



TENNESSEE DEPARTMENT OF AGRICULTURE

Regulatory Services Division

E85 Fuels – Issues and Solutions





E85 Fuels – Issues and Solutions Presentation Outline

- ✓ Review Fundamental Requirements for E85
- ✓ Blending E85 from Gasoline and Denatured Fuel Ethanol
- ✓ Meeting Seasonal Volatility Control Range
- ✓ Dispenser Labeling Requirements



TENNESSEE DEPARTMENT OF AGRICULTURE Regulatory Services Division

E85 Fuels Requirements

- ✓ All Fuel Standards in TN are based on ASTM International Standards and Tennessee Rules
 - ASTM D5798 is the governing document for Fuel Ethanol (Ed75-Ed85) for Automotive Spark-Ignition Engines (e.g. E85).
 - Covers important parameters such as volatility, EtOH content, Acidity, Inorganic Chlorides, Water,...
 - References all Standard Test Methods that are to be used to verify the characteristics of the fuel.
- ✓ Legislative Authority T.C.A. 47-18-1301 et seq.





E85 Fuels Requirements ASTM D5798

The property that most often results in fuel failures is vapor pressure
E85 fuel must fall within a minimum and maximum range for vapor pressure.

- ✓ October 2008 Coordinating Research Council issued CRC Report No. 652:
“2008 CRC Cold-Start and Warmup E85 And E15/E20 Driveability Program”
- ✓ In this 87 page report, the conclusions were that:
 - For E85 fuels, driveability improved with:
 - increasing vapor pressure
 - 4.7 psi E85 fuel had most demerits
- ✓ Class 1 & 2 fuels with vapor pressure tested in cool conditions, 23F, 33F, and 47F.
- ✓ E85 vapor pressures of 4.7, 5.7, and 7.0 psi used in fleet tests.



E85 Fuels Requirements ASTM D5798

- ✓ July 2009 Coordinating Research Council issued CRC Report No. 654: “2008 CRC Cold-Start and Warmup E85 Cold Ambient Temperature Driveability Program”.
- ✓ In this 84 page report, the conclusions were that:
 - For E85 fuels, cold start and warm-up driveability improved with
 - increasing ambient temperatures
 - increasing vapor pressure
 - increasing hydrocarbon content
 - No-starts only occurred at < 20 deg. F ambient temperatures
 - Total weighted demerits most pronounced at 0F and below
- ✓ Class 3 fuels were tested.
- ✓ Results inconclusive in terms of justification of lowering vapor pressure minimum.



TENNESSEE DEPARTMENT OF AGRICULTURE
Regulatory Services Division

E85 Fuels Requirements ASTM D5798

Question: What is the Issue with E85 Compliance?

Answer: Meeting the Minimum Vapor Pressure Requirement

Solution: Blending to Minimum Ethanol Limits

E85 Samples Tested Past 12 Months

Number of Samples Tested	% Violation for Vapor Pressure
53	20.75 (11 samples)



TENNESSEE DEPARTMENT OF AGRICULTURE
Regulatory Services Division

**E85 Fuels Requirements
ASTM D5798**

Vapor Pressure Range Requirements for Tennessee, PSI

December – February	9.5-12.0
March	7.0-12.0
April	7.0-9.5
May	5.5-9.5
June - August	5.5-8.5
September	5.5-9.5
October	7.0-9.5
November	7.0-12.0



TENNESSEE DEPARTMENT OF AGRICULTURE
Regulatory Services Division

**E85 Fuels Requirements
ASTM D5798**

What is the Minimum Ethanol Content For Compliance TODAY

November – March	70%
April - May	74%
June - August	79%
September - October	74%



E85 Fuels Requirements ASTM D5798

What is being done to alleviate the problem?

ASTM International Committee D02, Subcommittee A has balloted a change in the specification that will allow the minimum ethanol content to be lowered to 68% for all volatility classes.

If this ballot passes, will it guarantee compliance if blended to this target level?

No!

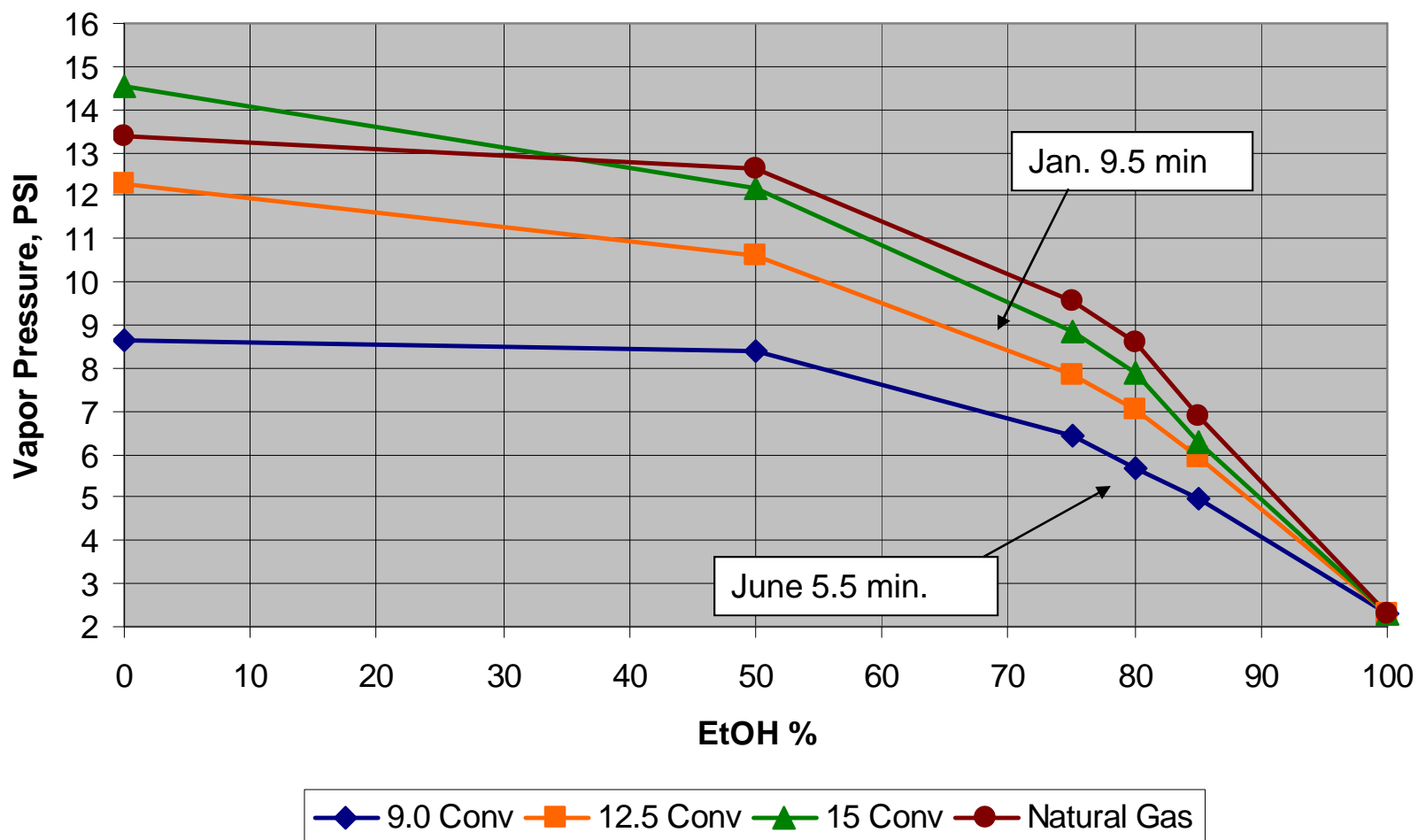
MONTHS (TN)	Current Min.	Proposed Min.
November – March	70%	68%
April - May	74%	68%
June - August	79%	68%
September - October	74%	68%



TENNESSEE DEPARTMENT OF AGRICULTURE

Regulatory Services Division

Vapor Pressure of Higher EtOH Blends





Other Considerations For Blending E85 Fuel Ethanol

- ✓ ASTM D4806 Standard Specification for Denatured Fuel Ethanol for Blending with Gasolines for Use as Automotive Spar-Ignition Engine Fuel has been developed primarily as a spec for blendstock material for E10 blends.
- ✓ There are a few properties of Denatured Fuel Ethanol (E100) that, if at the max limits, would compromise the suitability for blending to E85 Fuel Ethanol:
 - Inorganic Chlorides – low concentrations corrosive to metals
 - Copper – catalyst for oxidation which leads to gum formation
 - Acidity – corrosive in low concentrations (e.g. acetic acid)



Other Considerations For Blending E85 Fuel Ethanol

Specification Limits

Product \ Property	E85	E100
Inorganic Cl, ppm, max	1	10
Cu, mg/L, max	≈0.08	0.1
Acidity, mass %, max	0.005	0.007

Effect of Blending with DFE @ Max Limits:

Property \ % Ethanol	Acidity .005 max	Cu .07 max	Inorganic Cl 1 max
E85	.0059	.085	8.5
E79	.0055	.079	7.9
E74	.0051	.074	7.4
E70	.0049	.070	7.0

Solution: We have NOT seen real world field problems in these areas. However, you may choose to use purchase specs that will ensure that DFE is suitable for blending E85 Fuel Ethanol.



TENNESSEE DEPARTMENT OF AGRICULTURE Regulatory Services Division

E85 Classification and Method of Sale Requirements

- ✓ Declare E-85 on PTD's
- ✓ "How to Identify Fuel Ethanol," fuel ethanol shall be identified by the capital letter E followed by the numerical value volume percentage. (Example: E85)
- ✓ "Retail Dispenser Labeling," each retail dispenser of fuel ethanol shall be labeled with the capital letter E followed by the numerical value volume percent denatured ethanol and ending with the word "ethanol." (Example: E85 Ethanol)
- ✓ "Additional Labeling Requirements," fuel ethanol shall be labeled with its automotive fuel rating in accordance with 16 CFR Part 306.





TENNESSEE DEPARTMENT OF AGRICULTURE
Regulatory Services Division

Questions?

