

CORONASYS INNOVATION SHEET 31

SOLAR- POWERED STEAM GENERATOR

Background

Covid- 19 highlighted the challenges Low- and Middle-Income Countries (LMIC) face in ensuring the provision of health care to their citizens. Not only limited financial resources but also shortages in certain materials and frequent power cuts can limit their ability to do so. This applies not only to direct patient care (e.g. ventilators, medical devices) but also to necessary services such as sterilisation of medical products and invasive medical equipment. Additionally, LMIC suffer from a particularly high burden of healthcare-associated infections, partly due to the use of materials not properly sterilized¹². Researchers from the Massachusetts Institute of Technology³ have developed a Steam Generator that can keep up with challenging environments.

Features

The researchers developed a solar-powered and portable device. The steam generator can power an autoclave to sterilize medical equipment. The built-in solar component heats water to produce steam. The steam is then transferred to a pressure chamber. To avoid heat loss to the environment a so-called aerogel (a foam-like but solid material) made from silica is used as an insulator⁴.

Potentials

The device was tested under realistic weather conditions and can be used on cloudy or hazy days as well. It is built mostly from off-the-shelf components and the prototype did only cost \$38. The same principle could be used to power other devices as well⁵.

Points to consider

Even if it can be manufactured very quickly from commonly available materials, the Steam Generator is just a prototype so far⁶. The generated 240 watts are not sufficient to power the large autoclaves used in big operation theatres, so one would have to combine several of the Steam Generators to power those⁷.

Conclusion

The Steam Generator (or similar products) could help to relieve healthcare-related infection burden in challenging environments. Particularly in situations like the current pandemic, the device can add to a cost-effective, accessible, and applicable solution for remote settings.

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Publication: November 18, 2020

Country: USA/ International

Focus area: Prevention

Developers: Massachusetts Institute of Technology

- Zhao et al.

Beneficiaries:

- Clinics and physicians in remote areas

¹ Allegranzi, Benedetta, Sepideh Bagheri Nejad, Christophe Combescure, Wilco Graafmans, Homa Attar, Liam Donaldson, and Didier Pittet. “Burden of Endemic Health-Care-Associated Infection in Developing Countries: Systematic Review and Meta-Analysis.” *The Lancet* 377, no. 9761 (January 15, 2011): 228–41. [https://doi.org/10.1016/S0140-6736\(10\)61458-4](https://doi.org/10.1016/S0140-6736(10)61458-4).

² WHO. “Report on the Burden of Endemic Health Care-Associated Infection Worldwide,” 2011. https://apps.who.int/iris/bitstream/handle/10665/80135/9789241501507_eng.pdf?sequence=1&isAllowed=y.

³ MIT. “The Massachusetts Institute of Technology (MIT).” Massachusetts Institute of Technology. Accessed November 27, 2020. <http://web.mit.edu>.

⁴ Lu, Donna. “Portable Device Uses Solar Power to Sterilise Medical Equipment.” *New Scientist*, November 18, 2020. <https://www.newscientist.com/article/2260057-portable-device-uses-solar-power-to-sterilise-medical-equipment/>.

⁵ Zhao, Lin, Bikram Bhatia, Lenan Zhang, Elise Strobach, Arny Leroy, Manoj K. Yadav, Sungwoo Yang, et al. “A Passive High-Temperature High-Pressure Solar Steam Generator for Medical Sterilization.” *Joule*, November 2020, S2542435120304967. <https://doi.org/10.1016/j.joule.2020.10.007>.

⁶ Zhao, Lin, Bikram Bhatia, Lenan Zhang, Elise Strobach, Arny Leroy, Manoj K. Yadav, Sungwoo Yang, et al. “A Passive High-Temperature High-Pressure Solar Steam Generator for Medical Sterilization.” *Joule*, November 2020, S2542435120304967. <https://doi.org/10.1016/j.joule.2020.10.007>.

⁷ Lu, Donna. “Portable Device Uses Solar Power to Sterilise Medical Equipment.” *New Scientist*, November 18, 2020. <https://www.newscientist.com/article/2260057-portable-device-uses-solar-power-to-sterilise-medical-equipment/>.

Background on Innovation Sheet Series

As part of a real-time evaluation of the SARS CoV 2 pandemic (with focus on epidemiological, medical, economical, societal, technical, and cultural developments in Germany and Armenia) the CoronaSys research team, under the leadership of Prof. Dr. Martin Voss, is conducting a continuous monitoring of developments and medical, technical, and social innovations concerning Covid-19.

Multiple national and international media outlets, research platforms, and scientific and organizational guidelines, briefs, and updates are screened to feed into this outlet. The rationale behind this is to support the projects' network partners in Armenia and Germany with short summaries of key developments and promising innovations that are shaping the global, German, and Armenian outbreak response and recovery.

The aim of these short briefs is to give condensed and structured information on selected innovations emerging out of the conducted horizon scanning. This could be mainstream big-ticket items or fringe subjects that are easily overlooked in the global flood of information. Some innovations will be followed through their evolution in time while others may only appear once. While subjectively selected, the briefs are descriptive in nature and leave analysis and critical interpretation to the reader. Network partners in both countries are invited to provide feedback on their interest areas and suggest particularly relevant topics for the CoronaSys Workshop series.

The CoronaSys Innovation Sheet Series is published by the [Academy of the Disaster Research Unit](#), which is, as a non-profit limited liability company, a spin-off of the [Disaster Research Unit](#) at the Free University of Berlin. The series is part of the research project "[CoronaSys](#): Addressing the corona pandemic in Armenia through systemic risk management", sponsored by the German Federal Ministry of Education and Research.

If you have any questions, suggestions, or if you wish to be taken on (or off) the project mailing list for CoronaSys updates, innovation sheets, and workshop invitations, please send a message to Janina Schäfer (schaefer@a-kfs.de). For general project inquiries, you may contact the team lead Sara Merkes (merkes@a-kfs.de) or the project lead Martin Voss (voss@a-kfs.de).

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- 1 "New" Antiviral Face Masks
- 2 "Dyphox" Surface Coating
- 3 MOVES SLC Portable ICU
- 4 Portable TRI- KLEEN 500UV
- 5 Convalescent Plasma Therapy
- 6 ASIC-App
- 7 BinaxNOW Antigen Test
- 8 Corona Traffic Light
- 9 Aproof at Home Antibody Test
- 10 IVAT Hygiene Tower
- 11 LY-CoV555 Antibody Treatment
- 12 4C Mortality Score
- 13 Regional Corona Prediction Model
- 14 Computer-designed Mini- Proteins
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All previous CoronaSys Innovation Sheets are available online:

<http://coronasys.a-kfs.de/category/innovation-stream/>

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