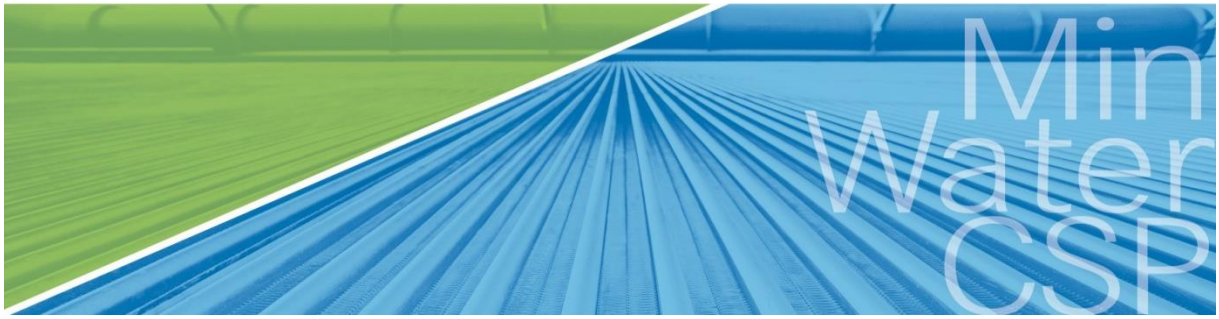


MinWaterCSP Newsletter

Edition: April/May 2017

Topics

1 Editorial

Dear Reader,

Our newsletters focus on minimized water consumption in CSP plants. In this third edition of the MinWaterCSP newsletter we present more about the project's approach related to the axial flow fan development and the Matimba reference fan installation. In addition we will introduce you to the Blog section of our website as well as updates from our sister projects.

Starting in 2017, you will receive our newsletter 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: Axial flow fan development - Matimba Reference Fan installation

Partners involved

- Notus Fan Engineering, South Africa
- Stellenbosch University, South Africa
- Kelvion Thermal Solutions, South Africa

The location at Matimba

During October 2016, a 10-man team consisting of personnel from Notus Fan Engineering, Stellenbosch University and Kelvion Thermal Solutions made the 1,700 km trip from Stellenbosch to Matimba Power Station. Matimba (which is the Tsonga word for "power") is home to the world's largest fan-assisted, air-cooled steam condenser and located on the flat plane of the South African bushveld, close to the small town of Lephalale in the North of the country.

Source of map: Wikipedia

The activities on site

The purpose of the visit: To successfully install a newly developed 30ft axial flow fan within the power station's cooling plant. Of course, the term "successful" can lend itself to many different interpretations. In the present case, it would be to reach operation of the fan without blade failure. In addition, measurements had to be undertaken to investigate whether higher aerodynamic performances (compared to the current state of the art) as well as improved dynamic blade responses, could be obtained. Supported by months of prior laboratory work, this would prove that the approach undertaken in both the fan's aerodynamic and structural design and manufacturing phase is a leap ahead compared to current state of the art techniques.

Picture 1: The "Reference Fan" blades arrives on site

Pictures 2 & 3: A new home for the newly designed and installed "Reference Fan"

Pictures 4 & 5: Happy with progress – members of the instalment team (fltr: Johan van der Spuy, Ferdi Zietsman and Osche Lombard of SUN) …

…resulting in tired hands.

The installation is finalized

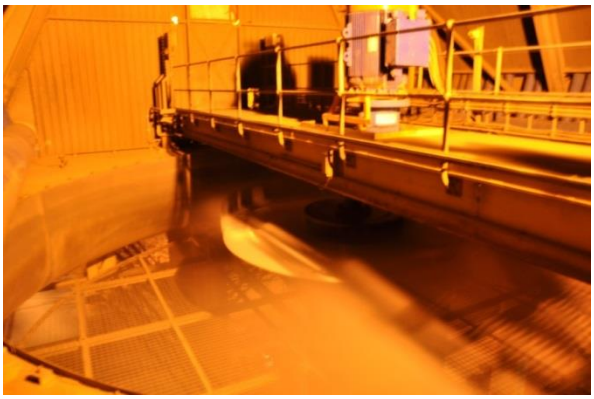
After a few days of exposure to 60 °C temperatures, oily surfaces, litres of sweat and a number of words not appropriate to be included in this writing, the "Reference Fan", as it is named, was finally installed. On the evening of Thursday, the 27th of October 2016, the fan commenced with its first revolution. It has continued operation without failure ever since.

Pictures 6 & 7: The long wait begins for the fan to start up (ftb Hans van Kamp, Johan van Niekerk and Chris Meyer of Notus)…

…and finally - some action.

<u>Results analysed from the measured data show that:</u>

1. The on-site measured blade natural frequencies are misaligned with the blade passing frequency, an operating condition conducive to little blade excitation and hence also less blade fatigue. This was an encouraging result to observe, since detailed finite element analyses were performed to develop a blade composite fibre lay-up that would avoid these danger-frequencies.
2. Start-up fan torque was approximately 50 % less compared to the fans presently installed at Matimba, decreasing the dynamic load on the fan drive (gearbox and motor) considerably. This occurs as a result of the 50 % lighter weight of the Reference Fan blades, compared to the blades presently installed.
3. Analysis to obtain an aerodynamic performance comparison showed that the Reference Fan proved to be approximately 8 % more efficient compared to the fan presently installed at Matimba, leading to a reduction in power consumption of 22 kW (per fan), while maintaining the same volumetric flow rate of air through the heat exchanger.



Picture 8: The Reference Fan in operation

From the results it can be concluded that the fan installation was indeed "successful" if compared to the original goal. Further development now focusses on the second full scale fan (termed the CSP fan) to be developed and tested within MinWaterCSP. For this, the Reference Fan design and manufacturing technique have now produced a solid foundation to moving forwards.

A last word of thanks goes to the team that was involved, offering their time to make this installation a success. They are:

Chris Meyer (Notus)
Hans van Kamp (Notus)
Johan van Niekerk (AMS, Notus)
Danie Els (SUN)
Osche Lombard (SUN)
Jacques Muiyser (SUN)
Hannes Swart (SUN)
Johan van der Spuy (SUN)
Ferdi Zietsman (SUN)

We would also like to extend our thanks to the personnel at Eskom, Matimba, who awarded us the opportunity to conduct the fan installation and supported us with their assistance on-site. They are:

Ockert Augusteyn (Eskom) and Francois Nel (Eskom)

Author: Francois-Louw, Kelvion Thermal Solutions, South Africa

Source Wikipedia Map: By File:South Africa location map.svg by NordNordWest derivative work by Htonl (File:South Africa location map.svg SRTM ETOPO1) [CC BY-SA 3.0 (http://creativecommons.org/licenses/by-sa/3.0)], via Wikimedia Commons from Wikimedia Commons

3 News

- **Joint activities with other H2020 CSP projects**

The European Commission is financing different approaches for improving CSP plants and/or reducing water consumption for cleaning purposes.
A list of all funded projects is available on the page of the EC's Innovation and Networks Executive Agency (INEA): *https://ec.europa.eu/inea/en/horizon-2020/h2020-energy/projects-by-field/concentrated-solar-power*

Some of the projects currently running under the H2020 Calls "Low Carbon Energy" and "Renewable Heating and Cooling" have started joint activities. MinWaterCSP is in contact with projects including : CAPTure, MOSAIC, NEXT-CSP, ORC-PLUS, SOLPART and WASCOP.
In each of our next newsletters we will introduce one or two of these projects.

Joint activities:

- Joint workshops for CSP plant operators, owners and suppliers;
  A first joint workshop was organised in collaboration with WASCOP in November 2016 on "Water consumption in CSP plants"
- Coming soon:
  - Joint newsletter providing information on H2020 funded CSP project progress
  - Joint H2020 CSP project group on LinkedIN

- **New projects in the MinWaterCSP Network – Shortly introducing …**
  - **"CAPTure – Competitive SolArPower Towers"**

CAPTure is a project funded by the European Union's Horizon 2020 research and innovation programme (Grant Agreement No. 640905). Their global objective is to increase concentrated solar power plant efficiencies and reduce levelised cost of electricity (LCOE) by developing the key components of an innovative plant configuration. This plant configuration is based on a multi-tower decoupled advanced solar combined cycle approach that not only increases cycle efficiencies but also avoids frequent transients and inefficient partial loads, maximizing overall efficiency, reliability as well as dispatchability.

  - **"MOSAIC – Modular high concentration Solar Configuration"**

MOSAIC is a project funded by the European Union's Horizon 2020 research and innovation programme (Grant Agreement No. 727402) coordinated by IK4-TEKNIKER. It aims to design, manufacture and validate an innovative CSP concept with low implementation costs at the highest plant efficiencies. MOSAIC concept is characterized by the development of new CSP modular configuration which will be based on a fixed hemispheric semi-Fresnel solar field and a high temperature mobile receiver.

- **MinWaterCSP Blogs published monthly**

Since mid 2016, MinWaterCSP's partners have been publishing monthly blogs on key experiences, technological developments, events they are organising or have attended and activities they want to share. Visit our website to find out more information in the 14 Blogs published to date.

Click on any of these links to view our newest Blogs and Articles:

- Blog #14 - Noise reduction strategies to the design of a new-generation of axial fan for air-cooled condensers, by partner UROME
- Blog #13 – Online survey for CSP Plant operators and owners linked to water management
- Blog #12 – MinWaterCSP project results for business opportunities – Methodology on exploitation, by partner Steinbeis 2i GmbH

- Article: Water Management Program on best concept and design for sustainable water utilization – study tours to collect input and to exchange with partners

Stay tuned! - *http://www.minwatercsp.eu/news/blogs/*

4 Events – Meet us at…

- **Intersolar Europe 2017** – in Munich, Germany; 31st May – 2nd June 2017; represented by Soltigua - Stand A4.357; http://www.intersolar.de/de/home.html
- **POWER-GEN Europe 2017** – in Cologne, Germany; 27th- 29th June 2017; represented by Kelvion Holding GmbH and ENEXIO Germany GmbH; http://www.powergeneurope.com/en_GB/index.html
- **STERG Symposium 2017** – Stellenbosch, South Africa, 13th – 14th July 2017; represented by Stellenbosch University (SUN); http://sterg.sun.ac.za/events/sterg-symposium-2017/
- **POWER-GEN Africa 2017** – Johannesburg, South Africa: 18th – 20th July 2017; represented by Kelvion Holding GmbH and ENEXIO Germany GmbH; http://www.powergenafrica.com/index.html

5 Stay in contact with us

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