Modified Atmosphere Packaging

For Biochar

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The Problem

• Char can self ignite under certain conditions- the more reactive material is left in the higher the fire risk. Also, Oxygen sorbtion is an exothermal process.

• Pictures on this page are of actual biochar fires that self ignited

• Stabilizing with water is only a temporary, expensive solution- why ship water?

• How can I safely ship and store dry biochar?

• Is there a more permanent, less expensive solution?
The Fire Triangle

- Fire needs 3 conditions present to occur: fuel, oxygen and heat. These are called the “Fire Triangle.”
- If any of the 3 conditions are missing, fire cannot occur.
- Using clever package design, we can reduce or eliminate one or more legs of the Fire Triangle.
- This is called “Modified Atmosphere Packaging” or MAP.
- How can this work with Biochar?
Modified Atmosphere Packaging (MAP)

- Used since 1821 in the food industry
- Typically displaces oxygen inside the package with an inert gas, like $\text{N}_2$, but $\text{CO}_2$ could be used with biochar.
- Barrier films prevent the transfer of gases and liquids in or out of the package, like water or $\text{O}_2$, keeping food fresh longer.
- A typical MAP process can involve filling, evacuation, purge, evacuation and heat seal.
- Torresak MAP technology was lifted from the food packaging industry and scaled up. Inert atmosphere internally helps to reduce fire risk.
- Vacuum packed, N2 purged coffee bricks are good examples of Modified Atmosphere Packaging.
The Solution: **TORRESAK™**

- Torresak uses vacuum sealing and N₂ purge to remove and displace oxygen inside the bulk FBIC bag. Fire cannot occur with less than 5% oxygen content. Torresak MAP brings O₂ content inside the bag down to around 1%.
- All bag materials are food grade, anti-static films and woven PP which prevent static sparking.
- Compaction of the biochar removes air space from between the particles, and also permits 20% more char to be packed in the bag.
- Negative pressure and compression immobilizes the char particles to prevent friction and hot spots.
- Hermetic liner structure prevents the transfer of O₂, N₂ or H₂O through the bag.
- The inert Modified Atmosphere inside the bag helps keep the biochar safe.
- The oxygen indicator instantly verifies bag integrity.
1. PROVIDES MODIFIED ATMOSPHERE PACKAGING (MAP)
   - Cubic shape optimizes space
   - Retains cube shape for easy stacking
   - Reduced risk of punctures and snags
   - Very strong – constructed with 5x safety factor

2. REPLACE O² WITH N² AND SEAL THE BAG
   - Package specifically designed for biochar
   - Trilaminate hermetic liner-Nitrogen flush
   - The vacuum sealing process immobilizes biochar particles to minimize friction and hot spots
   - Made from static dissipative materials to minimize sparking
   - Oxygen content reduced to just 1%

3. EMPTY, CUT AND REUSE THE BAG
   - Cut the seal off the top and bottom spouts to reuse
   - Up to 3 uses per bag

CHOOSE SAFETY, CHOSE TORRESAK!

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Torresak
Step 1 - Fill, N2 Flush and Compact
Torresak Step 2 - N₂ Purge, Vacuum Seal

- High volume, low velocity vacuum nozzle does not remove char fines from the bag. Air velocity is less than the settling velocity of char dust.

- Filled and compressed Torresak retains the cube shape of the form.

- Torresak footprint remains inside of a standard shipping pallet. This helps to reduce damage from forklift tines and snagging.
Oxygen Indicator

- Torresak has optional indicator tablets available to affix on the inside of the liner, behind one of the corner apertures. The user loosens the corner strap to view the indicator.
- Pink color indicates oxygen content is in the “safe” range.
- Blue/purple color indicates oxygen content is in the “fire risk” range.
- The oxygen indicator enables the user to identify suspect bags, and to take appropriate action, such as immediate inspection and isolation outdoors, in a safe area.
Smaller is Better for Freight Cost - Stacking

- Torresak is sized so that it can be stacked 2 high in extra tall shipping containers. This increases the weight of biochar in each container load by approximately 20-25% over shipping 72” single layer bags, by taking up container head space.
Brand Your Biochar with TORRESAK!

Print 2 bag side panels 2 ink colors with your Brand!

BRANDING IS EVERYTHING

$1.25  $3.25
THANKS FOR LISTENING.
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