Using solar in managing water for Industry

IEA SHC Task 62 :
Solar Energy in Industrial Water Management

SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

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IEA PVPS & SHC Workshop

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UNSW, Sydney, Australia
5th December, 2018

Task organised by: Dr Christoph Brunner (Operating Agent)
AEE INTEC – Institute for Sustainable Technologies, Austria

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VICTORIA UNIVERSITY
MELBOURNE AUSTRALIA

Problem Definition

- 20% of world water use is devoted to industrial use
- Fresh water is a scarce resource
- Disposal of wastewater requires expensive energy intensive treatment, or destructive to environment
- Desalination use rising exponentially

Solar thermal → WW treatment @ISEC 2018

- Highlighted cutting edge progress towards:
  - Decarbonizing the industry
  - Capturing and reusing thermal energy
  - Solar heat and PV technologies
  - Sustainable water treatment (biomass to energy, nutrient recovery, heat extraction)

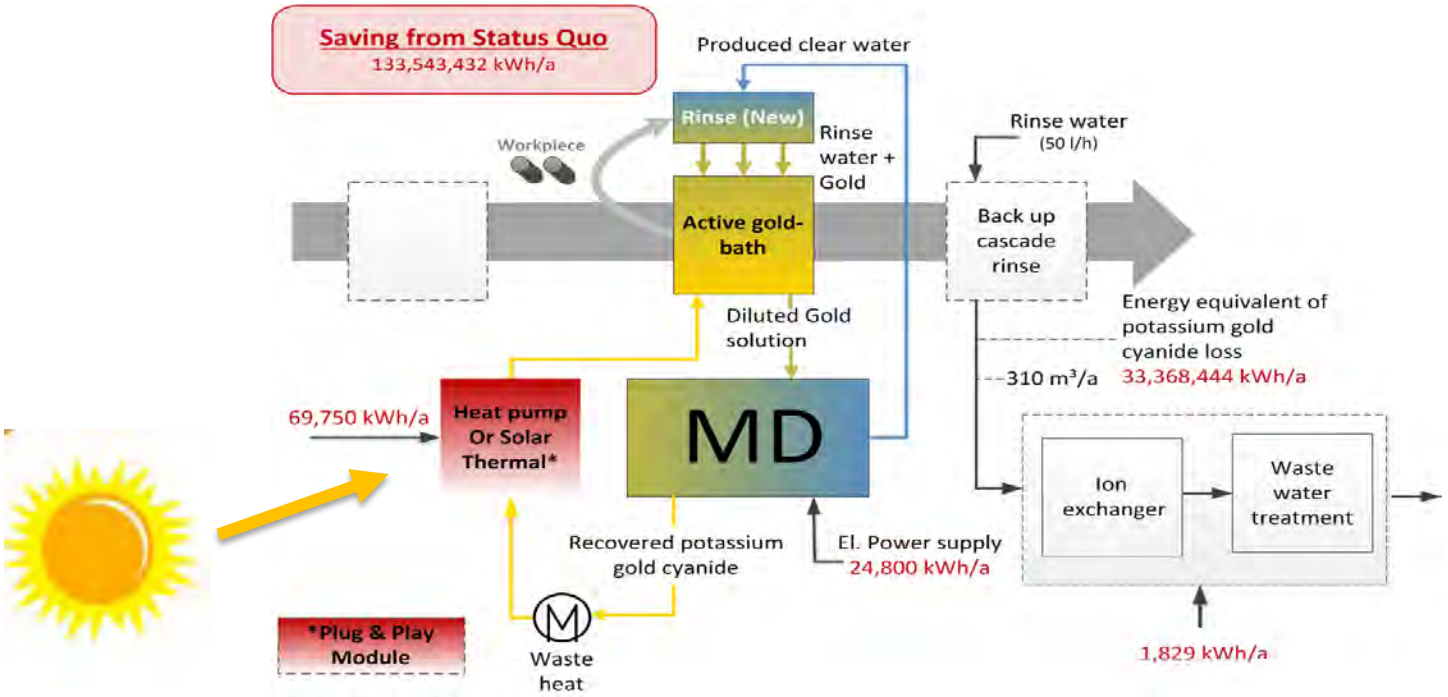
- Direct use of solar thermal to treat waste water not well represented
  - Opportunity to match progress on solar thermal technologies with need to treat wastewater sustainably

Scope of the Task

- To develop and provide the technical and economical possibilities for applying solar thermal energy and radiation to disinfect, decontaminate and separate industrial process water and wastewater in order
  - to push the solar water treatment market,
  - solve water problems at locations with abundant solar energy resources and
  - reduce the fossil-fuel consumption
- All low temperature solar radiation technologies supplying either thermal or photon primary energy
- For solar thermal turn key provider of SHIP, water technology sector (e.g. membrane producer,…), engineering companies and producing industry
- Identifying new technologies, innovative fields of application and business opportunities

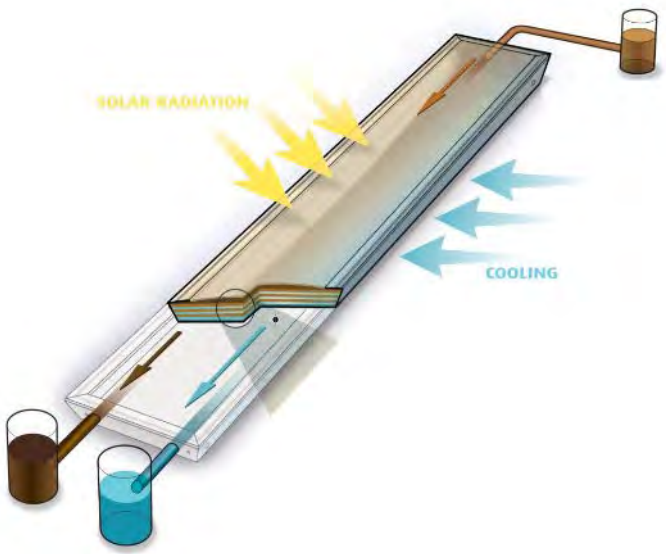
Examples / Projects

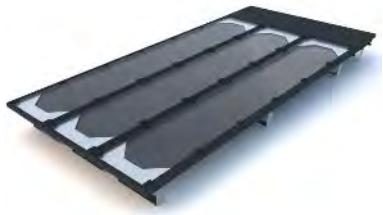
- H2020 project *"ReWaCEM"*
  - MD for recovery of **gold** and **palladium** streams
  - Membrane distillation as low-ex separation technology for recycling valuables from process baths in printed circuit board - PCB industry



Examples / Projects

- Company SOLARDEW
  - Small scale desalination
  - New solution for producing drinking water from virtually any source of polluted, contaminated or saline water by utilizing solar radiation and the use of a MD process
  - Main markets include developing countries, emergency relief (e.g. in case of natural disasters), military, etc.

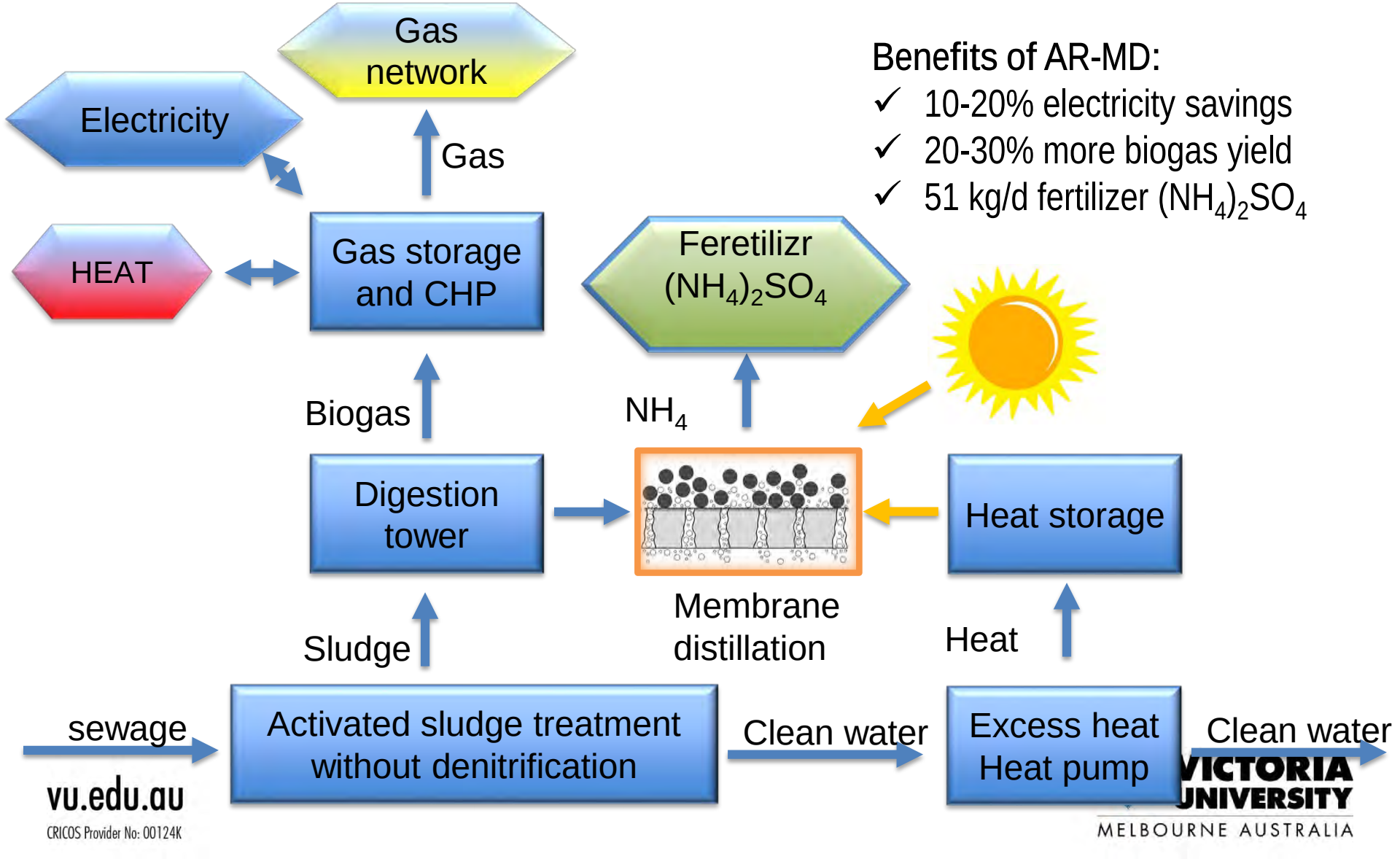




SOLARDEW
CLEAN WATER SOLUTIONS

Examples / Projects

- Ammonia recovery membrane distillation (AR-MD) at WWTP

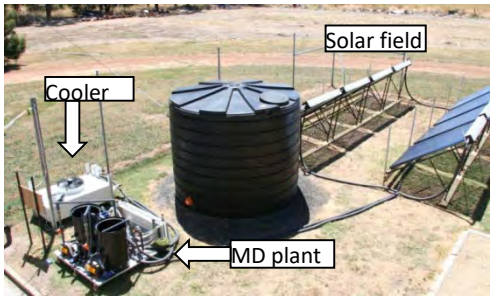


Benefits of AR-MD:

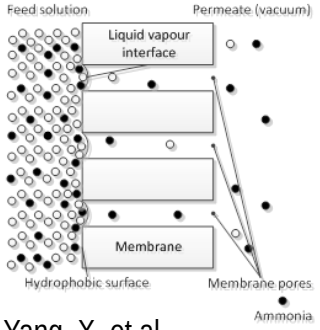
- ✓ 10-20% electricity savings
- ✓ 20-30% more biogas yield
- ✓ 51 kg/d fertilizer $(NH_4)_2SO_4$

Subtasks

- **Subtask A:** Thermally driven low temperature water separation technologies and recovery of valuable resources (Germany F-ISE)
- **Subtask B:** Solar Water Decontamination and Disinfection Systems (Spain CIEMAT)
- **Subtask C:** System integration and decision support for end user needs (Australia – Victoria University)



Kesieme, U. K., et al. (2013), Desalination, v323, p66



Yang, X. et al, Membranes, 4, p40

SUBTASK C

System integration and decision support for end user needs

Prof Mikel Duke (subtask leader),
Dr Cagil Ozansoy and Dr Wei Yang
Victoria University

Subtask C - Main Objectives

- System integrations concepts of solar thermal energy separation technologies
- Development of additional sector in SHIP Databank of realized installations
- Increasing awareness and basis for decisions taking in different technologies for target groups

www.sundropfarms.com

N. Dow, M. Duke, et al (2016). Desalination, 391 p30-42.
N. Dow, M. Duke et al (2017). Environmental Science: Water Research & Technology.

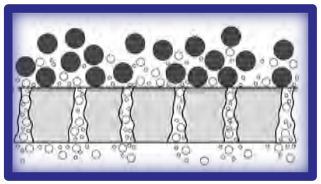
Subtask C - Core Activities

- Information gathering
- Information on current examples, established technologies and emerging technologies
- Decision making framework/guidelines development
- Interview industry experts
- Map of technologies as proposed solutions to end user questions, including weighting/metrics around maturity, cost, efficiency, reliance on other technologies, etc.
- Guidelines for external consultation and target groups
- Distribute draft to experts for feedback on relevance and ease of use
- Potential study
- Potential of increase of solar applications
- Awareness, dissemination and training

Progress

- Task approved
- Kick off meeting – 1-2 October, Graz, Austria
- Commence activities

- Website: http://task62.iea-shc.org/



Membrane distillation

Seeking your input!

- Interested to receive your input to the Technology List!
- Register a technology involved in utilizing solar thermal energy to treat water

Solar water treatment technology list

Solar Energy in Industrial Water & Wastewater Management

http://task62.iea-shc.org/

Version	
Number	1
Date	13-Nov-18

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Background
This document has been developed to capture the relelevant technologies for solar thermal and photo driven water treatment in the form of a convenient reference list.
Information included in this listing is intended to be utilised for preparation of documents that recommend technologies for utilisation of solar energy for wastewater treatment.
This list may be made available openly for download on the task website.
For more information, visit the website: http://task62.iea-shc.org/

Instructions	
1	Add any technology and associated details to the list below, where the technology is solar thermal and/or photo driven and can be utilised or play a key role in water treatment.
2	The technology should be for wastewater treatment (i.e. not drinking water treatment)
3	The technology and its details should be suitable for including in published documents
4	Technologies excluded from this list are photovoltaic and reverse osmosis
5	Populate the list with details under as many headings as possible.

Technology list

No	Name	Supplier or Researcher affiliation	Basic description	Technical performance characteristics (e.g. kWh thermal per kg COD removed) or other key performance indicators	Pros and cons	Performance (i.e. validated or not)	Demonstrati
1							

Thank You

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