

SURVEY OF E85 FUEL DISPENSING OPERATIONS IN THE U.S.



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TABLE OF CONTENTS

TOPIC	PAGE
Foreword	2
Objective	2
Audit Visits	3
Survey Criteria	3
Observations	3
Survey Data/Results	4
E85 Dispensers and Location Information:	4
E85 Dispensers and Accessory Equipment:	5
Maintenance and Survey:	5
Leak Detection:	6
Equipment and construction:	6
Fire service preparedness:	7
Conclusions	8

SURVEY OF E85 FUEL DISPENSING OPERATIONS IN THE U.S.

Foreword

A relatively new fuel for the US market, referred to as E85, is being produced and dispensed in ever increasing quantities. E85 consists of 85 percent ethanol and 15 percent gasoline. It is an alternate fuel source that is produced domestically and according to the National Ethanol Vehicle Coalition (NEVC – www.E85fuel.com) is dispensed at over 1,100 E85 refueling locations for over 3.5 million E85 compatible vehicles on the road today.

At present, UL has not listed dispensing related equipment for use with E85 fuel blends. Current dispensing equipment Listings are limited to fuels with a maximum 15% alcohol (i.e. ethanol, methanol or other alcohols). It is understood that high concentrations of ethanol are significantly more corrosive than conventional low ethanol concentrations blended with gasoline. This may result in the fuel chemically degrading the materials used in fuel dispenser components, and may ultimately effect the dispenser's ability to contain the fuel.

UL is reviewing E-85 equipment research and is meeting with industry and government experts to gather the information needed to develop revised certification requirements covering the high alcohol concentration blends. As part of this information gathering process, UL has performed audit reviews of some existing E85 refueling stations to gain field knowledge in this area.

Objective

Technical staff in the UL Regulatory Services Department visited existing E85 refueling stations to gain field information in the following areas:

- Review of initial AHJ approval process
- Identify dispensing and accessory equipment being used
- Identify maintenance and inspection processes
- Document equipment related problems encountered with E85
- Document leak detection methods and equipment
- Conduct visual examination of equipment
- Compare E85 verses gasoline and diesel equipment condition

Findings have been compiled and will be published for distribution to interested parties.

Audit Visits

During January and February 2007, UL's Regulatory Service staff visited E85 refueling stations in the Midwest US. When possible, local and state fire officials were contacted to inform them of the visit and the intent behind the research. In some cases, they were interested in participating in the audit visits.

Arriving unannounced at the refueling stations, service station personnel were advised that an information gathering review was being conducted to gain information on the installation and their experiences with E85 refueling in general.

Cooperation with service station personnel ranged from a high degree of cooperation, to little cooperation, which might have been based in part on concern as to the motive for the survey, and possible repercussions by corporate management. Many of their comments related to pricing, source for fuel and competition were anecdotal and did not have a bearing on the review.

Survey Criteria

The survey was designed assuming that the reviews would consist primarily of visual observations that could be readily completed on-site, without the need to disassemble, remove from operation, or operate any dispensing equipment. In some cases, visual reviews of the sump areas were conducted in cooperation with service station personnel. Most sites did not allow the dispenser to be shut down and opened to observe internal components, such as the meter, pump, and shutoff/sheer valves.

The survey also relied on anecdotal information on approvals, volume dispensed, repairs, maintenance, and inspections being provided by the service station personnel and the AHJs.

Observations

The following general observations were generated as a result of the audit reviews.

- Much of the equipment was exactly the same type as used for traditional fuel dispensing
- Many of the products had plastic protective covers on the devices, which limited the ability to view markings and models.
- Many of the hoses had been discolored or faded to the point that most markings could not be viewed.
- Leak detection was electronic equipment. The models used ranged in age and covered all the fuels, not just E-85.
- Less maintenance was noted with the use of E85 dispensing equipment in comparison to gasoline dispensing equipment.

- Most concerns expressed by the station operators related to profits and expenses, and fueling by customers of vehicles not designed for E85. They had very few concerns about E85 fuel/dispensing equipment compatibility.
- The station operators surveyed reported no significant safety or leakage problems.
- No dispensing equipment was found that bore the listing mark of a certification organization other than UL.
- There were no major differences observed between the conditions of dispensing equipment used for E-85 versus other fuels. The condition of the equipment varied and leaks or wear appears to be very similar between fuels.
- A number of operators commented that swivels used in E85 dispensing failed earlier than swivels that were used in gasoline dispensing. The operators added though that the swivels were replaced as necessary.
- Some operators noted that dispenser hoses assemblies would show wear on the outside and crack if fuel was splashed or leaked on their surface.

Survey Data/Results

The data obtained as a result of this survey is tabulated and described below:

E85 Dispensers and Location Information:

45 total service stations were reviewed:

- 28 (9%) service stations were in Minnesota of the recorded 307
- 6 (9%) service stations were in Wisconsin of the recorded 70
- 6 (15%) service stations were of the recorded 41
- 5 (3%) service stations were in Illinois of the recorded 152

Visits conducted with AHJ (Authority having jurisdiction) or Other:

- 30 (67%) visits were conducted with AHJ
- 15 (33%) visits were not conducted with AHJ

Note: Local and state fire officials were usually contacted to observe the survey, but not always, especially on weekends.

Original installation approved:

- 32 (71%) of the original installations were approved by the state or local fire department
- 13 (29%) unknown, or approved by other than the fire department

Number of Ethanol dispensers on site:

- 1-5 (80%)
- 6-10 (11%)
- 11 or more (9%)

Gallons of E85 dispensed per week:

- 500 or less (20%)
- 501 – 1500 (36%)
- 1501 – 4000 (16%)
- 4001 or more (4%)
- Unknown or not determined (11 - 24%)

Length of time that E85 has been dispensed on the site:

- Less than 1 year (31%)
- 1 – 2 years (38%)
- 3 – 4 years (11%)
- 4 years or more (11%)
- Unknown (9%)

E85 Dispensers and Accessory Equipment:

- 17 (38%) new E85 dispensers provided
- 28 (62%) existing gasoline dispensers used with no retrofitting for E85
- 0 (0%) existing gasoline dispensers used or identified with manufacturer recommended retrofits

Note: Data based on statements made by station operators.

Maintenance and Survey:**Service station specializes in E85:**

- 0 (0%) Yes
- 41 (91%) No
- 4 (9%) Unknown

Note: Unknown based on manager not being present during survey.

Parts replaced by service stations staff:

- 27(60%) None/unsure
- 9 (20%) Fuel handling outside dispenser components (Hose, Nozzle, etc.)
- 9 (20%) Other equipment (e.g. Keyboard/Meter)

Surveys were conducted by:

- 40 (89%) Owner
- 5 (11%) Service company

Frequency of the surveys:

- 34 (76%) Daily
- 11 (24%) On call/As needed

Note: The operator typically performed the daily inspections, and service companies performed the on call/as needed inspections. Most operators replaced exterior equipment and services companies replaced the internal components.

Leak Detection:

Leak detection provided by means of:

- 0 (0%) Inventory measurement
- 41 (91%) Electronic monitoring
- 4 (9%) None, or unknown to on-site staff

Leakage records available on site:

- 37 (82%) Yes
- 8 (18%) No

Leakage records were available as part of the electronic monitoring system.

Last documented date of leak detection system check:

- 29 (64%) Today
- 8 (18%) On receipt of leakage alarm
- 8 (18%) Unknown

Note that most systems have a continuous monitoring of the fuel and leak detection equipment.

Equipment and construction:

Secondary containment in sumps:

- 5 (11%) Yes
- 15 (33%) No
- 25 (56%) Unsure

Device, number of manufacturers for each device, UL listed or listed by other labs:

- **Dispenser – 3 manufacturers**
 - 12 (27%) UL Listed
 - 33 (73%) Other/Unknown

Many of the dispensers did not have a listing mark on the exterior of the dispenser. Many of them may have been removed or painted over.

- **Hose Assembly – 7 manufacturers**
 - 36 (80%) UL Listed
 - 9 (20%) Other/Unknown

- **Hose Nozzle – 2 manufacturers**
 - 40 (89%) UL Listed
 - 5 (11%) Other/Unknown
- **Breakaway – 7 manufacturers**
 - 30 (67%) UL Listed
 - 15 (33%) Other/Unknown
- **Swivel – 2 manufacturers**
 - 16 (36%) UL Listed
 - 20 (44%) Other/Unknown
 - 5 (11%) No swivel present
 - 4 (9%) No Inspection allowed

Many of the listing marks could not be read or found due to fading, removal, or painting of the tag or covered with protective housing. No listing marks of certification organizations other than UL were found.

Comparison of E85 and gasoline dispensing equipment:

Visual comparison of condition of E85 versus other fuel dispensing equipment:

- 36 (80%) Condition of equipment about the same
- 7 (16%) E85 equipment newer or in better condition
- 2 (4%) Gasoline equipment newer or in better condition

Apparently most of the equipment was not modified for E85 fuel dispensing, and was maintained and upgraded at the same frequency as the gasoline dispensing equipment.

Fire service preparedness:

Changes to fire fighting activities after E85 dispensed:

- 2 (5%) Yes
- 24 (53%) No
- 19 (42%) Unknown

Note: Based on discussion with local fire officials, it appears that in many cases no specific consideration had been given to modifying fire fighting protocols for fighting an E85 fire in comparison to a conventional gasoline fire. Most stated that the tactics to be used would be determined by the fire fighters on scene, and normal steps for use of foam (Class A or B) would be followed.

Conclusions

The initial results of our survey have indicated that E85 fuel exposures have not resulted in significant safety or maintenance problems. However some leakage was identified with swivels, possibly a few hoses and other containment components, which required replacement parts. No information was found that the E85 dispensing equipment degraded significantly faster than gasoline handling equipment, but this might have been a result of the limitations of the survey and the overall limited time these fuels have been dispensed. Additionally, the volume of E85 fueling was relatively small compared with conventional gasoline and diesel fueling.

The survey focused primarily on visual observations of several stations, and on discussions with fire officials and station operators who were willing to speak freely with us, and did not include a detailed examination of internal dispenser components and many below grade sumps. As a result, it is not realistic to use the results of this survey to draw definitive conclusions about the corrosive effect E85 fuel has on dispenser components.

In order to obtain more definitive information on potential E85 corrosion concerns with dispensing equipment, it is recommended that a limited number of E85 dispensers from the US market be disassembled and more closely examined, along with some gasoline fuel dispensers. UL will also conduct Field Investigations in more mature markets, such as Brazil, and implement a Research Test Program.