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A fresh coat

TANK COATINGS New sources of unconventional oil and gas have transformed the US energy industry, and sustainable tank coatings have evolved too, says *Tatsuya Nagakawa**

The world of storage tanks was once a simple one – fabricate the tank, hold the contents, repair, repaint when necessary, then scrap it when its life was over. Nowadays, a tank must meet the increasing challenges set by regulators and special interest groups that want to thrust it into a more ordered age of sustainability and reduced health risks. It's also running into a controversial boom caused by the giant shale oil and gas plays, particularly in the US.

Key influencers of change include governmental health and safety agencies, as well as environmentalists who have, for example, the elimination of harmful liquid spills and volatile organic compounds (VOCs) emissions as top priorities. They also want to make sure that practices of today don't come back to haunt us in the distant future, as happened with asbestos that was used as insulation more than half a century ago.

The US Environmental Protection Agency (EPA) looks set to bring in tough new regulations for underground storage tanks, particularly for secondary containment (anti-spill) in 2014. In August 2012, EPA went after owners and operators of 22 underground storage tanks at gasoline stations in New York State. EPA alleged

corrosion and testing lapses, as well as other violations of federal groundwater regulations in Buffalo, Amherst, and Tonawanda. Total fines could be over \$500,000, and the law authorises EPA to seek between \$11,000 and \$16,000 per tank for each day a violation exists.

There are approximately 584,000 underground storage tanks (USTs) across the US that store petroleum or hazardous substances. The greatest potential threat from a leaking UST is contamination of groundwater, the source of drinking water for nearly half of all Americans.

Predicting emissions

Hydrocarbon emissions dog some industries, particularly oil refineries and terminals. It is hard to keep them to a minimum without costly changes. Some firms specialise in addressing the issues. Chris Amstutz, director, terminal management industry solutions at Emerson Process Management, says being proactive in detecting problems is key: "We've actually done a few projects with some of the larger terminal operators that focused on reducing hydrocarbon emissions during all movements, tanks and loading operations.

“One of the key differentiators was the use of a predictive management solution that enabled maintenance personnel to proactively detect problems before they occurred. I see this approach in line with some of the requirements behind the new requirements in AP2350 around best management practices and risk assessments as part of an overall sustainability programme.”

Particulate emissions can be demonstrated to have a very large footprint around rail yards and industrial complexes such as oil and gas terminals. In California, diesel exhaust is listed as a Toxic Air Contaminant and has strong links to lung cancer and other respiratory and life-shortening ailments. Particulate traps, while expensive, are highly efficient.

Today, large storage tanks are mostly made from steel with others made of fibreglass and heavy-duty plastics-type fabric, as is the case with bladder tanks. Steel tanks are relatively cheap, save for stainless steel ones, and strong. With care they can last decades or

longer, and can be easily recycled. They also mostly coated with conventional epoxies, particularly where atmospheres and contents are corrosive.

In cold climes, epoxy coatings are highly susceptible to cracking as steel expands and contracts, and even more so if there are any torsion effects as is experienced with road tankers.

Frac tank boom

The US, burdened by an ever-increasing debt load of over \$16tr, had looked set to fall off a fiscal cliff at the end of 2012, but there is strong evidence now that the shale gas and oil plays will be part of the long-term fiscal salvation process for the US. According to the 2010 World Energy Outlook by the International Energy Agency (IEA), the world oil shale resources may be the equivalent of more than 5 trillion barrels of oil, in place of which more than 1 trillion barrels may be technically recoverable. Last November, the

IEA said the US would become the world's biggest oil producer by 2017, from its wealth of unconventional sources of oil and gas.

To get to that point, a lot of work is needed in developing the massive shale oil reserves that lie in great swathes under North America. Hydraulic fracturing ('fracking') techniques have moved on enormously, but have brought with them a new cast of chemicals. This presents challenges to storage tank builders, since the tanks involved in the fracking sector may have to cope with a cocktail of products never before encountered. Some of these can eat through inadequately protected steel, in some cases within hours. They include such exotics as formic acid, which is formidable challenge for storing securely in steel tanks.

The average conventional epoxy coating life in frac tanks is about eight months. New 'veggie' plastic coatings significantly outperform the conventional ones by a wide margin, making them a sustainable option. This has led to a rapid increase in demand for static storage

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tanks as well as road tankers to handle the vast volumes of produced water toxic wastes. As an alternative to steel, robust all-weather bladder tanks made of an extremely tough fabric can handle up to 50,000 gallons.

Veggie option

The new reality of trying to eliminate the use of VOCs from protective coatings and foams means looking at alternatives to conventional epoxy coatings. VOC-free epoxy coatings are emerging but a cheap, proven alternative has emerged that is produced with vegetable oil (renewable) and gypsum (fully recyclable) in speciality coatings that contain no VOCs and do not require them for application purposes or release them during cleanup and disposal.

The veggie plastic coating waste is also 100 per cent recyclable, thus eliminating any special disposal requirement and allowing contractors to demonstrate best practices in sustainability.

The coatings can also be applied in much lower temperatures than previously thought

possible with epoxies. In oil industries located in areas with often severe winters, this has severely limited the use of conventional coatings when temperatures plunge, but not for plasticised gypsum coatings.

Most recently a coatings contract for an ice cream factory freezer demonstrated the new record low temperatures in which the veggie plastic coatings can be successfully applied. The factory freezer had its concrete floor coated at -25°F (-32°C). Within 14 hours the freezer area, measuring about 5,000 square feet, was returned to full service. The coating, NSF 61-approved for food and water containment, had formed a tight bond and optimal hardness in an application that could not be achieved with conventional epoxies.

Cheap and cheerful

Cheap and simple sustainability solutions can also include using recyclable blast media, which minimises the volume of spent material that ultimately ends up in landfill. New LED

light technology is not only highly efficient but also long lasting. It runs cool and provides outstanding light coverage for hazardous areas where pipes and equipment abound.

Technology continues to march on with ever-increasing efficiencies in the area of pumping and compression offering prime replacement opportunities for ageing equipment. Stopping leaks, however small, can prevent a problem getting worse, or avoid issues in the future if it is found that groundwater has been threatened or even contaminated.

Peter Roosen, CEO of Castagra Products, which produces VOC-free veggie plastic coatings, says sustainability is not just good for the environment: "Where sustainability-related solutions provide sound, economical, technological or practice alternatives, then everyone becomes a winner, including those watching the bottom line."

**Tatsuya Nakagawa is vice-president of marketing & strategy for Castagra Products, Inc.*

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