Interchangeability Implementation Strategies

Appliance Research Opportunities

PHMSA R&D Forum
2007 New Orleans Meeting

Is This The Second "Great Conversion"

A purge burner igniting manufactured gas being replaced in a main by natural gas during the 'great conversion' in 1952

- Supply Mix Is Changing……..
- LNG Imports Will Play A Major Role
- End-use Technology Has Evolved
- Begs The Question….

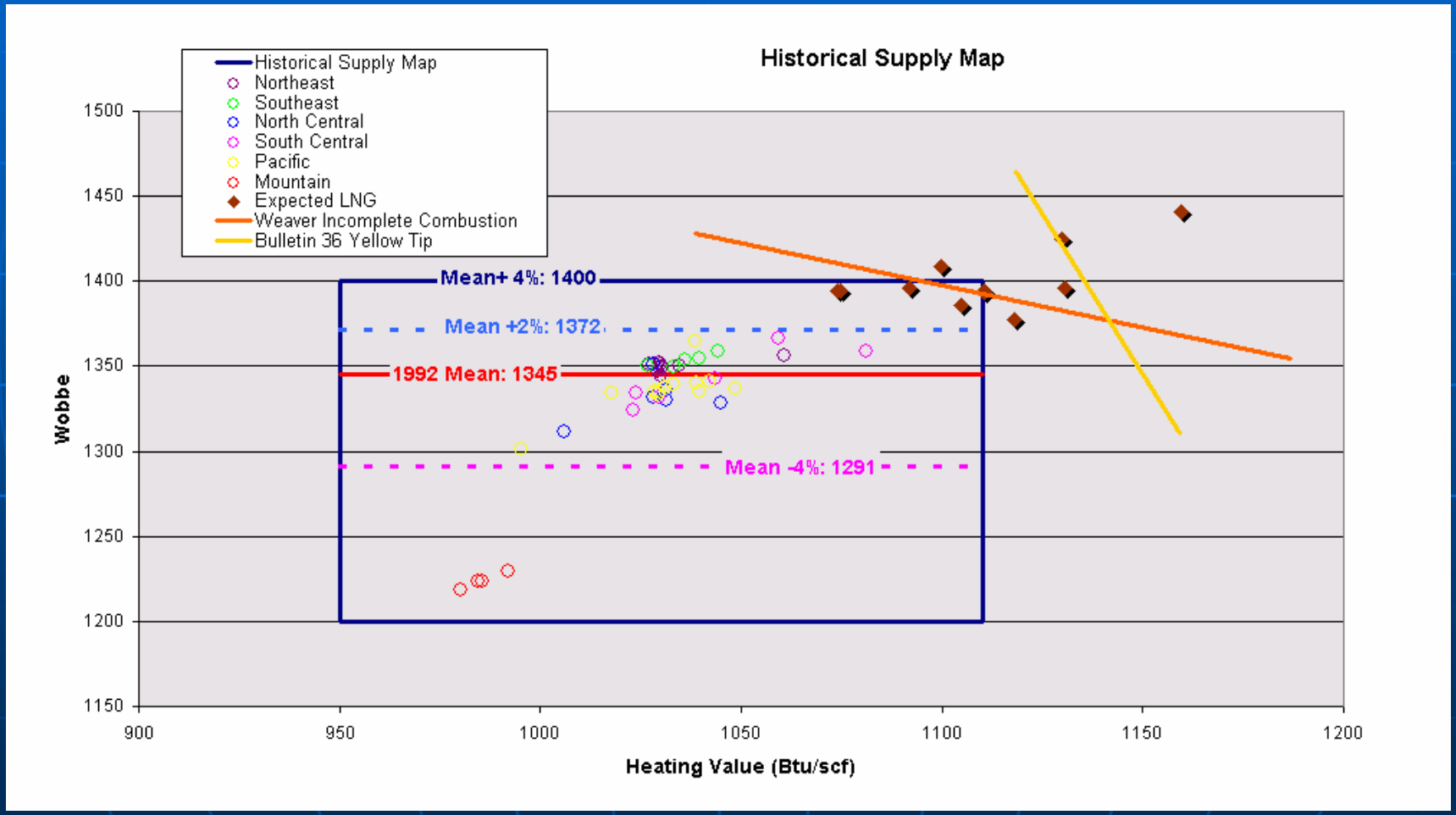
Is Yesterdays Research Sufficient To Examine Today's Challenges ??

Did The White Paper Help ???

- Historical Wobbe +/-4%
- Capped at 1,400 + 1,110 HHV
- Butanes+ 1.5 %
- Total Inerts 4 %

- ***Wobbe Alone May Not The Answer !!***

Opening the Wobbe "Umbrella"



Interchangeability Index Comparison

Method	Principally Measures (1)	Combustion Phenomenon Predictor	Historical Wide Acceptance in the U.S.
Wobbe	H	Inadequate	Yes
Knoy	H	Inadequate	No
AGA "C" Index	H	Inadequate	No
AGA Multiple Index	Y, L, F	Acceptable	Yes
Weaver Multiple Index	H, Y, I, L, F, S	Acceptable	Yes
Delbourg	H, Y, I, L, F	Acceptable	No (2)
Gilbert & Progg	H, Y, I, L, F	Acceptable	No (2)

(1) H= Heat Input, Y= Yellow Tipping, I= Incomplete Combustion, L= Lifting, F= Flashback, S = Sooting.
(2) Developed for European burner design.

Where Are We Today ?

- GAMMA Is Conducting Research on New Appliances Relative To Interim Guideline Recommendations
- Consideration Needs Be Given To Development of Limit Gas Testing Development
- AGA Bulletin 36 & AGA Report 4A Revision Task Groups
- Little or No Consideration Has Been Given To Assessing Risks and Developing Implementation Strategies to Deal With the “Installed Appliance Population”

What Does All Of This Mean ?

- Utilities MUST understand “installed appliance risks” to assess new supply opportunities
- Laboratory Testing of “Representative” Appliances, Including Maladjusted and Improperly Maintained Appliances is required
- Develop “Implementation Plan” To Address Appliance Related Interchangeability Issues Prior Introduction Of New Supplies

Proposed Project Objectives

- Assess & Update Existing Appliance Interchangeability Evaluation Criteria, Historical & Recent Research Programs – Identify Gaps
- Develop a Standardized Gas Interchangeability Risk Assessment & Evaluation Process For Installed Appliances Based On Field & Laboratory Testing.
- Standardize Interchangeability Criteria To the Extent Possible Considering “Harmonization” Of Evaluation Parameters

Suggested Approach

- Document Recent Appliance Testing Programs, Prevailing Installation Practices and Policies, Adjustment Gases – Identify Gaps
- Develop a Representative Sampling Plan for Gas Households and Appliances
- Collect Data on Input Rates, Flame Adjustment Status, and CO Production & Other Emissions in the Field for Appliances as Found
- Adjust Appliances and Document Field Adjustments
- Centrally Compile Data Across Utilities for Appliances as Found and as Adjusted

Suggested Approach

- Perform Laboratory Testing Of Representative Appliance Population “as found”
- Assess Interchangeability Criteria Relative To Interim Guidelines (and beyond ?)
- Develop Standardized Prediction Criteria Considering Reasonably Expected Substitute Gases Relative To Existing Adjustment Gases and Installed Appliance Population Sensitivities
- Develop A Standard Evaluation Process & Risk Mitigation Measures Based On The Abovementioned Criteria

Project Implications

- Distribution of Improperly Adjusted or Maintained Appliances Defines Population of Concern for Introduction of New Supplies
- Field Adjustment Status Provides Information on Mitigation Policy Options, Absent of Control for Gas Supply
- Responses of Improperly Adjusted or Maintained Appliances to Specific Gas Quality Changes Requires Controlled Laboratory Testing
- Representiveness, Repeatability, and Reliability of Field-to-Laboratory Testing is Essential
- Response to Specific Gas Quality Changes May Include a Combination of Changes in Installation/Service Policies and Gas Quality Specifications

SUMMARY

- First Comprehensive & Critical Research Regarding Interchangeability Criteria Considering Installed Appliances In Over 50 Years !!
- **The Time For This Work Is Now Considering Alternate Supplies That Will Have Direct Market Area Impacts !!**
- This Work Is Intended To Compliment The Work of NGC+ & Is Part Of The Overall Research Recommendations.
- Work Is Supported By AGA & Will Be Coordinated With AGA Bulletin 36 Task Group & BECS Committee