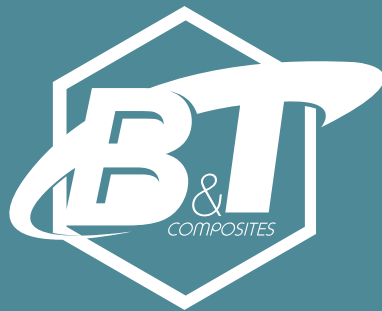


COMPOSING ^{THE} FUTURE





COMPOSING^{THE} FUTURE

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>>>INTRODUCTION

VISION >>>

It's in our DNA to discover, to learn, to lead. We must never stop doing this. We must explore new worlds, we must seek new ideas, we must invest in knowledge. It's our challenge. It's our mission. It's B&T vision.

CORPORATE MISSION

To conduct our business operations so as to increase the company's corporate value for the benefit of all shareholders, customers, suppliers, partners, personnel, applying the latest-state-of-the-art technology always one step ahead of time.

To meet our customers' needs responsibly and effectively, while expanding our presence in the global market.

To function reliably and flexibly in our relationship with employees, customers, suppliers and partners, while we strongly believe that customers will never love a company until the employees love it first.

STRATEGIC OBJECTIVES

Having a deep comprehension of our desirable mission, we plan our strategic objectives aligned with our company's mission and vision and organized in four categories.

Financial strategic objectives

- **Financial growth:** to increase revenue by 50% annually
- **Financial efficiency:** to decrease expenses by 10% annually

Customer strategic objectives

- **Current customer:** expand sales to existing customers, achieve and maintain outstanding customer service
- **New customer:** introduce existing products into a new market, based on differentiation strategy and introduce new products to new and existing markets.

Operational strategic objectives

- **Product management:** to have all product meet standard of excellence guidelines
- **Operations management:** increase community outreach
- **Technology management:** increase efficiencies through use of or virtual technology
- **Alliance management:** establish one new strategic alliance annually

People strategic objectives

- **Knowledge:** to continually learn and adopt current best practices
- **Training:** to develop the leadership abilities of B&T Composites team
- **Culture:** to align incentives and staff rewards with performance.

OUR PROFILE AT A GLANCE

B&T Composites is active in the field of composite technology since 2009. Specialized in producing light structures using carbon and glass fibers and fabrics applying especially the filament winding technique.

Based in Florina, northwest Greece, in a total, private owned area of 40.000 m², 4.000m² most sophisticated production facilities, latest technology machines and software, scientific know-how and wide experiences and expertise personnel. We are offering highest quality always as a standard. We have built our business on the fundamental principle that to have long-term success for all the involved people, we do not only have to comply with all applicable legal requirements and ensure that all our activities are sustainable, but additionally we have to create added value for our customers.

Our company rules do not only require strict compliance with the law, but also they guide our actions even if the law is more clement or where there is no applicable law at all. Being in a sector that follows a consisted upward trend, We are committed to the client and in a sector being on a consisted upward trend, we are confined to continuous improvement that will establish our company as one of the most reliable partner of the industry in the international market.

OUR AWARDS

The “Prize of Excellence” from the Federation of Industries of Northern Greece (SBBE) for two consecutive years (2014&2015).



B&T Composites, is honored with a prize by Athex Group, Athens Exchange Group for its excellent performance in the fields of innovation, research, extroversion and high technology, after the distinction had been received from Federation of Industries of Northern Greece. The company was invited by Athex Group in the ceremonial trade opening of Athens Exchange Group on Wednesday January 13th 2016. During the event, our company presented its future business plan and prospects to representatives of Greek and International investment funds.



OUR MANUFACTURING METHOD

Our manufacturing method is filament winding. Under the term “filament winding” it is meant that fibers are winding in layers around a metallic mandrel.

Our company owns two production lines. B&T Composites’ manufacturing capacity is up to 12m length one-piece.

The winding angle and the number of layers are calculated using complicated advanced mathematics and finite element analysis as well, by our experts.

The calculations are related with the application of the product. Each one is faced individually and according our clients’ needs and requirements.

Our raw materials are either carbon fibers or glass fibers or aramide fibers. Moreover we are conducting tests with basalt fibers in order to ascertain their properties.

The dimensions of the mandrel vary considering the required dimensions. The diameters range is from 10mm to 2.5m.

The first step of the manufacturing procedure is the positioning of the mandrel in the filament winding machine.

It is measured so as to fulfill strict tolerances requirements and checked for any damage in its surface. After that, release agent is added that is useful for the easy subtraction of the product. The UV radiation above the mandrel is used so as to have constant temperature and humidity during the humidity.

Continuing the short description of the manufacturing method, fibers are following. The fibers are placed in the tensioner. The fibers are impregnating in a resin bath before the winding. The type of the resin type is either epoxy system, or polyester or vinylester system. The application of the product determines the type of the resin system.

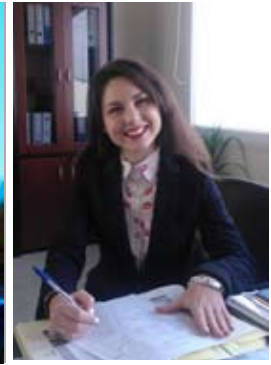
The programming of the filament winding machine is the next move. After that, the winding starts. During the winding, the product is supervised by the personnel. Every divergence, declination or deflection is recorded and immediately referred to the production manager. If it is possible, staff makes the corrections following the manager’s instructions. Otherwise, it starts from the beginning. By this way, we ensure that we offer best quality products to our customers.

>>>Not just tell you but also show you.<<<

A LITTLE BACKGROUND



8 years ago, he had a vision



Then he started to create a team



We have since grown the team



Our site...



...is not there, but is pretty much idyllic

Here is where we create state of art products...



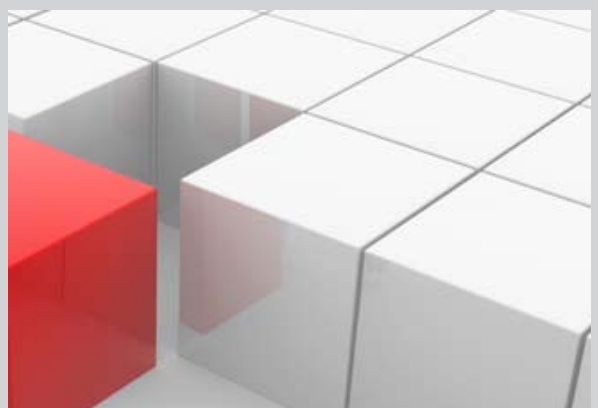
...and these are the means for them



When you have a problem...

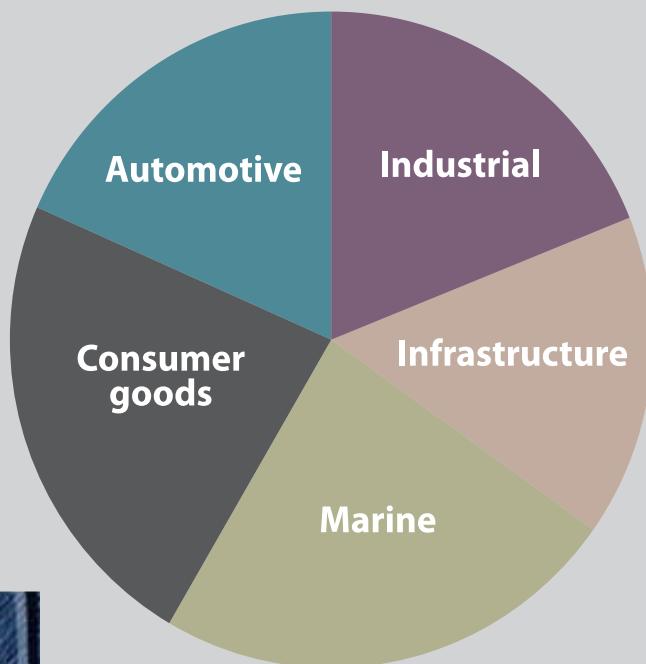


...we have the solution



>>>**ACTION**

OUR ASSORTMENT >>>



Masts



Arms with excellent durability



Unique 21m self-supporting mast



World Sailing Championship-May 2015-Lake Garda, northern Italy.
The biggest percentage of the winning boat was exclusively manufactured in our company.

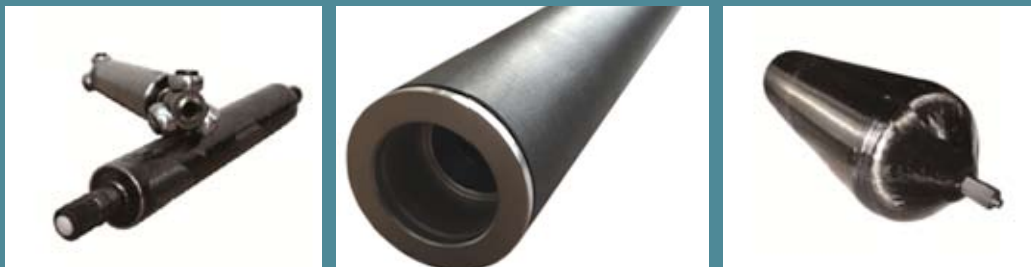
B&T Composites carbon shafts B&T Composites developed and brought into use and operation its carbon shafts for very first time in 2010. Despite the fact that the company is present for a short period of time, has managed to be established as one of the most reliable partner of the industry in the European market. B&T Composites offers sophisticated solutions by providing shafts with outstanding characteristics such as:

- Excellent fatigue resistance
- Low-weight
- Corrosion resistance
- Easy of installation
- High-misalignment capacity

The design of our shafts for torque transmission has been approved by DNV-GL.



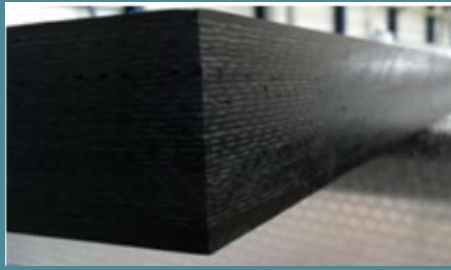
High precision is a demand for the automotive and marine sectors



Filament winding CNG tanks manufactured by B&T Composites

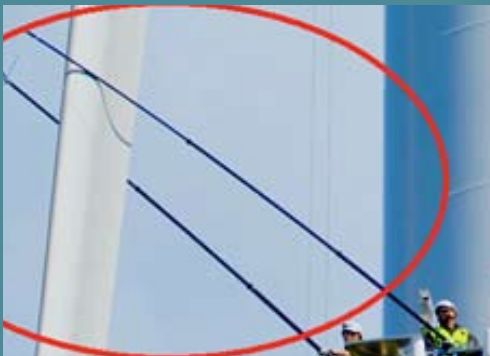


Varying our resin systems we manufacture consumer goods to meet our clients requirements.



Our company supplies some of the major players in the wind industry. We serve the wind business with light weight arms, that adjusted to wind turbine tower, ideal for service and maintenance. Using our light weight arms, the companies gain many advantages.

- Easy transportation, installation and fitting.
- No cranes are necessary.
- Weight saving.
- Money saving.
- Extended life cycle.
- Independent operation of wind turbine type, drivetrain, blade type and tower type.
- Environmental friendly.



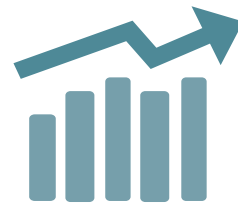
Our carbon fiber arm used in blade maintenance.

Our carbon fiber arm adjusted to a Vestas construction

SOME OF OUR RESEARCH PROJECTS

We know that a good foundation has three main pillars

- Create superior products, based on unique technical insights
- Optimize them for growth, not for revenue
- Know the competition and act accordingly



Since we have them all, we have managed to attract the interest of with most of the Mechanical engineering faculties of the universities in Greece.



National Technical University of Athens



Aristotle University of Thessaloniki



University of Patras



Democritus University of Thrace

“Universities and industry have been collaborating for over a century, but the rise of a global knowledge economy has intensified the need for strategic partnerships that go beyond the traditional funding of discrete research projects. World-class research universities are at the forefront of pioneering such partnerships. They are designed to run longer, invest more, look farther ahead and hone the competitiveness of companies, universities and regions. In short, they transform the role of the research university for the 21st century, anchoring it as a vital centre of competence to help tackle social challenges and drive economic growth.”

SCIENCE/BUSINESS, INNOVATION BOARD

Benjamin Franklin once said “An investment in knowledge pays the best interest”.

Hereinbelow, a small sample of our research proves the validates the quote.

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **SCHOOL OF NAVAL ARCHITECTURE AND MARINE ENGINEERING, DIVISION OF MARINE** **STRUCTURES, SHIPBUILDING TECHNOLOGY LABORATORY**

Experimental and numerical study of composite shafts

The Glass Fiber Reinforced Polymer (GFRP) shaft is a wind turbine power shaft. The manufacturing method was filament winding, its main dimensions are presented in table 1, its mechanical properties in table 2 and its design in Figure 1.

Length (m)	Internal Diameter (m)	External Diameter (m)	Thickness (m)	Winding pattern
0.862	0.250	0.260	0.005	[± 45] 12

Table 1: Dimensions of GFRP shaft

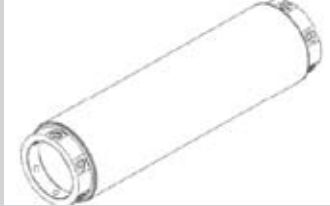


Fig. 1

Isometric view of the shaft

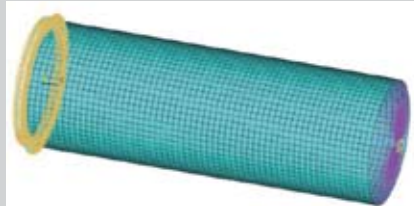


Fig. 2

Plot of the shaft with its boundary conditions and the torque applied on the master node.

The aim of this work is to develop a Finite Element Model of the shaft using ANSYS that will predict its mechanical behavior. Three different models were created. A layered shell model, a homogeneous shell model and a layered solid model.

The expected failure mode of the shaft is rotational buckling.

E1 (GPa)	37.04
E2 (GPa)	15.04
E3 (GPa)	15.04
G12 (GPa)	5.5
G23 (GPa)	2.75
G13 (GPa)	5.5
ν_{12}	0.28
ν_{23}	0.3447
ν_{13}	0.28

Table 2: Mechanical properties of the GFRP

Buckling load (kN/m)	Buckling mode shape
111.4	mode 4
111.4	mode 4
-48.3	mode 4
-48.3	mode 4
111.2	mode 5
111.2	mode 5
-111.2	mode 5
-111.2	mode 5
111.2	mode 5
111.2	mode 5
-111.2	mode 5
-111.2	mode 5
111.2	mode 5
111.2	mode 5

Table 3: Results of the eigenvalue buckling analysis

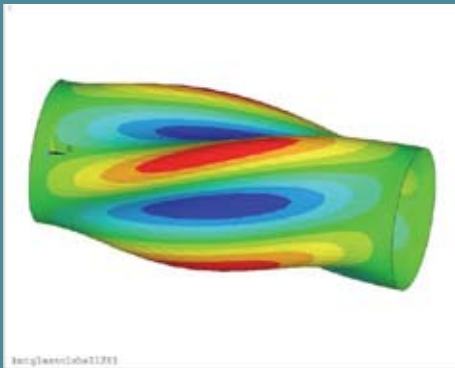


Fig 3: Contour plot of the radial displacements of the buckled shaft

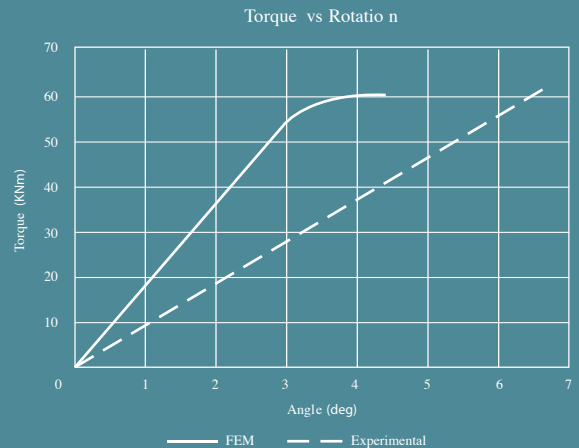
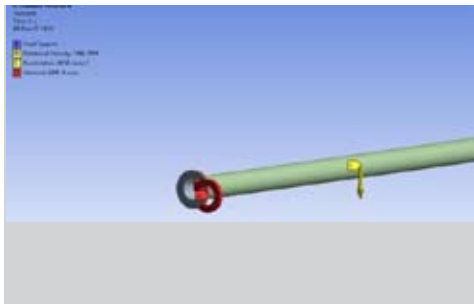


Fig 4: Comparison between FEM results and experimental curve

Figure 3 represents the buckled shaft with its radial displacements at the critical buckling load. The coloring represents the magnitude of the nodal radial displacement, with red representing the maximum (outwards) and blue representing the minimum (inwards) displacements. Figure 4 also indicates that the FE model predicts a much higher rotational stiffness of the shaft than the experimental as it can be seen by the gradient of the FEM curve in comparison to the experimental one.

Light weight arms for crane project

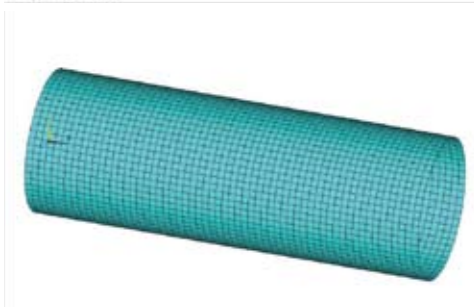
In recent years, the development of strong computational packages has opened the road for the simulation of the mechanical behavior of composite materials. The analytical methods available are insufficient in dealing with problems with complex geometries, while the complexity resulting from the interlaced form of the equations causes more problems that have not been solved yet. Additionally, no equations have been devised, that could express all the phenomena taking place in the mechanical behavior of a composite material. The Finite Element Method (FEM) comes to fill the gap that the insufficiencies of the analytical methods have created.



```
/CWD, 'C:\Users\ibil\Desktop\Shaft\bntglass\shell1'
/FILNAME, bntglassnlshe11281, 1
/TITLE, bntglassnlshe11281
/graphics, full !powergraphics off
```



```
/prep7 ! Enter the preprocessor
!* -----
!* GEOMETRY
!* -----
/units, si ! Unit System SI
*SET, L, 0.692 ! Length in m
*SET, Di, 0.260 ! Internal diameter in m
*SET, t, 0.005 ! Thickness in m
*SET, R, Di/2 ! Internal radius
*SET, Do, Di+(2*t) ! External diameter
*SET, pi, acos(-1) ! Set the Value of pi
```



```
circle, 1, 0, 0, 0, 360, 4 ! create circles
circle, 2, 0, 0, 0, 360, 4
1, 0, 12 ! create lines
1, 7, 11
1, 0, 10
1, 0, 9
csys, 4 ! activate a cylindrical coordinate system along the
! main X-axis
a1, 9, 1, 12, 0 ! create area from lines
```

Fig 5: Plots of shell and mesh geometry

Research regarding design, manufacturing and testing of deep sea pressure housings made of composite materials.

Objective: Development of verified structural design and manufacturing methods for the production of filament wound pressure housings made of advanced composite materials for deep water marine applications (depths ranging from 500 to 5000 m).

How we usually work:

- 1) We set forth the operational and structural requirements of the composite pressure housings.
- 2) We conduct techno-economical study for the European and international market.
- 3) We develop necessary knowledge about the material properties not only through the screening of the materials (data sheets, availability, cost, selection) but also through experiments in two material systems for the determination of mechanical and physical properties.
- 4) We perform the structural design and manufacturing of the proper composite pressure housings making Finite Element analysis modeling and manufacturing small-scale sample housings.
- 5) We define non destructive quality control procedures.
- 6) We perform experimental pressure tests to some of the small-scale cylinders and to the two sample housings.
- 7) We compare the FEA results with the experimental ones.
- 8) We manufacture the real vehicles.

Below, there is a view of our numerical analysis using the ANSYS software

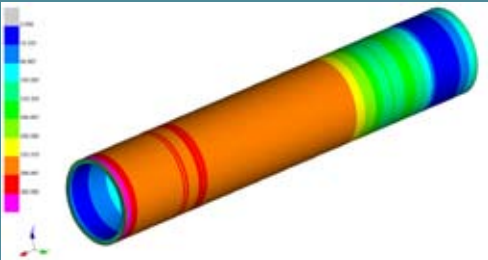


Fig 6: General view of our FEA for long housings

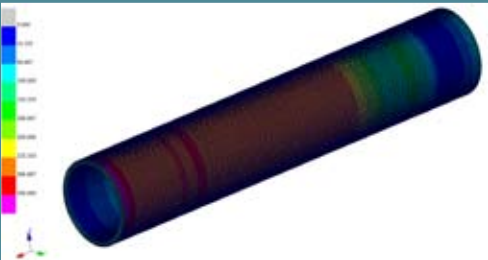


Fig 7: Bending eigenvalue, type 2 of the long housing

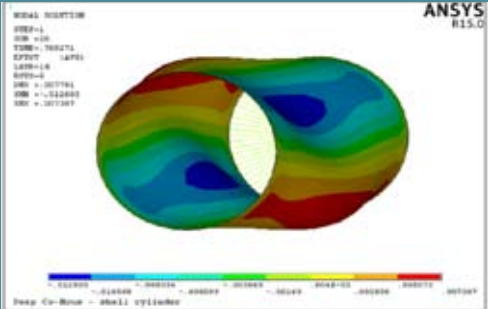


Fig 8: Displacement distribution of circumferential stresses on the outer diameter of the short housing

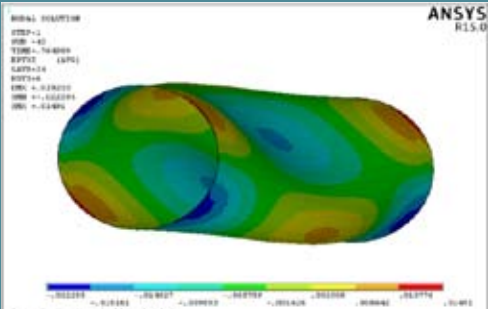


Fig 9: Displacement distribution of axial stresses on the outer diameter of the long housing

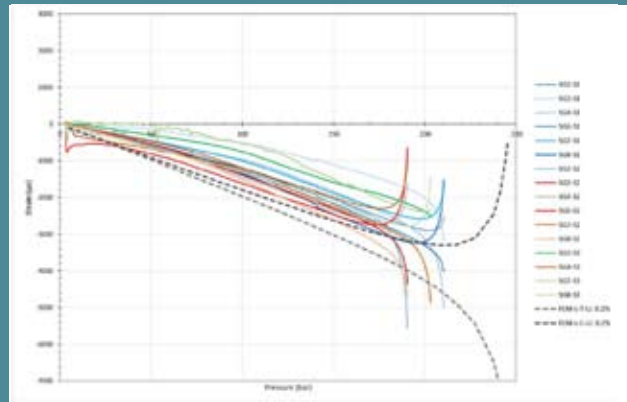


Fig 10: Comparative results of numerical and experimental axial results of short housings

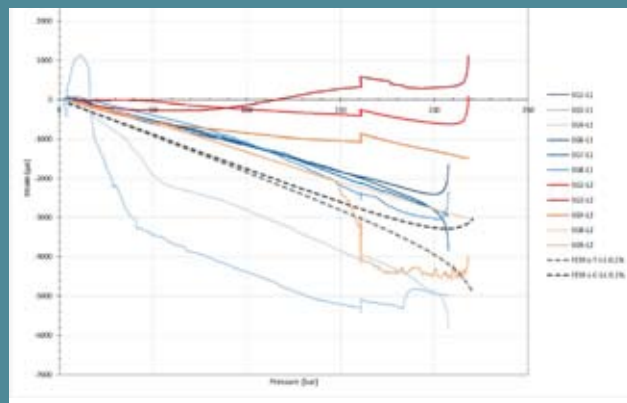


Fig 11: Comparative results of numerical and experimental axial results of long housings

UNIVERSITY OF PATRAS
DEPARTMENT OF MECHANICAL ENGINEERING & AERONAUTICS SECTION OF APPLIED MECHANICS

Static tests on un-notched ring specimens for mechanical property characterization of filament wound composite materials

Objective: This experimental investigation aims to validate, conclude and characterize Carbon - epoxy and Glass- epoxy composite in terms of mechanical properties.

The figures below show indicatively the results of the experiment test.

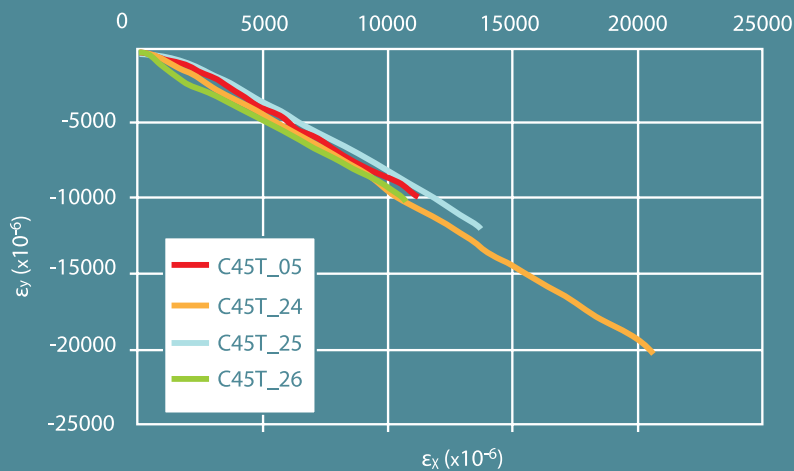


Fig 12: Axial stress vs. axial strain at position C (45°) in four specimens.

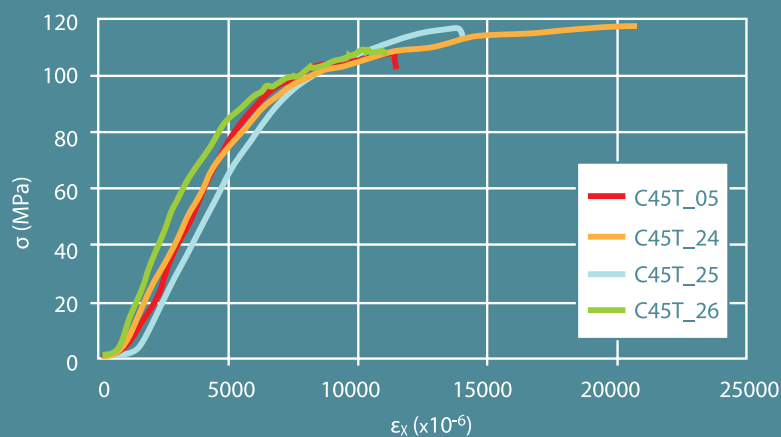


Fig 13: Transverse strain vs. axial strain at position C (45°) in four specimens.

ARISTOTLE UNIVERSITY OF THESSALONIKI
SCHOOL OF MECHANICAL ENGINEERING, DESIGN AND STRUCTURES DEPARTMENT,
MACHINE TOOLS AND MANUFACTURING ENGINEERING

Engineering Vibration Test

The Carbon Fiber Reinforced Polymer (GFRP) shaft is a torque transmission shaft for ships. The manufacturing method was filament winding, its main dimensions and properties are presented in Table 4.

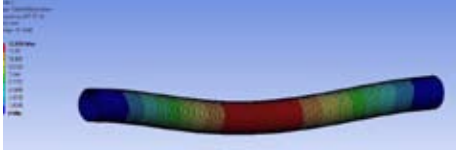


Fig 14: Mode shape of the first flexible mode

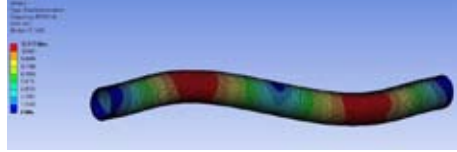


Fig 15: Mode shape of the second flexible mode

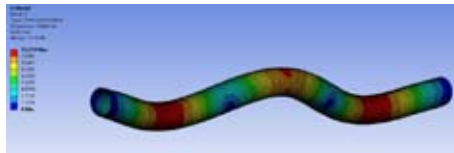


Fig 16: Mode shape of the first flexible mode

Property	Density d (kg/ m ³)	E_x (GPa)	$E_y=E_z$ (GPa)	$G_{xy}=G_{xz}$ (GPa)	G_{yz} (GPa)	Poisson's Ratio $\nu_{xy}=\nu_{xz}$	Poisson's Ratio ν_{yz}
Shaft 200 120°/ 86°	1580	120	11.22	10.30	5.60	0.25	0.48

Table 4: Dimensions of the Shaft

The aim of this work is to develop a Finite Element Model of the shaft using ANSYS that will show the flexural modes of the shaft and their convergence with the experimental ones.

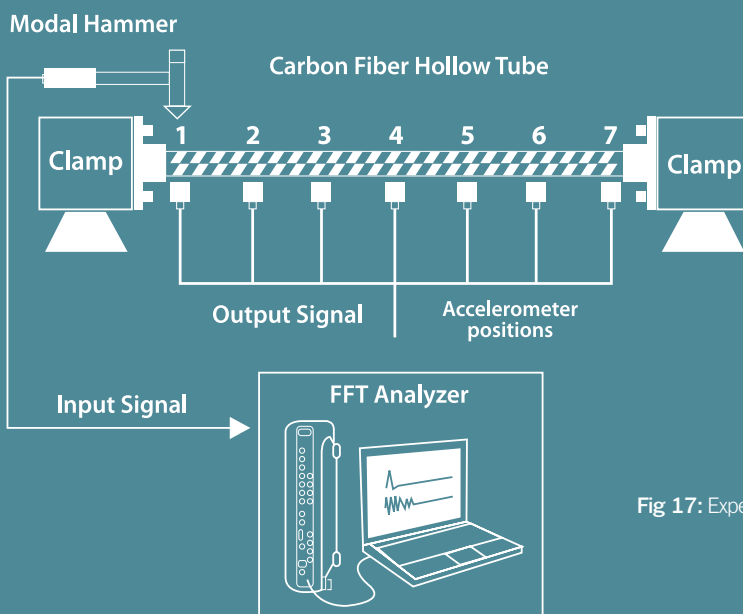


Fig 17: Experimental setup of vibration tests

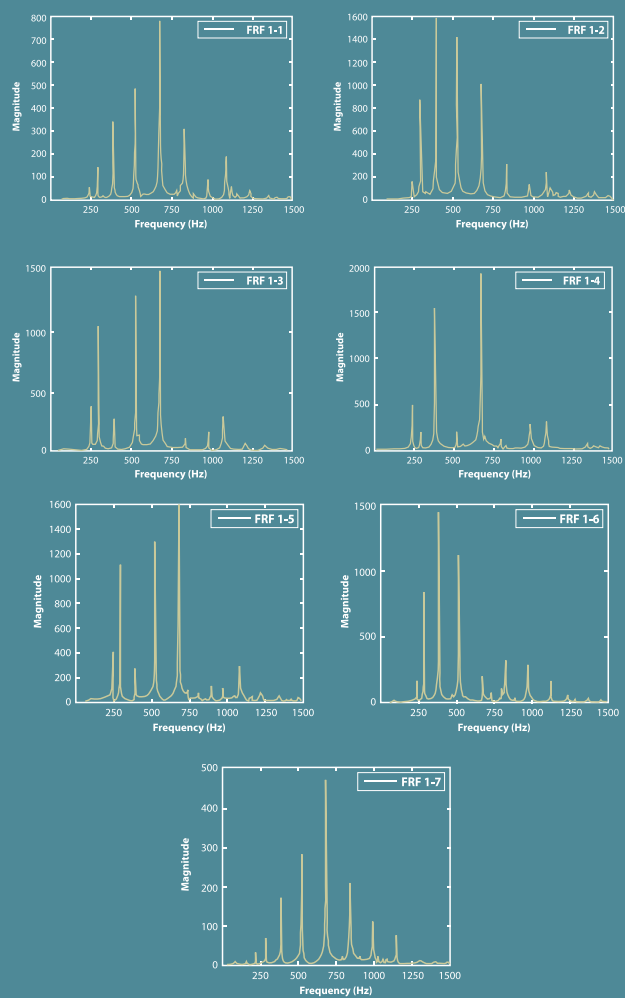


Fig 18: FRP of epoxy/ carbon shaft, points 1-7

Frequencies	
Hz	RPM
238	14280
288	17280
386	23160
525	31500
671	40260
851	51060
988	59280
1105	66300

Table 5: Frequencies and RPM during the tests

Torsion test

The aim of this work is to determine the elastic properties of both, carbon fiber and glass fiber tubular structures with the geometric properties that are being shown in the table below, using two types of materials.

Geometric properties	Carbon Fiber Shaft	Glass Fiber Shaft
Length (mm)	200	200
Thickness (mm)	0.75	1.3
Inner diameter (mm)	30	30
Outer diameter (mm)	31.5	32.6

Table 6: Geometric properties of carbon and glass fiber shafts

	Carbon fiber Torayca T700sc-1200-50c	Epoxy Hexion Epikote Resin 828L	Carbon Fiber Vf (65%)	Glass Fibres E-Glass Owens Corning R25H Type 30	Araldite LY556	Glass fiber Vf (65%)
E _x (MPa)	230.000	4.000	140.000	80.000	3.350	52.942
E _y (MPa)	14.000		8.900			13.879
E _z (MPa)	14.000		8.900			13.879
V _{xy}	0.246	0.35	0.3	0.2	0.35	0.244
V _{yz}	0.1		0.35			0.38
V _{xz}	0.256		0.3			0.244
G _{xy} (MPa)	14.500	1.480	4.800	33.330	1.240	5.029
G _{yz} (MPa)	6.200		3.400			5.023
G _{xz} (MPa)	14.500		4.800			5.029

Table 7: Geometric and plastic properties (per layer)

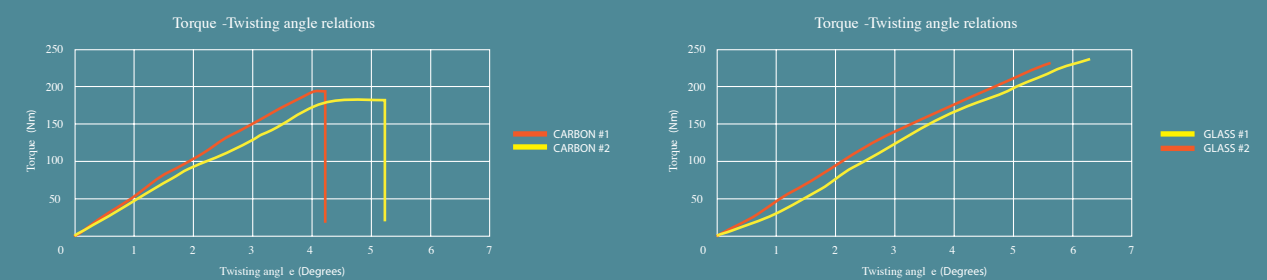


Fig 19: Experimental results

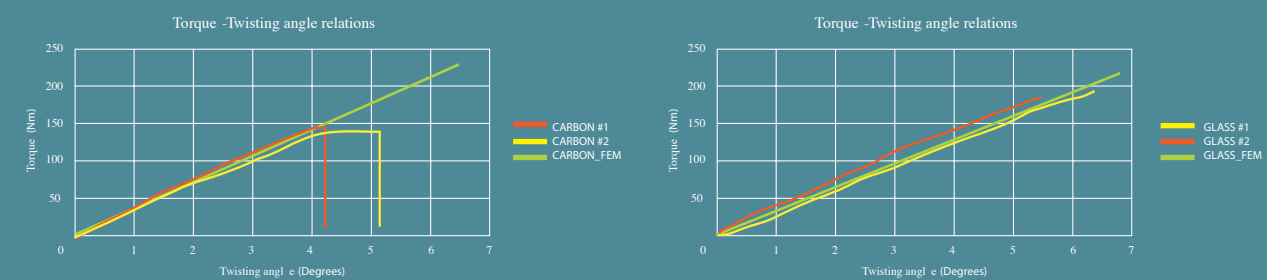


Fig 20: Comparison between experimental and FEM results

Quality Control of our shafts

Quality control of our shafts

Inner & outer cylindricity ($\nearrow \searrow$)

Inner & outer roundness (\bigcirc)

Concentricity between inner & outer cylinder (\odot)

Maximum and minimum limit of size for outer cylinder (\pm)

Perpendicularity (1) between a transverse plane of the shaft and inner and outer cylinder

Measurements in Clean Room (highly purified and regulated room) of EEDM at AUTH Measurement machine: Brown & Sharpe Dea Sciricco CMM, if it is a customer's demand



Fig 21: Clean room

	DESIRED	MEASURED	CHECK
inner	-	0.17	-
outer	0.5	0.134	✓
inner \bigcirc	-	0.151	-
outer \bigcirc	0.3	0.117	✓
\odot	0.3	0.171	✓
inner \bigcirc	-	0.057	-
outer \bigcirc	-	0.006	-

>>>CORPORATE RESPONSIBILITY

CORPORATE RESPONSIBILITY >>>

We in B&T Composites, have made the decision to systematically invest in Corporate responsibility

Our sponsorships

Recognizing the importance of education in the development of responsible entrepreneurship, we support doctoral dissertations and theses of engineering researchers of polytechnics in the country. They are being hosted in our facilities and provided all the necessary equipment needed to build the continuation of research and technological development.

We usually supply them with specimens to conduct experiments.

B&T Composites takes into consideration the results of the research needed for the improvement of its competitiveness.



Fig 22: Void fracture test



Fig 23: Our sponsorship in Team ART



Fig 24: Team Aristurtle sponsors

Team ART Aristotle University of Thessaloniki

"We would like to give our grateful thanks to B&T Composites S.A company for its valuable contribution to our team by constructing carbon fibers, which initially were used for experiments by our team. Yet our team used them for car's scissors construction, after giving us technical advises. Company's loyalty and professionalism are basic characteristics of B&T Composites S.A, which is specialized to innovative construction of carbon fibers and it is based in Florina"



Fig 25: Team ART racing car

Team ARISTURTLE, Aristotle University of Thessaloniki

“The Company B&T Composites S.A offers a great range of high quality solutions for demanding industrial requirements. It offers us scientific know-how and latest-technology products so as to manufacture our first electric racing car.”

CENTAURUS Racing Team, University of Thessaly

“We would like to thank you one more time for your contribution in our effort. Your cooperation was more than valuable for the integration of our activity.”



Fig 26: Team Centaurus racing car

Team FATEH, Thapar University, Patiala, India

“We thank B&T Composites, Florina, Greece for supporting us this season.”



Fig 27: Our sponsorship Team Fateh

Team ASAT, Aristotle University of Thessaloniki

We are proud sponsors of the Aristotle Space and Aeronautics Team, member of EUROAVIA. Despite the fact that the team is newly-born, they have already set ambitious long term goals, manufacturing an aircraft entirely made by carbon fibers and fabrics that will participate in prestigious contests. Moreover, the team ASAT is in close collaboration with ESA (European Space Agency) for the manufacturing of a rocket and of a satellite for data collection. B&T Composites ensures the continuing support of the team.

- Cooperation with Technical University of Crete, project “Requirement analysis of the Enterprise Resource Planning software”.
- Sponsor of day conference of Department of Mechanical Engineering of Aristotle University of Thessaloniki, on May 2016.



Fig 28: B&T Composites at day conference

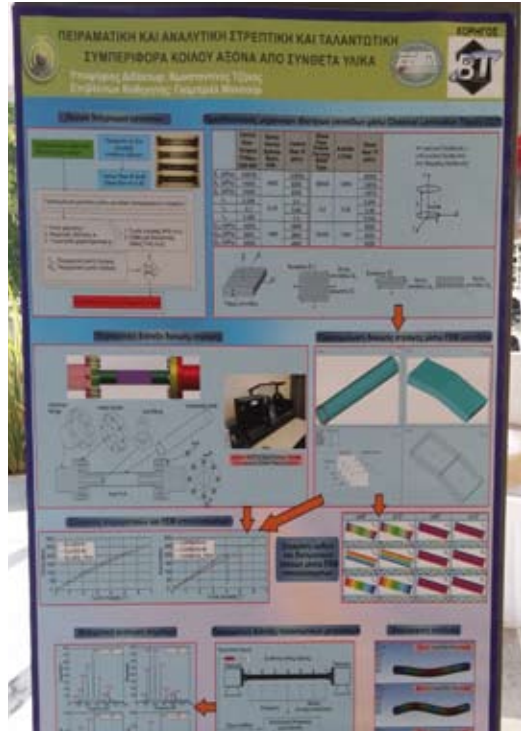


Fig 29: Conference poster

We are glad to announce you that B&T Composites will not only continue all the sponsorships for the next years but also will support with its carbon products all the teams of all the engineering faculties in Greece.

Supporting the athletic idea

B&T Composites sponsored the participation of its runner team in the 34th Authentic Marathon.



Fig 30: B&T Composites Marathon team

Our care for the environment

The company having developed timeless sense of responsibility towards the environment incorporates this trend in its facilities. We believe it is our duty to contribute actively to the improvement of living conditions and fostering an environmental culture.

We use state-of art anti-pollution technology

- The company has already established **two photovoltaic parks**, performance 100kW each, contributing significantly to reducing emissions of carbon dioxide CO₂. So apart from economic and regional development, the use and operation of the two photovoltaic parks contributes to the fight against climate change.

Respect and care for the environment is our common denominator for our activities. This is the reason we steadily improve our environmental performance.

In 2015, we completed a **pioneering solar energy utilization system**.

By installing **16 solar panels**, we manage to collect solar energy, which heats water. With the right water pipe system is fed into the polymerization oven which maintains a constant temperature 100°C. This takes much less use of electricity with significant economic and environmental benefits. At the same time strengthened the system heating facilities.

The **lighting system of solar energy** in the production area makes the building stand-alone and “green.” The domes placed per meter on the roof of the factory have the ability to diffuse light in doors. This saves a large amount of power that would be required to adequately light up 9.000 m² plant.

Rainwater collected in tanks and used for the water supply of the surrounding area and toilets.

The recycling of paper, plastic, metal, battery is an important priority for the company.



OUR PATENT

B&T Composites owns 10% of the rights to a patent developed in cooperation with East.Macedonia - Thrace Institute of Technology EMTH-IT (former TEI Kavala) Mechanical & Petroleum Engineering Department and Prof. Elias Sarafis, Ph.D., Dipl. Mechanical Engineer.

The title of the patent is **“Guidance method of robot after position detection of the user”**

Institution: Hellenic Industrial Property Organization

Application Number: 20160100022

Date of filing: 20.01.2016



Fig 31: Our patent

>>>**CONCLUSION**

“B&T COMPOSITES”, is highly estimated that with the support and the systematic boost of the operation of the company the results will be extremely impressive.

Therefore, we thank you for your patience in giving attention to the previous lines that significantly present a crucial but so important part of the company's activity and future goals.

However, it is expected to provoke your interest considering the company's short and long term expectations along with your business sympathy for creating an innovative and successful enterprising entity.

*“Architects cannot **renovate** it.*

*Businesses cannot **incorporate** it.*

*Churches cannot **inculcate** it.*

*Developers cannot **innovate** it.*

*Engineers cannot **calculate** it.*

*Governments cannot **legislate** it.*

*Judges cannot **adjudicate** it.*

*Lawyers cannot **litigate** it.*

*Manufacturers cannot **fabricate** it.*

*Politicians cannot **appropriate** it.*

*Scientist cannot **formulate** it.*

*Technicians cannot **generate** it.*

*Only you can **orchestrate** it.”*

Trust us

Trust B&T Composites



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<https://www.youtube.com/watch?v=gHsVZ2EbwbI&feature=youtu.be>

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