

High-Sulfur Spent Carbon Reactivation

History

CPL/Puragen Activated Carbons has been successfully recycling spent carbons via thermal reactivation since 2013, a process we refer to as REACT-Sys®.

The technology uses horizontal indirect-fired rotary kilns to desorb contaminants at high temperatures, restoring the carbon's pore structure and destroying the contaminants via a multi-stage thermal oxidiser and scrubber system.

We began in 2013 with a kiln dedicated to handling 'amber list' spent carbons from industrial processes such as VOC abatement, odour control and wastewater purification. In 2018, we added a second rotary kiln, allowing us to handle 'green list' spent carbons from drinking water and food grade applications. Our two processes are referred to as 'CR1' and 'CR2':

CR1 – reactivation of drinking water/food grade 'green list' spent carbons

CR2 – reactivation of industrial/environmental 'amber list' spent carbons

In 2023, as we celebrated a decade of spent carbon reactivation at our Immingham site, we were also awarded a prestigious 'Green Apple' award for environmental best practice, recognising the huge carbon footprint saving achievable (>90%) via the recycling of spent carbon, rather than use and subsequent disposal of virgin materials.



Limitations of Traditional Reactivation Techniques

Until recently, spent activated carbon heavily loaded with sulfur (typically >20% loading) could not be reactivated using standard thermal techniques. This is because of the risk of damage to reactivation equipment, due to the formation and deposition of elemental sulfur or, in the presence of any moisture, highly corrosive sulfur-based acids.

This was particularly an issue for the biogas and biomethane sector, where hydrogen sulfide (H₂S) is often the main contaminant in the gas stream, resulting in high levels of sulfur on the spent carbon.

As a consequence, these spent carbons were historically considered untreatable and had to be disposed of as waste.

Our Solution

After extensive R&D work by our team of technical experts, we have developed a unique, proprietary process for safely handling these high-sulfur, heavily-loaded spent carbons from biogas customers, and have added a third facility to our reactivation set-up at Immingham:

CR3 – reactivation of high-sulfur spent carbons from biogas/biomethane facilities

This breakthrough further demonstrates our commitment to the recycling of activated carbon wherever possible, to achieve a circular environmental filtration solution.

The Benefits of CR3

The obvious benefit of our CR3 process, which began operation in 2023, is that it allows the diversion and re-use of significant quantities of spent carbon that were previously considered ‘un-reactivable’ and had to be disposed of via costly specialised waste handlers. It also increases the size of our ‘pool’ of reactivated material, meaning we can supply more customers with recycled product. These reactivated carbons can either be supplied ‘as is’, typically for VOCs abatement and siloxane removal, or re-impregnated with functional chemicals to allow them to be used for the capture of inorganic pollutants such as hydrogen sulfide (H₂S) and ammonia (NH₃).

What’s more, our ‘No Hidden Fees’ policy means that we agree with customers, in advance, the cost of processing their spent carbons. We will not impose ‘hidden’ charges if spent carbons are more difficult to treat than expected.



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