Do We Need Safer Trucks?

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Trucking cases often focus on vehicle maintenance, hours of service, and crash reconstruction, but on occasion you may want to consider a product defect that either causes or contributes to the loss.

Does this mean Heavy Trucks are not perfect?

With my education, training and experience of over 30 years in vehicle design and development, I believe most vehicles and systems are adequately engineered. One reality with product design is that sometimes system components may be overlooked, or technology and safety improvements mean "the way we always did it" must change.

A good example is heavy truck fuel tanks. We've all seen the gleaming aluminum tanks mounted along each side of the tractor, out where they dress up the truck, but… is that really where you want to carry 100 gallons or more of volatile Diesel fuel? In an exposed aluminum container that is easily split open if hit by another vehicle or by parts coming off the truck itself?

I have been told that diesel fuel has a high flash point and is hard to catch on fire. While it is more difficult to produce a fire with diesel fuel than with the gasoline used in cars, if it was impossible to ignite diesel on fire in a crash we would not have 80 to 100 burn deaths in the United States every year for occupants of heavy trucks and the other vehicles involved in crashes with heavy trucks.

Truck fuel tanks look and function about the same now as they did 50 years ago. Has anyone ever done anything to improve the safety of the system? It is sad to say that not much has happened. Although tanks have changed from a bottom draw to a top draw to eliminate fuel lines from hanging at the lowest part of the vehicle, not much else has been modified.

In 1989 (almost 24 years ago) the United States Department of Transportation published Heavy Truck Fuel System Safety Study. This study includes specific recommendations along with a Failure Modes Effect Analysis (FMEA) and a fault tree analysis that is suitable as a basis for any manufacturer to design a safer product.

Some of the improvements include:

Reducing the susceptibility of tank mounts to failure by impact from highway structures or other vehicles.
Reducing the susceptibility of fuel tanks to failure by impact from highway structures or other vehicles.
Increasing the distance to be traversed by displaced components before they reach fuel tanks,
Providing protective barriers between fuel tanks and the adjacent components
Increasing the puncture resistance of the fuel tank.

The DOT Study also identified that:

"The objective of fuel system changes would be either to place fuel system components in locations where they would not be likely to sustain an impact or to design them to maintain integrity under anticipated impact conditions. The purpose of changes to other truck components would be to prevent their displacement into fuel system components under accident conditions or to shield fuel system components from impact."

And yet little has been done.

On the light vehicle side, effective changes have been implemented over the last 20 years to improve fuel system safety. One regulation that was added is a 50 mph rear crash test for fuel system integrity. All other crash tests conducted by automakers also must pass a posttest fuel system integrity test. This has required that fuel tanks be moved away from the perimeter of the vehicle, that they be protected from intrusion of neighboring components or edges, thereby ensuring protection and crush space are provided in the event of a crash.

Relying on my education, training and experience as an automotive structures engineer and heavy truck design

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engineer I undertook the challenge to design a technically feasible design that would improve heavy truck fuel system crashworthiness.

The design I developed has now been filed as a provisional patent no. 61/750418 titled "Truck Fuel Tank System for Improved Crashworthiness." This solution provides at least one technically feasible design that would reasonably achieve the goals established in the 1989 DOT report and the results shown in the crashworthiness of automotive fuel systems.

This model demonstrates the basic concept of relocating the fuel tanks inboard so that they are less exposed, and are shielded from potential damage due to collision or ground contact. This allows adequate space for all accessories and systems as well as provisions for energy absorbing materials surrounding the fuel tanks to further reduce intrusion and prevent fuel tank rupture.

This is one of many areas in heavy truck design where we can evaluate foreseeable physical conditions that present a hazard to the public. By presenting technically feasible solutions perhaps we can influence gradual change in an industry that "has always done it that way" and create safer highways.