Stove Testing with the Multiple Tests in the “Toolbox” Approach – Draft 2013-04-04 PSA

History:

A. On 19 March 2013, Crispin PP sent a one-page introduction to the Toolbox concept for testing of cookstoves. It was sent by PSA to the Stoves Listserv on 25 March 2013. It is a .pdf document, and is reprinted at the end of this document.

B. On 25 March 2013, PSA also sent what is repeated below (without intro statement.)

C. On 4 April 2013, PSA has added further comments about “Process Testing” of stoves.

Here starts “B” from 25 March 2013, by Paul Anderson (PSA).

Now that GACC Forum is concluded, there might be some discussion on the Toolbox approach that Crispin proposed.  I have again attached to this message his 1 page document.   My message below will not make much sense if you have not seen the foundation document attached. [Now at end of this doc.]

I am giving some examples:

Example number one:   suggested short name is "only hot water"

I define "large water heating" as 5 liters of water brought to a boil.  Period.   Just that.   This task is extremely common for making bathwater or for Pasteurizing drinking water.

From the "standard" WBT of past testing, there thousands of data sets with that data available.   Ignore for a while the simmering part.   Allow for BOTH the "cold start" and the "hot start" data sets (available for many stoves) to be BOTH reported (but not averaged.)

From that, what are the characteristics of each stove:   Time to boil, energy used, fuel used (with charcoal created but not counted as being the same fuel as was first used),  CO, PM (might not be available because of only reporting the CO and PM at the end of the full WBT, but some data from the continuous readings of concentrations might be able to be extracted).

Add on comments/observations about the functioning of the stove, such as ease of lighting and need for fuel tending and ease of conclusion of the task.   And notes about the fuels and any special circumstances, such as in a laboratory or in a household.   There should NOT be much difference between the lab and field in this simple test.  IF THERE IS MUCH DIFFERENCE,  then the lab method needs to be changed, such as not allowing the operator to touch the fuel more frequently than every 5 (or 8 or 10?) minutes, or corrections of other lab practices that at too "artificial".   From past experience, the boiling time of 15 minutes is exceptional.   20 to 25 minutes is quite good.    30 to 40 minutes is not very good, and more than 40 is a serious problem.

Note:  Of course I like this "test" because TLUDs will excel at it.   Fast ignition, strong heat, minimal fuel tending, almost self-extinquishing, and it gives you charcoal.   (Note that charcoal is NOT the same biomass fuel that was at the start, so the stove is higher in fuel consumption of the original biomass, but competitively low in energy consumption, and we can give a monetary value to the charcoal produced.)

But this is not the only task that should have a test.

Example number two:    suggested short name is "Soup (and lentils) for 10 people"

This task takes 5 liters of water and pretends to make a half-liter of soup or lentils for each of 10 people (or for 5 people having two meals from the pot).   This required bringing the pot to a boil and simmering it for 45 minutes.   This is essentially the standard WBT.   [Note:   This is NOT cooking dried beans for 2 to 4 hours, which could be proposed as a different test.]

Therefore, we have massive amounts of data sets already collected.  The DIFFICULTY is that there have been a multitude of calculation errors over the many years.   PERHAPS there could be re-calculation using the corrected formulae and the original data.   [Personally, I think that this should be done, and that GACC funding should be made available.   This is TOO IMPORTANT to be left unresolved, or expecting the testing centers to foot the bill.   OR we could throw out that earlier data and start all over, but that would seem too drastic.]

Example number three:    suggested short name is "stir-fry"

No water in this one.  But instead have a modest quantity of cooking oil that must be kept at some specified high temperature.   Remember, when actually stir-frying, fresh cold ingredients are periodically put into the oil, causing cooling immediately.   Perhaps that could be replicated by adding a specified quantity of cool (room temperature) oil into the pot at intervals of "X" minutes, with the fire required to bring the whole amount of oil up to the specified high temperature within "Y" seconds.    Note:   Actual stir-fry cooking frequently lifts the pan off of the fire, and does so whenever that heat is too high, so do not be overly worried that the fire is ever too high (except if with extreme stoves that would not be appropriate for stir-fry cooking).   How long do people do stir-frying?   Depends on the culture and the number of people to be fed.   Stove testers need to agree on how long the test is to be conducted.   Or to have a short version and a long version based on households, not restaurants.    NOTE:   IF additional cooking is to be done before or after the stir-fry event/task, such cooking is to be conducted and tested SEPARATELY.   And as Crispin noted,

An overall metric can be reported only if all sections of the test protocol have shared metrics and units.

When the TIME of the cooking event has completed, take the data measurements.   Separately, let the hot oil cool and it can be used many more times.  Hot cooking oil does not splatter if kept clean, and will not smoke until it is extremely hot such as when there is too little oil in a hot pan.   This test can be quite clean.

I hope that these three example are sufficient to get others to make comments, and maybe to  describe other "tasks for tests".

Note:   Crispin provided "Central Java" examples.  Others are needed.   For example, the task of making "steamed rice" in Java is different from making boiled rice in other places.    And boiled rice can have variations based on quantities of water, and whether or not a retained heat cooker (Hay box) is allowed to be used.

And do not forget pressure cookers.

In my opinion, "good-bye to over-reliance on the standard WBT". WBT (when corrected) has its place, but it is no longer divine (and never really was).

*I request that Ranyee (or someone designated) make sure that this message and the others to follow are appropriately sent directly to the persons at the regional testing centers and to others with vested interested in cookstove testing.   Many of them do not read the Stoves Listserv.  Perhaps the discussion should move to some other Listserv, but it must be open to all who are interested. Paul*

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*End of B, and start of C that is added on 4 April 2013 \*\*\*\*\*\*\*\*\*\*\*

1.  In my comments in Part B above, I defend the WBT (when calculations are corrected) as a viable example of a COMBINATION of a "large water heating" test (5 liters to a boil) plus a "simmering test" (5 liters simmering for 45 minutes), the latter I did not describe.   But combined, they are the "Soup for 10 people test" that I do describe.  With the single WBT dissected into its two main parts, we can live with it as PART of a full toolbox of tests of stoves.

2.  Note that these are "Task Tests" with starts and ends.

3. There can also be "Process Tests" (or some other name) that give a read-out of some meaningful data WHILE a test is progressing.   For example:

a.  An emission sensor (PEMS or combustion analyzer or a digital CO meter or ??) is operational and is showing the measurements of a stove that is functioning in its "steady state".   It might normally run for 15 minutes or for 2 hours or continually with more and more fuel being fed in.   The total time is not the important factor.   But some "time period" of steady operation is the standard, probably like 10 minutes, but to be representative of longer periods (not allowed to be "optimized" in the laboratory by selecting which 10 minutes gives the best results).   Not too long, not too short.   For a TLUD, the readings are likely to be extremely steady.   For other stoves, there will be spikes when the fuel is added, and those spikes and rises and falls will need to be noted, as well as the averages and maximum and minimums and SD and whatever else is useful.

b.  Similar to the emissions testing, but using only thermometers/thermocouples to measure temperatures:   In various places in the fire;  In the "pot" to see temperature increases such as Number of degrees C per 5 minutes in the range of 50 to 70 degree of water temperature.

c.  Perhaps a test of stove function based on a standard amount of fuel, as in:   Operate the stove using 1 kg or 500 g of fuel, or better yet to standardize the fuel by MJ in dry weight equivalent.   This can be important to point out that some stoves canNOT even utilize some types of fuels.   Why are all the tests conducted with wood?   If trying to save forests (not counting sustainable forestry for fuel), then a maize-cob burning stove is much better than one that burns only stick-wood.

I believe that a collection and combination of various tests will SERVE MUCH BETTER the needs of the cookstove communities than will the overreliance on the “standard WBT”, even when that WBT has eventually been corrected for errors in calculation, and formally reviewed openly.

I hope that there will be more discussion.

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