AFTER ETHOS OPEN HOUSE JANUARY 2014

ARC was very pleased to welcome 23 attendees to the informal “After ETHOS Open House” held at the ARC lab. Three emission hoods (two in the lab and one in the Test Kitchen) were continually used during the four days and, as usual, there was some dismay and some elation as stove inventors and promoters digested mostly real time results for CO, CO2, and PM. At least one person had to face unexpectedly poor emissions and Dr. Winiarski worked tirelessly to improve performance. As Kirk Smith says, “We get what we inspect, not what we expect.”

We were very lucky to have Dr. Alexis Belonio here as well as many committed TLUD and rice hull gasification experts. There was good progress in prototypes on expanding Turn Down Ratio in TLUDs which is needed to do well on the measures of simmering. We saw how to improve heat transfer efficiency and most of the stoves scored between 35% to 45% on High Power Thermal Efficiency. As you can see below, there were several Tier 4 scores in the selected group of rice hull gasifiers and TLUDS burning pellets. (Since only one WBT test with gravimetric PM was done on most of the stoves, the scores are only possibly indicative of performance.)

Stove type/model		rice hull 1	rice hull 2	tlud 1	rice hull 3	rice hull 3	rice hull 3	tlud 2
Location		apro	apro	apro	apro	apro	apro	ARC
Wood species		rice haul	rice husk	df pel	rice hulls	rice hulls	rice hulls	Pellets
Date		1.29.14	1.29.14	1.28.14	1.31.14	1.31.14	1.31.14	1/28/13
IWA Performance Metrics	**units**	**Value**	**Value**	**Value**	**Value**	**Value**	**Value**	**Value**
High Power Thermal Efficiency	%	35.7%	39.0%	46.2%	33.4%	30.7%	15.6%	45.5%
Low Power Specific Consumption	MJ/min/L	0.030	0.037	0.050	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
High Power CO	g/MJ$_d$	7.17	6.81	3.43	0.46	0.86	3.64	2.83
Low Power CO	g/min/L	0.21	0.33	0.01	#N/A	#N/A	#N/A	#N/A
High Power PM	mg/MJ$_d$	117.3	153.1	231.1	48.2	29.6	110.1	100.8
Low Power PM	mg/min/L	0.78	16.08	7.91	#N/A	#N/A	#N/A	#N/A
Indoor Emissions CO	g/min	0.96	1.46	0.32	#N/A	#N/A	#N/A	#N/A
Indoor Emissions PM	mg/min	8.9	72.0	31.2	#N/A	#N/A	#N/A	#N/A
Safety	Index							
		Tier	**Tier**	**Tier**	**Tier**	**Tier**	**Tier**	**Tier**
High Power Thermal Efficiency		3.0	3.3	4.0	2.8	2.5	1.0	4.0
Low Power Specific Consumption		2.7	2.1	1.0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
High Power CO		4.1	4.1	4.5	4.9	4.8	4.5	4.0
Low Power CO		0.9	0.6	4.9	#N/A	#N/A	#N/A	#N/A
High Power PM		3.3	3.1	2.7	3.9	4.2	3.4	3.0
Low Power PM		4.2	0.4	1.0	#N/A	#N/A	#N/A	#N/A
Indoor Emissions CO		1.0	0.6	4.2	#N/A	#N/A	#N/A	#N/A
Indoor Emissions PM		2.8	0.5	1.3	#N/A	#N/A	#N/A	#N/A
Safety		0.0	0.0	0.0	0.0	0.0	0.0	

Check out how well Rice Hull Stove 1 did on High and Low Power PM! Rice hulls seem to be a good fuel for low emissions, just as good as wood pellets. Would China consider using rice hulls as an alternate, carbon neutral fuel in their National Stove Project? Alexis could teach them how to use this amazing resource!

Again, an inadequate Turn Down Ratio was perhaps responsible for inferior low power Specific Consumption scores (LPSC, LPCO, LPPM). Notice, for instance, that High Power CO was generally in the Tier 4 range while Low Power CO was often much lower (with exciting exceptions.) As at some of the Stove Camps, even a single test survey seems to generate interesting results that might point out performance trends in a same type group of cooking stoves.

We hope that folks found the Open House to be informative and it was certainly a great pleasure for us to host such a skilled and experienced bunch of stovers!

Dean