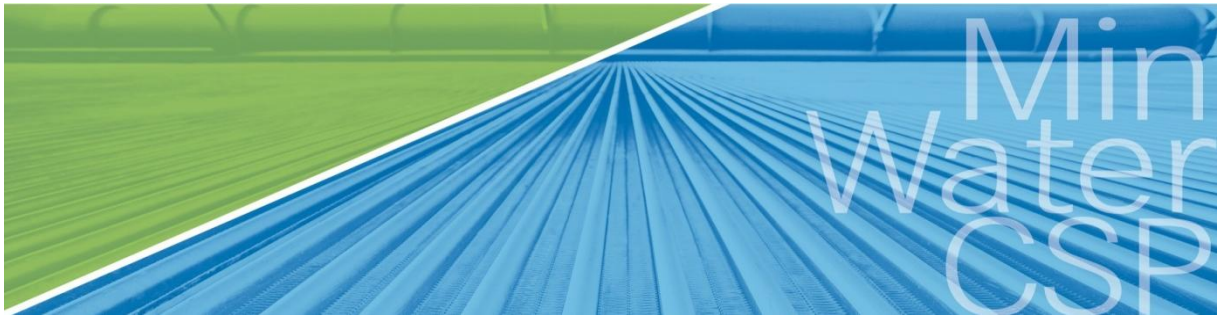

MinWaterCSP Newsletter

Edition: December 2016

Topics

1. Editorial

Dear Reader,

Our newsletters focus on minimized water consumption in CSP plants. In this second edition of the MinWaterCSP newsletter we present more about the project's approach on our cooling system specific axial fan design and optimization in Section 2 *Special Topic "Large diameter axial flow fans for the power and petrochemical industries"*. In addition we like to introduce to you specific *News* from our partners as well as our Blog section on our website.

From 2017 on our newsletter will be published every four months. We address it to all stakeholders who are active in the field of Concentrated Solar Power Plants, from power plant developers / operators and technology suppliers to the scientific communiy as well as governmental bodies.

If you have received this newsletter via a project partner's contact, please feel free to subscribe at our website to have the newsletter automatically forwarded to you in the future.

Enjoy reading!

Falk Mohasseb
Coordinator of MinWaterCSP
Kelvion Holding GmbH

2. Special topic: Large diameter axial flow fans for the power and petrochemical industries

Partners involved

- NOTUS Fan Engineering, South Africa
- Sapienza University of Rome, Italy
- Stellenbosch University, South Africa
- Kelvion Thermal Solutions, South Africa

Importance of topic

Concentrated Solar Power (CSP) plants are located in regions with abundant solar resource. Water availability in such a region is usually limited. As result CSP plants increasingly use a dry-cooled process to condense the steam that forms part of the power generation cycle. Direct dry-cooled condensing systems make use of axial flow fans to force or induce the flow of air through the cooling system. These fans are a source of parasitic power loss for a CSP plant.

Current state of art

Axial flow fans are supplied to CSP installations from a range of existing fan designs, linked to available fan blade mould sets. The best possible solution for a customer is therefore based on a fan selection process where the system requirements are matched to the range of available fan designs.

The MinWaterCSP approach

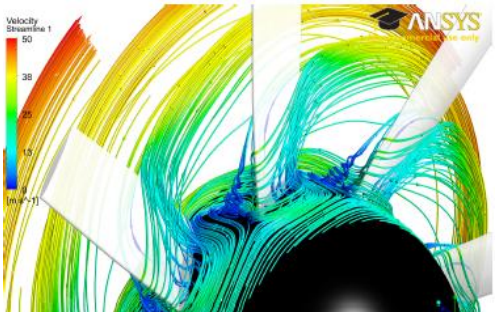

Figure 1: CFD results showing streamlines through an axial flow fan at low flow rates (Louw, 2015)

The approach proposed by the MinwaterCSP project is to have a cooling system specific fan optimized design. The fans are designed for optimum fan static efficiency in CSP plant cooling systems. The noise characteristics of the fans are improved by analysing and adjusting the results obtained from Computational Fluid Dynamics (CFD) simulations of the rotating fan blades (see Figure 1).

The Air Cooled Condenser (ACC) is analysed using CFD to investigate and improve its performance under windy conditions. Small-scale models of the prototype fan are tested in a BS 848, type A fan test facility (see Figure 2), located at Stellenbosch University.

Figure 2: Small-scale fan in BS848 fan test facility (Louw, 2015)

The fan blade manufacturing approach is based on novel cost-optimized, custom-made fan blade moulds. The appropriate resins are used in order to produce high quality and high strength fan blades. For the purpose of the MinwaterCSP project, the above process will be validated by manufacturing a large scale (24 ft.) production prototype of a purpose designed fan. The fan will be tested in a fan test facility, to be constructed at Stellenbosch University as part of the MinwaterCSP project.

Possible impact

This approach means that the eventual operator of the CSP plant will be able to increase plant efficiency due to reduced parasitic power losses. Most importantly the expected capital payback period for the plant will be reduced.

References

Louw, F., Investigation of the flow field in the vicinity of an axial flow fan at low flow rates, 2015.

3 News

- **Mobile device for soiling and cleanliness measurements at solar thermal power plants**

Picture: Measurement of soiling and cleanliness at parabolic trough solar mirror with pFlex mobile device

The MinWaterCSP project partners address the challenge of significantly reducing water consumption at CSP plants, while maintaining a high efficiency of the solar plant. To reach these targets measurement devices to assess the cleanliness of the solar collector field are used.

One device for cleanliness control is the new pFlex portable reflectometer, developed at Fraunhofer ISE (Germany) together with the company PSE (Germany). The instrument is easy to operate and offers precise measurements as well as simple data storage and transfer. The reflectometer is operated via a user interface on a mobile phone, further simplified by optional operating buttons on the instrument itself. pFlex is used for manual assessment of soiling at parabolic trough fields, heliostats and linear Fresnel collectors in the MinWaterCSP project. The research team at Fraunhofer ISE works now together with the company ECILIMP at an enhanced and fully automated version to be integrated into the ECILIMP cleaning systems. Questions about the degree of soiling and the efficiency of the cleaning process of the mirrors can now be answered more quickly and precisely. The assessment of soiling in the solar field with our measurement device gives the possibility to adjust to the individual needs of clients and helps to save time and water resources of solar fields.

Author: Fraunhofer ISE, Dipl.-Ing. Anna Heimsath

About PSE, the company which sells pFlex: http://www.pse.de/test-equipment/photovoltaic-modules/sensors/sensors/pflex-portable-handheld-reflectometer/

ECILIMP Termosolar, Spain: http://www.ecilimp.com/termosolar.php

- **Joint Workshop with "sister project" WASCOP**

  In the Horizon 2020 call topic *"LCE-02-2015 Developing the next generation of technologies of renewable electricity and heating / cooling"* two projects have succeeded: WASCOP and MinWaterCSP. Both projects exchange information on their approaches to minimize the water consumption in CSP plants and decided to bundle synergies on specific actions.

  On 29th November 2016, MinWaterCSP and WASCOP collaborated to organise a joint workshop for plant operators, plant owners and service providers to discuss about their solutions to reduce water consumption in the steam cycle and in cleaning, soiling and water treatment in solar fields. The one-day workshop was held at the Plataforma solar de Almeria (PSA) in Spain.

  Besides the representatives of each project, 28 CSP plant stakeholders were present so in total the round table consisted out of over 40 representatives. CSP plant operators expressed a positive feedback about the workshop and the relevance of the project activities, so further activities are planned.

  About WASCOP**:** It is funded by the European Union's Horizon 2020 research and innovation programme (GA No. 654479) coordinated by Commissariat à l'Énergie Atomique et aux Énergies Alternatives from Grenoble, France. It aims to develop an innovative water management of Concentrating Solar Power plants, a more flexible integrated solution comprising different innovative technologies and optimized strategies for the cooling of the power-block and the cleaning of the solar field optical surface.

  The project started in January 2016 and is scheduled for completion in December 2019.

  Link to press-release http://www.minwatercsp.eu/news/mediapress/

- **MinWaterCSP Blogs published monthly**

  Since mid of 2016 MinWaterCSP partners publish monthly blogs on specific experiences, technologies, events and activities they want to share. You find 9 blogs on our website which give an insight in the projects activities, share partners' benefits of the MinWaterCSP project or just to inform about the participation of partners at special events.

  Some examples:

  - Blog #7 – DG Research and Innovation showcased at COP 22 the contribution of research and innovation on climate-related challenges; IRESEN represented MinWaterCSP
  - Blog #6 – New Cleaning Technologies improved!
  - Blog #5 – Fresnel solar collectors' cleaning for maximum efficiency
  - Blog #3 – Full scale test facility on the premises of Stellenbosch University in South Africa

  Stay tuned!

  http://www.minwatercsp.eu/news/blogs/

4 Events – Meet us at…

- Concentrating Solar Power Workshop, Cranfield University, UK; 22 – 24 March 2017; https://www.cranfield.ac.uk/Courses/Short/Manufacturing/Concentrating-Solar-Power-CSP
- Wasser Berlin International, Berlin, Germany, 28-31 March 2017; represented by Waterleau; http://www.wasser-berlin.de/en/
- Technology Cooperation Days, Brokerage Event at Hannover Messe 2017; Hanover, Germany; 25 - 27 April 2017; represented by Steinbeis-Europa-Zentrum; https://www.b2match.eu/technologycooperationdays2017
- Intersolar Europe 2017 – in Munich, Germany; 31 May–2 June 2017; represented by Soltigua; http://www.intersolar.de/de/home.html
- POWER-GEN Europe 2017 – in Cologne, Germany; 27-29 June 2017, represented by ENEXIO Germany GmbH; http://www.powergeneurope.com/en_GB/index.html

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