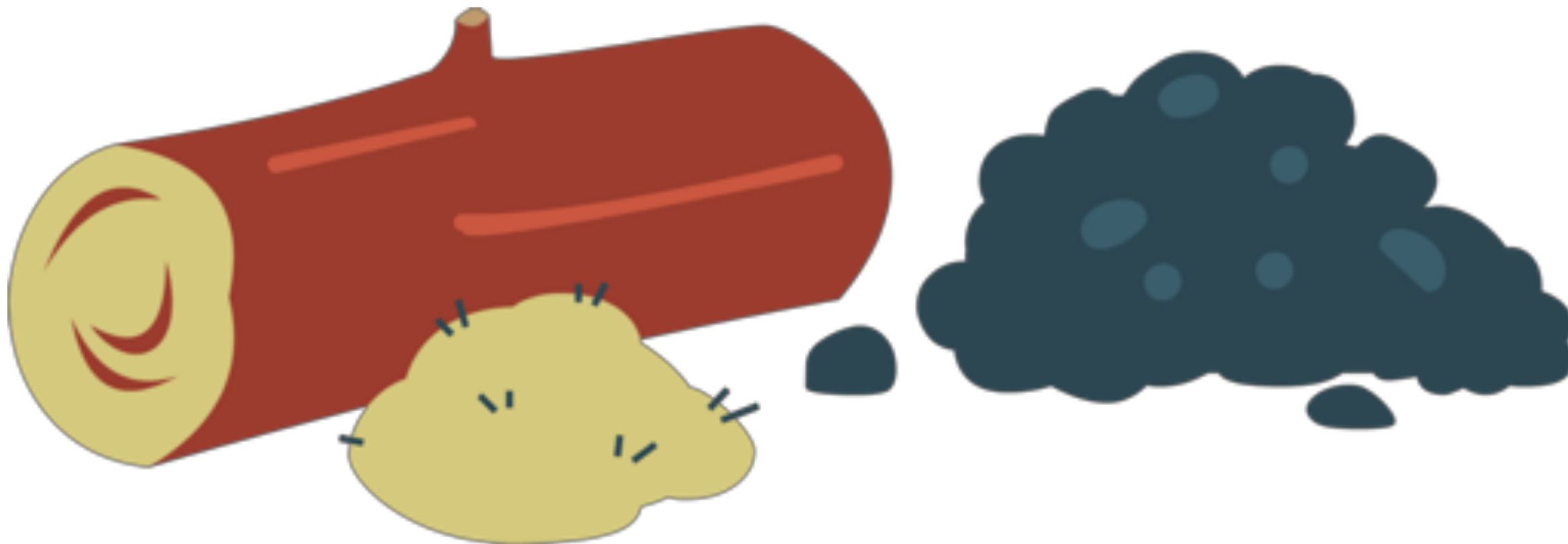


Session 3: Experience Standardizing Ethanol as a Cooking and Appliance Fuel

Lusaka Workshop
November 1, 2018
Brady Seals

POET[®]
CLEAN COOKING

NEARLY 3 BILLION PEOPLE COOK WITH SOLID FUELS



4.3 MILLION DEATHS PER YEAR

LINKED TO AIR POLLUTION VIA SOLID FUEL COOKING



BURNING TRADITIONAL BIOMASS FUELS LIKE WOOD AND CHARCOAL IS A MAJOR DRIVER OF DEFORESTATION





SUB-SAHARAN

AFRICA



SUB-SAHARAN

AFRICA

More than 80% of urban households use charcoal as their main cooking fuel.

In Africa, already 38% of the population lives in urban areas, and the UN estimates that this number will rapidly rise to 50% by 2040.



1 billion people in Sub-Saharan Africa

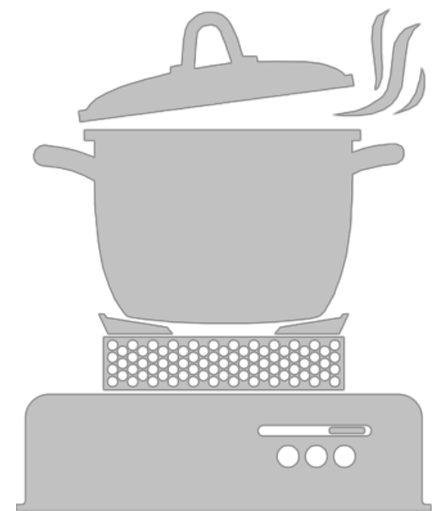
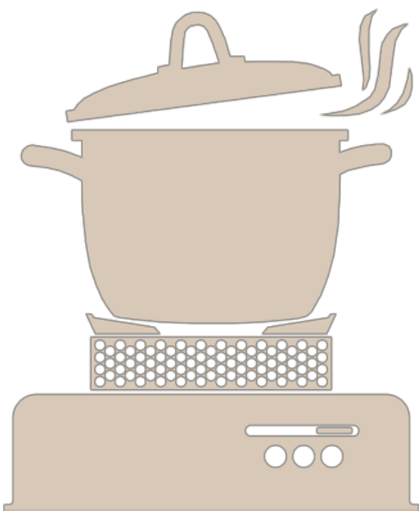
475 million people live in urban areas and that population **will double over the next 25 years.**

80% of the urban areas (**380 million people**) are cooking with solid fuel.

CLEAN RENEWABLE ETHANOL FUEL



- Ethanol fueled cookstoves address these issues
- Approximately 80,000 stoves distributed in over ten countries
- Very few ethanol standards specifically for ethanol as a cooking and appliance fuel



- Create a standard based on performance parameters which will:
 - Protect the consumer from purchasing sub-par quality fuel
 - Prevent ethanol as a cooking fuel from being consumed
 - Identify ethanol as a *cooking fuel* from other types of ethanol
 - Provide a benchmark for the classification of a new product



ASTM INTERNATIONAL

- One of the largest voluntary standards developing organizations in the world
- Representation from more than 150 countries
- National standards based on ASTM in 75 nations
- Over 34,000 members
- Over 12,700 ASTM standards operate globally
- Standards used voluntarily

Global Operations

- One of the world's largest Standards Developing Organizations - global reach
- Embraces all the principles of the World Trade Organization's Agreement on Technical Barriers to Trade
 1. Transparency
 2. Openness
 3. Consensus
 4. Relevance
 5. Coherence
 6. Development dimension
- Works across political, cultural and geographic borders
- Trusted for market relevance and technical quality
- The choice for many global industries – 47% outside



110

memorandums
of understanding

ASTM MEMORANDUMS OF UNDERSTANDING

CLEAN COOKING

ASIA	EUROPE	CENTRAL & SOUTH AMERICA	CARIBBEAN	MIDDLE EAST & NORTH AFRICA	EASTERN, WESTERN & CENTRAL AFRICA	SOUTHERN AFRICA
BANGLADESH	ALBANIA	BOLIVIA	ANTIGUA AND BARBUDA	AFGHANISTAN	ARSO	ANGOLA
BHUTAN	ARMENIA	CHILE	BAHAMAS	BAHRAIN	BURUNDI	BOTSWANA
BRUNEI DARUSSALAM	AZERBAIJAN	COLOMBIA	BARBADOS	EGYPT	CAMEROON	MALAWI
CAMBODIA	BOSNIA	COSTA RICA	BELIZE	GSO	COTE d'IVOIRE	MAURITIUS
CHINA	BULGARIA	ECUADOR	CROSQ	IRAQ	DEM.REP. CONGO	NAMIBIA
INDONESIA	CROATIA	EL SALVADOR	DOMINICA	ISRAEL	ETHIOPIA	SEYCHELLES
KOREA	EASC	GUATEMALA	DOMINICAN REPUBLIC	JORDAN	GAMBIA	SADC
LAO	GEORGIA	HONDURAS	GRENADA	KUWAIT	GHANA	SOUTH AFRICA
MALAYSIA	KAZAKHSTAN	NICARAGUA	GUYANA	MOROCCO	KENYA	SWAZILAND
MONGOLIA	KOSOVO	PANAMA	HAITI	OMAN	MOZAMBIQUE	ZAMBIA
MYANMAR	MOLDOVA	PARAGUAY	JAMAICA	PALESTINE	NIGERIA	ZIMBABWE
NEPAL	MONTENEGRO	PERU	MONTSERRAT	QATAR	RWANDA	
PAKISTAN	ROMANIA*	URUGUAY	ST. KITTS-NEVIS	SAUDI ARABIA	SIERRA LEONE	
PAPUA NEW GUINEA	RUSSIA		ST. LUCIA	TUNISIA	SENEGAL	
PHILIPPINES	SERBIA		ST. VINCENT - GRENADINES	TURKEY	TANZANIA	
SINGAPORE	UKRAINE		SURINAME	U.A.E.	UGANDA	
SRI LANKA			TRINIDAD & TOBAGO	YEMEN		
TAIWAN						
THAILAND						
VIETNAM						



- MOU signed in 2004 with ZABS
- Since then, ZABS has cited over 200 ASTM standards in their work
- Since ZABS is an MOU partner, anyone in Zambia can join as a member free of charge
- Simple 1 page application



Global Solutions to Common Problems

ASTM membership is open to direct participation globally

Known for Technical Quality and Market Relevance

ASTM process keeps the science in, and politics out

Solve Problems Expert to Expert

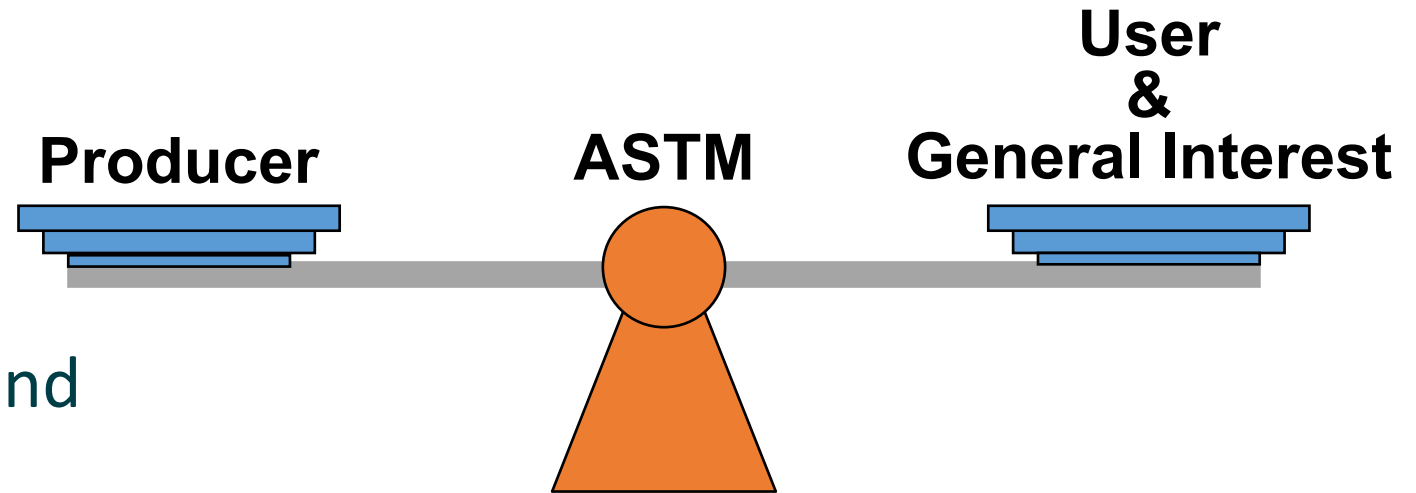
Collaborate in an open, transparent, and inclusive process

ASTM PROCESS

CLEAN COOKING

Equal Voice, Equal Vote

- Openness
- Consensus based
- Balance between Producers and Users/General Interest
- One official vote per “voting Interest”
- But all members can vote
- All negatives are addressed



Technical Committees are balanced.



OUR E-3050 PROCESS

CLEAN COOKING

1. Choose Committee
 - E48 Committee (Bioenergy and Industrial Chemicals from Biomass)
2. And Subcommittee
 - E48.05 Subcommittee (Biomass Conversion)
3. Task group assembled (members)
 - Comprised of 32 members representing various areas related to:
 - production of ethanol
 - regulatory implications of denatured ethanol
 - packaging and transportation of ethanol
 - safe handling of alcohol fuels
 - international distribution of ethanol
4. Met virtually seven times in 2015 over a 5 month period
 - (2 in-person meetings every year at ASTM – Dec/June)

THE ETHANOL COOKING FUEL STANDARD

CLEAN COOKING



Designation: E3050 – 16

Standard Specification for Denatured Ethanol for Use as Cooking and Appliance Fuel¹

This standard is issued under the fixed designation E3050; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers denatured ethanol intended to be used as a cooking or appliance fuel, or both.

1.2 Nothing in this specification shall preclude observance of federal, state, or local regulations.

1.2.1 Denatured ethanol has many regulatory limitations that cover the production, trading, transporting, distributing, wholesale and retail sale, and use of denatured ethanol; this specification does not purport to address the regulatory compliance aspects of these activities.

1.3 The addition of a denatonium benzoate is required in addition to any other denaturants that are added.

1.3.1 The denatonium benzoate is added as an additional deterrent to consumption. The denatonium benzoate must be added in an amount that meets the minimum and maximum requirements listed in [Table 1](#).

[D381](#) Test Method for Gum Content in Fuels by Jet Evaporation

[D4067](#) Practice for Manual Sampling of Petroleum and Petroleum Products

[D4177](#) Practice for Automatic Sampling of Petroleum and Petroleum Products

[D4306](#) Practice for Aviation Fuel Sample Containers for Tests Affected by Trace Contamination

[D4815](#) Test Method for Determination of MTBE, ETBE, TAME, DIPE, tertiary-Amyl Alcohol and C₁ to C₄ Alcohols in Gasoline by Gas Chromatography

[D5854](#) Practice for Mixing and Handling of Liquid Samples of Petroleum and Petroleum Products

[D5501](#) Test Method for Determination of Ethanol and Methanol Content in Fuels Containing Greater than 20% Ethanol by Gas Chromatography

[D7795](#) Test Method for Acidity in Ethanol and Ethanol

Keywords:

- appliance fuel
- cooking fuel
- denatured ethanol
- ethanol fuel
- stove fuel

SCOPE

1.1 Denatured fuel for cooking and/or appliance fuel

1.2 Not to preclude observance of other regulations (federal, state, local)

** Not addressing regulatory compliance

1.3 Denatonium benzoate required in addition to any other denaturants

** Deterrent to consumption of fuel. Amounts must meet min/max levels in spec table

1.4 Colored dye also required. Must meet min/max levels in spec table

** Visual indicates that the product is not potable

1.5 Values stated in SI units regarded as standard. No other measurement units included

1.6 Does not purport to address all safety concerns, if any, associated with use.

ASTM Standards

- D381
- D4057
- D4177
- D4306
- D4815
- D5854
- D7795
- E203
- E300
- E1064

TERMINOLOGY

Denatured ethanol – ethanol made unfit for beverage use by the addition of toxic or noxious materials

Higher alcohols – aliphatic alcohols of general formula $C_nH_{2n+1}OH$ with n being 3 to 8

Hydrocarbon – those components in an ethanol hydrocarbon blend containing only hydrocarbon and carbon

WORKMANSHIP

CLEAN COOKING

- Should be visually free from sediment and suspended matter
- Should be free of any adulterant or contaminant that can render the material unacceptable for applications
- Additives beyond denaturants and colorants discouraged. Higher molecular weight additives can create issues with combustion or lead to deposits.
- Monitoring the fuel using Test Method D381 can determine if additives have been added. Can provide early indication of contamination.
- Care should be taken when selecting and choosing colorant. Not all colorants are soluble in ethanol.

TABLE 1 Denatured Ethanol Cooking and Appliance Fuel Specifications

Property	Units	Limit	Min/Max	Test Method
Ethanol	volume %	90	Min	D5501
Water	volume %	10	Max	E203 or E1064
Higher Alcohols (C ₃ -C ₈)	volume %	2	Max	D4815
Hydrocarbon ^A	volume %	1	Max	Documented Addition
Acidity (as acetic acid)	mg/Kg	40	Max	D7795
Denatonium Benzoate	mg/Kg	10-20	Min-Max	Documented Addition
Colored Dye	mg/Kg	10	Max	Documented Addition

^A The hydrocarbons approved for use under this specification are as follows: gasoline, unleaded gasoline, natural gasoline, heptane, or rubber hydrocarbon solvent.

SAMPLING, CONTAINERS, AND SAMPLE HANDLING

CLEAN COOKING

- User strongly advised to review all intended test methods prior to sampling. Important to understand sampling technique, proper containers, and special handling required of samples.
- Correct sampling procedures critical to obtain representative sample.
 - *Automatic method sampling tests are provided.*
- Correct sample volume and appropriate container selection are important decisions that can impact test results.
 - *References to tests are included.*
- **Sample size** = minimum of 1 liter recommended
- **Lot size** = normally consist of the amount in the tanker compartment or other bulk container in which it is delivered. If this definition does not apply, definition should be agreed between supplier and purchaser.

TEST METHODS

Ethanol – Test Method D5501

Water – Test Methods E203 or E1064

Higher Alcohols – Test Method D4815 or other suitable gas chromatography method

Acidity – Test Method D7795

Solvent-Washed Gum Content – Test Method D381, air jet apparatus

Documented Addition – the process of providing written documentation on specific amount of a substance added

NEXT STEPS

- Other countries can consider adopting ASTM E3050 to ensure quality fuel reaches consumers.
- Individuals can become members of ASTM
 - Free ASTM membership for Zambia and other African countries
 - (MOU with ASTM)



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2019 MOU Committee Membership Application

Welcome to ASTM International and Participation on Technical Committees!

I want to join Committee

PLEASE PRINT ALL INFORMATION CLEARLY. DO NOT EXCEED THE CAPACITY OF EACH LINE.

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I agree, by my participation in ASTM and enjoyment of the benefits of my annual membership, to have transferred and assigned any and all interest I possess or may possess, including copyright, in the development or creation of ASTM standards or ASTM IP to ASTM. See ASTM IP policy, www.astm.org/prpolicy.html

Signature _____

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Thank you!

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