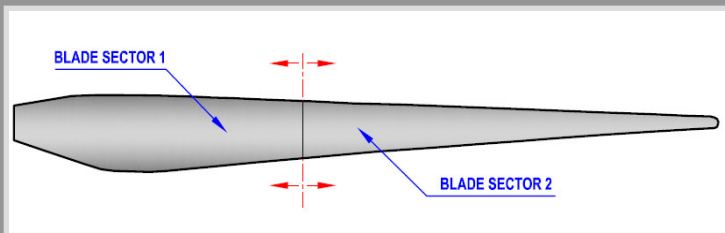


# Removable system to divide blades into sectors patented by TSF

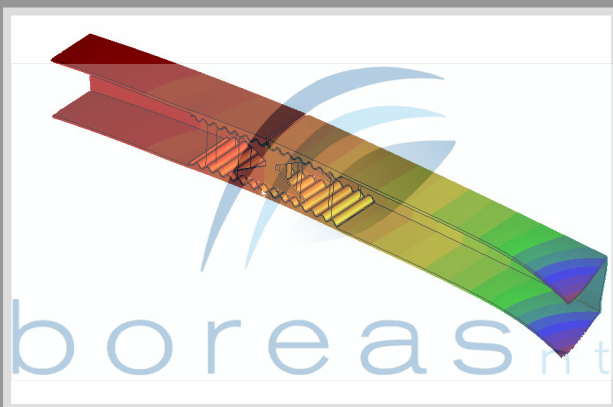
The idea designed and patented by TSF addresses the problem of the union of the wind turbine blades. The solution consists in separating the blades into two parts and then reassembling with special joint elements, therefore facilitating the manufacturing, transport, assembly and disassembly.



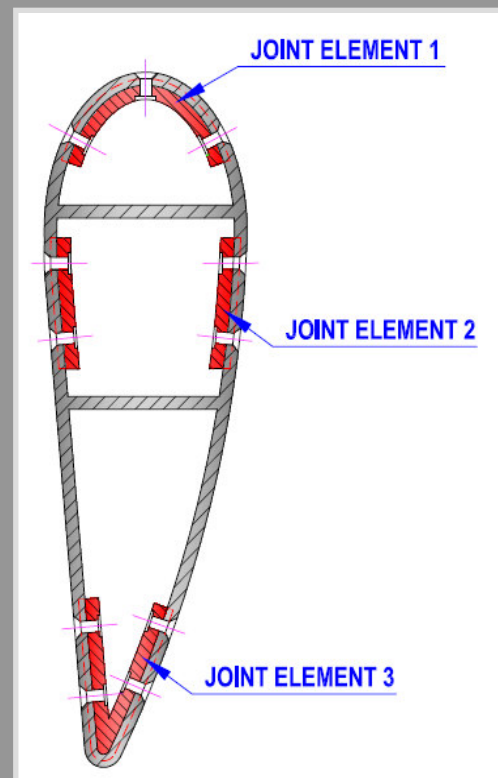
The special joint elements are manufactured in carbon fiber and transmit the load with known and reliable geometries. Thus reducing phenomenon such as local bearing or cracking; and the overall local effects that appear in other joints which use mechanical elements like bolts or adhesives. The system only uses bolts between the special joint element and the blade to guarantee the suitable position and the contact between the special geometries.

The structural integrity of the solution, with its ease of installation and possibility of further blade separation in its initial components (removable joint) allows the application in machines with great size or in machines in difficult access locations. Thus transport, installation and maintenance costs are reduced drastically.

Tension state in the simplified model of the removable system



## JOINT ELEMENTS LOCATION



To develop a suitable design solution, TSF's engineering requires the geometrical characteristics of the blade with its structural features, and load requirements.

For the calculation of the unions, TSF's engineering has a powerful finite element simulation tool. The program used is the prestigious MSC.MARC. The calculations are executed with tridimensional routines with unlinear finite elements to guarantee the behaviour of the materials regarding the mechanical characteristics and regarding the load transmission through all the components of the joint.

