

mmG™ 联洋



TCORE® | Balcore®

结构夹芯材料

创造绿色材料

SUSTAINABLE COMPOSITES

mmG™

联洋

Marine

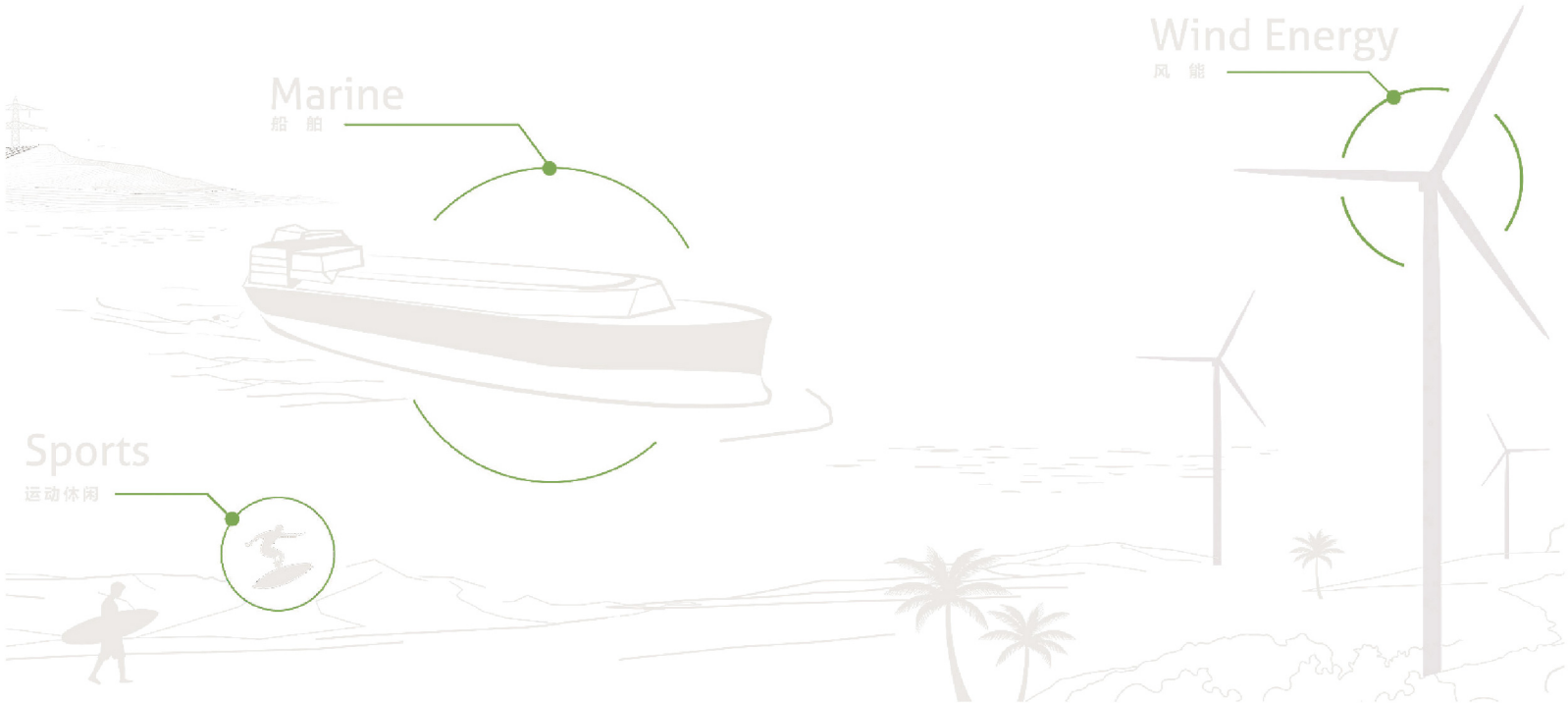
船舶

Wind Energy

风能

Sports

运动休闲



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Transportation
交通运输



Company Profile

浙江联洋新材料股份有限公司，是一家专业从事高性能复合材料研发、制造和销售为一体的高新技术企业和国家级专精特新“小巨人”。公司紧紧围绕绿色化发展、国际化经营、数字化转型、创新性驱动的战略发展规划，主要为清洁能源领域提供系列产品和服务。公司在浙江桐乡、意大利戈里齐亚和泰国罗勇分别建立了创新智造基地，服务全球市场。

NMG, is a high-tech enterprise specializing in developing, manufacturing and selling high-performance composite materials and a state-level specialized special new "Little Giant". The company is iclosely around green development, international operation, digital transformation, and innovation-driven StrategicProgramming, mainly for the clean energy feld to provide a series of products and services. The company hasestablished innovative and itelligent manufacturing bases in Zhejiang,Gorizia (Italy) and Rayong(Thailand) to serve the global market.



NMG总部 (HQ)

为践行“创造绿色材料”这一崇高使命，联洋将持续发扬“燃烧激情、创新成长”的企业精神，秉承以“正念、正心、正道”为核心的价值观，恪守“以客户为中心”的经营理念，为实现全球绿色可持续发展而奋斗。

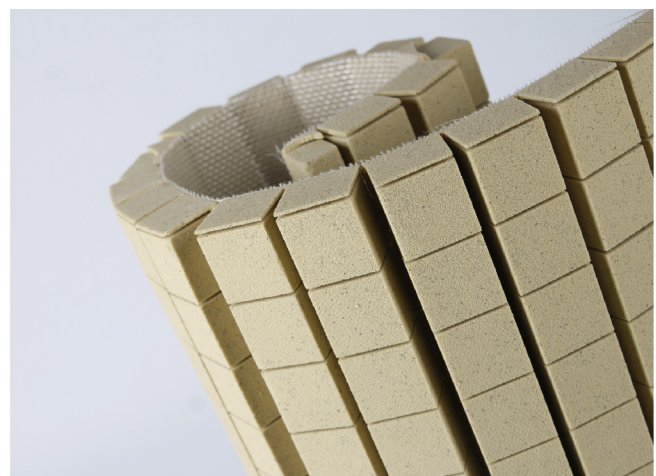
In order to fulfil the lofty mission of "Sustainable Composites", the company will continue to carry forward the enterprise spirit of "Burning passion, Innovative growth upholding the core value of "Mindfulness, Right Mindset, Right Path" abide by the business philosophy of "Customer-centric" to strive for global green and sustainable development.



TCORE®

TCORE和BALCORE系联洋公司结构夹芯材料的产品品牌。TCORE包括HPE Foam、UltraFoam、FenixFoam、MouldFoam、FlexFoam等众多系列产品。产品机械性能好、可循环利用、树脂吸收量低，可广泛应用于风能、船舶及海洋工程、汽车及轨道交通、运动休闲等领域。

TCORE and BALCORE are the products of NMG's structure core materials. TCORE is including HPE Foam, UltraFoam, FenixFoam, MouldFoam, FlexFoam, and many other series of products. The product has good mechanical properties, is recyclable, and has low resin absorption. It can be widely used in wind energy, shipbuilding and ocean engineering, automobiles and rail transit, sports and leisure and other fields.





Applications

应用领域

制造能力

MANUFACTURING



公司的结构夹芯材料生产车间按照智能工厂的要求设计和建造，配备国内外先进的设备，可以进行硬质泡沫的发泡和夹芯材料套装的加工。

The NMG's structural sandwich material production workshop is designed and built in full accordance with the requirements of smart factories, equipped with advanced equipment at home and abroad, which can be used for hard foam foaming and sandwich material processing.

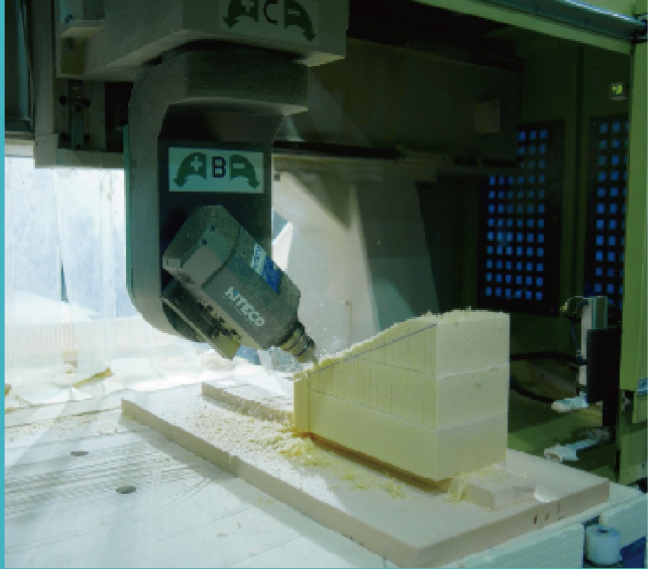




连续发泡生产线
Foaming Line



五轴加工生产线
Five Axis Line



泡沫壳体生产线
Foam Shell Line

创新能力 INNOVATION



公司从2013年起被评为高新技术企业，现有产品及在研产品均具有自主知识产权，2017年荣获浙江省专利示范企业。建立浙江省博士后工作站，荣获国家级专精特新“小巨人”企业、省级高新技术企业研究开发中心、浙江联洋高性能复合材料研究院、省级企业技术中心和浙江省科技奖等荣誉。

NMG was rated as Provincial High-tech Enterprise in 2013. Itsself-owned intellectual property rights cover all the products in existence and research. NMG has awarded a Patent demonstration enterprise in Zhejiang Province in 2017.

NMG has established provincial postdoctoral workstations and won the honors of national-level specialized new "little giant", Provincial R&D Center of High-tech Enterprise Zhejiang, NMG Research Institute of High-Performance Composites, Provincial Enterprise Technology Center and Zhejiang Science and Technology Award.



实验室

Laboratory

公司在国内外皆配备装备齐全的材料检测实验室，设备较为先进，如Instron万能材料试验机/疲劳试验机、卡尔费休水分测定仪、电位滴定仪、DSC热分析仪等设备，占地超500平方米，配备专业匹配检测人员20余人，具备从原料到制品等较为全面的检测能力。

国内实验室于2023年通过中国合格评定国家认可委员会（CNAS）认可，欧洲实验室于2018年获得挪威船级社(DNV)认可实验室资质。

NMG is equipped with various material testing machine locally and overseas site, including Instron universal material testing machine/fatigue testing machine, Karl Fischer moisture tester, potentiometric titrator, DSC thermal analyzer and so on. More than 20 person were involved the testing from the raw materials incoming inspection, products final inspection and some R&D projects.

The domestic laboratory was authenticated by the China National Accreditation Service for Conformity Assessment (CNAS) in 2023, and the European laboratory was accredited by the DNV in 2018.



TCORE®

HpeFoam

HPE泡沫是一种具有互穿网络结构的新型发泡材料，由于这种独特的化学结构，使其成为高强度、耐疲劳、耐高温、抗冲击等应用领域的理想选择。广泛应用于大型风力发电叶片及主承构件、船舶、运动器材等领域。

HPE foam is a new type of foam material with interpenetrating network structure. Due to this unique chemical structure, it is ideal for applications such as high strength, fatigue resistance, high temperature resistance and impact resistance. Widely used in large wind power blades and main bearing components, ships, sports equipment and other fields.



► 产品特点 / Features


 **卓越的抗疲劳性能**
Excellent fatigue resistance

 **树脂灌注更优越**
Ideal for resin infusion

 **适用于动态负载结构**
Suitable for dynamically loaded structures

 **树脂用量比其他泡沫更少**
Lower resin absorption

 **抗苯乙烯性能更高**
Higher styrene resistance

 **耐温性更高**
Higher temperature resistance

 **可循环利用**
Recyclable

▶ 产品数据 / Data

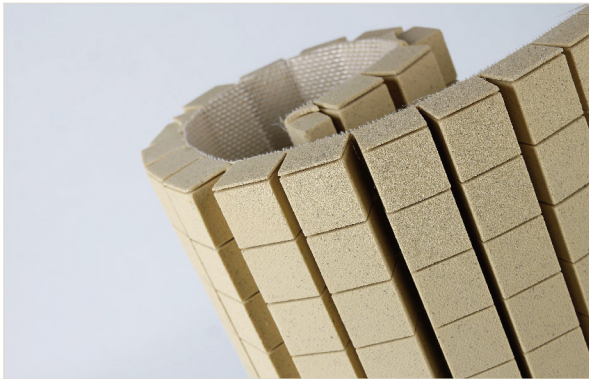
典型性能 Typical Performance		单位 Unite	F60	F80	HPE90	HPE110	HPE160	HPE220
密度区间 Density Range	ASTM-D1622	Kg/m ³	55-65	75-85	90-105	105-120	150-165	215-230
压缩强度 Compressive Strength	ASTM-D1621	MPa	0.55	0.8	0.85	1.1	2.1	3.8
压缩模量 Compressive Modulus	ASTM-D1621	MPa	30	45	55	65	90	170
拉伸强度 Tensile Strength	ASTM-D1623	MPa	0.55	0.80	1.0	1.1	1.6	2.8
拉伸模量 Tensile Modulus	ASTM-D1623	MPa	35	50	50	55	85	185
剪切强度 Shear Strength	ASTM-C273	MPa	0.48	0.60	0.8	0.9	1.2	1.6
剪切模量 Shear Modulus	ASTM-C273	MPa	7.5	12.0	16	20	30	55
剪切伸长率 Shear Elongation	ASTM-C273	%	25	20	20	15	10	6
吸水率 Water Absorption	ISO 2896	%	2	1.5	2	2	2	2
热变形温度 Heat Distortion Temperature	DIN-53424	℃	110	120	120	120	120	120

TCORE®

FenixFoam

Fenix泡沫是一种环保阻燃夹芯材料，具有优异的环保性、阻燃性、低烟密度和低烟毒性，适用货车、地铁等运输制造业、航空航天、船舶等对阻燃性要求较高的领域。

Fenix foam is an environmentally friendly flame retardant sandwich material, with excellent environmental protection, flame retardant, low smoke density and low smoke toxicity, suitable for trucks, subways and other transportation manufacturing, aerospace, ships and other fields with high flame retardant requirements.



► 产品特点 / Features



高温燃烧过程不传播火焰

NO flame transmission during high temperature combustion



取得M1-F2认证

(AFNOR列车内饰标准)
Certified by M1-F2 according to AFNOR



力学性能好

Good mechanical strength



取得HL2和HL3认证

(EN45545-2列车内饰标准)
Certified by HL2 and HL3 according to EN45545-2



适合生产阻燃、隔热、隔音制品

Suitable for flame-retardant, insulation and soundproof products



适用于不同工艺

(预浸料、L-RTM、其他灌注工艺)
Suitable for different processes



适用于各种树脂基体

Compatibility with different resin

▶ 产品数据 / Data

典型性能 Typical Performance		单位 Unit	FENIX 60	FENIX 80	FENIX 100	FENIX 200	FENIX 300
密度区间 Density Range	ISO 845	Kg/m ³	57-65	76-85	94-108	185-215	280-320
压缩强度 Compressive Strength	ASTM-D1621	MPa	0.55	0.85	1.2	3.8	7.0
压缩模量 Compressive Modulus	ASTM-D1621	MPa	28	45	60	170	250
拉伸强度 Tensile Strength	ASTM-D1623	MPa	0.55	0.80	1.1	2.5	5.5
拉伸模量 Tensile Modulus	ASTM-D1623	MPa	0.55	40	55	160	230
剪切强度 Shear Strength	ASTM C273	MPa	0.35	0.45	0.60	1.00	1.80
剪切模量 Shear Modulus	ASTM C273	MPa	6	11	0.85	0.85	0.85
剪切伸长率 Shear Elongation	ASTM C273	%	10	10	10	8	8
吸水率 Water Absorption	ISO 2896	%	<2	<2	<2	<2	<2
初始热导率 Initial Thermal Conductivity	ASTM C518	W/mK	0.026	0.027	0.028	0.048	0.068
热变形温度 Heat Distortion Temperature	DIN- 53424	°C	130	140	150	180	160
使用温度 Service Temperature	/	°C	-180,+110	-180,+110	-180,+120	-180,+120	-180,+120
火车阻燃性 Fire Resistance for trains	UNI 9177	Class	Class1	Class1	Class1	Class1	Class1
	AFNOR-NF P 92.501	Class	tbd	M1	M1	M1	tbd
	AFNOR-NF P 16.101	Class	tbd	F1	F1	F1	tbd
	EN 45545-2	Class	HL2/HL3(*)	HL2/HL3(*)	HL2/HL3(*)	HL2/HL3(*)	HL2/HL3(*)
船舶和游艇阻燃性能 Fire Resistance for ships and yachts	IMO RES A754(18)-9 PERFORMANCE CRITERIA	Class	B15(*)	B15(*)	B15(*)	tbd	tbd
	IMO MSC 307(88) FTP CODE-Part2-5	Class	tbd	tbd	Passed(*)	Passed(*)	Passed(*)

TCORE®

MouldFoam

Mould Foam泡沫是一种高密度模塑泡沫，主要分为两大系列。一种是采用化学原料通过发泡剂制备成型，泡孔细腻，无论使用何种加工设备，该材料均具有出色的可加工性，可提供各种不同密度的泡沫以满足不同应用端的需求。另外一种是采用回收泡沫粉、无机填料等并添加发泡剂和粘结剂模压成型制备，其力学性能甚至优于传统化学发泡产品，可根据实际需求定制化开发。考虑到其原材料为生产过程产生的废料，因此制造成本更低，且能有效解决制造生产过程固废的处理问题。Mould Foam泡沫可用于制造模型、原型设计和工业模具，如汽车模型、雕塑制品，也可用于门板的中空填充物等。

Mould Foam is a high-density molded foam that is divided into two main series. One is the use of chemical raw materials through the foaming agent preparation molding, the bubble hole is delicate. The other is the use of recycled foam powder, inorganic filler and add foaming agent and binder molding preparation, its mechanical properties are even better than traditional chemical foaming products, can be customized according to the actual needs of the development. Mould Foam can be used for manufacturing models, prototypes and industrial molds, such as car models and sculpture products, as well as hollow filling for door panels.



► 产品特点 / Features



较好的尺寸稳定性
High dimensional stability



低树脂吸收率
Low resin absorption



良好的闭孔结构
Fine closed cell structure



良好的机械性能
Good mechanical properties



良好的阻燃性
Good fire resistance



低吸水性
Low water absorption



高机械强度/密度比值
High value of mechanical strength/density ratio



易于加工
Machine easiness



生态友好
Eco-friendly

TCORE[®]

MouldFoam

▶ 产品数据 / Data

典型性能 Typical Performance		单位 Unite	80	150	240	350	420
密度 Density	ASTM D 1622	kg/m ³	75-90	140-160	225-255	330-360	400-440
压缩强度 Compressive strength	ASTM D 1621	MPa	0.8	2	4	7.5	11.5
压缩模量 Compressive modulus	ASTM D 1621	MPa	40	70	170	330	420
弯曲强度 Bending strength	ISO 178	MPa	1	2.5	5	9	13
硬度 Hardness	ISO 868	shore	Na	13	25	35	45
线性热膨胀系数CTE	ISO 11359	10 ⁻⁶ K ⁻¹	60	70	70	70	70
粗糙度 Milling behaviour	Roughness Rz after milling	μm	140	100	85	65	40
使用温度 Service Temperature	--	°C	-180~+95	-180~+60	-180~+60	-180~+60	-180~+70
成型工艺温度 (*) Process Temperature	--	°C	130	85	80	80	100

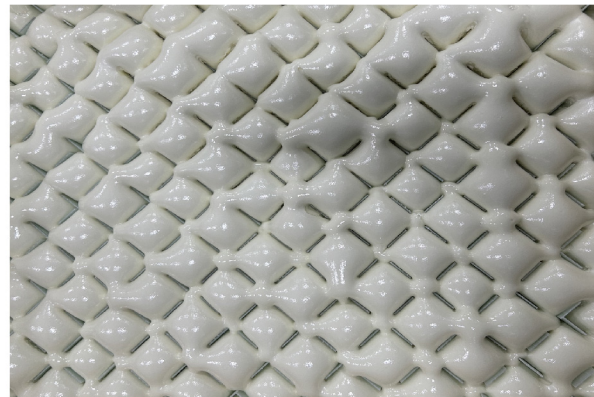
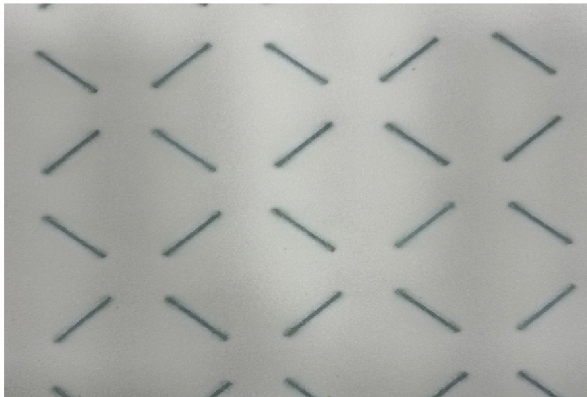
(*) maximum 1 hour

TCORE®

UltraFoam

UltraFoam在发泡过程中植入增强材料，根据增强体含量、类型可以实现不同性能增强。增强后的泡沫仍然具备开槽、打孔等加工能力，不影响树脂灌注和导流。

The UltraFoam is implanted with a reinforcement material during the foaming process, enabling different performance enhancements depending on the content and type of reinforcement. The enhanced foam still has the processing ability of slotting and punching, without affecting the resin perfusion and diversion.



► 产品特点 / Features



丰富的材料种类和较高的可设计性
Rich Material Types and higher designability



优良的抗弯强度
Excellent bending strength



优良的耐疲劳性和损伤容限
Excellent Fatigue Resistance and Damage Tolerance



适合不同的制造工艺：预浸料、RTM以及其他灌注系统
Ideal for different manufacturing processes: pre-preg, resin-transfer moulding and other infusion systems



与各类树脂兼容性好
Excellent compatibility with different resin



良好的机械性能
Good mechanical properties

▶ 产品数据 / Data

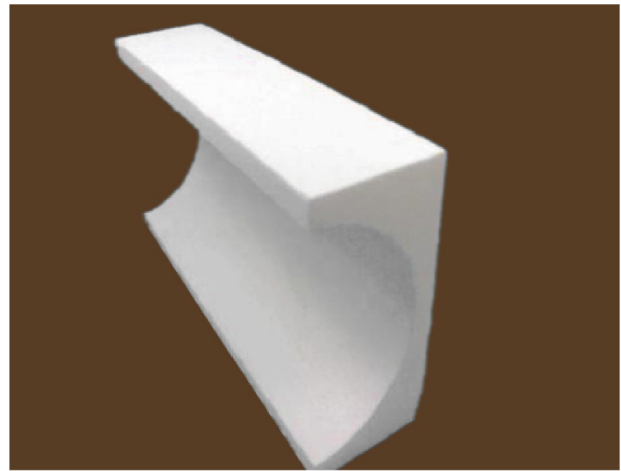
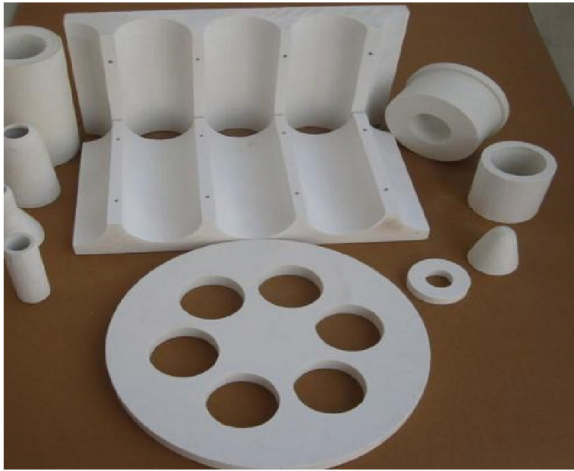
检测项目 Typical Performance			UltraFoam (平板)	UltraFoam (壳体)
序号	检测项目	单位	标准	标准
1	名义密度 Density	Kg/m ³	140-160	280-300
2	拉伸强度 Tensile Strength	MPa	2.3	4.0
3	拉伸模量 Tensile Modulus	MPa	600	800
4	压缩强度 Compressive Strength	MPa	6.0	7.0
5	压缩模量 Compression Modulus	MPa	700	800
8	13方向剪切强度 13Shear Strength	MPa	1.2	2.0
9	13方向剪切模量 13Shear Modulus	MPa	230	240
10	23方向剪切强度 23Shear Strength	MPa	1.2	2.0
11	23方向剪切模量 23Shear Modulus	MPa	170	180

Tcore[®]

FlexFoam

FlexFoam泡沫是基于Tcore泡沫独有的发泡工艺生产制备而成，区别于PET挤出发泡和PVC蒸汽发泡成型的高能耗和低效率。根据客户产品图纸一次性浇注成型，生产效率高，无须采用数控车床等就能实现异形件的生产，产品尺寸精准且无损耗，可以根据客户需要定制化开发。

FlexFoam is manufactured based on Tcore foam's unique foaming process, which is different from the high energy consumption and low efficiency of PET extrusion foam and PVC steam foam molding. According to customer product drawings, one-time casting molding, high production efficiency, without the use of CNC lathes can achieve the production of special-shaped parts, product size is accurate and no loss, can be customized according to customer needs.



► 产品特点 / Features



高效率
High efficiency



零损耗
Zero Scrap



尺寸精确
High Size accuracy



定制化
Customized



BALSA WOOD

BALCORE是一种生长在美洲热带森林里的轻木，木材质地虽轻，但结构却很牢固，因此，是航空、航海以及风电叶片制造的宝贵原材料之一。

BALCORE is a kind of balsa wood that grows in the tropical forests of the Americas. Although the wood is light in texture, the structure is very strong, so it is one of the valuable raw materials for aviation, Marine and wind turbine blade manufacturing.



► 产品特点 / Features



强度/刚度-重量比突出

Significantly high specific strength/stiffness



抗冲击性能好

Good impact resistance



温度适应好 (-212~+163°C)

Service temperature varies from -212to +163°C



出色的耐疲劳性能

Excellent fatigue resistance



环保材料

Eco-friendly material



隔音隔热性能好

Good sound and heat insulation



防潮性能好

Good humidity resistance



BALSA WOOD

▶ 产品数据 / Data

典型性能 Typical Performance		单位 Unit	BC110	BC150	BC220
木方密度 Block Density	ASTM-C271	Kg/m ³	110	160	220
木条密度 Timber Density	ASTM-C271	Kg/m ³	70-150	110-220	150-290
密度范围 Density Range	ASTM-C271	Kg/m ³	100-120	135-176	220-242
压缩强度 Compressive Strength	ASTM-C365	MPa	6.3	11.5	13.9
压缩模量 Compressive Modulus	ASTM-C365	MPa	1993	3919	5199
剪切强度 Shear Strength	ASTM-C 273	MPa	1.8	2.8	4.3
剪切模量 Shear Modulus	ASTM-C273	MPa	106	160	206
拉伸强度 Tensile Strength	ASTM-C277	MPa	7.4	11	13.8
拉伸模量 Tensile Modulus	ASTM-C277	MPa	2200	3000	3930
室温下导热性 Thermal Conductivity At Room Temperature	ASTM-C177	MPa	0.048	0.066	0.084
含水率 Moisture Content	ISO 3130	W%	≤12%		



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