

Tanks for the refreshment: volume transport of clean, healthy essentials of life

Tanks are everywhere. In their infinite variety of shapes, sizes and uses, they are vital to a functioning society. When it comes to food, however, and chances of contamination or colonization by bacteria, there is only one reliable candidate. That is why trucks with stainless steel tanks carrying edible oils, sugar, milk and all the other raw materials that go into the manufacture of foodstuffs are common sights on highways and, on occasion, railways. Less commonly, they are used to transport potable water. The reasons, however, remain the same: longevity, strength, corrosion resistance, and ease of cleaning and sanitation.

Not by road alone

– Milk by rail in New Zealand

How can a country with 0.1% of the world's population produce 2.2% of the world's milk and do it in a way that takes trucks off the roads and reduces the carbon footprint of milk production? There is no single answer but part of the solution is transport of raw milk by rail.

It was in 1929 that the first road tanker made of Type 302 (UNS S30200) stainless steel was used to transport raw milk to a dairy, and stainless steel milk tanks have been used continuously ever since. And in countries where the production of milk is particularly intensive and the volumes are high, even railways are called into service.

Railways excel at moving bulk liquids. Over the years, improvements in insulation and cooling equipment have resulted in purpose-built rail-mounted stainless steel milk tanks capable of carrying large volumes of raw milk from rail-head milk tanks to receiving stations at a dairy factory. These containers are "intermodal": they can be shifted from one mode of transport



Four times every day dedicated milk trains pass through the New Zealand countryside carrying raw milk to a processing plant. Photo courtesy Andrew Hamblin.

(such as a truck) to another (such as a rail car).

Two sizes of rail-mounted inter-model tanks are in use: one of 40,000 litres (about 10,000 gal.) made of Type 316L (S31603) and one, such as seen below, of 25,000 litres (about 6,600 gal.) made of Type 304 (S30400). These are called "iso-containers" because they conform to the International Organisation for Standardisation standard for refrigerated milk containers. Construction and maintenance of road and rail-mounted milk tanks must also comply with globally recognised 3-A sanitary standards.

New tankers for old – Clean drinking water when and where needed in New Delhi

India differs from New Zealand in every metric imaginable and faces different challenges: old infrastructure or lack of new infrastructure in fast-expanding urban mega-cities; climatic extremes of heat and drought; constrained water supplies and falling water tables. These are some of the realities facing many large cities in India and New Delhi, the country's second-largest, is a case in point.

The water authority for the New Delhi National Capital Territory has long maintained a fleet of water tankers and in times of need they can supply minimum local needs until repairs are made, additional capacity is installed, or the summer heat abates.

This long-standing service had traditionally used carbon steel tankers, the interiors of which were periodically painted with a coal tar paint to slow the inevitable corrosion. But the injurious chemicals that leached from the coatings, together with increasing volumes of rust particles as the tanks aged, led to many complaints about the quality of the water.

The recent decision to privatise this part of the water distribution system provided an opportunity to review the state of the equipment and see if something better could be found. It was quickly seen that nickel-containing stainless steel was the preferred material to replace carbon steel tanks.

Why stainless steel?

Stainless steel does not require the coal tar lining of the previous generation of water tankers. This has an immediate

positive impact on the acceptability of the water to consumers and removes a long-term health hazard. While taste may be of lesser importance when you are lacking water, the fact that stainless steel does not affect the flavour of water is also welcome.

The tanks are expected to give many years of service and carry thousands of loads. As a matter of good practice, their interiors will be regularly cleaned and rinsed. Ordinary soap and water is sufficient most of the time. If, however, some contamination is accidentally introduced into the tank, stainless steel will tolerate whatever strong cleansing or disinfecting agents are needed to restore it to a safe state.

While identifying the most appropriate material for the water tanks was not difficult, there were initial concerns about the cost differential between carbon steel and stainless steel. This changed when the Delhi water authority and its contractors took into account the low maintenance and repair requirements of stainless steel tanks. This means a higher availability of the equipment and, overall, fewer trucks to achieve the same distribution capacity. Moreover, the projected service life of the tanks is five times longer than the typical three to four years associated with carbon steel tanks. Seen in this light, the apparently "expensive" stainless steel was highly competitive.

The picture improved even further when the superior strength of the stainless steel allowed a thinner gauge of sheet (4 mm) to be used. Depending on the size of the tanker, the total weight is between 500-1,100 kg (1,100-2,400 lbs.) lighter than the old carbon steel versions. The fuel savings over the life cycle of the tanker are expected to be significant and, in addition, air pollutants will be proportionately reduced.

Thus in January 2013 the first of 385 truck-mounted water tanks made of Type 304 (UNS S30400) stainless steel entered service in the National Capital Region of New Delhi.

"We are so pleased" said Mr. R.S. Tyagi, Chief Engineer of the Delhi Jal Board. "We knew stainless steel was the best material for the purpose but going through the process of calculating the true cost of different material choices made stainless steel the clear winner." The other winners, of course, are the citizens of New Delhi who will be receiving clean, safe and refreshing water in times of need.



Ready for the streets and suburbs of New Delhi: one of the fleet of new water distribution trucks with their nickel-containing stainless steel tanks. Photo: Firoz Alam/Fabtech Industries.