

Major shift approaching for tank coatings..

An applicator inspecting the Ecodur 201 coating for a global oil and gas company



The Castagra Spray Rig in front of a large tank coated in Montana



Not much has changed in the past few decades in basic corrosion prevention techniques for bulk storage tanks, until now that is, with the advent of field-proven vegetable oil-based coatings.

Conventional epoxies, polyurethane and polyurea products abound offering excellent cold weather application performance, chemical resistance, overall durability, and many are solvent free.

But, they all have one thing in common. They are petroleum based.

Polyurea is created by the chemical reaction between a di-isocyanate and a polyamine without the aid of a catalyst. It is usually applied using

a spray coating system in a 1:1 mix ratio.

Polyurethanes, and so-called hybrids, (a mix of urea and urethane groups) are also 1:1 spray systems, but these contain a third component (a catalyst) to reduce reaction time.

Epoxies, which are, in strict technical terms, the uncured resin component with hardener usually an amine, have become a generic name for many two part coatings and glues. Similarly, polyurethane

is the generic term for the resulting chemical reaction between a polyol resin and a polyisocyanate hardener.

20 year pedigree

The big change that is taking place is the advent of plasticised gypsum coatings called 'veggie plastic'. These are highly fire retardant and highly resistant to acids, salts, and mechanical abuse.

First developed over 20 years ago as baseboard moldings and shingles, they have been proven on ship decks and road surfaces, demonstrating exceptional longevity particularly when in contact with steel and wood because of their exceptional grip in the range of 98% for metals and a 100% chemical bond with cellulosic materials (wood, straw).

Over the past few years US-based coating specialist Castagra Products has taken its veggie plastic coatings into the oil and gas fields for coating storage tanks, pipes and even settling ponds.

With excellent cold weather performance down to -25°C, the winter months are no bar to tank coating maintenance. Being VOC-free, only standard protection is required during spray operations with no risk in absorbing noxious fumes as the basic formulation consists almost entirely of castor oil and inert gypsum.

Cold weather performance

Peter Mueller, Senior VP for Norwegian oil company Saga Petroleum, knows all too well about the apparent effects of extreme cold on conventional epoxies.

'Epoxies appear to be unable to cope so it was with some desperation that we decided to try out Ecodur. Its application in extreme low temperatures was a

revelation. The speed of its application and thoroughness, especially around joints, was impressive. Close examination revealed no microcracking or failures of adhesion.

'I recommend the product be applied to heights beyond base level protection as this would be a prudent extension of the use of a product that is extremely cost-effective compared to conventional coatings.'

Castagra CEO, Peter Roosen, a mechanical engineer by education, who first developed the plasticized gypsum as the result of a friendly challenge from a finishing carpenter to create a bendable synthetic wooden molding, says:

'When we came to address the oil and gas industries with their challenges of protecting storage tanks large and small, as well as pipes, we realised that not only were protective qualities of major concern with regards to chemicals but also the physical aspects of robustness against mechanical and thermal effects.

'Simply put most epoxies do not stand up well to stress caused by torquing and temperature variations. You only have to examine a large ship deck which has been epoxy coated to see how, in a matter of months, cracking forms along welds and rust stains emerge.

The cost of corrosion

The total cost of corrosion for the storage tanks is \$7 billion (€5.4 billion) a year.

'Oil tanks are notorious for collecting water that has run down as condensation from chilly steel walls as well that trapped in the oil when it was stored. The water absorbs the acids from the oil which then immediately start attacking unprotected steel. With epoxy coatings micro cracks quickly start forming and the acids reach the steel.'

Roosen comments: 'No-one has a coating-fits-all, but, we believe, we have

extended effectiveness with our Ecodur and Terapoxo products, a suite of coatings that have the versatility edge and certainly longevity and robustness required particularly in the fracking industry.

'Cocktail' storage

The US fracking industry, which has exploded on the scene of late despite having been around in more primitive forms since the 1860s, has brought onto the highly exotic fracking mixtures.

'Most are pretty tough on steel storage tanks, both mobile and static, with failures being measured in weeks and months as opposed to decades with conventional oil storage,' Roosen says.

The average life expectancy of frack tanks is around eight months causing considerable expense in maintenance and eventual replacement costs.

'Some chemicals have proven exceptionally tough on steel with formic acid being perhaps one of the major challenges in storage for the fracking industry.'

Fracking companies in the US do not have to reveal the chemical composition of their solutions. They fear the loss of competitive advantage after investing millions of dollars in research to come up with the right 'cocktail'. They are also under some pressure from environmentalists who are gravely concerned about the potential threat to water tables.

Key differentiation

'Whatever your perspective on this, the bottom line is the solutions have to be stored safely and our two-part coatings have drawn favorable attention and approval from three of the biggest companies in oil field services,' says Roosen.

Sustainability has become a key policy of the major players in the oil and gas industry and Roosen sees a strong differentiation now between

conventional coatings for tanks and 'veggie' plastic ones, which are a perfect fit in the drive for sustainability.

Renewable contents

Castagra's Ecodur contains renewable castor oil and cheap, recyclable gypsum. Even the waste product is 100% recyclable and biologically totally inert. A reflection of that being it even has an ANSI/NSF61 rating for potable water storage.

The company is actively taking the renewability of castor oil to the next step in the US. It works with and supports a castor bean development program with Texas A & M. The aim is to produce a mechanically harvestable, low height, bean

source. Plasterboard disposal is a major headache in the US and most other countries also as, in many instances, straight dumping in waste tips is prohibited,' Roosen explains.

NACE standards

Storage tank corrosion is a multi-billion dollar headache. However the country fortunately has an excellent source of knowledge interchange in the form of NACE International which has worked tirelessly since the 40s to bring about real progress in corrosion control.

'All our surface preparation is done to NACE standards because, as NACE so succinctly puts it, it is well recognized that you can



Peter Roosen, Castagra's CEO in a castor field (the coating's main ingredient) in Texas

crop with an exceptionally low ricin content in the bean skin. Texas used to have a thriving castor bean growing industry a century ago.

The plant thrives in poor soils and has the potential to renew vast agricultural acreages that have fallen into disuse due to salt invasion from artesian well over use.

'Our coatings are also capable of using waste Gyproc board as the paper backing makes for an excellent reinforcing fibre

make a poor coating perform with excellent pretreatment, but you cannot make an excellent coating perform with poor pretreatment,' Roosen concludes.

'By combining NACE surface preparation standards with the appropriate veggie plastic coatings, you have a solution that also answers the demands for meeting sustainability needs while being highly cost-competitive.'

For more information:
www.castagra.com