

# FUEL RETAILER INFRASTRUCTURE COMPATIBILITY WITH HIGHER BLENDS OF ETHANOL

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## I. EXECUTIVE SUMMARY

This issue brief describes the compatibility of the current fueling infrastructure at fuel retailer locations with higher blends of ethanol. It will be shown that the vast majority of the legacy infrastructure at fuel retail locations across the United States is compatible with higher blends, and the percentage of compatible fuel storage and dispensation systems will only continue to go up as new fueling locations are built and existing locations upgrade.

## II. INTRODUCTION

There are currently around 145,000 fueling locations in the United States.<sup>1</sup> The vast majority—about 120,000—are convenience stores selling fuel,<sup>2</sup> with the rest a mix of gas-only stations, grocery stores with fuel pumps, marinas, and other locations. As higher ethanol blends of fuel—like E15, E30, and E85—become more widespread, the fueling infrastructure at those 120,000 retail locations must be ensured to be compatible with the higher blends.

Fueling infrastructure at a fuel retail location consists of 60 components subject to review for fuels compatibility.<sup>3</sup> Each of the 60 must be demonstrated to be compatible with higher blends before a location can store, dispense, and sell blends greater than 10% ethanol. Compatibility is regulated by the United States Environmental Protection Agency (EPA), which has explicitly listed the following components as requiring compatibility: underground storage

tanks (USTs), piping, containment sumps, pumping equipment, release detection equipment, spill prevention equipment, overflow prevention equipment, and also all pipe dope or sealants.<sup>4</sup> All of those components have for many years been manufactured to be compatible with higher blends of ethanol in gasoline.

## III. HISTORICAL FUELING INFRASTRUCTURE COMPATIBILITY

In 2012, a year after the EPA rule that allowed the nationwide sale of E15, Oak Ridge National Laboratory researched the legacy infrastructure's ability to handle the switch from E10. They concluded that "[i]n general, the materials used in existing UST infrastructures would not be expected to exhibit compatibility concerns when moving from E10 to E15" and "compatibility is not expected to be altered noticeably when moving from E10 to E15."<sup>5</sup>

This echoed a 2009 UL (an independent research center) statement supporting Authorities Having Jurisdiction permitting legacy systems to be used with fuel blends containing up to 15% ethanol. Legacy infrastructure storing and dispensing E15 "should not result in critical safety concerns," with "no significant incremental risk of damage."<sup>6</sup> This correlates well with the fact that many components rated up to E10 were actually tested using E15, and sometimes an "aggressive" E15.<sup>7</sup>

So even 15 years ago the legacy fueling infrastructure was recognized by independent equipment certification experts to be compatible with blends above E10. Today, legacy compatibility is known to extend higher than E15, to E30 and E85 and, as is the case for nearly all fueling infrastructure components manufactured today, to E100.

<sup>1</sup> American Petroleum Institute. Service Station FAQs.

<sup>2</sup> National Association of Convenience Stores. U.S. Convenience Store Count.

<sup>3</sup> US Department of Energy (2016). Handbook for Handling, Storing, and Dispensing E85 and Other Ethanol-Gasoline Blends.

<sup>4</sup> US Environmental Protection Agency (2020). UST System Compatibility with Biofuels.

<sup>5</sup> Kass, M.D. et al. (2012). Analysis of Underground Storage Tank System Materials to Increased Leak Potential Associated with E15 Fuel. Oak Ridge National Laboratory.

<sup>6</sup> CSP Daily News (2009). UL Announces New E15 Dispensing Directive.

<sup>7</sup> Lamberty, R (2021). One more time: Yes, you probably can E15. Really. Ethanol Producer Magazine.



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## IV. TANKS

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### A. HOW MANY CURRENTLY-IN-USE USTs ARE COMPATIBLE WITH HIGHER BLENDS?

On average, each fuel retail location has 2 – 3 USTs,<sup>8</sup> which can store gasoline, diesel, or ethanol-blended fuel, depending on what that location offers for fueling options. In 2015, the National Renewable Energy Lab (NREL) stated that “most tanks are compatible with ethanol blends above E10.”<sup>9</sup>

How many is “most”? The number has increased over time. Ten years ago, in 2013, ICF International, on behalf of the EPA Office of Transportation and Air Quality, conducted research that showed about 75% of the United States’ 380,000 USTs at fuel retail locations were compatible with blends of ethanol greater than 10%.<sup>10</sup> New research conducted by the Nebraska Ethanol Board shows that today that number is closer to **85% – 90%**, with some states, like Nebraska, surpassing 90% UST compatibility. This data was derived through statistical analysis of a representative sample of eight states’ currently-in-use gasoline USTs at fuel retail locations.

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### B. WHAT MAKES A UST HIGHER-BLEND COMPATIBLE?

USTs are made from one of two materials: steel or fiberglass. Steel tanks, regardless of when they were manufactured, have been known for years to be compatible with any blend of ethanol up to E100 and any blend of biodiesel up to B100.<sup>11</sup> A list of all major manufacturers of steel USTs and the compatibility of their tanks can be found in the Appendix on page 4.

Fiberglass tanks have a more complex compatibility history. Since 1990, all double-wall fiberglass USTs manufactured have been compatible with any blend of ethanol up to E100. For single-wall tanks, depending on the manufacturer, they have been

compatible with higher blends since 1995 (Containment Solutions) or 2005 (Xerxes).

Given that data is not available for the UST manufacturers in each state’s list of approved USTs, the overall nationwide compatibility percentage of 85% – 90% was calculated using 2005 as the beginning of single-wall fiberglass UST higher-blend compatibility. Thus, it is likely that some Containment Solutions single-wall tanks manufactured between 1995 and 2005 were not counted as compatible, so the true percentage would be even higher. A list of all major manufacturers of fiberglass USTs and the compatibility of their tanks can be found in the Appendix.

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## V. PIPES AND FITTINGS

The piping systems at fuel retail locations are commonly made from either fiberglass or flexible plastic, with the split for currently-installed pipes about half-and-half.<sup>12</sup> Both piping materials have a long history of compatibility with higher blends.

Underground fiberglass piping and fittings installed in service stations have been compatible with up to 100%-percent ethanol for over 40 years.<sup>13</sup> Since 1988, fiberglass piping and fittings have been certified up to E100, and before then, the fiberglass components used in pre-1988 piping were essentially the same as those subjected to UL compatibility testing, and it was demonstrated that there was no material or technical reason why pre-1988 piping should not perform equally well when handling higher blends.<sup>14</sup>

Flexible plastic pipes were introduced in the 1990s thanks to EPA’s recommendation of the development of jointless pipes. All flexible plastic pipes installed 1989 onward are compatible with higher blends.<sup>15</sup> Given that they entered the market after that, all flexible plastic piping currently in use at fuel retail locations nationwide should be compatible up to E100. A list of major UST-system

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<sup>8</sup> Wesser, J. (2022). How does a gas pump know when to shut off? ABC27.

<sup>9</sup> Moriarty, K., & Yanowitz, J. (2015). E15 and Infrastructure. National Renewable Energy Laboratory.

<sup>10</sup> ICF International (2013). Technical Analysis of the U.S. Retail Infrastructure for Ethanol Fuel Blends.

<sup>11</sup> Steel Tank Institute (2012). Steel Facts Number 2.

<sup>12</sup> US Department of Energy (2016). Handbook for Handling, Storing, and Dispensing E85 and Other Ethanol-Gasoline Blends.

<sup>13</sup> Curran, S. (2015). Ethanol Compatibility with Fiberglass UST Systems. Fiberglass Tank & Pipe Institute.

<sup>14</sup> Ibid.

<sup>15</sup> US Environmental Protection Agency (2015). Musts for USTs.



pipe manufacturers and the compatibility of their pipes can be found in the Appendix.

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## VI. PIPE DOPE

Pipe thread sealants, commonly called pipe dope, are also required to be compatible with the blend of ethanol a fueling location stores and dispenses. Over the years many fuel retailers have raised concerns about the incompatibility of their underground fuel storage systems' pipe dope, as well as the cost to upgrade their pipe dope to be compatible with higher blends. Manufacturers' statements tell another story.

According to NREL, manufacturers of pipe dope used in UST systems have stated that their products have been compatible with ethanol blends up to E20 for many years.<sup>16</sup> Furthermore, one pipe dope manufacturer has a 90% market share: Federal Process Corp. Federal Process has stated unequivocally that not only is their standard blue-formula pipe dope compatible with fuels up to E20, it has been compatible for far longer than fuel retailers have voiced their concerns.<sup>17</sup> The only other potential manufacturer, Rectorseal, has also stated their standard formula is compatible with E15.<sup>18</sup>

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## VII. OTHER UNDERGROUND FUELING COMPONENTS

In 2016, the US DOE put together a list of manufacturers of other components of an underground fuel storage system—sumps and accessories, manholes, flexible connectors, fill caps and adaptors, entry fittings, overfill prevention, leak detection, sensors, drop tubes, vents, and more. Of this extensive list of manufacturers and their products' compatibility with higher blends of ethanol, every single one produces components compatible up to at least E85. Of the components

these manufacturers produce, 100% (112 out of 112 different listed components) of them are compatible with blends above E10, and 88% (98 of 112) are compatible up to at least E85.<sup>19</sup>

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## VIII. DISPENSERS

There are two manufacturers of fuel dispensers at fuel retail locations that have had a significant combined market share for many years: Gilbarco Veeder-Root and Dresser Wayne. Both companies manufacture dispensers compatible with greater than 10% blends of ethanol. In 2010, Gilbarco announced that all standard fuel dispensers it has manufactured since 2008 are compatible with up to E15.<sup>20</sup> That same year, Dresser Wayne stated that all of its standard dispensers have always been warranted up to E15 regardless of when they were manufactured.<sup>21</sup> These announcements reflected the UL statement from 2009 that declared all legacy system dispensers can be used with ethanol blends up to 15%.<sup>22</sup> Furthermore, all Dresser Wayne dispensers since 2014 are compatible with up to E25,<sup>23</sup> and both Gilbarco and Dresser Wayne sell dispensers compatible up to E85.<sup>24</sup>

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## IX. OTHER ABOVEGROUND EQUIPMENT

Related fuel dispensing equipment to the dispenser includes the dispenser filter, hanging hardware (hoses, nozzles, breakaways, and swivels), shear valves, and submersible turbine pumps. The DOE maintains a record of manufacturers of these components and their compatibility with higher blends. All of the listed components from all manufacturers are compatible up to at least E15, and of the listed components, nearly 90% of them are compatible with blends greater than 15%.<sup>25</sup>

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<sup>16</sup> Moriarty, K., & Yanowitz, J. (2015). E15 and Infrastructure. National Renewable Energy Laboratory.

<sup>17</sup> Mullen, C. (2019). Pipe dope and higher ethanol blends. *Ethanol Producer Magazine*.

<sup>18</sup> Mullen, C. (2019). Pipe dope and higher ethanol blends. *Ethanol Producer Magazine*.

<sup>19</sup> US Department of Energy (2016). Handbook for Handling, Storing, and Dispensing E85 and Other Ethanol-Gasoline Blends.

<sup>20</sup> Petroleum Equipment Institute (2010). Gilbarco Expands Standard Fuel Dispenser Warranty from E10 to E15.

<sup>21</sup> Energy AgWired (2010). Dresser Wayne Continues Warranty for E15.

<sup>22</sup> CSP Daily News (2009). UL Announces New E15 Dispensing Directive.

<sup>23</sup> Growth Energy. Retail Equipment: Pump Configuration and Compatibility.

<sup>24</sup> US Department of Energy (2016). Handbook for Handling, Storing, and Dispensing E85 and Other Ethanol-Gasoline Blends.

<sup>25</sup> Ibid.



## APPENDIX

### I. STEEL UST MANUFACTURERS AND HIGHER-BLENDS COMPATIBILITY<sup>26</sup>

Manufacturer	Ethanol Compatibility
Arterra Group, Inc.	E0 – E100
Caribbean Tank Technologies, Inc.	E0 – E100
Eaton Sales & Service LLC	E0 – E100
General Industries	E0 – E100
Greer Steel, Inc.	E0 – E100
Hall Tank Co.	E0 – E100
Hamilton Tanks	E0 – E100
Highland Tank	E0 – E100
J. L. Houston Co.	E0 – E100
Kennedy Tank and Manufacturing Co.	E0 – E100
Lancaster Tanks and Steel Products	E0 – E100
Lannon Tank Corporation	E0 – E100
Mass Tank Sales Corp.	E0 – E100
Metal Products Company	E0 – E100
Mid-South Steel Products, Inc.	E0 – E100
Modern Welding Company	E0 – E100
Newberry Tanks & Equipment, LLC	E0 – E100
Plasteel	E0 – E100
Service Welding and Machine Company	E0 – E100
Southern Tank & Manufacturing Co., Inc.	E0 – E100
Stanwade Metal Products	E0 – E100
Talleres Industriales Potosinos	E0 – E100
Tanques Antillanos C. x A.	E0 – E100
Watco Tanks, Inc.	E0 – E100
We-Mac Manufacturing Company	E0 – E100

### II. FIBERGLASS UST MANUFACTURERS AND HIGHER-BLENDS COMPATIBILITY<sup>27</sup>

Manufacturer	Ethanol Compatibility
Containment Solutions, all tanks	E0 – E100
Owens Corning	
<i>Single wall tanks between 1965 and 1994</i>	E0 – E10
<i>Double wall tanks between 1965 and 7/1/1990</i>	E0 – E10
Xerxes	
<i>Single wall tanks prior to 1981</i>	E0
<i>Single wall tanks February 1981 through June 2005</i>	E0 – E10
<i>Single wall tanks after July 2005</i>	E0 – E100
<i>Double wall tanks prior to April 1990</i>	E0 – E10
<i>Double wall tanks after April 1990</i>	E0 – E100

### III. PIPE MANUFACTURERS AND HIGHER-BLENDS COMPATIBILITY<sup>28</sup>

Manufacturer	Ethanol Compatibility
Advantage Earth Products	E0 – E100
Brugg	E0 – E100
Franklin Fueling	E0 – E85
OPW	E0 – E100
NOV Fiberglass	E0 – E100
NUPI	E0 – E100
OMEGAFLEX	E0 – E100



<sup>26</sup> Moriarty, K., & Yanowitz, J. (2015). E15 and Infrastructure. National Renewable Energy Laboratory.

<sup>27</sup> Ibid.

<sup>28</sup> US Department of Energy (2016). Handbook for Handling, Storing, and Dispensing E85 and Other Ethanol-Gasoline Blends.