



# INCA BioBalsa™

## HIGH PERFORMANCE, UNIFORM DENSITY, COST COMPETITIVE ALTERNATIVE TO AMAZON BALSAM WOOD AND PET

Wind turbine blades, airplanes and boats are made from balsa wood which has low density and high strength. These unique characteristics deliver the necessary compressive and sheer strength, fatigue and impact performance.

In the case of wind turbine blades, shaped balsa wood is sandwiched in the core of the blade and surrounded with styrene resonated glass fibre mats. Today's giant 100m+ blades require 150 cubic meters of balsa.

Balsa is harvested from Amazon rainforests vital for carbon capture and the livelihood and sustainability of indigenous communities. Thanks to dramatically increasing demand for renewable energy, supplies are now limited and very expensive. Legal balsa exports doubled between 2019 and 2020 and by 2020 demand outstripped supply and balsa prices tripled.

Historically, Ecuador supplied more than 95% of commercial balsa until those forests were exterminated. About 60% of balsa is now plantation grown to ensure a consistent supply for wind blade manufacturing. It has also moved to Peru where a black market is thriving thanks to reduction in controls as a result of the pandemic.

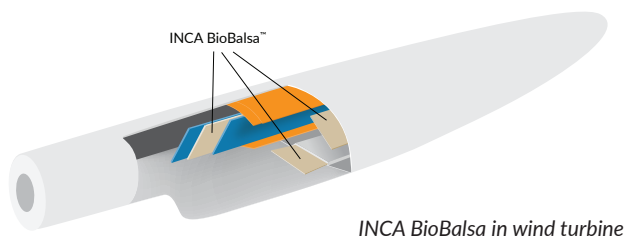
Balsa is fast-growing but doesn't grow quickly enough on balsa plantations to extract whole logs large enough to cut long boards. Manufacturers have resorted to gluing together cross-cut squares from trunks of trees to form stress skin panels.

This development has added considerable cost to manufacturing balsa dimensional sheets, since each cross-cut section of tree stalk has to be cut in a rectangular shape to allow block-to-block gluing to form desired planks. In addition, cross-cut balsa planks have very little flexural modulus strength due to loading being applied in the fiber direction, rather than across the fiber direction as is typical for normal wood products. To strengthen cross-cut balsa, manufacturers add toxic styrene adhesives and glass fibre, which is energy intensive to manufacture.

As the supply of balsa diminishes and the cost increases, one leading blade manufacturer has resorted to using PET and PVC foams in blade tips, however balsa is still required to provide shear modulus for the root section of the blade. Neither PET or PVC are price competitive or sustainable.

## INCA BioBalsa is the high performance, sustainable cost competitive alternative

Constructed from hemp hurd cellulose, BioBalsa offers comparable density to balsa of 10 lbs/ft3 (160 kg/m3) – but with better compressive strength thanks to randomness of fibre placement – which delivers uniform strength in all directions. Unlike balsa, it can be formulated to reject moisture and adjusted to specific binding resins and flame resistance specifications. Similar to balsa, but unlike PET and PVC, it has the sheer strength required for installation in all sections of the wind turbine blade – including the root section.



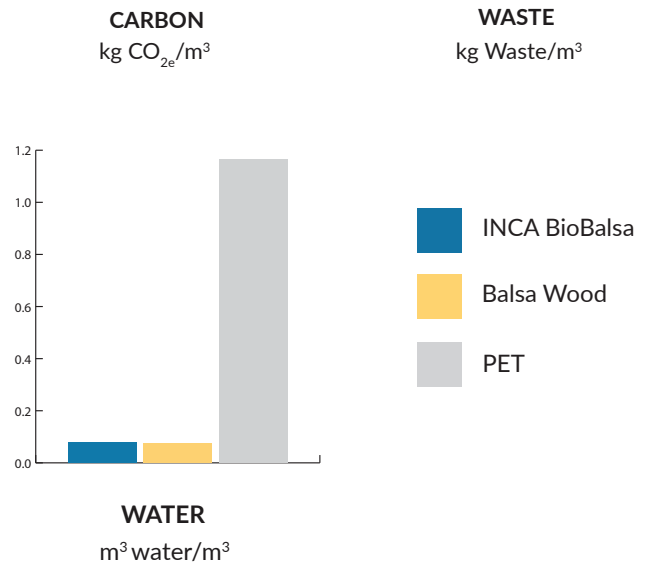
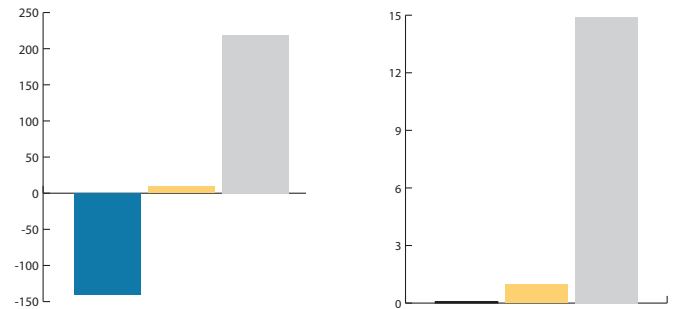
Versus balsa, PET or PVC, INCA BioBalsa is sustainable at every stage of its lifecycle. While growing, hemp sequesters 8-15 tonnes of CO2E per acre.

INCA acquires hemp from the Canadian Prairies where hemp is sustainably grown for protein. INCA decorticates the waste stream into fibre and hurd for our advanced composites product line. This puts the waste biomass to productive use and provides farmers with an additional revenue stream.

Our manufacturing process results in significant reductions in carbon emissions and waste versus the alternatives. After decommissioning, new technologies have been developed that will enable blades to be deconstructed and the individual materials recycled. INCA BioBalsa will be 100% made in Canada.

## INCA BioBalsa delivers high performance and 164% less carbon impact than PET and 107% less than balsa

| Product | Unit                                | INCA BioBalsa | Balsa Wood | PET    |
|---------|-------------------------------------|---------------|------------|--------|
| Carbon  | kg CO <sub>2e</sub> /m <sup>3</sup> | -140.2        | 9.6        | 219.2  |
| Waste   | kg waste/m <sup>3</sup>             | 0.066         | 0.959      | 14.909 |
| Water   | m <sup>3</sup> water/m <sup>3</sup> | 0.079         | 0.076      | 1.166  |



## We are forging the path to leadership in natural fiber composites

INCA Renewtech transforms high quality biomass into groundbreaking products for the transportation, consumer products, and building materials industries.