xylem

Activated carbon solutions and services for the petroleum refining industry



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With over 25 years of experience in the activated carbon business, Xylem is uniquely equipped to supply a full range of Westates® activated carbon products and related services for a variety of applications in petroleum refineries. We currently supply these products and services to dozens of refineries, offering prompt, expert service.

Regulatory compliance and the desire to improve product quality are key drivers for the use of activated carbon in refineries. The following discussion highlights these common applications and the solutions that Xylem can supply.

Vapor phase applications

VOC treatment and control

Compliance with either the Benzene National Emission Standard for Hazardous Air Pollutants (NESHAP) regulation or local air emission regulations drives the need for VOC control at several emission points within the refinery, including:

- Sewer pumps/junction boxes
- Covered API separators and DAF units (level changes and diurnal breathing losses)
- Vacuum truck exhaust
- Wastewater and storm water storage tanks (level changes and diurnal breathing losses)

Typical carbon system design for these applications is two carbon adsorption units in series at design velocities of 25-80 ft^3/min. Either an upflow or downflow configuration may be used.

Vapor/solvent recovery

Activated carbon is often used in systems designed for the recovery of economically valuable products (gasoline vapors, benzene, and solvents) at refineries and terminals. Both pressure swing (for gasoline vapors) and temperature swing (for benzene and solvents) designs are commonly used.



In this application, activated carbons with high working capacities (allowing for effective adsorption and desorption through numerous cycles) are preferred. Carbon system designs are provided from various system manufacturers and vary by application.

Hydrogen sulfide removal

The processing of sour crude oil often results in the formation of hydrogen sulfide (H_2S) at various points in the refinery. Activated carbon is a common technology to control the nuisance odors and corrosion issues that often result from H_2S.

Specialty grades of carbon are often used to enhance the H_2S capacity. System designs are similar to VOC abatement applications (25-80 ft^3/min design velocity, upflow or downflow configuration).

Liquid phase applications

Wastewater treatment

Local wastewater discharge permits often regulate organic contaminants (often measured as COD, BOD, TOC, or biotoxicity) that adsorb well onto activated carbon. Treatment may occur via collection of the various wastewaters to a central treatment system, or by treating at point sources.

Refinery applications - actived carbon products and services
(Please refer to product literature for additional information on our specific activated carbons and adsorption systems)

	VOC treatment/ control	Vapor/ solvent recovery	H_2S removal	Wastewate treatment	Groundwater remediation	Boiler feedwater	Amine purification	Decolorization
Activated carbon products	VOCarb® S series VOCarb 48C VOCarb P60	VOCarb 616VR VOCarb VRP2 VOCarb P601	Midas® OCM VOCarb UOCH-KP	AquaCarb S series AquaCarb 830 AquaCarb 1240	AquaCarb S series AquaCarb 830 AquaCarb 830C AquaCarb 1230C	AquaCarb 1230AWCLS	UltraCarb 830 UltraCarb 1240	UltraCarb 830 UltraCarb 1240
Adsorption systems	Vent-Scrub® series RB series		Vent-Scrub series RB series	Aqua-Scrub® series PV® series LP series HP® series	Aqua-Scrub series PV series LP series HP series	Custom design (contact your local sales representative)	Custom design (contact your local sales representative)	Custom design (contact your local sales representative)
Carbon services	Turnkey carbon installation and removal services – vessel exchange, vacuum exchange, and slurry exchange Local branch service network serving 85% of the US population within two hours or less NESHAP and Subpart CC and FF requirements Onsite monitoring and equipment maintenance services OSHA certified/trained technicians Computer modeling and technical support services Flexible financing options							

Due to the nature of the contaminants involved in wastewater treatment, onsite pilot studies are often required to properly design the adsorption system. Recommended empty bed contact times of 15 minutes per bed are typical for this application. Series operation of the adsorbers is recommended to optimize the utilization of the carbon.

Groundwater remediation

Organic compounds such as BTEX and MTBE often migrate into groundwater supplies from a variety of sources, including:

- Leaking storage tanks
- Process upsets or spills
- Unlined wastewater holding ponds

Local discharge permits often require that activated carbon be used to treat these groundwater sources. Recommended empty bed contact times are typically 5-8 minutes for BTEX, and 10-15 minutes for MTBE. Series operation of the adsorbers is recommended to optimize the utilization of the carbon.

Boiler feedwater treatment

Impurities in boiler feed water used to produce steam in the refinery can lead to various problems including:

- Scaling
- Corrosion
- Foaming
- VOC carry over into the steam

In this application, a low silica carbon is often desired to prevent silica from leaching into the feed water. Recommended empty bed contact times of 5-10 minutes per bed are common.

Process applications

Amine purification

Various alkanolamines are used by refineries to purify gas streams by removing acid gases such as CO_2, H_2S, and COS. During this process, the amine solution picks up hydrocarbons and organic acids. Activated carbon is utilized to treat a slipstream of the amine solution to

prevent buildup of these hydrocarbons, and provides several benefits to the refinery:

- Improved amine scrubbing efficiency
- Reduced corrosion rate
- Reduced operating costs

In this application single-stage adsorbers with 20 minutes of empty bed contact time are required, with pre- and post-filtration (5-10 micron) used to remove solids and prevent carbon fines from entering the amine solution.

Decolorization

Activated carbon is the perfect choice to remove unwanted color or other organic impurities from desired end products such as jet fuel, kerosene, gasoline, lube oil, and other products.

Warning

The adsorption of organic compounds onto activated carbon generates heat. In rare instances, adsorbed compounds may also react on the carbon surface to generate additional heat. If these heat sources are not properly dissipated, the carbon bed temperature may rise to the point where the carbon can ignite, leading to a fire or other hazardous condition. A description of industry-accepted engineering practices to assure the dissipation of heat and safe operation of the carbon bed can be provided upon request. In certain applications where the risk of ignition is significant, activated carbon may not be a recommended treatment technology. Please contact your Technical Sales Representative for more details.

All information presented herein is believed reliable and in accordance with accepted engineering practices. Xylem makes no warranties as to the completeness of this information. Users are responsible for evaluating individual product suitability for specific applications. Xylem assumes no liability whatsoever for any special, indirect or consequential damages arising from the sale, resale or misuse of its products. Subject to change without notice.

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