

MEMORANDUM

TO: Energy & Environmental Policy Committee Members
Engineering Policy Committee Members

FROM: Richard Moskowitz, Regulatory Affairs Counsel

DATE: February 28, 2007

RE: Diesel Fuel Temperature Compensation

This memorandum discusses the impact that diesel fuel temperature compensation initiatives could have on the trucking industry. For the reasons set forth below, we recommend that ATA oppose initiatives to permit the *voluntary* use of temperature compensation devices (*i.e.*, permissive temperature compensation) by fuel retailers. We do not have enough information to fully characterize the impact that *mandatory* temperature compensation initiatives will have on the trucking industry. We recommend that ATA commission a formal study of the issue, monitor state and federal legislative initiatives to mandate temperature compensation, and monitor efforts of the National Conference of Weights and Measures to address temperature compensation at the retail level. Finally, we recommend that ATA not intervene in the existing lawsuits challenging the sale of diesel fuel without temperature compensation measures.

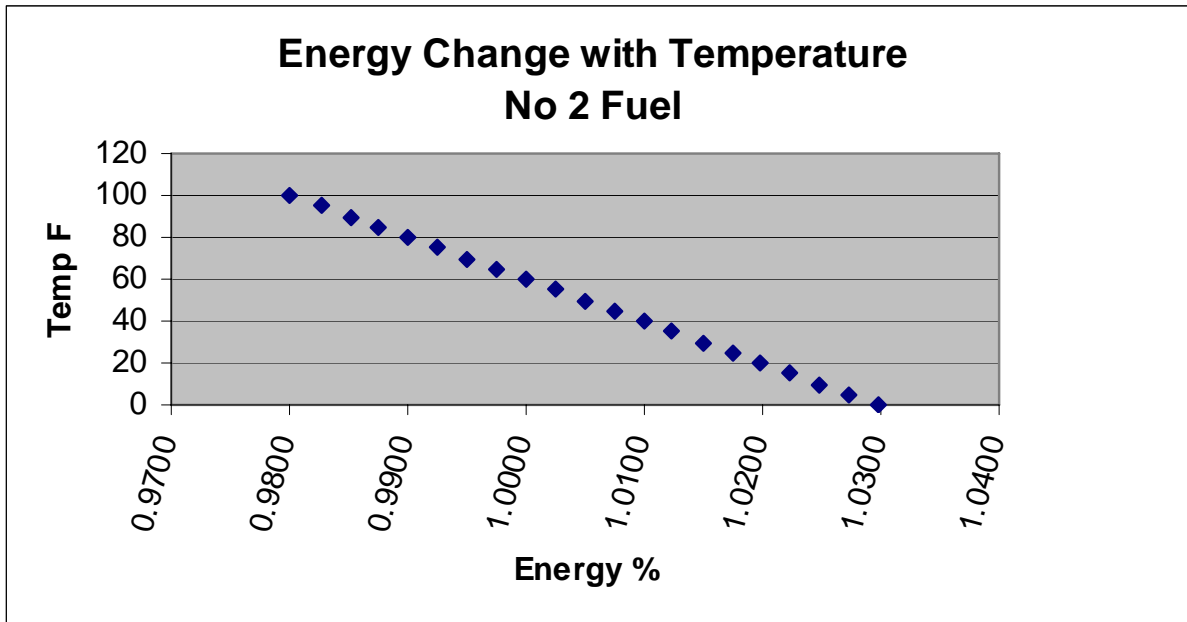
A. Issue Statement

Hot fuel is a phrase used to describe the decrease in the energy content of a gallon of fuel as its temperature rises. In the United States, a standard gallon of diesel fuel is measured volumetrically at 231 cubic inches. The volume of diesel fuel, like that of any other liquid, varies according to its temperature -- as diesel fuel warms, it expands and becomes less dense (*i.e.*, has a lower BTU value per gallon). Fuel with a lower energy value will have a corresponding negative impact on the fuel efficiency of a truck.

In the United States, most bulk fuel is sold with reference to a baseline temperature of 60 degrees Fahrenheit.¹ According to the Technology and Maintenance Council's Recommended Practice 1109 and the American Society of Testing Materials Petroleum Measurement Tables, an increase in temperature of 15 degrees results in a corresponding decrease in the energy content of diesel fuel of 0.76%. Therefore, at 75 degrees an end user will need to purchase 0.0076 gallons more to do the same amount of work as a gallon dispensed at 60 degrees. At 95 degrees the fuel correction factor rises to 1.0177 and the end user will need to purchase an additional 0.0177 gallons to perform the same amount of work as a gallon dispensed at 60 degrees.² The graph below shows the relationship between temperature and the energy content of diesel fuel:

¹ This temperature was chosen because 60 degrees is the average ground temperature in Pennsylvania, where petroleum was first discovered in the United States.

² Fuel sold at temperatures below 60 degrees would have a corresponding higher energy content per gallon.



As a result of the known correlation between fuel temperature and volume, large amounts of fuel (e.g., fuel tendered by refiners, pipelines and bulk storage terminals) are sold on a temperature-corrected basis. The sale of non-bulk fuel “below the rack” (i.e., once fuel leaves a terminal until it is dispensed to the end user’s vehicle) is not adjusted for temperature. The failure of retail establishments to install pumps capable of correcting the volume of fuel sold depending upon its temperature has led to allegations that fuel retailers are taking advantage of fuel consumers by purchasing fuel at 60 degrees and then selling it at a higher temperature.³ Under these circumstances, a fuel retailer may purchase 10,000 gallons of diesel fuel at 60 degrees and be able to sell 10,076 gallons at 75 degrees.

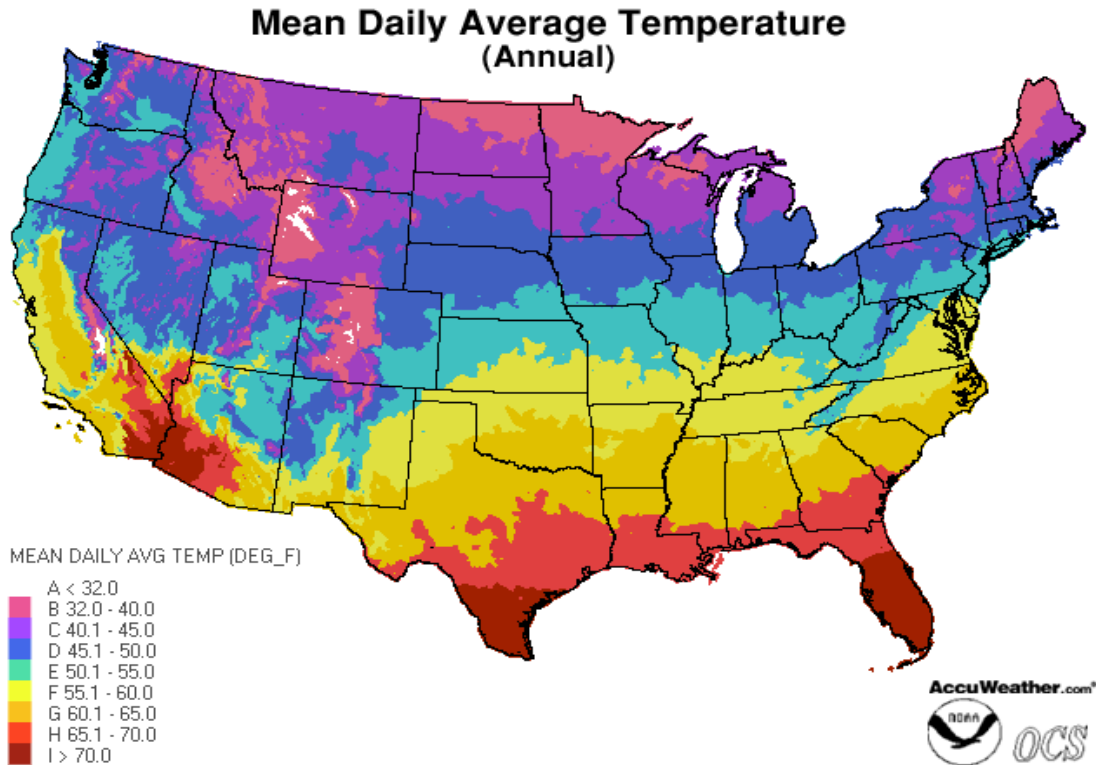
B. Is Hot Fuel Affecting the Bottom Line?

Numerous factors influence the temperature of fuel at the dispenser, including the temperature of the fuel leaving the refinery or terminal, transport time, ambient temperature, tank level prior to filling, the portion of the storage tank that is underground, ground temperature, and the amount of time the fuel remains in the tank between time of delivery and the time it is dispensed.

³ Lawsuits against fuel retailers have been filed in California and New Jersey on the issue and ATA has been contacted by both the plaintiffs and defendants in these suits. These lawsuits allege fraud for the failure to compensate for the temperature of the fuel being dispensed.

The petroleum distribution industry believes that the temperature variation in petroleum products evens out over time, as some fuel is purchased above 60 degrees and some fuel is purchased below 60 degrees. The Owner Operator Independent Driver Association (OOIDA) alleges that consumer losses in warm states are ten times larger than consumer gains in cool states and believes that overall losses range from \$400 to \$700 per truck per year. OOIDA further alleges that the failure to install automatic temperature compensation devices is costing consumers between \$1.7 billion and \$1.9 billion, annually. These figures reportedly include the gains that consumers realize from the sale of cold fuel (*i.e.*, fuel sold below 60 degrees).⁴

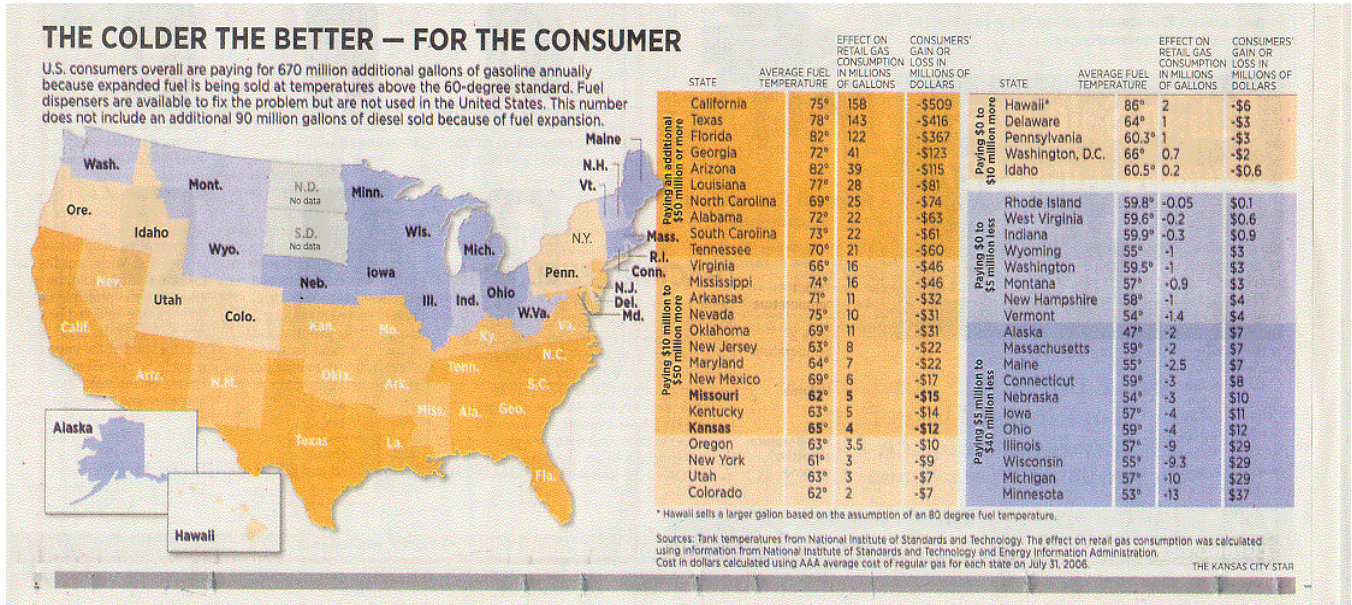
The following chart provided in a recent OOIDA presentation indicates the average temperature throughout the continental United States; however, this chart does not indicate the temperature at which fuel is dispensed:



Ambient temperature is only one variable that must be understood in analyzing the impact of automatic temperature compensation devices at retail pumps. Most fuel in the United States is dispensed from underground storage tanks, making the ground temperature and the amount of time the fuel spends in the ground prior to being

⁴ In a 2002-2004 study of 1000 gas stations in 48 states, the National Institute of Standards and Technology found that the average dispensed temperature of a gallon of gasoline was 64.7 degrees F, almost five degrees above the 60 degree benchmark.

dispensed critical variables in analyzing the fuel temperature compensation issue. Depending on latitude and altitude, ground temperatures generally range from 45°F to 75°F. The following chart was prepared by the *Kansas City Star* to support an article describing the hot fuel issue. The statistics provided relate to gasoline sales; however, the ground temperatures would have a similar influence on diesel fuel sales:



Another important factor in the analysis is the proximity of the retail station to the refinery. Diesel will be warm when it leaves the refinery, but will cool as it moves through the distribution system to the terminal. Transportation by tank truck to the retail establishment will either raise or lower the fuel temperature based upon the ambient air temperature and the amount of time it takes to deliver the fuel. Once delivered to the retail establishment, the temperature of the diesel will gradually approach the ground temperature, assuming the fuel is dispensed from an underground tank.⁵

The technology exists to retrofit retail diesel fuel pumps with metering devices that adjust the flow to reflect changes in fuel temperatures. The cost of installing temperature compensation devices on fuel dispensers is significant. Electronic pumps could be retrofitted with automatic temperature compensation mechanisms; however, mechanical pumps installed before the mid 1990s would have to be replaced. The cost of retrofitting an electronic pump is estimated to be \$2,000 per pump, while the cost of replacing a mechanical pump would be \$15,000 - \$20,000 per pump.⁶ Given the average life of a fuel dispenser, the National Association of Convenience Stores (NACS) estimates that approximately 25% of the fuel dispensers would have to be replaced rather

⁵ Fuel stored in an above ground tank will eventually equal the temperature of the ambient air.

⁶ OOIDA estimates that a digital pump retrofit would cost between \$1,200 and \$2,350, depending upon the number of products dispensed by the pump. OOIDA further estimates that the cost of a new digital pump is \$15,000.

than retrofitted. NACS also estimates that the total costs for upgrading the approximately 670,000 retail fuel dispensers would be between \$3 billion and \$4 billion.

Retail petroleum distribution is one of the most competitive industries in the United States and consumers often will select where to refuel based on price differentials of a penny per gallon. Fuel retailers argue that even if there is a small benefit to the consumer from automatic temperature compensation below the rack, that benefit would be offset by the increased retail price of fuel that would be charged to recover the cost of upgrading and maintaining dispensers and truck metering devices for temperature compensation.

Due to the impact that temperature has on the energy value of diesel fuel, selling temperature corrected fuel throughout the distribution system is an equitable means of ensuring that neither the buyer nor seller gains a competitive advantage. However, as a result of the numerous variables that affect the temperature of diesel fuel at the dispenser and the likelihood that the costs of retrofitting dispensers would be passed on the consumer, determining the impact on the trucking industry of mandatory temperature compensation at the retail level will require further study.

C. Permissive Temperature Compensation

While it is impracticable to reach a conclusion on the impact that mandatory temperature compensation will have on the trucking industry, we can safely conclude that permissive temperature compensation would disadvantage diesel fuel consumers. Permissive temperature compensation leaves the decision on whether to install temperature compensation equipment to the fuel retailer's discretion. A permissive temperature compensation regulatory environment would allow retailers to game the system by installing temperature compensation equipment where the average temperature of the fuel dispensed is below 60 degrees and refrain from such installations where the average temperature of the fuel dispensed is above 60 degrees.

Permissive temperature compensation also could undermine fair trade and transparency in the retail marketplace. Many trucking companies rely upon daily price surveys to determine where and how much fuel to purchase at given points along a truck route. Other trucking companies rely on advertised price to determine where to refuel. The use of temperature compensation equipment by an unknown portion of the retail fuel providers will greatly complicate the ability to determine the most economical place to refuel. Compensating and non-compensating retailers, whether located across the street from one another or across a state border, would no longer be selling comparable volumes of product, making it impossible to make an educated purchasing decision. For these reasons, we believe that ATA should oppose permissive temperature compensation, as that form of retail fuel distribution would most certainly disadvantage the trucking industry.

D. Automatic Temperature Compensation – Existing Regulations

The National Conference of Weights and Measures (NCWM) oversees the content of National Institute of Standards (NIST) Handbooks, which sets standards relating to delivery of fuel products (*i.e.*, Handbooks 44 and 130). Although NCWM standards are not binding, they are adopted and enforced by individual state weights and measures agencies.⁷ NCWM is responsible for evaluating changes to provisions related to the dispensing of refined petroleum products. NCWM has not yet developed standards for automatic temperature compensation devices at the retail level.

Currently, no states require automatic temperature compensation at the retail level.⁸ California recently determined that the NCWM manual did not prohibit permissive temperature compensation at the retail level, and announced that fuel retailers would be permitted to install temperature compensation devices. ATA will work with the California Trucking Association to inform the Department of Weights and Measures that permissive temperature compensation will disadvantage consumers.

Congress can enact legislation to require temperature adjustment. The Fair Packaging and Labeling Act of 1966, for instance, imposed uniform rules on how the weight or measurement of packaged products is displayed so that consumers could more easily make an informed choice. We are not aware of any pending federal legislation that would mandate automatic temperature compensation for retail fuel pumps.

No other country mandates temperature compensation at the retail level. In 1990 a Canadian law, supported by oil companies and retailers, went into effect. The Canadian regulation *permits* retailers to adjust for temperatures on a voluntary basis. The yearly mean temperature in Canada is only 43 degrees, and most fuel is likely purchased at temperatures below 60 degrees. Temperature compensation devices are used to reduce the volume dispensed to account for the cold fuel's higher energy content. The failure to temperature correct cold fuel disadvantages fuel retailers and, not surprisingly, 95% of the fuel retailers in Canada have installed the temperature compensation devices.

⁷ Weights and measures regulations are the responsibility of the states. The National Institute of Standards and Technology offers technical assistance to the states, but doesn't have any enforcement powers.

⁸ In Minnesota, Montana, New Jersey and South Dakota there are various forms of prohibition on the temperature compensation of fuels. In North Carolina, North Dakota and Pennsylvania temperature compensation is permitted under certain conditions, such as when both buyer and seller agree. In California, Colorado and Idaho, wholesale purchasers have the option to require temperature compensation on sales above certain minimums. In Arizona and Texas, temperature compensation is mandatory only at the wholesale level on sales of over 5,000 Gallons. In Hawaii, there is a mandatory recalibration of pumps to reflect a high average local temperature (80° F) – Hawaiian retail pumps dispense a larger gallon (*i.e.*, 234 cubic inches); however, the volume does vary with the temperature. Missouri, Texas and California have pending legislation that would mandate temperature compensation at the retail level.

E. Other Considerations for ATA Members

In addition to being the largest consumer of diesel fuel in the United States, ATA members dispense a significant amount of fuel through central refueling operations.⁹ Some ATA members actually sell diesel fuel to owner-operators and could be required to bear the dispenser retrofit costs for these operations, if temperature compensation is mandated. Although not named as defendants in the hot fuel lawsuits referenced above, these companies may be vulnerable to such allegations.

In a recent presentation on the issue, OOIDA indicated that automatic temperature compensation devices should also be required for tank trucks that deliver petroleum products. The National Tank Truck Carriers is unaware of the existence of automatic temperature compensation devices for tank trucks and therefore cannot estimate the cost of retrofitting these trucks.

CONCLUSION

The temperature at which fuel is dispensed has a direct impact upon the energy content of that fuel. As such, a permissive regulatory regime, where fuel retailers are given the ability to choose whether to install pumps equipped with automatic temperature compensation, must be opposed in order to avoid the likelihood that fuel retailers will intentionally take advantage of the consumer.

Based upon the limited amount of information available, it is premature to reach a conclusion on the impact to consumers from the mandatory deployment of temperature compensation equipment at the retail level. For this reason, as well as the exposure of some motor carriers to similar actions, we do not recommend that ATA participate in the pending lawsuits. We also are unable to recommend whether ATA should support state or federal legislative efforts to mandate temperature compensation devices at the retail level.

ATA staff recommends that the issue of mandatory temperature compensation be further studied, either by the American Transportation Research Institute (ATRI) or perhaps the National Academy of Sciences. This study should focus upon quantifying the economic impact of failing to deploy temperature compensation equipment at the retail level on a state-by-state basis, the short-term and long-term costs that would be passed on to the consumer if such equipment were mandated, and the impact of changing the 60 degree reference temperature based on geographic or seasonal considerations. Pending completion of this study, ATA staff recommends that ATA actively oppose permissive temperature compensation regulations.

⁹ EPA estimates that wholesale purchaser consumers account for 40% of the diesel fuel consumed in the United States.