



**NIGERIAN ALLIANCE FOR  
CLEAN COOKSTOVES**

# **Stove Testing and Standards**

**March 2018**

# Introduction

- Proper design of stoves enhances the efficiency of combustion ultimately helps to reduce deforestation
- Testing of stoves in a standard laboratory contributes toward improved future designs and also leads to the adoption of common terminology;
- The Global Alliance for Clean Cookstoves and International Standards Organization have identified a clear need for a common standard for Improved Cookstoves and are working in an attempt to standardize test procedures for all cookstoves.

# Stove Testing Protocols

Major stove testing protocol categories include:

- 1) Water Boiling Test (WBT) – lab test
- 2) Heterogeneous Testing Protocol (HTP) – lab test
- 3) Controlled Cooking Test (CCT) – field test
- 4) Kitchen Performance Test (KPT) – field test
- 5) Uncontrolled Field Test (UFT) – field test

The WBT, CCT and KPT are the most accepted testing protocols for cookstoves

# Summary of WBT

- ❑ The WBT is a lab based test using the laboratory emissions monitoring system (LEMS). The test measures and analyses the following parameters:
  - Thermal efficiency
  - Emissions (CO<sub>2</sub>, CO and PM)
  - Fuel to boil 5 litres of water
  - Energy to boil 5 litres of water
  - Time to boil 5 litres of water

Thermal efficiency and emissions are measured in Tiers with Tier 4 being the highest performance and Tier 0 being the lowest. The minimum accepted rating by the Global Alliance for Clean Cookstoves is Tier 2 for these 2 parameters

# Summary of WBT cont'd

IWA VITA WBT Tiers	units		Tier 0		Tier 1		Tier 2		Tier 3		Tier 4
High Power Thermal Efficiency	%	<	0.15	≥	0.15	≥	0.25	≥	0.35	≥	0.45
Low Power Specific Consumption	MJ/min/L	>	0.05	≤	0.05	≤	0.039	≤	0.028	≤	0.017
High Power CO	g/MJd	>	16	≤	16	≤	11	≤	9	≤	8
Low Power CO	g/min/L	>	0.2	≤	0.2	≤	0.13	≤	0.1	≤	0.09
High Power PM	mg/MJd	>	979	≤	979	≤	386	≤	168	≤	41
Low Power PM	mg/min/L	>	8	≤	8	≤	4	≤	2	≤	1
Indoor Emissions CO	g/min	>	0.97	≤	0.97	≤	0.62	≤	0.49	≤	0.42
Indoor Emissions PM	mg/min	>	40	≤	40	≤	17	≤	8	≤	2

# Summary of CCT

- ❑ The CCT is designed to assess the performance of the improved stove relative to the common or traditional stoves that the improved model is meant to replace.
- ❑ Stoves are compared as they perform a standard cooking task that is closer to the actual cooking that local people do every day.
- ❑ However, the tests are designed in a way that minimizes the influence of other factors and allows for the test conditions to be reproduced.

# Summary of KPT

- ❑ The KPT is the principal field-based procedure to demonstrate the effect of stove interventions on household fuel consumption. It includes (i) an assessment of the qualitative aspects of stove performance through household surveys and (ii) to compare the impact of improved stove(s) on fuel consumption in the kitchens of real households.
- ❑ An important parameter assessed in KPT is the safety of the stove. The following are evaluated: sharp edges/points, cookstove and pot tipping, containment of fuel, obstruction near cooking surface, surface temperature, heat transfer to surroundings, cookstove handle temperature, chimney shielding, flames surrounding the pot and flames exiting fuel chamber.

# Stove testing in Nigeria

- ❑ There are 2 globally recognized stove testing laboratories in Nigeria – the Clean Cookstoves Development and Testing Centre Afikpo, Ebonyi State; and the National Stove Eligibility Laboratory at the University of Nigeria Nsukka.
- ❑ The Clean Cookstoves Developed and Testing Centre is owned and operated by ICEED and offers services in stove testing and analysis using the LEMS and the WBT Protocol, capacity building and stove design/redesign.
- ❑ The National Stove Eligibility Laboratory is managed by the National Centre for Energy Research and Development (an arm of Energy Commission of Nigeria) and performs the same functions as the Afikpo Centre. In addition, it is the designated laboratory that certifies all improved cookstoves imported into or produced in Nigeria.

# A word on standards

- ❑ The ISO Technical Committee 285 was set up to develop a uniform standard for biomass stoves under the ISO process.
- ❑ Nigeria graduated from “O” member to “P” member of the ISO Technical Committee in 2013.
- ❑ Currently, the process is at the stage of Working Groups and Task Groups working on different aspects of the proposed standard.
- ❑ Nigeria is a member of the TG on Fuels.
- ❑ Some progress has been made in unifying the test protocols for (i) Field tests, (ii) Laboratory tests, (iii) Over-arching issues and (iv) Social Impacts of cookstoves.

# A word on standards cont'd

- ❑ Following international best practices, the National Mirror Committee on Clean Cookstoves and Fuels was convened by the Nigerian Alliance for Clean Cookstoves in 2013.
- ❑ Initiated by ICEED, the committee is headed by the Standards Organization of Nigeria (SON) and has other federal government parastatals including Energy Commission of Nigeria (ECN) and National Environmental Standards and Regulations Enforcement Agency (NESREA) as members. Other classes of members include stove developers/importers, research institutions, environmental rights groups, the academia and media.
- ❑ Currently, the NMC has developed a draft national standards, known as interim benchmarks for biomass cookstoves in Nigeria. The benchmarks have passed stakeholder review and is currently being integrated as part of the mandate of SON. Once this is done on or before the end of Q2 2018, Nigeria will have standards for biomass cookstoves. SON will work with the National Stove Eligibility Laboratory and other relevant institutions to certify all improved biomass cookstoves and enforce the standards.

# Criteria for choice of stoves and fuels

Based on the knowledge on stove testing and standards, the following criteria are essential when producing or introducing a stove for any program:

- ❑ Performance of stoves - Performance of stoves in terms of wood use reduction is perhaps the most important factor especially for rural poor households. There are some secondary performance goals such as particulate matters emission and other harmful gases. Only stove testing can show the true performance of these stoves.
- ❑ Supply chain of stoves – A stove intervention programme will not be successful if stoves are distributed but non-benefiting households do not continue to buy these stoves. Therefore a strong supply chain is important to ensure that stoves are always in the local market and enjoy widespread usage.
- ❑ After sales service - Some presence of stove suppliers accepting complaints or request for maintenance is essential. Hit-and-run stove suppliers can only damage the market.

# Criteria for choice of stoves and fuels cont'd

- ❑ User acceptance of stoves - No matter how technically good a stove product is, the acceptance by households is necessary. Families must test them and choose which stove types meet their needs.
- ❑ Prices of stoves - The lower the prices, the more the demand. High priced stoves will therefore not lead to wider dissemination, especially in rural communities.
- ❑ Availability of fuels - Wood is the most available fuels in almost all rural communities in Nigeria. Therefore stoves using special fuels that are not in the open market in the rural areas will have low chances of success.
- ❑ Affordability of fuels - LPG is the most expensive of the cooking fuels and prices of wood is the lowest of all the fuels. Prices of fuels matter a lot for the cooking choices of families.
- ❑ Accessibility of fuels - Fuels can be available, but not accessible. Households prefer fuels that they can get in their neighbourhood. Wood is everywhere and kerosene can be bought in small quantities in most places.

# Thank you!



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