Clearing the Air (and Water)

CARB regulation leads to development of Enhanced Vapour Recovery systems for ASTs that help prevent hydrocarbon emissions from compromising the safety of the environment

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Stop and think about it for a minute or two: when was the last time you gave even a second thought to the level of cleanliness of the air you breath or the water you drink? How about whether that winding stream or open meadow might be contaminated by carcinogens? On any given day, we can move from home to car to office to store to park to movie theatre and back home again without even once considering if the air is safe to breath in any of those places. From the kitchen tap to the water fountain at the gym, we consume water throughout the day without needing to verify whether or not it may be harmful to our health.

The bottom line is, we all have many more important things to do and worry about during the course of the day than whether or not that deep breath we take or that glass of water we swallow will have an adverse affect on us.

All of this despite the fact that contaminants are all around us, all with the potential to do damage to the safety of the air and water that we generally take for granted. From chlorofluoro-carbons that may damage the ozone layer to the transport tanker that is delivering several thousand gallons of unleaded gasoline to the local service station, the potential for airborne contamination is ever-present. However, that potential is minimised through the creation and implementation of regulations that have been designed to restrict the release of harmful emissions into the atmosphere. These regulations result in cleaner air and water, and an overall healthier environment in which we live our lives.

One of the leaders in developing regulations that help ensure the cleanest air, purest water and greenest environment – especially in regard to controlling the release of harmful hydrocarbon emissions, vapours and volatile organic compounds (VOCs) during the delivery, transfer, storage and use of petroleum products – is the California Environmental Protection Agency's Air Resources Board (CARB). One of CARB's more recent edicts concerns the certification procedure for vapour-recovery systems that are installed at gasoline-dispensing facilities (GDFs) – whether public or private – that store their products in aboveground storage tanks (ASTs).

As of July 1, 2010, all GDFs in California – a universe that includes retail outlets, fleet/commercial fuelling operations, municipalities, aviation fueling sites, and agriculture, construction, maintenance and emergency response operations – needed to be compliant

Today, the technology exists to create Enhanced Vapour Recovery systems for aboveground storage tanks that can prevent spills and overfills of petroleum products, as well as the release of potentially harmful hydrocarbon emissions into the environment.

with Vapour Recovery Certification Procedure CP-206, alternately titled, *'Certification Procedure for Vapour Recovery Systems At Gasoline Dispensing Facilities Using Aboveground Storage Tanks.'* CARB defines a vapour-recovery system as a complete system and its components, including all associated ASTs, dispensers, piping, nozzles, couplers, processing units and any other equipment or components necessary for evaporation control or the control of gasoline vapours during refuelling operations at GDFs.

The Challenge

There are two things that immediately come to mind when thinking of CARB and its mandate: its unwavering commitment to providing the cleanest air, water and environment possible for the residents of California, and that when it talks, people listen. When CARB adopts a new environmental-compliance regulation, regulators around the nation generally sit up and take notice because these CARB regulations, or variations thereof, are typically adopted by other states when they themselves are required to meet U.S. Environmental Protection Agency regulations.

Since its establishment in 1967, CARB has systematically attempted to eliminate sources of air pollution in California. After establishing stringent emission regulations for vehicles, petroleum-product storage terminals and underground storage tanks, among others, CARB turned its attention to ASTs. As of July 1, 2010, all new GDFs with ASTs must be equipped with certified Phase I vapour-recovery systems on their tanks in order to meet CARB's enhanced vapour recovery (EVR) standards. CARB also requires certified vapor-recovery equipment on the delivery trucks in order to control emissions during the filling of ASTs.

Many of the state's counties argued that the vapour-recovery equipment didn't work as advertised when it was mixed and matched with equipment from a different manufacturer. As a result, they demanded that the EVR systems be tested as a unit, not just as a series of individual components. In response, CARB ruled that these EVR systems must be 98%, or virtually, vapour-tight and that all of the state's ASTs (of which 60% to 70% are located on private property, with the majority used in agricultural applications) in service prior to July 1, 2010, be upgraded, and that all new tanks purchased after that date be "protected," i.e. insulated or double-walled. Protected ASTs have the capability to keep the temperature of the fuel within them stable, which eliminates standing storage (evaporative) loss, also known as breathing loss. Evaporative loss occurs when the sun heats the tank, causing the fuel to volatilise and vent to the atmosphere, meaning that as the temperature increases, so does the amount of emissions that can enter the atmosphere.

From a federal standpoint, most ASTs need to meet the EPA's Spill Prevention, Control and Countermeasure (SPCC) requirements (40 CFR, Part 112). Locally, most AST systems are required to meet state and local fire codes, and may also need to meet state or local regulatory requirements that safeguard human health and the environment. ASTs are often selected as design choices over USTs due to various reasons, such as rocky or shale environment, portability, excellent corrosion resistance, flexibility of fuelling location, etc. ASTs can be more cost-effective than buried double-wall USTs when overall life cycle costs, real estate, record-keeping and testing are considered. These insulated double-wall tanks are weather and bullet resistant, aesthetically pleasing, and easy to maintain. Installing vapour tight equipment is a real ecological bonus, with little expense, and with real payback in VOC emissions and escalating associated health and safety costs.

One of the growing concerns regarding AST use is the number and types of emissions that they produce. Emissions from ASTs vary depending on their size, type and configuration. Making emission control even more complicated for an AST is the number of areas on the tank where vapors are liable to escape, including vent pipes, fill ports, tank gauges, dispenser nozzles and emergency vents. In addition, a significant amount of emissions are the result of standing storage loss.

These hydrocarbons that evaporate and vent into the atmosphere are a precursor to ground-level ozone, which is a serious

pollutant in cities across the United States. Ground-level ozone is a key component of smog, which is formed when the hydrocarbon emissions react in the presence of the sun with the nitrogen oxides that are present in the air.

The smog that plagues many urban areas can cause irritation and damage to the eyes, skin and lungs of residents, while some hydrocarbons are also considered toxics and can cause serious health problems, including cancer and death, with lesser symptoms being respiratory problems, headaches, dizziness, reduced cardiovascular function, arrhythmia and brain damage. That's why it is imperative that the emissions that originate from ASTs successfully be controlled, recovered and contained.

The Solution

With all of this in mind, it is the moral obligation of petroleum producers, distributors, regulators, engineering firms and end-users to protect the public and any personnel who are employed at AST bulk-storage facilities at all costs, while safeguarding the environment, air we breathe and the water we consume, not just for today, but for future generations. This "good neighbour" policy leads to the creation and implementation of legislation that has been designed to protect the environment and challenge companies to create vapour-recovery systems that meet the needs of AST emission control.

Addressing CARB's demands for a complete EVR system for use with ASTs, OPW Fuelling Components, Hamilton, OH, set about developing a series of components that could be used in harmony to create a fully functional AST EVR system. Those efforts were rewarded on July 12, 2010, when CARB issued "Executive Order VR-401-B: OPW Phase I Enhanced Vapour Recovery (EVR) System For Aboveground Storage Tanks (AST)," which stated that "the OPW System is certified to be at least 98.0 percent efficient" in controlling emissions during AST-loading operations. The OPW system is not only able to produce a "tight fill," or one that eliminates vapour emissions, but it has a vapour return that returns the produced vapours back to the delivery truck, where they can be converted back to gasoline.

OPW tested both its own and competitive offerings and found that there was no equipment, created as a single system, available to meet California's 98% vapour-tight mandate. Since OPW engineers dismissed the possibility of designing for an allowable 2% emission leak rate, they ultimately designed the EVR system for 100% vapour-tight performance. This would allow it to withstand a wide swing in temperature, from sub-zero to 120ºF (49ºC), with winter and summer fuel blends, in driving rain and wind conditions, and swirling California dust. They did this by incorporating superb seals, designs and a reduction in parts in order to attain long-lasting vapour tightness and maintenance-free operation for several years. All of these design parameters were part of the project, with the knowledge that there are frequent tank refillings and daily vehicular fill-ups.

The difficult challenge in this approach was to design equipment, as a system, that would cost the same to the end-user as the currently available "leaky" equipment. This would result in a definitive payback to the state by reducing VOC emissions and ultimately avoidance of increased health-care costs due to airborne carcinogens. With continual growth in vehicular registrations, this is a big initiative for California as more fuelling frequency will occur. More importantly, one state estimates that one tonne of VOC emissions equals $4,000 to $5,000 in taxpayer cost per year, so 30,000 targeted tonnes of California VOC emission reduction per year means a minimum of $150 million in savings year over year forever, as well as an improvement in quality of life and numerous other safety aspects.

Specifically, technological advancements in the following EVR components helped OPW gain CARB certification:

Emergency Vent Valve – When pressure builds, lid is forced off seat to relieve pressure; when pressure is relieved, lid is automatically reset, which facilitate zero emissions

AST Direct-Fill Spill Containers – Special drain valve and one-piece casting base catches spillage to help prevent soil contamination and groundwater pollution

Poppeted Adaptor with Overfill Prevention Valve – Prevents AST overfilling by providing a positive shut-off during a pressurised-fill (pump-on) delivery

Anti-Siphon Valves – The integral anti-siphon valve isolates the tank from potential siphon that is due to a broken or leaking remote fill pipe

Mechanical Tank Gauge – Read liquid levels in horizontal or vertical ASTs while providing accurate numerical counter readout, which eliminates the need for on-site manual gauging

Four-Signal Tank Alarm – Can sense up to four different liquid levels with audible alarm and visual notification of an alarm event

Remote Fill Spill Container – Prevents spilled product from entering soil near remote, horizontal-fill and vapour-return connections on an AST during normal tank-filling operation

Rotate-able Swivel Adaptor – Mates with vapour-recovery elbow on the delivery truck when recovery of vapours is required

Caps – Have enhanced ribbed seals that increase sealing forces to provide a bubble-tight seal

Ball Valve – Used where a shut-off point is desirable to isolate a section of the piping system

Solenoid Valve – Prevents accidental siphoning of ASTs if a leak or break occurs in the fuel-supply line

Spring Balance Hose Retractor – Provides smooth and steady tension throughout the hose extension and return; keeps excess hose off the ground and out of harm's way

As mentioned earlier, many states eventually adopt CARB standards when they are required to meet U.S. EPA regulations, meaning that the use of these technologically advanced pieces of EVR equipment is ideal for more than AST applications in California. In fact, although a state may currently not require CARB-certified products, if it ever does adopt similar air-quality rules, sites that are using advanced AST EVR products will be covered without the need of an expensive retrofit. Also, using CARB-certified products – even when not required to – will demonstrate a concern about the air we breathe while providing a healthier environment now and for future generations.

Conclusion

Much is made about industries that adopt "best practices" for their operations. Well, what can be a better practice than protecting the air we breathe, the water we drink and overall public health interests? With this in mind, eliminating or reducing to their lowest level the hydrocarbon emissions that are produced during AST loading is a crucial consideration. That's why regulations like those established by CARB help set the standard for other states to follow. These regulations also produce opportunities for companies to create the products that help ensure compliance for the facility operator – while simultaneously doing well for the wider world. AF

In 2010, all gasoline-dispensing facilities in California that featured ASTs for product storage needed to be compliant with CARB's certification procedure for Enhanced Vapor Recovery.