

You May Be Interested.....

On April 15, EPRINC and EIA held a roundtable workshop on the 9 billion gallon ethanol consumption mandate for 2008. This measure was enacted in December 2007, by the Energy Independence and Security Act (EISA). The workshop brought together a comprehensive cross-section of stake holders. Attached is an overview of the dialogue and a summary of the “take-away” points.

Ethanol consumption had grown rapidly on its own: At year-end, the monthly run rate was at 7.5 billion gallons annualized. All the nation’s RFG was blended and ethanol had begun to reach into the conventional portion of the gasoline pool. Progress in blending more conventional gas is being made by increasing ethanol’s geographic footprint, a pay-off to efforts in the “midstream” oil industry space. Just as important, midstream has successfully worked with state regulators in areas where E-10 needs to be rolled-out, establishing the physical standards for environmentally compliant fuel.

Economic distribution of ethanol is a cooperative endeavor, and railroads, ethanol producers and midstream operators have worked together to facilitate unit train transport, which is key here. Meanwhile, oil pipelines are researching ethanol’s compatibility with steel, which has been a barrier to the most economic form of transport.

E-10 acceptability in most engines had been realized, but early concerns about “over-spec” blends were expressed, suggesting much more study was called for before E-12 or E-15 becomes an option to enhance consumption.

The workshop participants pointed toward the likelihood of adequate supply for 2008, with corn being tight but available, plant capacity near the 9 billion gallon goal, and plant economics that cover operating, if not capital costs. Many ethanol producers seemed to be benefiting from corn contracts priced below the market. At workshop time, ethanol supply seemed to be “hanging in” despite these threats. But, as the growing season has progressed, rain in the Corn Belt has adversely impacted planting and early growth. Corn prices have soared, with ethanol prices trying to keep pace. Ethanol producers have deferred new plant start-up, and feedstock supply and cost cause serious supply concerns. This has resulted in national concerns about food prices, and could lead to rethinking of the mandate, at least for 2008.

If you have any questions or comments on the report, please contact Larry Kumins at larryk@eprinc.org, Tel: 443-949-7462.

Presentations from participants in the workshop are available in the publications section of our website and can be accessed through the following link: www.eprinc.org/files/agendaEPRINCEIA.html

Other EPRINC Contacts:

Lucian Pugliaresi, loup@eprinc.org (Tel: 202 944 5082)

Ben Montalbano, benm@eprinc.org (Tel: 202 944 3339)

Larry Goldstein, larryk@eprinc.org (Tel: 631 335 9302)

**Ethanol Mandate 2008---Summary
The EPRINC-EIA Ethanol Roundtable Discussion
April 15, 2008
Washington DC**

In a Nutshell

EPRINC-EIA brought together a range of stakeholders to discuss early progress---and identify obstacles---to meeting the 9 billion gallon ethanol mandate established for 2008 by the Energy Independence and Security Act of 2007 (EISA). The discussion highlights are:

Status Quo

Ethanol entered the motor fuel pool quickly. By the end of 2007, consumption exceeded earlier mandates, running at 7.5 billion gallons annualized. All RFG was blended; ethanol's reach was extending to conventional fuel. E-10 comprised 54% of motor fuel. The 2008 mandate will bring this to about 65%.

Ethanol Transport

Compatibility issues have kept pure ethanol and gasoline blends out of petroleum pipelines, the chief transport mode for oil products. The pipeline industry is studying this extensively---initial results are expected this summer. While optimism is prevalent, if and to what extent ethanol and its blends will be deemed suitable for pipeline input is unclear; it might be impossible. Additionally, DOT is at work on safety considerations for ethanol pipeline transport.

Meanwhile, ethanol movement by rail grows, with unit trains offering the best economics. Since most ethanol plants and fuel terminals do not have sidings for rail cars, not to mention unit trains, trucks commonly cover the "first" and "last" mile. New oil terminal facilities are configuring rail access where they can. Rail offers routes that suit ethanol transport geographically; pipelines more often are laid-out for Gulf Coast-North/NE transport.

Transport to the southeast part of the country is needed to bring ethanol to currently unblended gallons.

Implementation: The 9 Billion Gallon Mandate

Some concern was expressed about obligated parties to meet the blending requirement and acquire sufficient RINs to demonstrate compliance. With 2007 blending at a high level and excess RINs theoretically available, will there be a tradable surplus for easy compliance, or will they be unusable? And since 2008 did not start at a 9 billion gallon

“run rate”, end-of-year months should have much higher ethanol utilization to average 9 billion for the whole year. How will the compliance program deal with late year physical blending realities?

EPA expressed unwillingness (at least initially) to consider modifying the compliance program details or attempt to lower the 9 billion gallon mandate. Even if gasoline sales do not realize expected levels, the amount of gasoline blended with ethanol will need to increase such that 90 billion gallons of E-10 will be consumed.

Broadening Ethanol Distribution

Markets in the South East represent the location of conventional gallons needed for ethanol blending. At issue here---and to a lesser extent in the rest of the nation---is capacity to actually receive ethanol and do fuel blending, as well as state environmental regulation of fuel characteristics. The former are being addressed by new projects from a number of integrated oil companies investing in the mid-stream market segment, assuring consumers a flow of centrally blended fuel. The later is moving toward resolution, as numerous state standards---some of which inhibited blending state-compliant fuel---become standardized to the point where one basic fuel for ethanol blending will likely meet region-wide specs soon.

Ethanol Supply

RFA reported that there were 8.5 billion gallons of corn ethanol capacity currently on line, and another 5.1 billion gallons capability under construction. Manufacturing capacity per se does not seem to be an issue; it could well be that feedstock considerations become more important.

Corn cost plays a major role in ethanol plant economics. A decline in farmers' corn planting intentions suggests nearly a billion bushels less corn will be grown this year than last. Rain has delayed planting in much of the Corn Belt, leaving late-planted crops vulnerable to yield reduction for late development during hot weather. Corn markets responded with \$7.00 prices. But ethanol prices have remained in the \$2.50 per gallon area. Confronted with these figures, ethanol producers would find it difficult to recover corn cost, and likely be unable to cover other costs as well, not to mention earning no profit. To the extent that ethanol plants' output continues, it is likely that hedged corn prices are contributing, and when the low-cost corn is gone, either ethanol prices will have risen, or output will begin to decline.

Ethanol and Engines

If gasoline sales fall, and the distribution of ethanol is sufficiently limited by infrastructure considerations, a situation could arise wherein the mandate was not met. Obligated parties and others might seek to “over-blend” fuel, exceeding the 10% limit set

by EPA and engine manufacturers warranties. The auto industry expressed concerns that limited initial testing of E-20 had resulted in engine system damage, suggesting much more testing is called for there appears to be a need to exceed E-10. With marine engines, concern was expressed that accidental over-blending takes place and pictures of damaged engine parts were shown that might be linked to high-ethanol content. A photo of a gas station sign advertising E-20 was also shown.

With the status quo, E-10 is successfully operating in current model autos, and most current model marine applications. Marine offers special challenges because of ethanol's affinity for water; it tends to attract water into boat fuel tanks, where the mix becomes problematic. In fact, boat gas tanks have had a history of ethanol incompatibilities, especially fiberglass tanks, where ethanol has dissolved the laminate.

In the long run, with ethanol mandates scheduled to average over 20% of gasoline consumption, and E-85 up-take very slow, concern exists that higher blends will be sought, perhaps without adequate study of engine impact.

The Status Quo Outlined

The rapid entrance of ethanol into the motor fuel market during 2006 devolved for the sudden shift out of MTBE and the immediate need for a replacement blending component. The natural market for ethanol as a motor fuel component is in RFG, where ethanol has a natural role as an oxygenate well as an octane booster. By the end of 2007, all RFG contained ethanol, meaning that the natural market was fully satisfied and additional gallons of ethanol would call for penetrating the conventional gasoline share of the market and selling conventional E-10. During December 2007---when the 9 billion gallon mandate was enacted---the US gasoline fuel pool was composed as estimated in Table 1 below.

Table 1. The Gasoline Pool and E10 - December 2007	
	(mbd)
US Refiners - RFG	3.0
US Refiners - Conventional E-10	1.5
US Refiners - Conventional Unblended	4.0
Imported RBOB	0.6
Imported Conventional	0.4
Total	9.5
Sources: EPRINC estimates based on EIA Data	

Including imported RBOB blended in the US, an estimated 5.1 mbd (about 54% of the gasoline pool) of E-10 was sold. If this fuel was blended with 489,000 bd of ethanol (the equivalent of 7.5 billion gallons per year), the resulting blended fuel contained nearly 10% ethanol, the limit. No more ethanol can be consumed here. Were ethanol blending to extend its reach for 2008 by including another 1.5 billion gallons, this would likely involve accessing some of the 4.0 mbd of domestic refiners' conventional fuel. For the 2008 mandate, another 100,000 bd of ethanol must be blended into conventional fuel to make an additional 1.0 mbd of E-10. All else being equal, with total gasoline consumption at 9.4 mbd as originally forecast for the year as a whole, this would extend E-10 to 65% of the gasoline pool for 2008.

Mandates ultimately call for use of 14 billion gallons of corn ethanol to be blended into the motor fuel pool. If gasoline demand were to remain at last years' levels---and the blend limit remained at 10%--this would call for virtually all of the gasoline sold to be E-10. Universal distribution to all parts of the nation would be needed, and to the extent that ethanol did not reach every gasoline gallon, higher percentage blends---such as E-85 or an intermediate blend such as E-15 or 20---will be needed for mandate fulfillment.

Moving Ethanol Into Expanded Markets

At workshop time, an unresolved physical conflict between at least some types of ethanol and some pipeline steel appears to exist, and fears that it could lead to stress corrosion cracking (SCC) of pipeline walls has precluded carriage in US pipelines. SCC has appeared in some steel storage tanks and associated piping, sending a warning about apparent incompatibility.

SCC is an insidious form of pipeline deterioration, because the pitting that results is hard-to-detect using the tools with which pipelines are internally inspected. A study program, which will provide the key to whether or not, and in what form, ethanol can safely be shipped via pipeline is underway. The research is sponsored by the AOPL; CC Technologies, a research organization experienced in doing the studies, researching the nature of SCC in pipeline steel, and what practices might mitigate the problem. CC Technologies will also shed on the compatibility of pure ethanol as well as various blends in which types of pipeline systems. This is the first phase of what is likely to be an extensive study, and a late-summer report is expected.

Other compatibility issues appear to involve seals and gaskets. These are certified by Underwriters Laboratories, and UL needs to resolve any issues and certify acceptability. More appears to be known about these system components than the steel itself.

Beyond issues regarding ethanol and pipeline integrity, is the matter of shipping E-10 blends without damaging the blended material. Since there has been no pipeline carriage of the new fuel, the extent to which it might become contaminated with water picked up in the pipeline is an unanswered question. Pure ethanol---and perhaps some blends---is a strong solvent, and a cause for concern about dissolving substances accumulated in the pipeline, and picking up contaminants that might damage the motor fuel.

Another over-arching consideration is the geographic layout of the nation's pipeline grid, which has largely been configured to carry petroleum from refining centers along the Gulf Coast to consuming sectors in the central and northern part of the country. Much ethanol production is located in the Midwest, and is transported to markets in the east, northeast, and west and more recently the south. For supplying ethanol markets in the north, east and south the pipeline system generally heads in the wrong direction.

Safety regulations need to be established that are clear cut, so that they don't stand in the way of doing what can be technically accomplished. DOT seeks input from pipelines undertaking research and testing programs to gather information upon which practical safety standards can be based. Hazmat licensing and standards for addressing ethanol's specific safety characteristics (such as firefighting) and first responder preparedness need to be set.

Beyond ethanol in existing pipelines DOT is working on requirements that will eventually apply to new, yet to be built pipelines that will clearly address safety needs without becoming an undue burden.

Moving Ethanol Into Expanded Markets - Pipelines and Rails

A close correlation between ethanol output and RR carloadings was articulated, suggesting that rail is the preferred way of transport. The rapid deployment of ethanol during 2005 and 2006 doubled rail carloads supports this causality—at the transport core, rail is the preferred mode for a great deal of product movement. But for the total railroad industry, ethanol carloads comprise less than 1% of traffic, so near-term increases can be accommodated without overloading the rail system.

Most ethanol shipments originate in the Midwest, with shipments headed northeast and increasingly south. Rail offers directional configuration supporting this traffic. Existing oil pipelines, in contrast, essentially run in the directions aimed at bringing fuel into the central and eastern part of the nation from refining and crude producing centers. The bulk of shipments on oil pipelines originate in the gulf coast area. Based on the geographic configuration of the rail system, it offers mid-western ethanol producers shipping opportunities that would not be afforded by existing pipelines were shipment of ethanol or blends to receive a green light.

Unit trains offer ethanol the best rail transit economics. Here, close planning and producer-rail cooperation is called for because ethanol competes with other commodities for transit “slots”, and because unit trains call for special terminal infrastructure at ethanol plants as well as fuel terminals. In many cases, the first and last mile of ethanol shipment will be via truck, since not all ethanol plants and fuel terminals will have sufficient rail infrastructure, although some new terminal-storage-blending facilities in process take advantage of “brown-field” sites now having, or having had, robust rail access.

Railroads currently have few capacity “chokepoints” now, but steadily growing rail traffic in general will create significant “above capacity” situations—many in the central part of the country---in the decades to come. New investment will be called for to prevent bottlenecks. DOT projects a 75% increase in the number of tons of freight transported in the US by 2035, highlighting the need for expanded facilities; coordination among ethanol transporting stakeholders will be key to assuring future transport capacity availability.

Economics also play a role in expanded capacity. But rising transport demand and industry consolidation have occurred almost in the same time frame. This has lead to 4 firms owning much of the nationwide footprint---suggesting the rails hold sufficient pricing power to assure the viability of new investment.

Program Implementation Issues

The Renewable Fuel Standard (RFS) was required by the Energy Policy Act of 2005 (EPACT 05). Subsequent, year-end enactment of the Energy Independence and Security Act of 2007 (EISA) ---with expanded volumes of ethanol consumption mandated---enhanced the importance of the programmatic aspects of the RFS.

To ensure that obligated parties blend ethanol in mandated amounts, the EPA has developed a tracking system that assigns a 38 digit renewable identification number (RIN) to each gallon of ethanol produced or imported. RINs---and the trading program that facilitates compliance among obligated parties---began among EPA registered parties in September 2007, when the RFS program went into effect.

Extra RINs were accumulated for starting ethanol inventory. As noted above, ethanol use was far ahead of the EPACT 05 mandate for 2007, so more RINS existed than needed to meet the 2007 RFS. In fact, the “run rate” of ethanol blending in December was about 7.5 billion annualized gallons---equal to the 2012 EPACT 05 target.

How early surplus RINs were actually used has a great deal to do with the life expectancy of the unused RINs, so it is not entirely clear exactly how many RINs will be “left over” (and what their market price or “value” might be) at the end of 2008 for obligated parties to deal with meeting any blending shortfall, assuming there is one. Obligated parties must comply with RINs, 80% of which must come from the current year; no more than 20% may come from the previous year. This leads to some ambiguity about the “ageing” of RINs and the number of usable RINs that might be available during 2008.

The RINs framework is now solidly in place and EPA indicated no urgency to make changes, especially since there has been no early showing of difficulties. The concept of a shortened RIN “number” was discussed in general terms, but no linkage was made associating the need for such a measure with a specific problem, current or anticipated.

EPA expressed unwillingness to consider taking measures to relax the 9 billion gallon mandate, even if national gasoline consumption falls below forecast. Were gasoline consumption to fall below estimates, the 9 billion gallon requirement would not change, but the **percentage** of ethanol required to blend would rise.

This is becoming an issue during 2008. The most recent EIA *Short Term Energy Outlook* forecasts this year’s gasoline consumption at 9.224 mbd. ¹ This is the equivalent of 141 billion gallons. That’s a downward revision from the March forecast of 9.37 mbd ² (144 bil. gals.), suggesting there will be 2% less gasoline consumed but the same amount of ethanol mandated. The revised motor fuel consumption figure means there are fewer blend able gallons available. Blenders will have to find more (a higher percentage)

¹ See <http://www.eia.doe.gov/emeu/steo/pub/xls/Fig14.xls>

² See DOE/EIA -0383 (2008), Table 11.

unblended conventional gasoline---reaching deeper into this part of the gasoline pool---to place the mandated amount of ethanol. In the case of these forecasts (subtracting one from the other), an estimated 150,000 barrels per day more conventional gasoline will need to be blended so that ethanol content will not exceed 10% and so that all 9 billion gallons “finds a home”. The E-10 pool will have to reach that much farther into conventional consumption, and assumes the transportation and distribution system extends its reach to the location of consumption of these barrels.

Given the extent of pump price increases, it may well be that gasoline consumptions declines even further, necessitating going deeper into the conventional portion of the gasoline pool, and perhaps further a field as well, extending the ethanol distribution footprint.

Declining total motor fuel demand is a factor that will cause obligated parties to reach further into the conventional gasoline pool for opportunities to blend without exceeding the E-10 standard. Because declining motor fuel demand is without much historical precedent, it comes as a largely unexpected factor as ethanol mandates increase.

Broadening the Ethanol Footprint

Marathon blended 10% of the ethanol consumed in 2007. Traditional markets historically using ethanol blends (RFG, oxygenated areas) are now saturated, calling for expansion into markets where ethanol use—prior to the ESICA mandates—has been discretionary. Markets in the Southeast have been late in subscribing to E-10, but this is changing quickly, as the regions gasoline volumes are important to meeting the 2008 mandate.

Many refinery expansion and enhancement projects are located in the Gulf Coast area, and this will supply E-10 petroleum-based blending components via the Colonial pipeline (moving diagonally across the south to Virginia and north) and up the Explorer pipeline, across the Mid-west to the Great Lakes area.

The midstream part of the motor fuel distribution system is accommodating ethanol needs, with a complex matrix of enhancements to the transportation and distribution infrastructure. Mid-stream operators see rail, truck, and barge transport as regionally important transport modes; much of the Southeast terminal operations are water-served. The make-up of the ethanol transport matrix—with the various transport modes interfacing along delivery paths---poses some challenges that have not, at this point, been met; greater investment will be called for.

Significant new investments are being made in ethanol blending capability at new and existing terminals in the Southeast and along the pipeline routes. Hub blending locations will add important capability located where the heretofore unblended (conventional) gallons are consumed, and will facilitate increased ethanol use. Hopefully, their progress will match the fast pace of mandated ethanol growth.

The conventional gallons consumed in the southeastern corner of the nation are impacted by states having their own, dissimilar volatility regulations. This has stymied E-10 growth into these areas and this portion of the gasoline pool. Progress on rationalizing these standards has been made. But, for E-10 to be marketed universally, the states must facilitate an ASTM-compliant base fuel that is suitable for ethanol blending. Moving these states toward one blending material provides greater “fungibility,” avoiding supply shortfalls, ensuring consistent availability, and minimizing the need for transporting and storing small quantities of fuel that need to be kept separate. It helps minimize what had started as a proliferation of boutique gasoline formulations and provides a constructive step toward nationwide motor fuel standards.

A significant share of the new “midstream” infrastructure sponsored by integrated oil companies’ also expanding refining capacity, which basically backstops their distribution business. Refinery output aimed at gasoline formulated for ethanol blending. Refiners seek to provide lower octane mogas to be boosted with ethanol. In order to do this, states in the region need to follow-through on recent developments harmonizing E-10 standards.

A final link in E-10 distribution is the retail outlet. For retailers, the only investment called for is tank cleaning, costing less than \$1,000 per tank. Generally speaking, it is likely that E-10 retailing can accommodate mandated sales without too many impediments, although retailers are under tremendous margin pressure and have few resources with which to undertake expensive modifications or absorb increased costs.

Ethanol Supply

RFA reports that there are 147 ethanol plants---with combined capacity of 8.5 billion gallons per year---currently operating. In addition, 55 facilities are under construction, and 6 expansion projects are under way. This will add another 5.1 billion gal/yr capacity. Presumably they will all come on line despite daunting economics, resulting in 13.6 billion gal/yr potential availability.

Ethanol production economics are in question, to the extent that a pro-forma model of plant financials suggests that---at recent corn and ethanol prices of \$6.00/bu and \$2.50/gal---plants are covering out-of-pocket operating costs but not amortizing investment and providing a positive rate of return. More recently, corn prices have risen because of bad weather; near-term impacts should be seen in ethanol supply figures.

With these economics at work, the outlook for 2008-9 corn market becomes a factor impacting plant operating rates and ethanol output. Representing something of a new game for corn because of speculative interest, strong demand globally and unprecedented price levels, forecasting is difficult. The USDA survey of farmers planting intentions---effective March 1--- showed 9% fewer acres to be planted in corn, with acreage shifted to

soybeans and wheat. That could change, because crop prices have shifted in favor of corn and because plantings have been delayed due to wet weather.

If the current estimate plays out, coupled with a 2.5% projected increase in productivity, the 2008 corn harvest would be nearly a billion bushels less than last year. With ethanol production keyed to the 9 billion gallon figure, ethanol's call on corn will be nearly a billion bushels higher, leaving 2 billion fewer bushels of corn available for ethanol.

This may change as recent price trends and weather play out in actual plantings. But it suggests high corn prices are needed for sufficient corn supply and that---for the next planting season, where ethanol's call on corn will be even higher---still higher prices may be called for to divert acres into corn production.

Corn prices on the input side and gasoline prices---which theoretically cap ethanol prices---are determining factors in how much ethanol plant will be utilized. Under recent economics, wet-mill plants in operation paying CBOT prices for corn would break even; at hedged or contract supply prices below CBOT (a current reality), many plants would cover operating and capital costs and earn profits. Dry mill plants might not cover all operating costs, making no contribution to capital cost; wet mill plants have more favorable operating economics.

An analysis of plant economics suggests that facilities now under construction would likely be completed since---industry wide---facilities are covering operating cost and making a contribution to financial costs. But, \$6.00 corn and \$2.50 ethanol may not provide enough incentive/investment support for construction of capacity not already in process. In addition, the corn-ethanol price spread has deteriorated, as corn (at least temporarily) hit \$7.00.

With current plant status and overall economics, the fleet of plants may meet 2008's mandated 9 billion gallons. Capacity may well come on line ahead of this requirement, providing capacity beyond this year's needs. It is possible that capacity for the full renewable biofuels requirement may be available in the latter part of 2008 and 2009, much earlier than the motor fuel market could absorb the extra ethanol. That would drive ethanol prices down.

On a closing note, discussion suggested that unfavorable plant economics could lead to a wave of consolidation in the industry. That should not be surprising; ethanol is a relatively new industry that has enjoyed very rapid growth. This could lead to the exit of some capacity, although at this juncture, it is hard to tell if that would stand in the way of achieving the 9 billion gallon mandate.

Ethanol and Engines

Concern was expressed about how, in the long run, 36 billion gallons of renewables---mostly ethanol---might be absorbed by the gasoline pool. This becomes a concern under the realization that gasoline sales may well not grow at all, and might remain constant at today's consumption rate; they could also decline. If E-10 remains the dominant fuel, the ability of the motor fuel pool to absorb ethanol is effectively capped at about 14 billion gallons. E-85 use is seen as ultimately becoming a powerful way to introduce significant increments of ethanol into the motor fuel pool. In fact, this may need to occur in out-years---assuming a rolling fleet of flex-fuel vehicles---as the mandated amount of ethanol increases beyond the 14 billion gallon E-10 uptake capability. But, if E-10 distribution is limited by geographic considerations, for example, policy and commercial interests may promote E-12 or E-15 blends as a way to meet mandated volumes.

E-85 use in flex-fuel vehicles has not been as successful in the U.S. as in Brazil and Sweden, where higher ethanol blends are marketed on Btu parity with gasoline, reflecting that ethanol has one-third less energy content (and provides proportionately less mpg). Automakers selling cars in Brazil, for example, provide conversion tables that help consumers choose the best fuel value based on the pump prices for gasoline and various ethanol-gasoline blends. Pump prices seem to be rationalized to reflect effective mpg.

In the U.S., pump prices have not reached a balance point reflecting what amounts to the mpg from a gallon of motor fuel. E-85 is typically priced well above gasoline on this basis; E-10 receives no apparent discount, even though it has 3% lower energy content.

U.S. E-85 use in the 6 million existing flex-fuels minimal, because its price has not found its correct level in the marketplace and because for more frequent refueling required---3 tanks of E-85 are needed to travel the same distance as 2 tanks of E-10. E-85 prices as reported by AAA³ are nominally below E-10/conventional pump prices. But they are substantially above conventional/E-10 pump prices on a BTU/MPG adjusted basis. The market place---were it to be effectively pricing this new, limited distribution fuel---would price on BTU/MPC parity, and it has not as yet done so.

A photo of a retail gas station displaying E-20 pricing was shown by one presenter, suggesting that some over-blend is overtly being marketed. This fuel is not certified by EPA with regard to environmental acceptability and effect on vehicle/engine ability to meet emission standards. Nor is it part of ASTM D4814, a specification that regulates fuel quality in many localities.

Limited testing has suggested that E20 blends adversely impact catalysts, and can result in excess VOCs. Much more extensive testing would be called for before EPA could certify blends other than E-10 for widespread use in other than flex-fuel vehicles.

³ See <http://www.fuelgaugereport.com/>

Evidence was shown suggesting instances where recreational marine engines have failed because of suspected fueling with higher ethanol blends. The thought was articulated that it may well be that local blending has resulted---erroneously or by design---in above-spec ethanol content. Boats operate under constant load; their engines consequently operate at high power settings. This leaves them vulnerable to damage resulting from over-spec ethanol blends, as well as water contamination. The marine environment is especially conducive to water pick-up in ethanol blends; higher ethanol content fuels attract more water.

There are about 18 million boats in service. Boats have long service lives; as a result many are older and fuel systems are vulnerable to ethanol related deterioration, even at E-10 specification. Common issues include dissolved fuel system components fouling engines, as well as accumulated debris being “cleaned out” by ethanol and damaging engine components such as carburetors.

In addition to automobiles and boats, there are a vast number of small gasoline powered devices and vehicles, such as lawnmowers, snowmobiles, etc. Legacy equipment not designed to accommodate fuels containing ethanol presents a history of difficulties similar to those experienced in marine applications. The more-recent inventory of small engines designed for current fuel supplies operates on E-10 without significant difficulty, but concern exists about over-spec blends.