
STERG
SOLAR THERMAL ENERGY
RESEARCH GROUP

The design and construction of an _open volumetric air receiver for the STERG test facility

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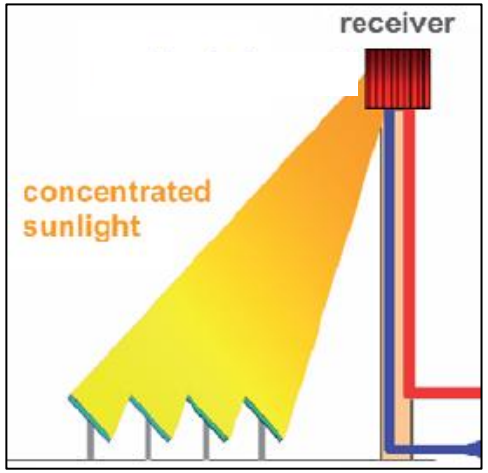
Agenda

1. Research Proposal
2. Motivation
3. Open Volumetric Air Receiver (OVAR)
4. SA CSP Industry
5. Conclusion

1. Research Proposal

Topic

- Central receiver power plant
- Design of an air receiver for the STERG test facility
  - Simple and low cost design
  - Use local content and manufacturing
  - Supply hot air to a thermal energy storage system



2. Motivation

Types of air receivers

Open	Closed	Hybrid
Ambient air	Compressed air	Both
• New receiver	• Spiky Central Receiver Air Pre-heater (SCRAP) - M. Lubkoll	• Hybrid Pressurized Air Receiver (HPAR) - H. Kretzschmar - L. Heller

2. Motivation

STERG test facility

© Helio100

- TIA Helio100 project is a central receiver technology development project
- 100kW pilot facility
- *Under construction*: rock-bed thermal storage system

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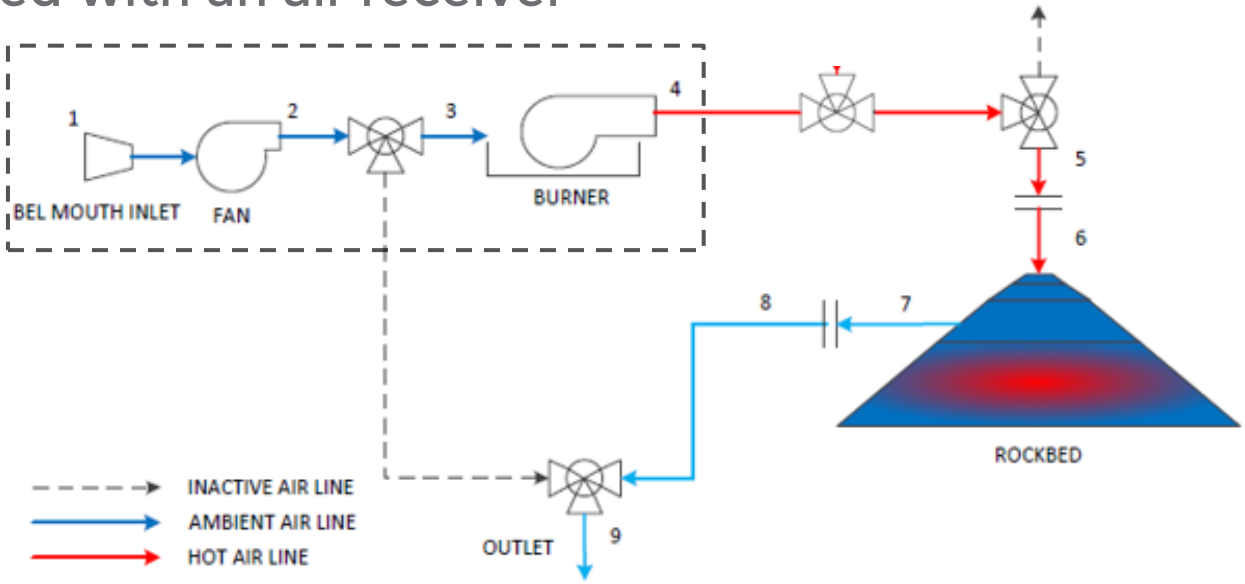
2. Motivation

Rock-bed storage

- Gas combustor designed to be retro-fitted with an air receiver

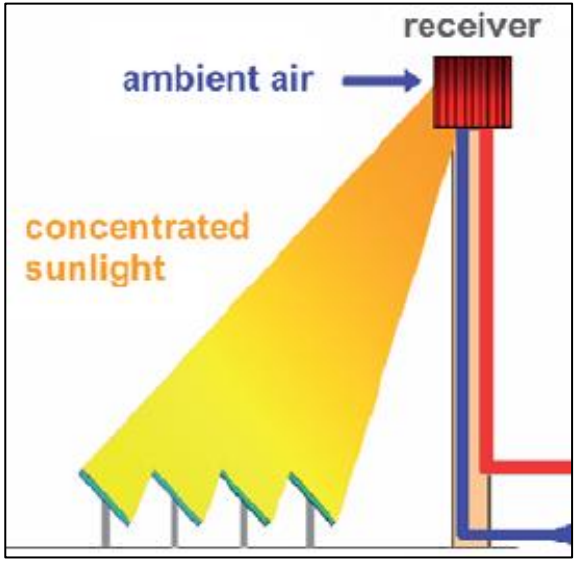


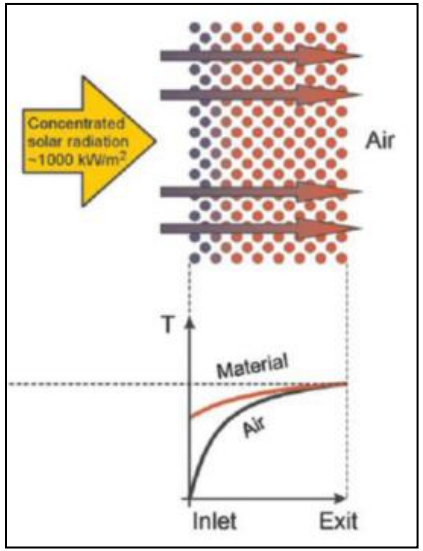
Source: Henk Laubsher

3. OVAR

Principle

- Highly porous structure absorb concentrated solar radiation
- Ambient air, non-pressurized
- Advantages?
- Difficulties?



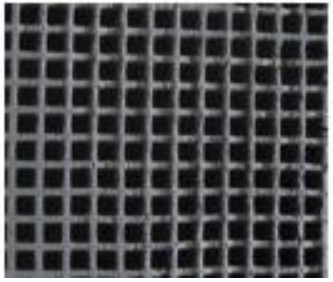


Source: (Fend 2010)

3. OVAR

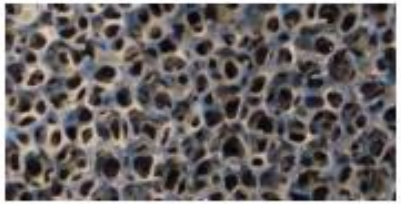
Absorber Materials

SiSi carbide honeycomb



Corrugated metal foil

Ceramic foam



Source: (Fend 2012)

3. OVAR

Absorber Materials

Refractory fire bricks

Merits:

- High temperature resistance
- Good thermal shock resistance
- Low thermal expansion
- Cheap and locally available

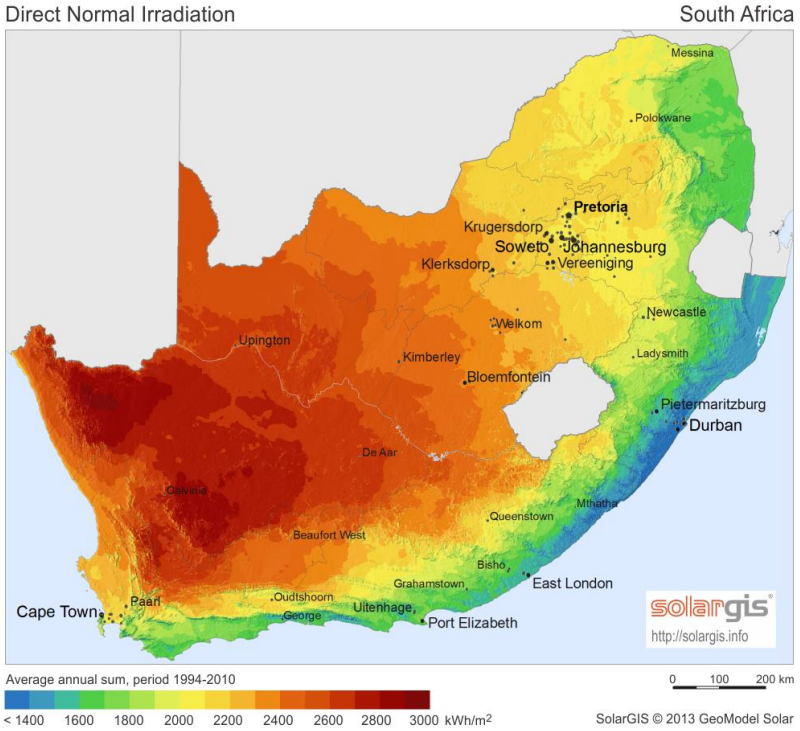
Drawbacks:

- Low porosity
- Low thermal conductivity
- High reflectance

4. SA CSP Industry

General

- SA has excellent solar resources
- Dispatchable energy is the key
- Central receivers:
  - Khi – 50 MW
  - Redstone – 100 MW



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5. Conclusion

- OVAR to be designed for the STERG test facility
- Focus on simple and cost effective design
- Novel absorber material?
- Contribute to the development of sustainable and dispatchable energy for SA

Thanks for your kind attention!

ACKNOWLEDGEMENTS:

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CRSES

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