

## E85 and Your Fuel System: The Corrosion Debate

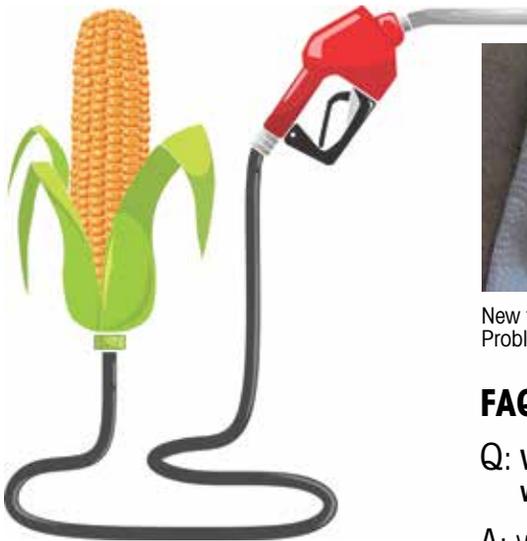
### E85 Materials Compatibility

E85 fuel excited the racing world with the promise of “getting race gas performance at regular gas pricing.” At the beginning, there appeared to be some trade-offs.

E85 has only been commonly used in motorsports for a few years compared to gasoline. There is little information about long term use of high percentage ethanol blends in a race environment so our information is based on shorter term data collected from our customers’ feedback.

When E85 first started to make its appearance in a few cars at drag strips in the Midwest 5-7 years ago the fuel was mainly treated like methanol, but over time racers discovered that the corrosion problems they used to have with methanol didn’t seem to be an issue with Ethanol / E85. However, the common misconception about Ethanol being corrosive still persists in the racing community today.

The fact of the matter is that uncontaminated ethanol is not corrosive. However, ethanol is hygroscopic in nature and is capable of absorbing large amounts of water.



When ethanol-based fuels become contaminated with significant amounts of water (over 2% by volume) the formation of mild organic acids can occur. Formic acid, acetic acid and other compounds can adversely affect soft metals like aluminum, zinc, brass, and copper causing a white powdery residue.

**The solution is simple – keep your fuel dry!** Seal drums of fuel by removing the pump and installing a plug. Keep your fuel cell or tank full if not in use. Pick materials to use in the fuel system and engine that are corrosion resistant. It’s that simple to use E85 without any adverse effects.



Dirty filter from a recently converted service station.



New filter on left. Filter on right is after 2,000 miles. Problems were traced to contaminated fuel.

### FAQs

**Q: Will my fuel cell and foam be OK with E85?**

**A:** We could not find any reports of a fuel cell (aluminum or plastic) that has had issues with E85 – including the foam. However, that does not mean it isn’t possible to have an issue (especially with uncoated aluminum). To avoid any problem we recommend storing the vehicle with the tank either completely full or completely empty. In moist environments, it is also important to seal the tank vent to prevent moisture from being absorbed from the air.

On one hand, the best bet to be certain the foam will not breakdown is to remove it; however, fuel cell manufacturers put the foam in the cell for a reason – crash protection. It’s recommended that you contact the cell manufacturer for specific guidance on fuel cell foam compatibility with ethanol and the safety considerations if removing it. Fuel cell foam will break down over long periods of time regardless of what fuel is used and eventually needs to be replaced.

**Q: Will braided lines be OK with E85?**

**A:** While long term life may be slightly reduced with E85 all common brands seem to be compatible with E85. The OEMs have been dealing with 10% ethanol in fuels since the early 80's and appear to be producing parts that are not sensitive to ethanol. Most braided line in sizes commonly used for fuel systems in motorsports are designed for pressures many times higher than the application.

**Q: Are hard aluminum fuel lines OK with E85?**

**A:** Testing for 3 years has shown zero corrosion on the inside of 1/2" Russell aluminum line. Cutting used line open at bends and straight portions shows a "like new" surface inside.

If there is a leak in the line it would allow air and moisture into the line and it would show corrosion. Steel lines have not been an issue either, other than the fact that ethanol seems to clean up any sludge or residue left from gasoline which may clog fuel filters a time or two until it is all gone.

## The Takeaway:

E85 itself is not the problem.  
Contaminated E85 is a problem.  
Choose your service station carefully.

By now, fuel system component manufacturers have pretty much eliminated earlier problems from incompatible materials.



Black metallic residue resulting from incompatible materials in fuel pump.

**Q: What about the inside of carburetors?**

**A:** With regular usage there has been no corrosion on the inside of carburetors. This includes both zinc and aluminum castings. If a carburetor is allowed to sit for extended periods of time with the bowls full some oxidation may occur (more so with uncoated aluminum main bodies than with zinc castings).

**Q: What fuel pumps, regulators, and filters are compatible with E85?**

**A:** To make 100% certain please contact the manufacturer of the pump you are looking at. That being said, most of the higher quality billet aluminum pumps have a hard anodized coating and are compatible. Some brands include Aeromotive, Weldon, and Magnafuel pumps. Watch for pumps with seals that are advertised as alcohol compatible with nylon or stainless gears or vanes.

If it's methanol compatible it is definitely E85 compatible; if its gasoline compatible it is probably OK but no guarantees!

The same holds true with regulators. The billet aluminum ones are usually hard anodized and hold up very well. Make sure that any o-rings are compatible by checking with the manufacturer. Again examples are Aeromotive, Weldon, and Magnafuel.

The best filters are the stainless steel mesh type. You can use paper in some E85 applications, but is not recommended. Swift Filters are made with a 2 part epoxy that is compatible with all fuel types. It is a good idea to change or clean your fuel filter every year to make sure you do not start the race season with a partially clogged filter.

**Q: What about internal engine parts?**

**A:** E85 naturally acts like a solvent... it's like having a pressure washer inside your engine. The lack of carbon deposits on the top of pistons and cylinder head chambers after E85 only use is remarkable. Spark plugs stay cleaner longer and so do oxygen sensors.



Fine white powder on a non-anodized aluminum bracket reacting with E85.



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