience* (Annarita Salladini, Processi Innovativi Srl. Italy)
- 12:40-13:05 - *Operations of a 40 Nm3/h-class membrane reformer system at Tokyo Gas* (Hisataka Yakabe, Tokyo Gas. Japan)

13:05- 14:00 Lunch

Session C: Alternatives

C1. Alternative applications:

- 14:00-14:25 - *Membrane based fuel reformer for CHP applications* (Fausto Gallucci, Eindhoven University of Technology. The Netherlands)
- 14:25-14:50 - *Potential uses of Pd-membranes in thermochemical biorefinery operations* (Kyriakos Panopoulos, NTUA. Greece)

C2. Self-supported membrane:

- 14:50-15:15 - *Development and applications of Pd-Ag dense permeator tubes* (Silvano Tosti, ENEA. Italy)

15:15- 16:00- Session D: Closing discussions

D1. Interactive discussion

D2. Closing speech



Pd Membrane Technology Scale-Up Workshop

**12-14 November 2012
Rome, ITALY**

Venue

Visconti Palace Hotel
Via Federico Cesi 37. Rome, Italy



Deadline

Please register by **October 26th, 2012.**

Guaranteed room reservation at the Visconti Palace hotel if register by

September 14th, 2012.

Registration

<http://cachet2.eu/node/89>

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Scope & Objectives

Thanks to its outstanding hydrogen selectivity, palladium membrane has attracted extensive R&D interest in the 21st century. It is envisaged as a potential breakthrough technology on hydrogen production, with promising applications for hydrogen power, refining and petrochemicals, hydrogen vehicles and many more. CACHET-II, CARENA and CoMETHy are three membrane research projects funded by the European Commission through FP7. Although the projects were originated from three different funding priorities, CACHET-II under the ENERGY, CARENA under the NMP and CoMETHy under the FCH JU priority, the three projects have found commonality and synergy in their research objectives. It is believed that a collective workshop to discuss “palladium membrane scale-up challenges and solutions” would greatly benefit the three European projects, as well as other membrane developers in the world.

The workshop covers a good breadth of topics that are critical for palladium membrane technology scale-up: from the fundamentals of palladium membrane, support and seal manufacturing, to various concepts of membrane module design and system integration; from lab-scale long-term stability testing results to industrial pilot plant operational insights. The event brings together representatives of academia, research institutions and industrial stakeholders, and will form a unique knowledge sharing experience for all participants.

CACHET-II is an EC FP7-funded project with a total budget of €5.2m, conducted by an 8-member consortium of leading research institutes, universities, energy businesses and engineering companies. It is coordinated by BP, aiming to develop innovative membrane technology to increase the energy efficiency of pre-combustion CO₂ capture in natural gas- and coal-fired power plants.

The CARENA project (Large collaborative project) aims to create technologies - CAlytic Reactors based on New mAterials- enabling an efficient conversion of light alkanes and CO₂ into higher value chemicals. 18 partners are involved in this project and coordinated by ECN- The Netherlands.

<http://www.carenafp7.eu/>

<http://www.cachet2.eu/>

The COMETHY project is a collaborative project co-funded by the Fuel Cells and Hydrogen Joint Undertaking with a total budget of ca. 4.9 M€. The project is conducted by 12 organizations coordinated by ENEA (Italy). The general objective is to develop a compact & fuel-flexible membrane reformer for hydrogen production, adaptable to different heat sources.

<http://www.comethy.enea.it>

Workshop Programme

Monday 12 November 2012

8:00 - Registration

9:00- 10:00 - Opening & Welcome

9:00-9:30 - Opening speech

9:30-10:00 - Project introduction of workshop partners

- *Introduction to CoMETHy : Compact Multifuel-Energy To Hydrogen converter (Alberto Giaconia, ENEA. Italy)*
- *Introduction to CARENA: Pd-membrane based reactors for C1 to C4 conversion (Arend de Groot, ECN. The Netherlands)*
- *Cachet II: Carbon capture and hydrogen power production with palladium membrane (Bai Song, BP. United Kingdom)*

10:00 – 10:20 coffee break

Session A: Individual Scale-up Challenges

A1. Upscaling of Pd/Pd-alloy deposition

- *10:20-10:45 - Very large deposition equipment for industrial membrane manufacturing (Laurent Dubost, HEF. France)*
- *10:45-11:10 - Fabrication of Pd-based membranes by magnetron sputtering – possibilities and status at SINTEF (Thijs Peters, SINTEF. Norway)*
- *11:10-11:35 - Preparation of supported Pd alloy membranes (Alfredo Pacheco, Tecnalia. Spain)*
- *11:35-12:00 - Opportunities and restrictions of Electroless Plating as deposition technology for Pd(alloy) membranes (Marcel den Exeter, ECN. The Netherlands)*

12:00- 13:00 Lunch

A2. Upscaling of membrane support technology

- *13:00-13:25 - Overview of porous ceramic tubes processing and coating (Fabiano Rodrigues, Saint Gobain. France)*
- *13:25-13:50 - Multi layer design of sintered metal support structures for Pd-membranes (Harald Balzer, GKN. Germany)*
- *13:50-14:15 - Development of ITM-based palladium membranes for use in hydrogen production (Wolfgang Schafbauer, Plansee. Austria)*
- *14:15-14:40 - Presentation by CTI on ceramic support (details to be confirmed)*

14:40 – 15:00 coffee break

A3. Membrane seal technology development

- *15:00-15:25- Ceramic-to-metal seal development by IMR (Chunhai Jiang, IMR. China)*
- *15:25-15:50 - Presentation by Sinyuan, China on general seal development (details to be confirmed later)*

A4. Membrane module mechanical design:

- *15:50- 16:15 - Membrane module design: a general introduction (Emma Palo, TKT. Italy)*
- *16:15-16:40 - Design and performance aspects of Pd-membrane reactors for methane to methanol conversion (Frans van Berkel, ECN. The Netherlands)*
- *16:40-17:05 - Membrane module design of CACHET-II project (Clemence Bourles, Technip. France)*

20:00 - Dinner & Networking