Michael T Venturini, Sun Chemical, reports on how the company's sustainability policy is put into practice

A journey to eco-efficiency

In recent years, sustainability has become a significant part of the way many companies conduct their businesses. It perhaps began and is most prominent with consumer products but people's desire for improved eco-efficiency has pushed the concept far upstream to major industrial processes.

One area often overlooked but significant because of its scale, is pigment manufacturing. Pigments are used throughout everyday items, from printed packaging to household paints to yellow traffic markings.

Sun Chemical is one of the world's largest pigment producers, with a wide range of products produced in plants located in all major markets around the world.

Sun Chemical has a sustainability policy in place, which states that it is the company's responsibility to be involved in the communities where its facilities are located and to use manufacturing processes that demonstrate environmental excellence through reduced waste generation, lower energy and water usage and strong safety performance as measured by several key metrics – greenhouse gas emissions, energy and water consumption, carbon footprint and safety record.

By measuring these key metrics, Sun Chemical has the ability to improve its customers' eco-efficiency and, in turn, enhance the sustainability of their processes and end products.

SUN CHEMICAL'S MUSKEGON, MICHIGAN PLANT

One of the Sun Chemical facilities that is constantly working to enhance its environmental footprint is located in Muskegon, Mich. Known for its breathtaking beaches, Native American heritage and passion for fishing and hunting, Muskegon is the largest city on the eastern shore of Lake Michigan. It is also home to the only location in the USA where azo pigments are manufactured.

Azo pigments were some of the first synthetic organic pigments to reach widespread commercial usage. Azo and related products range from vivid yellow to bright red and they find major uses in printing inks and coatings.

In the area of coatings, Monarylide Yellow 74 finds significant application in household paints. Monarylide Yellow 65 is the standard azo pigment for traffic markings, including the ubiquitous double yellow line commonly seen on many of the 2.6M miles of US paved roadways[1].

Sun Chemical's Muskegon plant manufactures 120 different shades of orange, red and yellow organic azo pigments that are used by customers who make printing inks, coatings and plastics. Formulated to the specific needs of customers at the highest global standards, these pigments are delivered to customers across the USA and beyond.

The plant features 343,000ft^2 of covered space spread across eight buildings on 630 acres. Built in 1977 with major renovations and upgrades as recently as 2009, the facility is certified to ISO 9001 quality control standards, ISO 14001 environmental standards and OHSAS 18000 (occupational health and safety) standards.

Compliant with ISO 14001 environmental certification standards since 2003, Sun Chemical's Muskegon manufacturing plant is regularly evaluated by management for solutions, which can improve the facility's carbon footprint. In fact, thanks to 28 recent projects, a total of 726t/yr of CO_2 emissions have been avoided. This article will highlight some of these projects and show the role each has made in meeting Sun Chemical's sustainability initiatives.

PRODUCING ICE MORE EFFICIENTLY

The defining feature of azo pigments is the azo N=N linkage commonly obtained by the coupling of aniline and acetoacetanilide or their derivatives. (**Figure 1**). Although a relatively straightforward reaction carried out in university chemistry classes, there are key steps in pigment synthesis that require precise temperature control to achieve good lightfastness and a range of other important pigment properties. To achieve the necessary control, large amounts of ice are used.

After an assessment of the existing ammonia system at the facility, it was determined that the azo ice system was erratic and unreliable. System temperatures

The Muskegon team in charge of the compressor project and many of the other 28 projects run at the facility to improve its environmental footprint

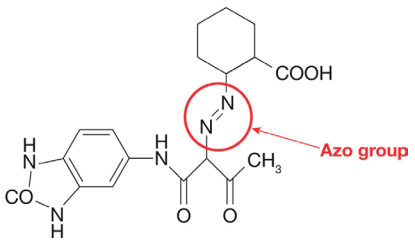

Fig 1. The defining feature of azo pigments is the azo N=N linkage commonly obtained by the coupling of aniline and acetoacetanilide or their derivatives

were above normal limits and the ice being delivered to the strike tanks was not as cold as it should have been.

To improve efficiency, system controls were modified and compressors drawing less energy and utilising shorter cycle times were installed. The changes have helped generate significant savings, a large part of which is realised when the ice makers are not actually in use.

Additionally, the bin chiller piping and controls were modified so that they could operate more efficiently and hold the ice at an optimum temperature for delivery to the strike tanks.

Since the ice is now colder, a normal pigment batch uses less of it, generating more savings. The new controls are operating the compressors on redundant smart pressure transmitters that control the compressors in tenth-of-a-pound increments rather than the pound increments used by the old system. As a result, the system is saving energy in all modes.

LANDFILL GAS USED AS SUPPLEMENTAL FUEL

The United States Environmental Protection Agency (EPA) requires landfills to install gas collection and control systems so that they can at least collect and flare methane, which is naturally produced as garbage decomposes.

In an effort to reduce gas flaring, the Muskegon County municipal landfill provided Sun Chemical's Muskegon plant with the unique opportunity to implement a project, which would reduce its usage of natural gas by using biogas as a supplemental fuel.

After collaborating with the county authorities and another local business, Sun Chemical became a user of the landfill's biogas. Sun Chemical utilises the biogas to generate steam, which then heats the site's lead boiler and strike tanks. The steam created by the biogas is also used as booster heat for the facility's buildings. The lead boiler runs almost entirely off biogas now.

In order to capture the biogas, Sun Chemical had an underground pipe installed from the landfill to the site and converted the lead boiler to run on biogas, natural gas or any combination of the two. A control system was also installed to help monitor usage and any irregularities that could occur.

The biogas from the landfill provides Muskegon with 85% of its steam requirements.

USE OF TREATED GROUNDWATER FROM SUPERFUND SITE BENEFITS COMMUNITY AND ENVIRONMENT

Down the road from Sun Chemical's Muskegon plant is a location where a former business had left soil and groundwater contaminated with pesticides, benzene and other chemicals that pose a risk to health and safety. The location became an EPA Superfund site for environmental remediation.

In order to preserve the nearby Little Black Creek, listed as a state trout stream, a groundwater intercept was built to prevent contaminated water from getting into the nearby wetland filtering areas.

Sun Chemical approached the Michigan Department of Environmental Quality; the US Environmental Protection Agency, Region V; and the Department of Justice with a unique project where for the first time ever, EPA region V, a private company and public organisations, would work together to foster an environmental benefit.

The project was called WIP, the Wastewater Integration Project and Sun Chemical proposed that they would take over and manage the groundwater treatment plant at the Superfund site.

By doing so, Sun Chemical would treat the contaminated groundwater using activated carbon and oxidation processes to ensure that the water would meet required quality standards. Sun Chemical would then pump the treated water to three large bladder tanks located on the Sun Chemical site. This volume accounts for a significant portion of the water used on the site.

By using recycled water from the Superfund site, Sun Chemical helps to prevent contaminated wastewater from seeping into Little Black Creek and replaces the need for Sun Chemical to use its four production wells.

By limiting the use of the production wells, Sun Chemical reduces its electricity consumption but more importantly, the regional environment benefits by reducing the drawdown of millions of gallons of water a day from the underlying aquifer, thus, making more water available to Muskegon residents and reducing the strain on regional water reserves.

By managing the water treatment plant on the Superfund site and using the processed water, Sun Chemical plays a small role in helping preserve the nearby trout creek and wetlands and allows the community's passion for fishing and hunting to thrive.

ONGOING EFFORTS IN REDUCING ENERGY USAGE

These are just three of 28 projects at Sun Chemical's Muskegon facility that have reduced emissions, saved energy and reduced its carbon footprint. Other projects include changing the steam dryer to a natural gas dryer to improve drying efficiency; the installation of a heat recovery system for the dryers; and an investment in a modern filtration system to reduce in-house dust and maintain good air quality at the facility.

Thanks to these efforts and the improved eco-efficiency of the azo pigments manufactured, at the Muskegon plant, Sun Chemical is able to help its customers increase the eco-efficiency of their processes and end products. To learn more and download Sun Chemical's most recent sustainability report, visit www.sunchemical.com/sustainability.

Sun Chemical's Muskegon, Michigan, USA pigments manufacturing facility

Reference
1. www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_statistics/html/table_01_04.html.

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