



Source: Vacono

emissions of volatile organic carbons from these tanks.

CTS presented an approach where installing aluminium domes would significantly reduce emissions

Emission statistics for ExxonMobil RAP tanks:

Description:	Emissions per year:	Emission reduction (%):
Emissions for reference fixed roof tank (BREF Storage tanks 2005, IPPC)	20,513 kgs	0
Emissions for tank with external floating roof, double seal	1,708 kgs	91.7%
Emissions for tank with internal floating roof, double seal	184 kgs	99.1%

Source: CTS

from external EFRs being converted to IFSSs.

Storage tank emissions and their volume largely depend on direct exposure of floating roofs to sun radiation (heating up the tank contents), and the wind speed directly above the floating roof.

As aluminium domes shield the formerly external floating roof from direct sun radiation the temperature of the product stored in tanks equipped with an aluminium dome roof goes down significantly.

The second aspect contributing to tank emissions

is the wind speed, and aluminium domes eliminate wind influence on former external floating roofs as well. This also reduces emissions, as the evaporation of hydrocarbons and chemicals increases when wind disperses vapours, and reduces when wind effects are not significant.

'Storage tanks with no fixed roof function like chimneys. When the wind blows across the top it causes a negative vacuum, sucking out the vapour past the seals,' Margolf comments.

Cost-efficiency

The addition of a fixed roof, be it aluminium or steel, essentially turns an EFR into an IFR, thereby decreasing emissions, reducing the risk of tank collapse, minimising water ingress and cutting down corrosion.

Although the initial cost of adding a fixed roof may be high, terminals will reduce maintenance expenses and lose less product through evaporation, so will benefit from the cost benefits in the long run. ●

Roof drain systems

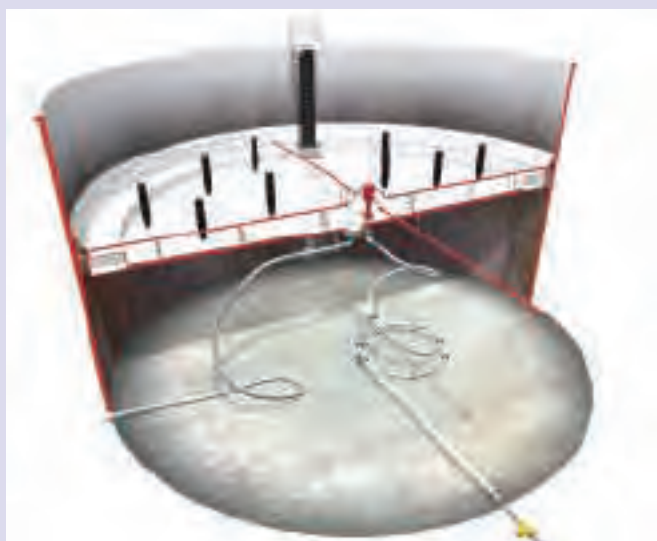
EFRs need to be equipped with adequate roof drain systems to prevent water ingress.

'Operators can use inexpensive systems to get water off the roof, but face the risk of plugging and cracking or leaking product on to the ground,' HMT Tank's Chip Breitweiser says. 'If there is a blockage, storm water accumulation could sink the roof.'

HMT offers multiple types of drain systems, including a hose, swivel joint and pivot master joint. The hose is flexible to ensure a repeatable lay pattern – as the roof goes up and down the hose has to lay in exactly the same pattern. However using this system runs the risk of vapour lock increasing wear and tear over time.

With the swivel joint, the roof drain pipe takes liquid off the top of the tank and makes a U-turn in that swivel point through a rigid pipe system. Where the swivel point occurs there must be a gasket or packing material to prevent maintenance. The pivot master is an in-line joint equipped with a flexible pipe.

'The swivel joint suffers



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more leaks, and we would like to avoid the expense of water going into storage tanks,' Breitweiser adds. Manufacturers must ensure every component inside will last until the next inspection, which could be 10-20 years away.

Mesa Rubber, a division of US-based Mesa Industries, also supplies three roof drain systems: Resist-All-Clad floating roof tank drain controlled repetitive-lay

system; Armor-clad floating roof tank drain single coil-lay pattern; and Mesaflex floating roof tank drain single coil lay pattern.

'When Mesa Rubber designs roof drain systems it takes into account average annual rainfall in the area of service then makes a suggestion to the tank owner or contractor to see if one or more drains are needed and whether they should be four or six-inch, for example,' David

Schafer, sales manager at Mesa Rubber, says.

'The roof drain hose is designed on the height of a tank not its diameter,' he goes on. 'It really depends on the geographic position. For instance, a 300ft tank in Phoenix, Arizona, would probably need just one hose due to low rainfall, while a 300ft tank in Texas might need three.'

The Resist-All-Clad has a specific design that keeps the hose in a permanent position as the roof moves up and down. The Armor-clad generally stretches out further and has the capability to wander with the turbulence of the tank during filling and draining.

'In the tank drain industry there have been three styles of hose for the last 25-30 years. The only changes have really been in improving inner liners (the conduit talking water out shell of tanks) or chemical resistance of liners,' Schafer concludes.

Mesa Rubber's roof drain systems are used by terminal operators and industry players, such as Kinder Morgan, Teppco, Sunoco Logistics, NuStar, Marathon Oil and TransMontaigne.