

3R Recycle - Reuse – Reduce

zero emission pyrolysis technology for phosphorus recovery from food grade animal bone grist for production of Bio-Phosphate products.



phosphorus recovery • pyrolysis • zero emission • biophosphate • biofertiliser

Key facts:

- **Category of the technology:** reductive thermo-chemical (zero emission pyrolysis) phosphorus recovery.
- **Input:** food grade cattle and other types of bone grist
- **Output product(s):** ABC-BioPhosphate organic/low input farming innovative fertilizer, BIO-NPK-C formulations and adsorbents.
- **Available capacity:** >12,500 t/y ABC Bio-Phosphate output.
- **Focusing geographical areas:** EU27, UK, USA, Australia, Japan
- **Technology status:** beyond TRL8
- **EC/MS Authority permits:** Industrial scale pyrolysis plant installation/operation permit: FES/01/0851-33/2015.



Summary of the technology:

The specific objective of 3R Recycle-Reuse-Reduce zero emission pyrolysis and phosphorus recovery key enabling technology is the added value upgrading and valorisation of food grade animal by-products into safe and high value recovered organic Phosphorous fertilizer by integrated thermal and biotechnological recycling means. The Animal Bone Char (ABC) **Bio-Phosphate product is made of food grade animal bone grist**, most importantly cattle bones. This mono feed basic material is already processed at 133 degree Celsius for 20 minutes under 3 bar processing conditions. The **high Phosphorous content animal bone grist** input feed streams are low value utilized by-products. In the 3R process the bone grist is processed at as high as **850 degree Celsius material core carbonization temperature, which is far higher than usual biochar processing temperatures, but absolute needed to get high quality product**. During the advanced pyrolysis (reductive thermal processing) all volatile and protein based compounds are removed from the mineral frame, and a highly macro-porous hydroxyapatite (70-76%), CaCO₃ (7-13%) and carbon (8-11%) content mineral material produced. The output products are high quality and safe **Bio-Phosphate** and its BIO-NPK-C bio-formulated variations used for wide range of organic/low input farming and environmental (adsorbent) applications.

Competitive position and advantages:

- **High material core temperature 850°C reductive thermal processing** with specific treatment conditions, which is resulting output products with unique surface and material composition characteristics.
- **Mono feed: the 3R is specialized on animal bone high temperature and added value processing.** The high economically value can be obtained by the 3R processing and the following wide range of bio-formulations.
- **Zero emission environmental & climate impact performance:** all material streams in all states are recycled, reused and converted into useful and safe products. Autothermal, producing surplus bioenergy.
- **Added value innovative technical content:** the 3R technology is an IP protected original invention, complex and original industrial design and solution in all elements, with revolutionary innovative engineering solutions, that has been specifically designed for animal bone processing to recover concentrated Phosphorus.

Contact

Name: Edward Someus

Company: 3R-BioPhosphate Ltd.

Web: www.BioPhosphate.net

<https://biofertilisers.3rbiofarm.com/>

e-mail: biochar@3Ragrocarbon.com



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