Swancor®
Green Energy & Environmental Protection & Safety

SWANCOR HOLDING CO., LTD.

SWANCOR ADVANCED MATERIALS CO., LTD.
ADD: No. 618 Songsheng Road, Songjiang District, Shanghai 201600, China
TEL: +86 21 5774 6183
FAX: +86 21 5774 6177
shanghai@swancor.com.cn

SWANCOR (TIANJIN) WINE BLADE MATERIALS CO., LTD.
ADD: No.6, Caiyun Street, Hangu Modern Industrial Park,
Tianjin Economic–Technological Development Area,
Tianjin 300480, China
TEL: +86 22 5991 6567
FAX: +86 22 5991 6568
tianjin@swancor.com.cn

SWANCOR HIGHPOLYMER CO.,LTD.
ADD: No. 9 Industry South 6 Road, Nantou City 54066, Taiwan
TEL: +886 49 225 5420
FAX: +886 49 225 1534
nantou@swancor.com.tw

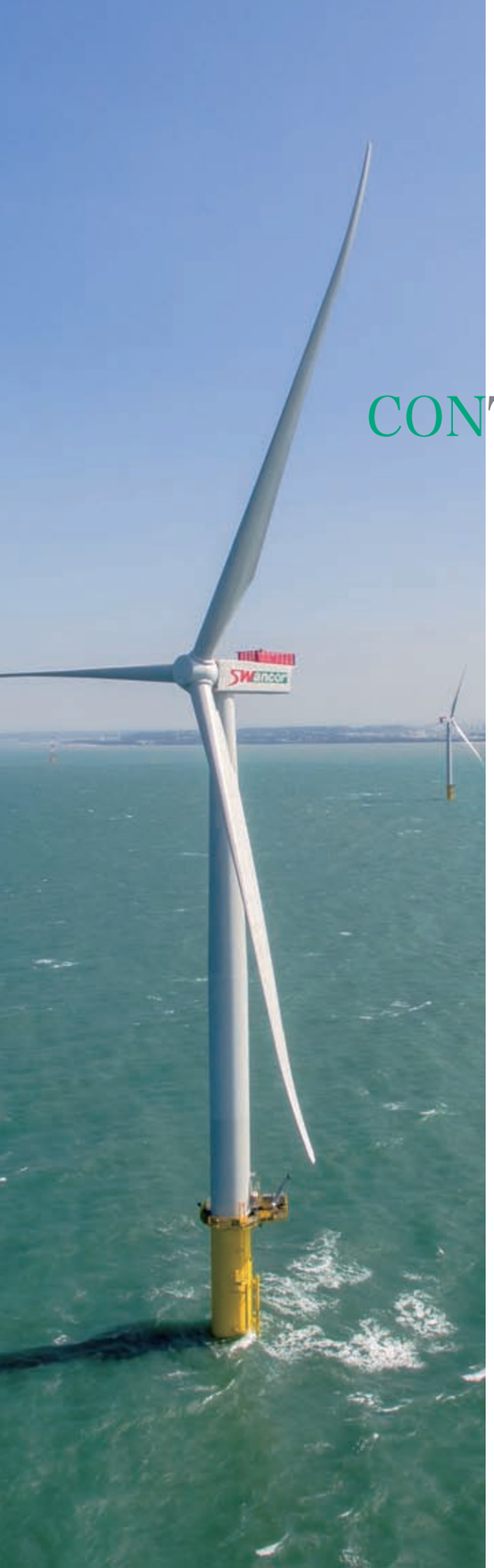
SWANCOR (JIANGSU) NEW MATERIALS CO.,LTD.
ADD: No. 26, Xie xin Rd, Funing Economic Development Zone,
Jiangsu 224400, China
TEL: +86 515 8788 6518
FAX: +86 515 8788 6015

SWANCOR IND (M) SDN. BHD.
ADD: PTD 4910, Jalan Rumbia 5, Kawasan Perindustrian
Tanjung Langsat, Mukim Sungai Tiram,
81700 Pasir Gudang, Johor, Malaysia
TEL: +607 255 6605
FAX: +607 255 7562
johor@swancor.com

SWancor NEWS
2019

OUR VISION:

Swancor commits to be a respected company in green energy, environmental protection and safety fields, and becomes a global brand.

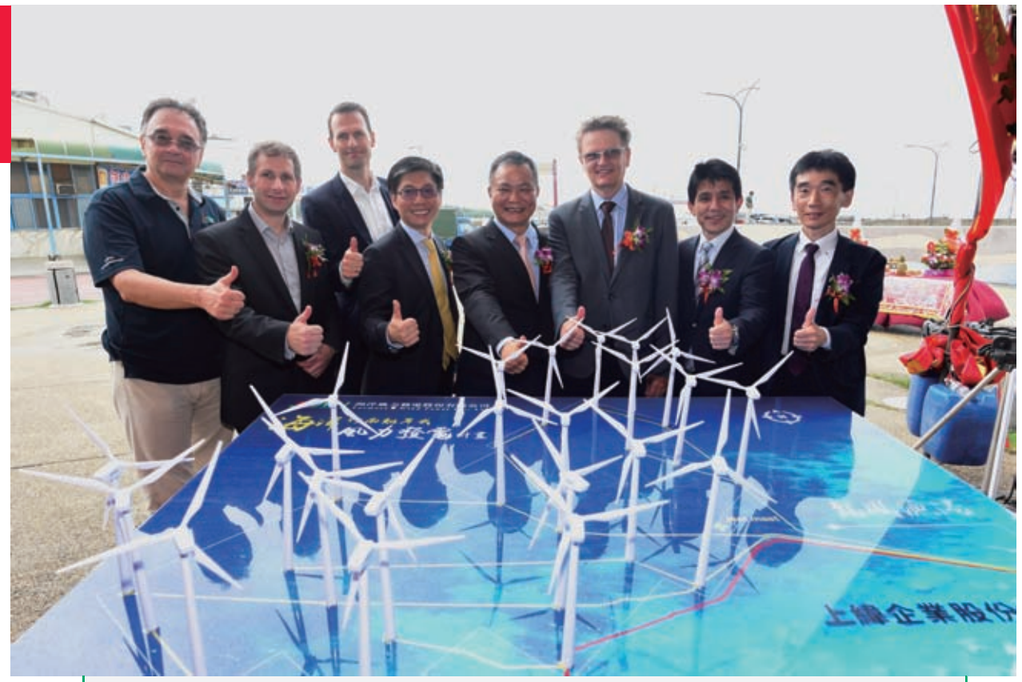


CONTENTS

Swancor Expands Oversea Market by Setting Production Site in Malaysia
The Grand opening of SWANCOR IND (M) SDN. BHD.

The Grand Opening of Swancor Ind (M) Sdn Bhd, a subsidiary of Swancor Holding, was held on 21st March 2019. This is the first production site outside the Greater-China area and is an important milestone for Swancor in the continued development in overseas markets. At the opening ceremony, Swancor welcomed guests from Malaysian Chamber of Commerce Johor Branch, Goldwind Technology, Dairen Chemical and distributors in Southeast Asia and other important partners participated in the event.

SWANCOR IND (M) SDN.BHD.has a plant area of approximately 8,000 square meters. The main products are environmentally-friendly and corrosion-resistant materials. The designed annual production capacity is 7,000 tons. The trial production has been successfully completed in March. In the future, the ASEAN market will mainly be supplied by Malaysia factory and gradually expand to other overseas markets to provide more competitive services.



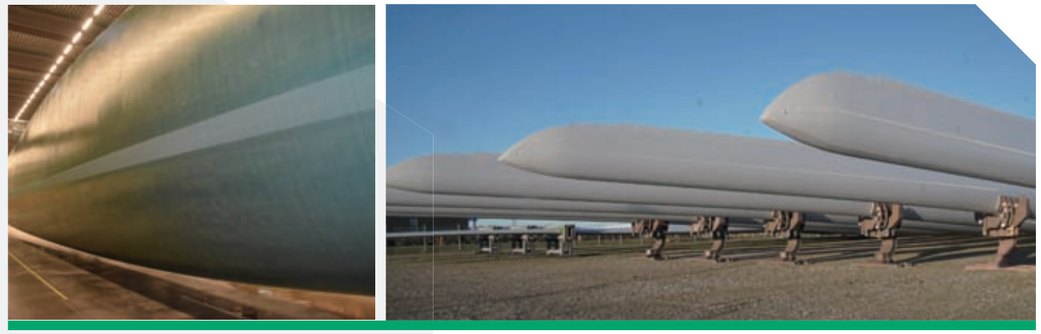
The First Turbine of HAIYANG was Successfully Installed Phase II

The first turbine of HAIYANG phase II was successfully installed on the outer sea of Miaoli, Taiwan on July 24, 2019.

The blades are manufactured by Siemens Gamesa in Denmark, using SWANCOR resins which are produced in Nantou, Taiwan. The first wind turbine made of Taiwan produced resin was successfully installed on July 24. Siemens Gamesa 6MW turbines with 75 meter long blades are used in HAIYANG phase II . The installation of the wind turbine is carried out by the Seajacks Zaratan, a self-propelled jack-up vessel. The vessel first raised up a platform on the seabed, and the pre-assembled wind turbine tower is then lifted up and installed on the monopile foundations. Followed by the installation of the nacelle and the blades.

There are two phases of HAIYANG offshore wind farm. The first phase has a capacity of 8 MW. The first two wind turbines were installed in October 2016 and started operation in April 2017. The second stage has a capacity of 120MW and a total of 20 wind turbines. It is located about 2-6 kilometers away from the coast of Miaoli County, Taiwan. The installation is expected to be completed by the end of 2019. After completion, the total generating capacity will be 128MW, which can supply the electricity of 128,000 households every year.

Swancor Resin Material Aprroved by Siemens Gamesa Renewable Energy to be Used in HAIYANG Offshore Wind Farm Phase II



The photo was provided by SGRE

Swancor and Siemens Gamesa Renewable Energy (SGRE) signed a memorandum of cooperation in 2018. In order to actively realize the localization of Taiwan's wind turbine materials, the two parties successively signed the supply contract for the wind turbine blade resin in HAIYANG offshore wind farm Phase II . Furthermore, Swancor and SGRE reached another important milestone at the end of 2018, and began to use the resin produced in Taiwan to complete the first batch of offshore wind turbine blades. Swancor also became qualified resin supplier for SGRE offshore wind turbine.

SGREis one of the major suppliers of offshore wind turbines worldwide, and Swancor actively strives for its wind power materials needs in Asia. In addition, Swancor is also engaged in the certification of wind power resin materials and wind power carbon fiber composite materials of various international wind turbine manufacturers.

Swancor has the dual role of the international wind power material supplier and offshore wind power developer. In addition to continuously promoting the application of resin materials and carbon fiber composite materials in wind turbine blades, it will contribute to the localization of wind turbine materials in Taiwan and will complete HAIYANG offshore windfarm as scheduled. There will be the first two wind farms built in Taiwan, and we will continue to invest in the localization of offshore wind power industry.

Mr. Robert Tsai, Chairman of Swancor, said: "We are honored to be qualified by SGRE, and the first domestic manufacturer to supply its offshore wind turbine materials, and will continue to strive for cooperation opportunities in Taiwan and the global market in the future."

Niels Steenberg, General Manager of Offshore Wind Power in SGRE Asia-Pacific region said: "We introduced localized content early in the beginning of 2019, and used the resin raw materials supplied by Swancor to cast the first batch of offshore wind turbine blades, putting localization into practical action."

Siemens Gamesa Renewable Energy (SGRE) has more than 2,300 offshore wind turbines in operation with a total installed capacity of over 11 GW. SGRE's experience dates back to 1991 when it established the world's first offshore wind farm. With a focus on safety and innovation, SGRE is constantly striving to reduce the energy costs of offshore wind power.

2019 JEC Exhibition, Paris, France

On March 12-14, 2019, JEC exhibition - the most important composite material exhibition in Europe, was held in Paris Nord - Villepinte. During the short three-day exhibition, it received more than 35,000 spectators and more than 1,200 exhibiting companies. During the same period, several academic conferences and technology sharing sessions of world famous industry companies were held. The hot search terms of this year's JEC exhibition are: environmental protection, carbon fiber, automotive light-weight and air transportation.

Swancor has participated in JEC exhibition for many years. During this exhibition, it has received new and old customers from Europe, North America, South America, Middle East and Asia. Having extensively discussion with new development direction of the composite materials including the halogen-free fire retardant material , carbon pultrusion profile for wind energy etc, and also learned the concepts and trends of the industry.

This year, Swancor and Moldex3D, the leader in the mold flow analysis software system of the plastic injection molding industry, have joined forces to complement each other. Swancor has always adhered to the core values of “Quality, Integrity, Innovation, Diligence”, and achieved the grandeur of “becoming a respected chemical material company in the field of green energy, environmental protection and safety, and becoming a world-renowned brand”.

China Composites Expo and "Swancor Cup" National Composites Design & Fabrication Competition for University Students

On September 5-7, 2018, the "24th China International Composites Exhibition" was successfully held at the Shanghai World Expo and Convention Center. Swancor has newly introduced carbon fiber composite products for wind power turbine spar caps and continues to interpret the "green materials and environmental protection and safety" concept of "Green Energy & Environmental Protection & Safety" and continue to interpret "composite experts" style.

" Swancor Cup" The 4th National Composites Design & Fabrication Competition for University Students was held during the exhibition. The topic of the competition was “Thermoplastic Carbon Fiber Composites Leaf Spring ". 45 teams from 25 universities have joined the competition this year. The material was sponsored by SunWell Carbon Fiber Composites Co. Ltd. After 2 days of competition, 6 teams were awarded for their creative design and works. 3 teams were awarded for their delicate posters. The competition has drawn a lot of attention. In this contest, the application creativity award was added to encourage students to openly think about the materials. The possible application fields of thermoplastic carbon fiber composite materials and the design concepts and products of the products are proposed.

“Swancor Cup” The 5th National Composites Design & Fabrication Competition would be one of the most popular activities during 25th China Composite Expo this year. 70 teams from 30 universities and colleges would join the competition with theme of “Composite Energy Absorbing Column”. As the major sponsor, Swancor believe that the “Swancor Cup” would be a good opportunity of communication and competition to undergraduates. It could magnificently help them to understand and practice composite designing and fabrication.

——Swancor Public Welfare Foundation.

Good business management is inseparable from a good social environment. Donating is also a form of corporate giving back to the society. Only by integrating the interests of the company with the overall interests of the society, so that the social value of the enterprise is reflected in social responsibility, the enterprise can make great strides in business developing.

Swancor noted that there is a serious shortage of school supplies in remote areas, and funds are invested annually to finance these primary and secondary schools. From 2018 to early 2019, Swancor representatives went to six schools in Fujian Province, Anhui Province, Shanxi Province, Henan Province etc. The children of these local remote primary schools took the necessary teaching materials and school supplies.

In order to cultivate more and better talents in the composite industry and promote the development of the industry, Swancor has established the Swancor Scholarship for many years. At the end of 2018, Swancor went to Wuhan Polytechnic University,

Nanjing University of Technology, Hebei University of Technology, Sichuan University and Yancheng Institute of Technology to give the Swancor Scholarship to outstanding college students. Each of these universities exports a large number of outstanding talents in the composite industry every year. Swancor also hopes that the outstanding students who receive the scholarship will experience the talents, inherit the donation, contribute to the society, and reward others.

Aspiration, love, and responsibility

Introduction of Environmentally Friendly Styrene-free Vinyl Ester Resin

Introduction

Epoxy-modified vinyl ester resin is a heavy-duty anti-corrosion resin developed in the 1960s, vinyl ester resins are produced through addition polymerization of epoxy resin and mono-carboxylic acid containing unsaturated double bonds, such as acrylic acid, meth acrylic acid, and diluted with unsaturated monomer such as styrene or acrylic monomers. With epoxy resin backbone and reactivity similar to unsaturated polyester resin, vinyl ester has excellent mechanical properties and operability. Its unique molecular structure also brings superior corrosion resistance which makes it irreplaceable in industrial heavy anti-corrosion application

In order to carry out the “Law of the People's Republic of China on Environment protection” and “Law of the People's Republic of China on the Prevention and Control of Air Pollution” to control industrial pollution and unorganized emission of VOCs, the “Standard of Unorganized Emission Control for VOCs”, GB 37822-2019 is formulated. The standard would be executed by July 1st 2019 for new established projects and by January 1st 2020 for existing projects. The standard specifies unorganized emission control requirements during storage, transfer, shipping, processing, leakage control from facilities and pipings, open liquid surface as well as exhaust gas treatment system requirements and pollution monitoring requirements within and around the company of VOCs materials. Based on above requirement, it is necessary to develop a styrene free environmentally friendly vinyl ester resin, which has similar mechanical properties, heat and chemical resistance as traditional vinyl ester products. Swancor developed BPA-type styrene free vinyl ester SWANCOR SF901 and fire-resistance styrene free vinyl ester SWANCOR SF905. These products are diluted by active monomer with low toxicity and low volatilization. The properties for SWANCOR SF905 are listed in table 1 to table 3.

Table 1. Resin Properties of SF 905

Item	Regulations
Appearance	Deep Yellow Clear Liquid
Solid Content*1	58.0±1.0%
Viscosity*2	800±100cps
Gel Time*3	20±10min
Shelf Life	9 Months(under 25℃)

*1 . 135℃ ×1h，Oven
*2 . LVT#3-60rpm，25℃
*3 . 6%CoOct: 0.5%, DMA: 0.6%, MEKP: 1.2%, 25℃（Solution）

Table 2. SWANCOR SF905 Casting Properties（4mm pure resin casting）*4

Item	Regulations	Test Method
Tensile Strength	60-70 MPa	IS0 527-2 \ GB/T 2567
Tensile Modulus	3.7-4.2GPa	IS0 527-2 \ GB/T 2567
Tensile Elongation	2.0-4.0%	IS0 527-2 \ GB/T 2567
Flexural Strength	108-125MPa	IS0 178 \ GB/T 2567
Flexural Modulus	4.0-4.5GPa	IS0 178 \ GB/T 2567
HDT	110-115°C	IS0 75\ GB/T 1634
Barcol Hardness	50-60	GB/T 3854
HOI	⩾ 27%	GB/T 8924-2005

*4 . Post curing: 24 hours at room temperature then 2 hours at 105°C .

Table 3. SWANCOR SF905 Ignition and Flash Point

Item	Test Result	Test Method
Flash point(Closed)	111°C	GB/T 5208-2008
Lgnition point	138°C	ASTM D92-16b

VOC, Volatility and Smell

The minimum vapor pressure of the smallest monomer in the formulation was 48.4 Pa /25 °C . Compared to the 853 Pa of styrene monomer at 25 °C , it can be concluded that at the same temperature, SWANCOR SF905 has only 1/18 VOC than the conventional vinyl ester resin. When such a resin is used in an open environment, it results in greatly suppressed VOC and less odor, which is more acceptable to the operator.

Air Dry

Vinyl ester resins and unsaturated polyester resins are both cured by free radical polymerization, which used peroxide as initiator and cobalt salt as Promoter. Free radicals are produced by the redox reaction between peroxide and cobalt salt and lead the cross-link reaction for double bonds from main chain and monomers, which lead to the cured resin.

Oxygen in the air will react with phenol inhibitors to capture the free radical during cure and result in under-cure on the surface of laminates. Traditional vinyl ester use styrene as active monomer and thick lamination would generate enough heat to avoid sticky surface after 2-4 hours curing. New monomers such as acrylic ester with high molecular weight, have much lower activity compared with styrene. This will lead the resin have bad surface curing and even sticky.

Now there are three major methods to improve air-dry properties: (1) Covered by thin film to make isolation from air. (2) Add wax to resin to make isolation from air through curing. (3) Introduce functional groups, such as allyl ether and alkenyl butylene ether which have carbocation groups and will absorb oxygen to create free radicals. Other methods such as applying oxygen-resistance coating or using photo sensitizer are also used, but the third method is the best. We synthesize the functional group to main chain to improve the air-dry properties. Although the air-dry properties are not as good as traditional vinyl ester using styrene, FRP fabricators feedback the surface-dry time difference has negligible effects on applications.

Chemical resistance

Chemical resistance tests of SWANCOR SF905 are carried out and compared with market equivalent. The corrosion media are based on customer’ s recommendation using RC/ methanol/ethanol mixture (toluene/isooctane/methanol/ ethanol = 40/40/20/20 V/V @38 °C) and 20% HCl (@45 °C). The anticorrosion performance is examined through the variation of mass, barcol hardness and flexural strength.

Table 4 shows SF905 has comparable little swelling mass increase after 14 days’ test. Hardness retention rate is 80.36% while the Equivalent only has 23.64%. Flexural strength retention rate is 97.26%while the offset only has 35.12%. The result shows the SF905 has better resistance against organic molecules. Table 5 shows that SF905 has slight advantage compared with Equivalent. To sum up, SF905 has good performance against organic molecule and normal acids. It would be a good protection material to similar corrosion media.

Table 4. SWANCOR SF905 against RC / Methanol / Ethanol mixture

Resin	Time (day)	0	2	7	14
SF905	Weight (g)	4.67	4.69	4.71	4.74
	Retention (%)	100.00	100.47	100.94	101.55
Equivalent	Weight (g)	5.63	5.71	5.80	5.93
	Retention (%)	100.00	101.48	103.11	105.37
SF905	Hardness	56	53	47	45
	Retention (%)	100.00	94.64	83.93	80.36
Equivalent	Hardness	55	37	26	13
	Retention (%)	100.00	67.27	47.27	23.64
SF905	Flexural Strength (Mpa)	87.80	125.85	97.87	85.39
	Retention (%)	100.00	143.34	111.47	97.26
Equivalent	Flexural Strength (Mpa)	114.21	109.12	76.61	40.11
	Retention (%)	100.00	95.54	67.08	35.12

Table 5. SWANCOR SF905 against 20%HCl

Resin	Time (day)	0	4	11	18	26
SF905	Weight (g)	4.29	4.30	4.31	4.32	4.33
	Retention (%)	100.00	100.41	100.64	100.7	100.89
Equivalent	Weight (g)	10.25	10.27	10.301	10.31	10.33
	Retention (%)	100.00	100.25	100.5	100.6	100.82
SF905	Hardness	50	49	51	43	47
	Retention (%)	100.00	98.00	102.00	86.00	94.00
Equivalent	Hardness	52	49	50	44	44
	Retention (%)	100.00	94.23	96.15	84.62	84.62
SF905	Flexural Strength (Mpa)	101.22	117.09	79.25	99.16	94.88
	Retention (%)	100.00	115.68	78.29	97.96	93.74
Equivalent	Flexural Strength (Mpa)	104.16	110.61	88.93	85.41	96.19
	Retention (%)	100.00	106.19	85.38	82.00	92.35

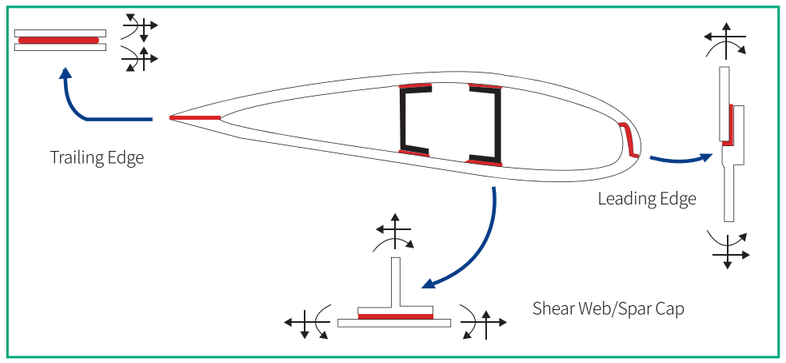
Conclusion

Environmentally friendly vinyl ester resin SWANCOR SF905 has excellent workability, outstanding mechanical properties, good air-dry properties and remarkable corrosion resistance to organic molecule and normal acids. It could be used to replace traditional styrene-based vinyl ester resin and to meet future national environmental protection policy. Swancor will continue to work on the development of the FRP industry to achieve a safer, safer and healthier environment.

Introduce of High Toughness Adhesive for Large Wind Blades

1、Introduction

Wind energy has received much attention as an renewable energy source. According to the latest data from the Global Wind Energy Council, as of 2018, the cumulative installed capacity of wind power in the world has reached 591 GW, of which the total installed capacity of offshore wind power is 23 GW, accounting for about 4% of the total installed capacity. The total installed capacity has steadily increased, and the installed capacity of the single turbine is gradually increasing, which requires the longer blade. Adhesives, which are critical materials for blade manufacturing, are required to have operational time and toughness for longer blades. In order meet the needs of larger blades, Swancor launched SWANCOR 2535 series products SWANCOR 2535-A/BS and SWANCOR 2535-A/BL. These new products are especially suitable for large blades application with long operating time, high toughness and low density. High toughness brings excellent fatigue resistance and longer service life of the blades. Low density reduces the weight of blade weight to achieve the goal of reducing costs and higher efficiency. Adhesives for blades are used on edges of blade shell and the joints between shear web and spar cap. It should engage the stress during the turbine operation (Figure 1 shows the stress model), This means that the quality of the adhesive will affect the life of the blade. The following are the properties of SWANCOR 2535 series:



Source: Composite materials for wind turbine blades: issues and challenges

Figure 1. Force Diagram for Adhesive on Blades

2、SWANCOR 2535 series properties

SWANCOR 2535 series are two-component adhesive. SWANCOR 2535-A is epoxy adhesive and the SWANCOR 2535-BL, SWANCOR 2535-BS are hardeners. Customers could choose different hardener according to the gel time requirements. (SWANCOR 2535-BL has longer pot life).

SWANCOR 2535 series also show excellent thixotropic and anti-sagging properties during applications especially while the mould has high temperature. It has no deformation and no sagging, which brings outstanding process operability. The following are the characteristic properties for SWANCOR 2535 series.

● Basic characters

Table 1. Basic Characters

	SWANCOR 2535-A	SWANCOR 2535-BS	SWANCOR 2535-BL
Item	Base	General hardener	Slow hardener
Appearance	Yellow paste	Blue paste	Blue paste
Viscosity(Pa.s)@100 1/s	20~60	10~30	10~30
Density after curing (g/cm^3)	-	<1.2	<1.2
Ratio(W/W)	100:45		

● Low density after curing

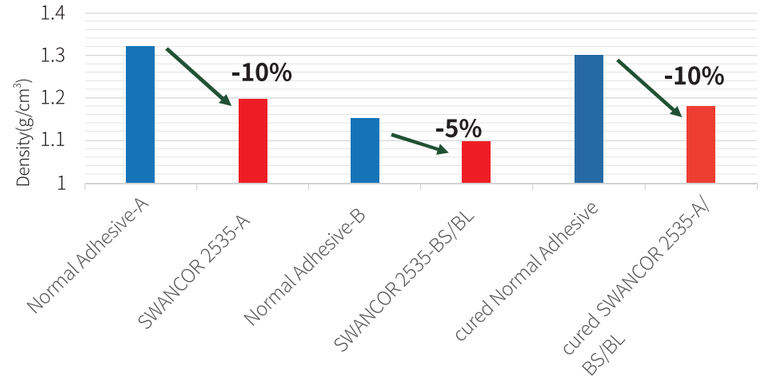


Figure2. Density Comparing

Density after curing for SWANCOR 2535 is below 1.2g/cm^3, which is 10% lower than normal adhesive. (Curing condition: 8hrs@70°C)

● Long exothermal peak time and low peak temperature

Table 2. Pot life of SWANCOR 2535 (100g , 60%RH)

	SWANCOR 2535-A/BS		SWANCOR 2535-A/BL	
Test Temperature（°C）	30	25	30	25
Peak time（mins）	140~160	180~200	170~210	300~400
Peak temperature(°C)	~50	~35	~40	~30

Workable time test

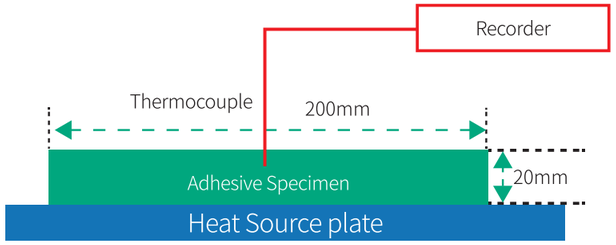


Figure 3. Operation Sketch

Table 3. Gel Time Database

	SWANCOR 2535-A/BS	SWANCOR 2535-A/BL
Method	Heat source: 35°C Temperature：28~32°C	
Peak temperature(°C)	47	44
Peak time（mins）	130	150
Workable time（mins）	~120	~140

SWANCOR 2535 has longer workable time and lower exothermal peak temperature, which match requirements for application on site.

Excellent shear properties

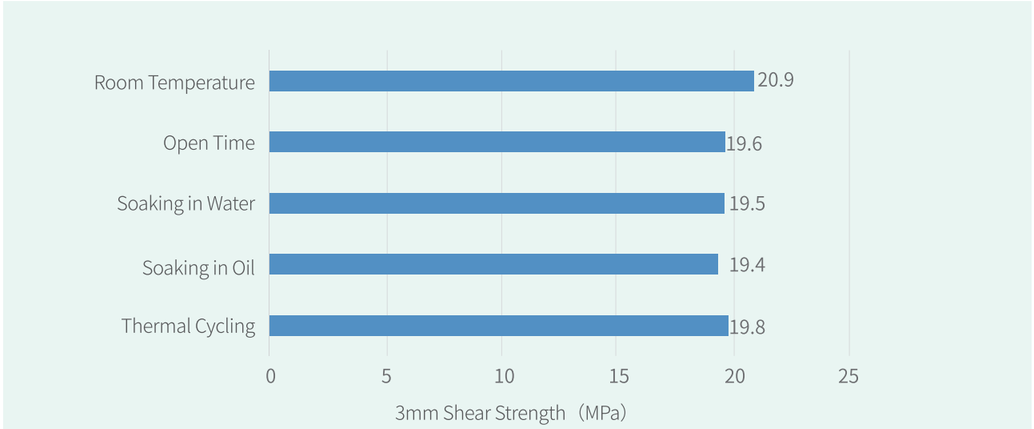


Figure 4. Tensile Lap Shear Strength Under Different Condition

Test method：1 . Open time：28°C、90%RH、90min

2 . Soaking in water/oil：50°C ×240h

3 . Thermal cycling：90°C ~-40°C、45%-99%RH

SWANCOR 2535 could retain 90% shearing strength after soaking in water and oil or thermo cycling.

High toughness (Better elongation)

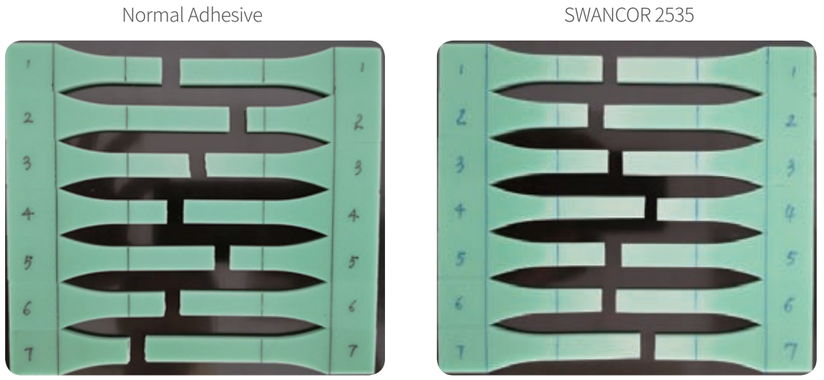


Figure 5. Specimen Comparing for Tensile Test

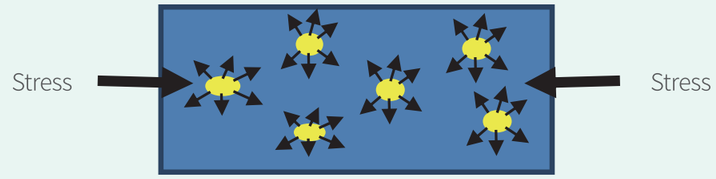


Figure 6. Sea island structure

Normal adhesive has elongation of 2-3%.Plasticizer leads sea island structure in cured SWANCOR 2535. It could disperse stress inside structure and make elongation higher than 7%, which increases 200% compared with normal adhesive.

High toughness (Excellent fatigue resistance)

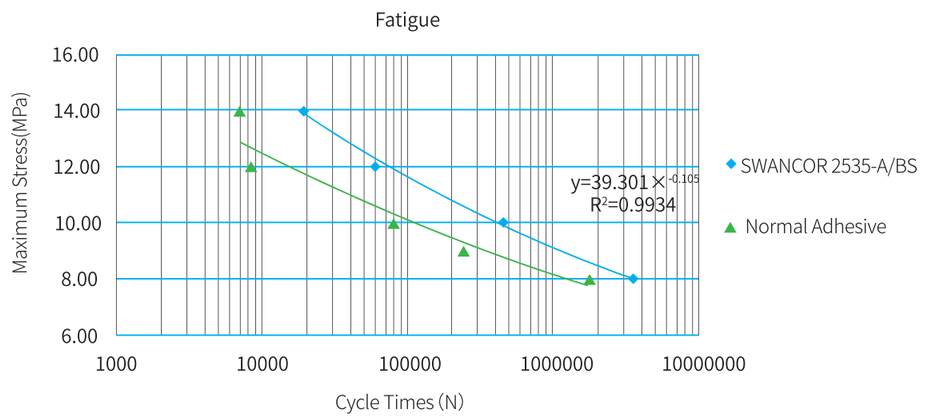


Figure 7. Fatigue Curve

Compared to conventional adhesives, SWANCOR 2535 can withstand more cycles in the same stress range and has better fatigue resistance. This product disperses the stress in the blade and maintains the bond quality, which helps to extend the life of the blade.

● Outstanding anti-sagging

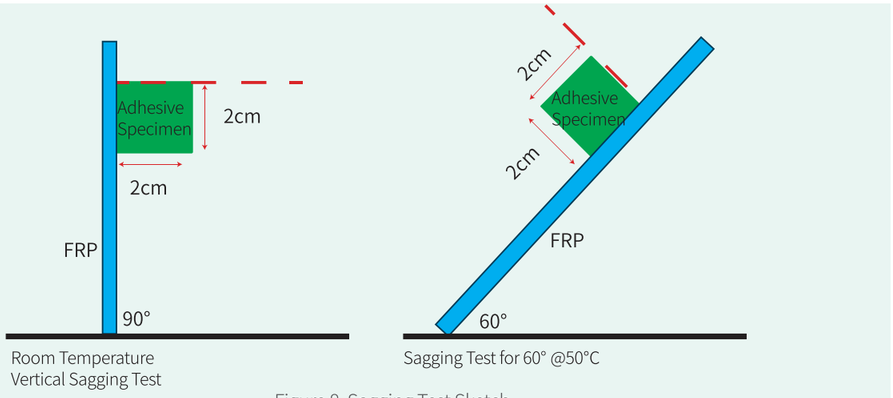


Figure 8. Sagging Test Sketch

Room temperature sagging and high temperature sagging tests show the shift less than 2mm, which meets customer requirement.

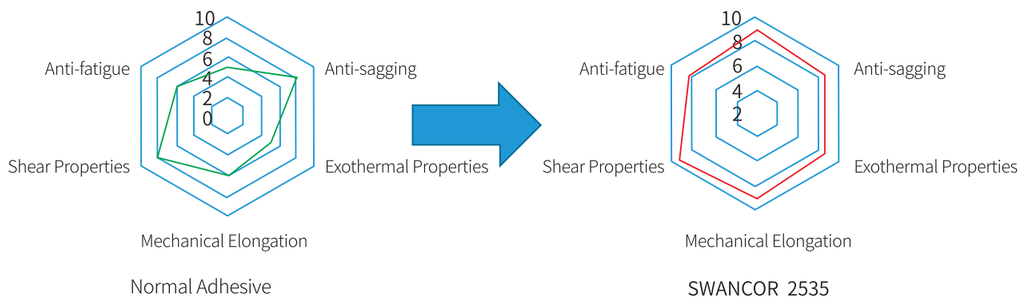


Figure 9. Complex Properties Comparing

3、Conclusion

In conclusion, SWANCOR 2535 has better properties comparing with normal adhesive. It is more suitable for large blades production.

Infusion Resin for Offshore Turbine Blades

Foreword

With the advantage of zero carbon emissions in operation, as well as low pollution in fabrication, the proportion of wind energy has increased significantly. According to the statistics published by Global Wind Energy Council, annually installed wind capacity worldwide in 2018 totaled 51.3GW. The newly added onshore wind capacity in 2018 fell by 3.9% from the prior year to 46.8GW. On the other hand, the newly added offshore wind capacity in 2018 increased slightly by 0.5% from the year 2017 to 4.49GW.Due to the saturation of the development of onshore wind farm worldwide, wind farm developers are gradually shifting their focus from the development of onshore to offshore wind farms.

Different from the development of traditional onshore wind farm, the construction condition and operation condition of offshore wind farm is more complex and requires better quality. Furthermore, the construction cost and operating cost of offshore is much higher than onshore. Therefore, offshore wind turbine is evolving to large capacity generator gradually. Below is the formula of wind turbine generator system generating efficiency.

Wind Power $P_w = \frac{1}{2} \rho A v^3$

Density [kg/m³]
Small changes with elevation & temperature.

Area [m²]
Squared effect of changes in radius.

Velocity [m/s]
Cubic effect of changes in wind speed.

Refer to: http://windpowernejikata.blogspot.com/

According to above formula, it can be seen obviously that the generating capacity of wind turbine is related to air density, swept area and wind speed. The generating capacity is directly proportional to the blade length square. The popular generating capacity is 4.8MW or above in Europe, while the capacity is mainly between 3-4MW in Asia.

With the wind turbine moves towards larger scale, the blade length increases as well. At present, the lengths of mainstream onshore wind turbine blades are between 55-70 meters, and 70-85 meters for offshore wind turbine blades. The requirement of raw materials for large blades is also increasing.

Introduction of SWANCOR 2519-1A/BS

SWANCOR 2519-1A/BS is a new generation epoxy infusion resin, which applies to fabricate offshore large wind blades. It is designed to meet the operating requirements and properties specification of large offshore wind blade.

The feature of SWANCOR 2519-1A/BS are as follows.

1.Low mixed viscosity, easy to infiltrate with glass fiber

SWANCOR 2619-1ABS has lower mixed viscosity than normal infusion resin, its mixed viscosity is lower than 200cps at 25 ° C. Lower viscosity can achieve better performance of impregnation with glass fiber.

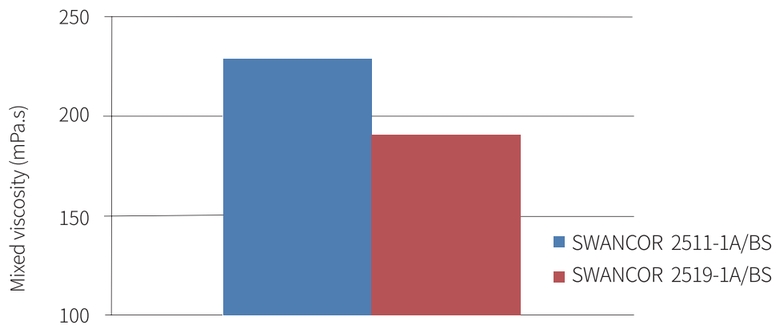


Figure 1. Mixed Viscosity at 25°C

2.Longer viscosity development time which makes it suitable for infusion of large scale blade.

SWANCOR 2519-1A/BS has longer operating time than conventional infusion resin, with an increase around 25%, which can meet the infusion time requirement of large blade.

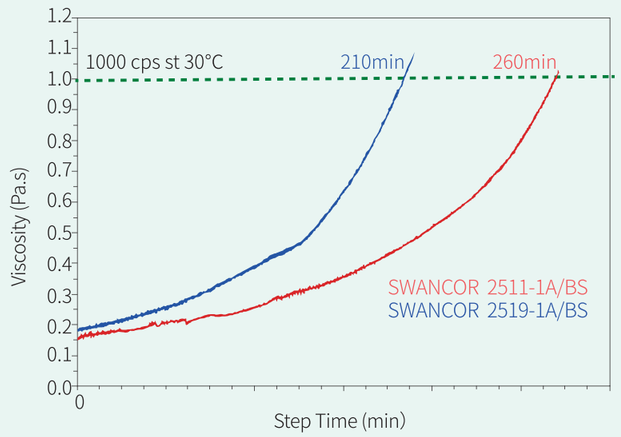


Figure 2. Viscosity Development Curve

3.Faster Tg development characteristics can shorten the lead time of blade effectively.

SWANCOR 2519-1A/BS not only reduces the mixed viscosity and lengthen infusion time, but also has faster Tg development, which can shorten the production cycle time of blades and improve production efficiency.

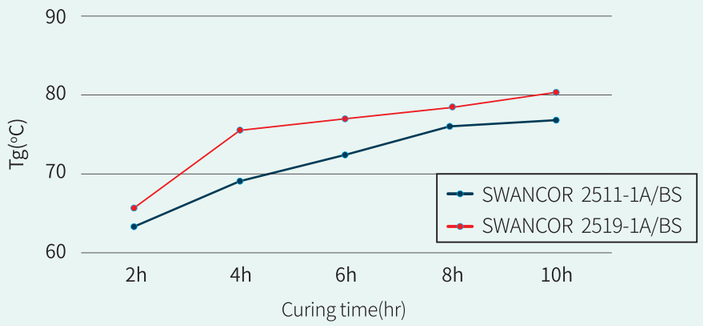


Figure 3. Tg Development Curve at 70°C

Conclusion

SWANCOR 2519-1A/BS is an infusion resin specially designed for offshore large scale blades with the following features.

1.Low mixed viscosity makes it easier to impregnation with glass fiber.

2.Longer viscosity development time which is suitable for infusion of large scale blade.

3.Rapid Tg development characteristics brings higher blade production efficiency.

In addition, SWANCOR 2519-1A/BS has excellent mechanical properties and fatigue properties. SWANCOR 2519-1A/BS was already approved by Siemens Gamesa Renewable Energy to produce 75 meter blades and will be used in Taiwan’s first offshore wind farm HAIYANG.

The photo was provided by Swancor Renewable Energy.