

Inactivation of helminth in a solar concentrator and pit latrine + feasibility review of solar sanitation

Posted by AFoote - 19 Nov 2012 04:29

Hi smart SuSanA community,

Emily Woods and I were recently at a bunch of conferences presenting some of our work regarding solar concentrators as a fecal sludge management solution. In case you couldn't make it I've attached the presentation here.

There is still lots that needs to be improved before scaling it up. Emily is currently in Naivasha, Kenya doing some customer development work to better identify the best before and after processes based on local circumstances.

Excited to hear your feedback and we are currently exploring how to create a full service with the MoSan toilets that Mona has done some great work on. One aspect we are considering in terms of collection is plastic bags. If you have any experience/thoughts/concerns with using plastic bags as a collection and transport mechanism please add comments under the plastic bag topic.

Thanks so much!

Cheers,

Andrew

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Re: Presentation: Inactivation of helminth in a solar concentrator and pit latrine + feasibility review of solar sanitation

Posted by JKMaKowka - 19 Nov 2012 13:51

Ahh, so you are some of the people experimenting with this...

I was actually thinking about experimenting with this to disinfect faecal sludge:

www.builditsolar.com/Experimental/RSB/RSB.htm

(Maybe also as a simple water desalination device).

But due to time limitations I never actually got around actually building something. Would be great if someone with experience with that would evaluate the use of such a rotating collector. I think the main benefit is probably lower costs and that (nearly) no sun tracking is necessary.

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Re: Presentation: Inactivation of helminth in a solar concentrator and pit latrine + feasibility review of solar sanitation

Posted by canaday - 21 Nov 2012 04:03

Dear JKM,

This is a very promising line of research, one that I have started to experiment with.

The rotating solar boilers you linked to are for boiling water and they spin at 60 revolutions per minute, which I do not understand and which I am certain that ours can be much slower. Potentially the solar concentrator would effectively pound the tube with sun from all angles and it would not need to turn at all.

I propose that it would be best to make these from post-consumer PET plastic bottles and to use TetraPak for the reflectors (taking advantage of the shiny aluminum layer on the inside), in order to reduce the cost and environmental footprint. Such transparent "pipes" would also allow the UV radiation to contribute to pathogen elimination.

We killed Ascaris eggs in one brief trial in which the temperature was high enough to deform the PET plastic (so roughly 80 degrees C).

In hot, sunny places, these water-tight "pipes" could simply be placed on tin roofs and would likely be sufficiently baked in much less than one week.

Have there been other trials related to this?

Best wishes,

Chris Canaday

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Re: Presentation: Inactivation of helminth in a solar concentrator and pit latrine + feasibility review of solar sanitation

Posted by JK Makowka - 21 Nov 2012 06:58

canaday wrote:

Dear JKM,

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Ahh, there seems to be a slight misunderstanding how these work (as opposed to the concentrators linked in the OP and what you are proposing).

The novel idea about the RSB is that it is acting like a vacuum-tube solarthermal collector by establishing a near perfect isolation.

The functional principle is that due to the rotation of the cylinder the air trapped inside will start to rotate too. By doing that the hot air which would normally rise upwards will instead rise towards the center of the tube counteracting the centrifugal force that is created by the rotation.

The 60 turns per minute is just the right amount of centrifugal force in a cylinder of about 1m diameter to establish a stable heat gradient and thus a near perfect isolation.

The concentrator build around the prototype it is not strictly necessary, and as you can see in the annex of the file linked, costs for such a solar collector can be probably very low as an inflatable version could be easily created.

Furthermore due to its circular shape it does not really need any sun tracking, and even shorter periods of cloudiness will not cool it down since it is so well isolated.

I have been actually (theoretically) prototyping a very simple but probably effective saltwater distillation device on this principle, and also think that the -hot air- collecting effect of it could maybe be utilized to quick-dry agricultural products or such which a slightly different setup.

Due to the stable heat of it I also think that it could be quite effective for disinfecting fecal sludge. The rotation could also be used to overturn and mix the sludge in the cylinder, if it is not fully filled, and thus increase the security of the process even further.

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Re: Presentation: Inactivation of helminth in a solar concentrator and pit latrine + feasibility review of solar sanitation

Posted by Ewoods - 21 May 2013 11:37

Dear JKM

This is very interesting idea for getting a more consistent heating in the concentrator. I would be interested in talking you about further tests you have done and temperature outputs, and the possibility of testing here in Kenya along side our other concentrators. We currently have a few projects going in Kenya and are now comparing various methods of solar inactivation of feces.

For anyone interested in the inactivation tests that we did with solar in Chile last year, here is the video from the Fecal Sludge Management conference in Durban last year:

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Re: Presentation: Inactivation of helminth in a solar concentrator and pit latrine + feasibility review of solar sanitation

Posted by JKMaKowka - 21 May 2013 13:54

Dear Ewoods

Due to me changing jobs in Dec. 12, I never got around actually experimenting with this. Thus I am not sure if I can be of any help with trying out an RSB for fecal sludge disinfection.

On a positive side though, I am now working in Kampala, Uganda and would be naturally very much interested in your pilots in Kenya.

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