Shower heat exchanger: reuse of energy from heated drinking water for CO2 reduction

Z. Deng, S. Mol, and J. P. van der Hoek

This paper deals with the efficiency of in-house heat exchangers to re-use the warmth of discharged shower water. Heating water contributes significantly to the carbondioxide footprint of households in The Netherlands, so the topic is very relevant. In the research both lab experiments and field test are undertaken to verify the efficiency claim of a commercially available heat exchanger.

The research seems to be driven by the ambition of Waternet, the water cycle company of Amsterdam (The Netherlands) to reduce its CO2 footprint in 2020. In fact, this is explicitly stated. Authors all work for Waternet, which is not strong. I suggest in future studies add at least one author to the research team who works for another organization or University only. Essence of the paper is the question to what level the application of the chosen device could contribute to the sustainability ambition of Waternet. This is unfortunate, a more general set-up and more critical approach would probably have led to more interesting and more convincing results. It would have been interesting to compare several heat exchangers. At least an explanation should be added why the DSS device was selected. In the calculation of the CO2 reduction potential, the CO2 footprint of the production and transport of the devices is not taken into account, nor is the footprint of the activities and used materials of the installation. The costs of installation of the devices in existing houses are underestimated, yielding too optimistic return on investment times. Finally, assuming that all households of Amsterdam would been equipped with these devices is most unlikely. Some of the points above will be less relevant if the title of the paper would refer more concisely to what has been done: determining the effect of the placement of 100 shower heat exchangers in a student housing estate. Consider to change paragraph 3.2, focus less on Amsterdam, and more on a single household or a fictive city of 100.000 inhabitants.

Secondly, please be stricter in separating introduction, methods, results and discussion. Some examples are mentioned in the table below.

Having said that, the combination of a lab test and field test to evaluate the claim of a supplier has been undertaken with care and is convincing.

Details:

Page	Line	Comment
several		Use ‘shower turn’ in stead of shower in relevant situations.
120	7	The objective not to compare lab and field conditions. The objective is to evaluate the supplier’s claim of the efficiency.
	9	58-62 should be 57-62 (see page 127, line 3)
	11	Why mention 4% of the total energy of all households in Amsterdam could be saved? The results are valid for a

		single household as well.
	23	‘Heated’ should be ‘heating’
	23	Define ‘heat loss’
121	3	‘Reduction of greenhouse in 2040’ compared to?
	10-12	Relevant for the urban environment, the emission of green house gasses will contribute to heat stress of cities.
	27-28	Description is only valid for horizontal exchangers
122	9-22	The majority of these lines should be moved to the method.
	9-13	Why 2 horizontal and 6 vertical? 4 vs 4 would have been more logic.
	11	‘for comparison’. It’s not completely clear why the lab set up was needed? More accurate measurements, more measurements, more extreme conditions? Lab setup has just one extra T measurement compared to Uilenstede.
123	3-4	Authors probably refer to the reason why the exchangers were installed in Uilenstede, not why they were used in this research.
	17	Starts should be start
	19	What measurement is meant here? Flow? Temperature? And what do you mean with manually? Please explain in more detail how the data was logged and transferred to the Waternet database. Real time? Dataloggers? Manually written?
	20-21	This should be moved to results
124	15	‘30 min’. Why so (unrealistically) long? On page 126 line 8-11 you seem to prefer realism.
	13-14 & 21	Why different flow rates?
	24-26	On page 123 line 20-21 you speak about a failing ‘monitoring system’, do you mean the system consists of uncontrolled students?
125	2	The should be a
126	6-11	Why introduce a standard if you decide not to follow the standard?
	10	Influence should be approach
	11	It might be more realistic, but by not using the standard, the results cannot be compared to other research? Most probably the results will be less accurate when including the water before stabilization.
	15	Is supposed to be. You measured it, so why suppose?
	14-17	This is method, not result.
	18	In the range of should be between
	25	Chosen? Couldn’t you measure or is a reference available. Page 127 line 18 mentions 34,5 degrees.
127	4	Remove ‘rises to’
	5	Only should be limited to
	10	Slightly, please give the percentage rather than a subjective measure
	10	Recognizable should be significant

	21	Lower: how much?
	24	First comfort class, what is that?
128	14	Mostly should be mainly
	16	Nm3/year
	17-18	Remove
	19-24	Explain, or discuss
129	11	Regarding should be for
	Fig 2	Light blue and dark blue difficult to discriminate
	Fig 2	Add a line from the shower (the discharge) to the heat exchanger.