Steel for Vehicle Fuel Tanks is the Most Cost Competitive of the Automotive Materials

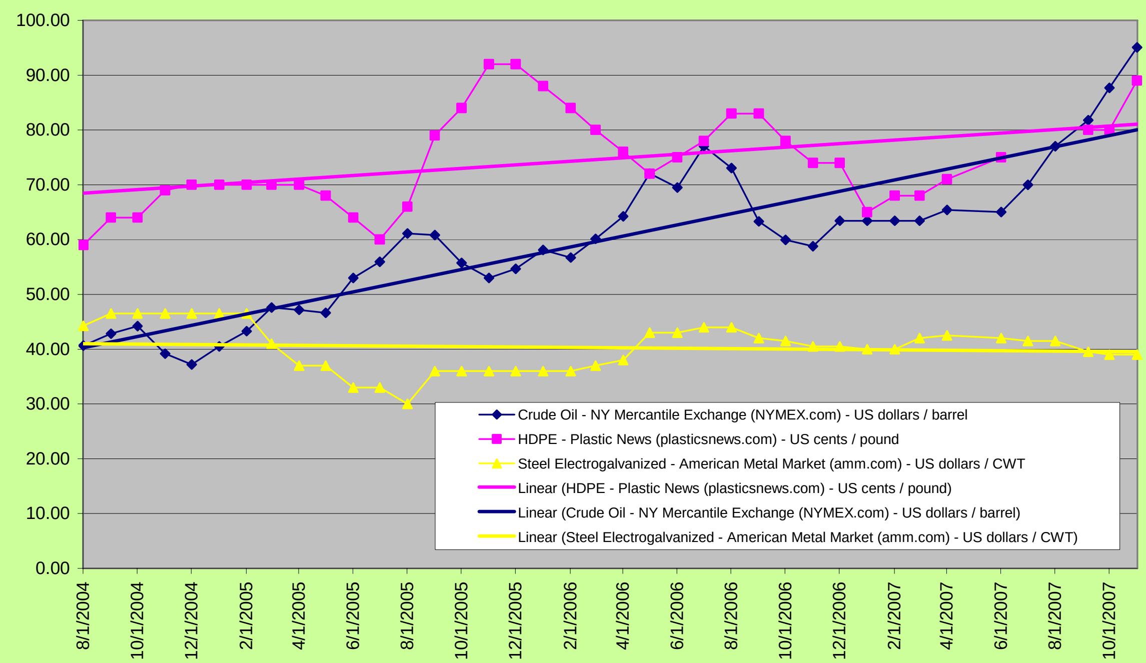
Steel used for automotive fuel tanks, or any automotive application for that matter, is low cost and has a relatively stable price history over long periods of time. It is extremely competitive against alternate automotive materials, such as magnesium, aluminum and plastics.

The steel industry has made extraordinary progress in maintaining this price stability, as demonstrated by the graphic in Figure 1, which succinctly tells the competitive story. The trend line for steel, shown in yellow, is flat suggesting long term price stability.

Plastic on the other hand, such as HDPE, which is widely used in vehicle fuel tanks, is at the mercy of the supply and the cost of oil used in the production of plastic. The price of crude oil on the world market is frequently influenced by foreign governments that attempt to control global supply.

In recent years, the price of crude oil has been in an upward trend as shown by the blue line in Figure 1.   It begins at January 2004, with crude costing about $30 per barrel, and it ends at December 2006 with the cost of crude shown to at almost $70 per barrel. In July 2007, the price of crude oil was at record levels of greater than $75. Because of its dependency on oil, the price of HDPE has also been following an upward path parallel to the price of crude. This is shown in the figure below.

SASFT Materials Price Trends as of 11/26/2007



Recent trends of published materials costs used for fuel tanks indicate:
- greater stability of steel -vs- high density polyethylene (HDPE)
- closer dependence of HDPE costs on crude oil costs

The future outlook for crude-oil prices is not bright. A Canadian investment bank report in July 2007 predicted that crude-oil prices would hit $80 a barrel by year's end and may reach $100 a barrel next year. In October 2007, that prediction became a reality and $100/barrel is conjecture by many. "Soaring oil demand" will outpace global supply growth, the CIBC World Markets report indicated. The trend points to triple-digit prices, which "may be permanent as major oil-producing countries in the developing world reduce exports to meet soaring demand at home," said the report by the wholesale and corporate banking arm of the Canadian Imperial Bank of Commerce.

North American Steel Industry Committed

The North American steel industry is committed to reaching the highest levels of productivity in order to maintain its competitive position. Swiftly changing customer demands and expanding global competition have triggered sweeping transformation and modernization. Today, the steel industry is in the world's top tier of productivity, environmental responsibility, competitiveness and product quality.

One of the things working for steel in North American are the abundant and fairly inexpensive supplies of iron ore, coking coal and scrap, the basic raw materials for making steel. The cost of these raw materials, which, for the most part, are produced domestically, remains relatively unaffected by global politics.

Another area where steel has made significant progress is in labor productivity, which has more than tripled since the early 1980s, going from an average of 10.1 man-hours per finished ton to an average of three man-hours per finished ton. Many North American plants are producing a ton of finished steel in less than one man-hour. Groundbreaking labor/management agreements have facilitated industry consolidation. Broadened job scope and streamlining of management personnel have produced dramatic operational efficiencies and increased worker involvement.

Working with the Department of Energy, the North American steel industry has implemented new technologies to improve energy efficiency. In 2003 steel reached a new milestone, reducing energy intensity per ton of steel shipped by 7 percent, for a total of 23 percent since 1990.

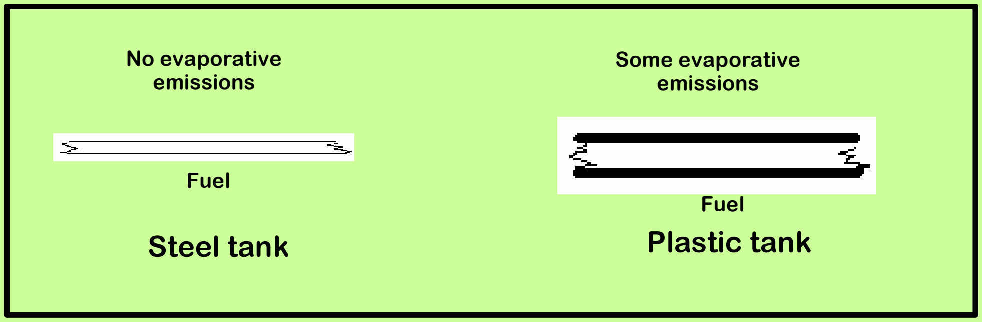
The industry is on track to a sustainable future by reducing its use of energy, which represents 20 percent of the cost of making steel. AISI has set a long-term strategy to identify opportunities in energy substitution, energy recovery and energy savings that will allow North American industry to produce steel using one barrel of oil per ton less than today's processes by 2025.

Demands for Emission-Free Fuel Tanks…Increasing Costs for Plastic Fuel Tanks

A contributing factor to the increasing cost of plastic fuel tanks is the demand for zero emissions, which is making the manufacture of plastic tanks more complicated and more expensive. The need for multiwall construction is the primary reason.

"California has established new more stringent regulations not only for more fuel efficient vehicles but also for the elimination of evaporative emissions from their fuel systems," says Peter R. Mould, program manager for the Strategic Alliance for Steel Fuel Tanks (SASFT). "Many states in the U. S. are following the California example. The low-cost single wall molded plastic tanks, which have a permeation problem, may be things of the past.

"The emission problem is exacerbated by the increased use of flex-fuel, which is a blend of gasoline containing up to 85 percent ethanol (E85), and the use of bio-diesel, which is a renewable fuel manufactured from vegetable oils, animal fats, and recycled cooking oils," Mould continued. "Steel tanks are impermeable; fuel vapors cannot get through the tank wall."



“Some tanks designed to meet California's stricter evaporative fuel standards consist of an inner layer of HDPE joined by an adhesive layer and barrier layer of polyamide or ethylene-vinyl alcohol (EVOH) copolymer. An additional adhesive layer is joined by a layer of ‘regrind’ and an outer layer of HDPE, ”explains Mould.

Design Flexibility Contributes to Cost Competitiveness of Steel

Increased technical performance by fuel tank manufacturers world wide is enhancing the cost competitiveness of steel tanks. Despite the ‘myth’ that only blow molding of plastics can produce complex shapes, steel is being used routinely to make complex shaped tanks, such as saddle tanks as shown schematically here.

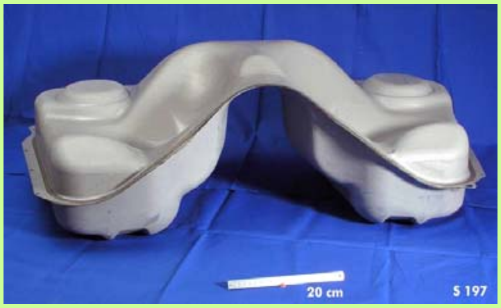
These manufacturers are using the new, highly formable steels and they have developed a number of advanced forming techniques that allow for greater flexibility in forming complex shapes. The multi-axis and high speed seam welding processes with tight radii are keys to the enhanced competitiveness of steel tanks.

An engineering feasibility study conducted a few years ago by SASFT shows that steel fuel tanks can meet design flexibility, volume capacity and weight requirements for complex, saddle-shaped fuel tanks while providing the inherent impermeability favored for meeting stringent evaporative emissions standards. The study also highlighted the additional economic and environmental incentives of low cost and convenient, profitable recyclability of steel tanks.

SASFT conducted the study to explore the potential of fuel tanks made from new steels and using advanced manufacturing processes to match or exceed the performance of current, blow-molded, multi-layer plastic tanks that have been growing in popularity.

The study used a current-production plastic tank as a benchmark on which to base a redesign in steel. "What we found in the feasibility study is that not only are steel tanks cost-competitive with current plastic tanks, but they also can meet challenging design specifications for irregular shapes," said Peter Mould. "This will enable vehicle makers to take advantage of steel’s intrinsic impermeability to meet new regulations on evaporative emissions, such as PZEV (partial zero emission vehicle)."

Since the engineering study was completed, several complex-shaped saddle tanks have been adopted for serial production in many vehicles (such as the Ford Mustang and a Mercedes Benz tank shown in the figure below).



Ford Mustang

Mercedes Benz

As a result of the above developments, automakers are re-evaluating plastic fuel tanks in favor of systems made of coated low carbon steels and stainless steels. Meeting stricter requirements for permeability may require plastic fuel tanks to become heavier and more costly, thereby mitigating the perceived weight and cost advantages plastic fuel tanks have enjoyed.