



MICROPOLLUTANT REDUCTION AT WASTEWATER TREATMENT PLANTS USING ACTIVATED CARBON



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Superior performance

- ♦ Very high elimination of micropollutants (MPs) by dosing with powdered activated carbon (PAC) at 10-20 mg/l
- ♦ Very high reduction of post-ozone oxidation byproducts with granular activated carbon (GAC) filters
- ♦ Improved water quality and ecosystem health by reducing MP loads to surface waters

Application overview

Micropollutants refer to an emerging threat to water quality in rivers, lakes and reservoirs caused by the release of organic and mineral substances to surface waters. These substances are present in many common products that pass through the body into wastewater, eventually polluting the aquatic environment. Although there are many sources of MPs, the main source is wastewater treatment plant (WWTP) effluent. Existing WWTPs were designed to reduce solids, organic material and nutrients, but not MPs. Common MPs include:

- ♦ Pharmaceuticals
- ♦ X-ray contrasting agents
- ♦ Cosmetics and personal care products
- ♦ Hydrocarbons and solvents
- ♦ Hormones
- ♦ Plastics
- ♦ Pesticides
- ♦ Metals and radioactive elements

When released into the environment, many MPs become persistent, bio-accumulating in the food chain, and posing risks to the environment and human health. Endocrine disruptors, for example, are chemicals that can interfere with the body's endocrine system and produce adverse developmental, reproductive, neurological and immune effects in humans and wildlife. MPs can mimic or block naturally occurring hormones in organisms and have been linked to lowered fertility rates, pre-/post-natal development abnormalities, and the increased incidence of some cancers. Moreover, MPs can cause these adverse effects at extremely low concentrations in water (nanograms per liter).

Advanced treatment technologies

Because many MPs are not easily removed in conventional WWTPs, advanced wastewater treatment technologies are required to reduce their release. Two advanced treatments have been shown to remove over 80% of micropollutants from wastewater: 1) dosing with powdered activated carbon (PAC) followed by sand filtration (SF); and 2) oxidation by ozone followed by granular activated carbon (GAC) filtration.



Products

Our high quality granular and powdered activated carbon products deliver exceptional MP elimination and adsorption of ozonation oxidation byproducts for wastewater effluent purification, significantly reducing total MP loads and potentially harmful residuals from entering surface waters.

	Powdered Activated Carbon (PAC)		Granular Activated Carbon (GAC)	
	NORIT® SAE SUPER	HYDRODARCO®	NORIT GAC 612 WFD	NORIT GAC 830W
Product positioning	♦ Best performing	♦ Economical	♦ For high solids loads	♦ For low solids loads
Benefits	♦ Eliminates 80% of many MPs with a PAC dose of 10-20 mg/l	♦ Eliminates 80% of many MPs with a PAC dose > 20 mg/l	♦ Removes MPs ♦ Eliminates oxidation by-products ♦ Enables options for nitrogen and phosphorus removal ^{*)}	♦ Removes MPs ♦ Eliminates oxidation by-products

^{*)} Cabot's Technical Paper (TP1015): 1-Step Filter - Towards WFD quality with one post-treatment step

Powdered Activated Carbon

NORIT SAE SUPER activated carbon is the industry benchmark in terms of performance, delivering extremely high MP elimination at low PAC dose rates < 20 ppm (Figure 1). The carbon has high mesoporosity, which reduces the effect of pore blocking from adsorption of the dissolved organic carbon (DOC) fraction, and high microporosity, which enables the adsorption of MPs (Figure 2).

Figure 1 MP Removal with Cabot PAC

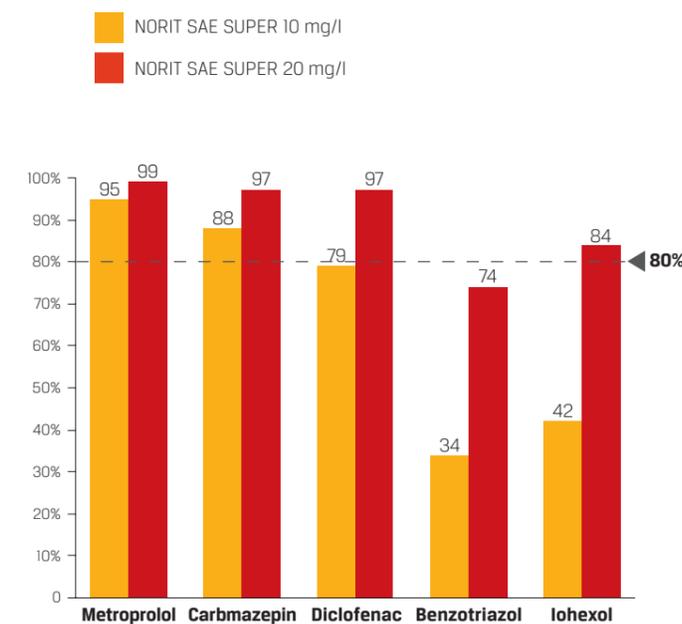
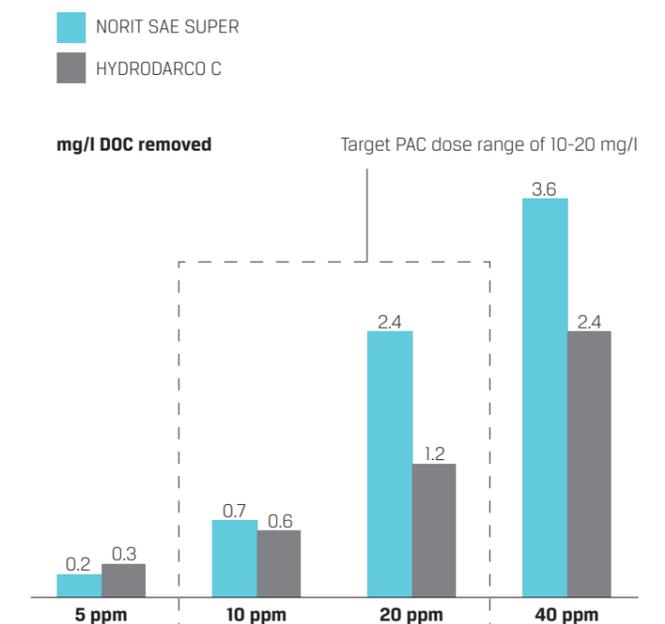


Figure 2 DOC Removal with Cabot PAC



NORIT® SAE SUPER has been proven to effectively remove the major compound classes of MPs, including:

Compound class	Description	PAC Ability to adsorb
Pharmaceuticals	Analgesics, antibiotics, antidepressants, bronchodilators, chemo-therapy drugs, hypolipidemics	●
Hormones	Natural and synthetic hormones (birth control pills)	●
Endocrine disruptors	Chemicals that interfere with body's endocrine system (plasticizers, PCBs, dioxin)	●
Pesticides & chemicals	Organic micropollutants including algicides, biocides, corrosion inhibitors, herbicides, insecticides	●
X-ray contrasting agents	Hydrophilic, iodine containing, radio opaque compounds given to patients to enable X-rays	●

● Strong ○ Weak

GAC Filtration following ozone treatment

NORIT GAC 612 WFD activated carbon features a larger particle size that enables additional options for nitrogen and phosphorus removal and adsorption of MPs and byproducts in a single step, making it an ideal biological filter following ozone treatment. This process prevents the release of harmful byproducts into the environment, while simultaneously handling the high solids loads and long filtration cycles required.



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