RemBind™

Frequently Asked Questions (FAQ)

RemBind: Immobilising Soil Contaminants

1. What is RemBind?

RemBind is a proprietary mix of activated carbon, aluminum hydroxide (amorphous) and other adsorption agents. These create a large internal surface area with mixed charges that bind chemical contaminants via ionic bonding, Van der Waals forces (adsorption) and other physical and chemical interactions. This binding reduces the leachability of the contaminants, mitigating effects on health and the environment.

2. Which contaminants can RemBind immobilise?

In theory, RemBind will immobilise any organic contaminant including PCBs, PAHs, TPH, PCP, PFOS and PFAS (Per- and Polyfluorinated Alkyl Substances) etc. It will also immobilise amphoteric metals including chromium and arsenic. It binds certain shorter chain PFAS with a higher affinity than activated carbon (e.g. 6:2 FtS, PTBS).

3. How much product do I need to add? How do I know it will work for my soil?

While RemBind has been fully proven over all soil types, Ziltek recommends running a simple bench-scale trial to determine the type and amount of RemBind required for your situation. Ziltek can undertake the trials (if you send us 5-10 kg of soil) or you can run them yourself using an easy-to-follow protocol. Typically, addition rates of 2% to 5% (w/w) are adequate for most situations. Trials can be completed in around 1-2 weeks.

4. Which grade of RemBind product is right for me?

The product is available in two grades: RemBind (standard) and RemBind Plus. RemBind is adequate for most applications, particularly suitable for PAHs and TPHs. For contaminants with relatively stringent regulatory threshold values like PFAS, RemBind Plus is more suitable because it has a stronger binding capacity. Simple bench-scale trials will help to determine the right product for your situation (see 3 above).

5. How do I add the product in the field?

RemBind is very simple to use. You basically add the product to the soil at the pre-determined addition rate and mix thoroughly. Then add water to 40% moisture content (apple crumble consistency) and leave to fix for 48 hours before collecting validation samples. Purpose-built soil blending equipment (e.g. pug mill) can be used to process 500 tonnes of soil per day, but a loader or backhoe can also be used for smaller volumes or budgets.

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6. What is the cost?

Price on application, varies with volume and location. As a guide, the reagent cost is typically around $15 to $75 per tonne of soil depending on addition rates and product grade.

7. What is the availability of the product?

The product is available in 1m^3 bulk bags and is generally available within 14 days from order depending on country location.

8. Why wouldn't I use activated carbon?

While activated carbon will bind a range of organic contaminants, it is relatively expensive and does not bind some shorter chain compounds with the same affinity as RemBind. These smaller compounds tend to be important from a regulatory perspective due to their high mobility (e.g. perfluorinated compounds PTBS, 6:2 FtS).

9. Has it been validated? Are there credible case studies?

Yes. RemBind has been used for many projects to treat PAHs, TPH, and PFAS on a large scale and at bench scale. It was used to treat 15,000 m^3 of PAH impacted soil on Sydney harbour, Australia at an addition rate of 5%. This soil was reused onsite saving significant transport and disposal costs.

Another PAH project won a national award for environmental excellence in South Australia, treating 2,000 tonnes of soil from a manufactured gas plant for safe landfill disposal. PFAS impacted soil has been treated with RemBind to reduce leachability to <0.02 ug/L, well below the Minnesota Department of Health drinking water guideline of 0.3 ug/L. Project referees are available on request.

RemBind has been used at commercial scale to treat PFAS contaminated soil. In Australia, it was used to treat 1,000 tonnes of PFAS contaminated soil from 2 airport fire-training grounds for safe landfill disposal with full EPA sign-off and no ongoing management requirements, with a target soil leachability of 0.02µg/L. In the USA, it was used to backfill a PFAS contaminated excavation which is nearby a drinking water source. References available on request.

10. Has it got regulatory acceptance?

All full-scale projects completed to date have had specific regulatory approvals.

11. How long does the binding last?

The long term stability of the RemBind product has been rigorously tested using the Multiple Extraction Procedure (EPA Method 1320) which simulates 1,000 years of acid rain in an improperly designed sanitary landfill. This is the most stringent test available for soil leachability.

12. Can you leave treated soil on site?

Yes, depending on the jurisdiction and intended site use. In Sydney, Australia 15,000 m^3 of treated soil was reused at an industrial site as part of a redevelopment.

13. What if I have other inorganic co-contaminants in my soil such as heavy metals?

Specific amendments can be added to RemBind to tailor a solution for most situations. For example, to treat lead co-contaminants, a phosphate-based amendment can be added to RemBind by the manufacturer to facilitate a single-step addition rate in the field. Contact Ziltek for your specific treatment requirements.

14. Does it also treat water?

Yes, RemBind also effectively removes contaminants from water. It is particularly effective in removing PFAS compounds from waste water and groundwater with trial results available from independent studies conducted in Germany and Australia. It can be used in bed filters, slurry reactors, permeable reactive barriers and some pump and treat systems.

15. After water treatment, what do you do with the spent RemBind?

It can be incinerated, disposed to landfill, or can be regenerated for reuse through a proprietary washing process. Contact Ziltek for further information.

16. RemBind doesn't actually destroy the contaminants, what are the implications?

RemBind immobilises contaminants in soil with proven long term stability using the most rigorous soil leaching test available worldwide (US EPA method 1320). Immobilisation is a very cost-effective and immediate solution. Other treatment technologies are relatively expensive and time consuming and have variable efficacy. For example, for PFAS contaminants, incineration temperatures of >1,100^{o}C are required to destroy the contaminant – this is an extremely expensive process and is not suitable for small volumes for soil.

17. Is RemBind effective at high ionic strengths?

Yes, trials conducted by CSIRO have shown that RemBind is not significantly affected by changes in ionic strength.

18. Is it safe to leave RemBind treated soil in place?

Yes, trials by University of Queensland show that RemBind significantly reduced the bioavailability and ecotoxicity of PFAS in contaminated soils using plants and worm studies as ecological receptors.

19. Does RemBind leach any metals that may breach drinking water guidelines?

The RemBind product does contain certain metals which contribute to its effectiveness, however the leachability of these metals is very low – test's performed by a water authority in the USA confirmed that the metal content of leachate from RemBind Plus in an in-situ water treatment scenario were well within the allowable limits for drinking water.

20. Does the total aluminum content affect reuse options?

The aluminium content of treated soil will generally be less than 1%. Aluminium is not considered a toxic substance at these levels. Some jurisdictions will have regulatory thresholds for aluminium for contaminated sites but these are relatively high.