FINE FINISH NEWS VOL -19

What's Inside:

EDITOR'S NOTE

It is a pleasure to bring to you this issue of FINE FINISH NEWS, which is also our first offering of 2018. In this edition, we bring you latest in technology, our new products, trainings available to update competencies of your human resources and to ensure the continuing competence of testing capabilities.

Autoclaves are the workhorse of composite industry to get mandated figure of less than 1% void content. The high cost of autoclave made scientists and engineers to work and develop resin systems and associated low cost processes such as upgraded infusion which can produce composites with less than 1% void content and this led to the birth of out-of-autoclave technology. We at FINE FINISH are tuned to cater to this new process.

The development of maritime applications for composites, necessitates resin and adhesive systems which can withstand continuous exposure to sea water under temperature and pressure fluctuations. Our adhesive system, Epofine-4859/Finehard-4859 foots the bill well.

The fundamental capability of our research activities is largely supported by in-house testing capability, which is probably the best in India. To satiate our urge for new knowledge, we have established two new tests, viz, fracture toughness for plastics & composites and arc resistance for electrical insulation.

To serve plastics and composites testing laboratories, we run proficiency test programmes at periodic intervals. To update our customers' scientists and engineers, we also conduct various training programmes to update their technical and functional skills.

Wish you Happy Reading thorough this edition of FINE FINISH NEWS !!!!!

Dr G S Prabhu

Managing Director

NEW PRODUCTS

Two Component Epoxy Adhesive for Sea Water Application

Epofine 4859/Finehard 4859 is a two-component toughened adhesive system. This is an excellent bonding paste for GRP pipe and it gives good green strength. This cures at room temperature of greater than 5^0C and has multiple applications. This is suitable for wide variety of metals, ceramics and many other substrates such as certain plastics and composites. It has some of the unique advantages and they are highlighted below:

- Simple Mixing Ratio of 100:43 by weight or 100:50 by volume.
- It has a tolerant mixing ratio.
- High strength toughened adhesive system.
- Good performance upto 140^0C.
- Excellent water resistance.
- Very good chemical resistance and electrical insulation.

After curing at 40^0C for 16 hrs, Lap Shear Strength in the range of 23 to 25 N/mm^2 is obtained. This test can be performed in our ISO/IEC 17025:2005 accredited laboratory. The joints improve in Lap Shear Strength when kept at 90^0C even when kept in humid environment.

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Finehard 2753

Finehard 2753 is a cycloaliphatic amine based hardener suitable for cold or warm curing of epoxy resins.

It can be used in various applications and some of them are as follows:

- Pale coloured finishing coatings.
- Formulation of Gel Coats.
- Chemical Resistant Coatings.
- Self Levelling Flooring.
- Carbon Fibre Composites.

It has some special features and they are given below:

- Very low viscosity.
- Good Flexibility.
- Moderate Potlife.
- Moderate Curing Speed.
- Normal Contact pressure for curing.
- Excellent heat resistance even above 150^0C.
- Very good chemical resistance and electrical insulation.

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NEW TESTING FACILITIES

Arc Resistance Tester

The high-voltage, low-current type of **arc resistance** test is intended to simulate only approximately such service conditions as exist in alternating current circuits operating at high voltage, but at currents limited to units and tens of milliamperes between solid electrical insulating materials.

The test is conducted as per test method **ASTM D 495.**

This test method covers, in a preliminary fashion, the differentiation of similar materials' resistance to the action of a high-voltage, low-current arc close to the surface of insulation, when a conducting path is formed causing the material to become conducting due to the localized thermal and chemical decomposition and erosion.

The test method is intended, because of its convenience and the short time required for testing, for preliminary screening of material, for detecting the effects of changes in formulation, and for quality control testing after correlation has been established with other types of simulated service arc tests and field experience.

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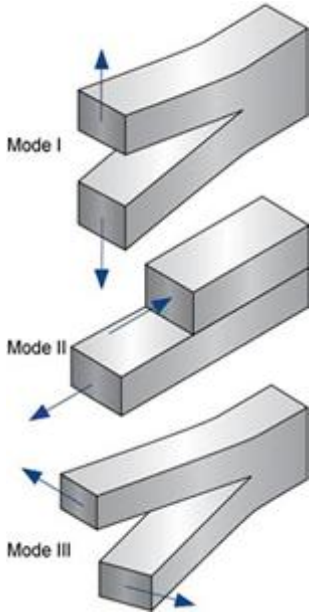
Fracture Toughness Test

Fracture toughness is a property which describes the ability of a material to resist fracture, and is one of the most important properties of any material for many design applications. Fracture toughness is an indication of the amount of stress required to propagate a preexisting flaw. It is a very important material property since the occurrence of flaws is not completely avoidable in the processing, fabrication, or service of a material/component. Flaws may appear as cracks, voids, metallurgical inclusions, weld defects, design discontinuities, or some combination thereof.

A parameter called the stress-intensity factor (K) is used to determine the fracture toughness of most materials. A Roman numeral subscript indicates the mode of fracture and the three modes of fracture are illustrated in the image to the right. Mode I fracture is the condition in which the crack plane is normal to the direction of largest tensile loading. This is the most commonly encountered mode and, therefore, for the remainder of the material we will consider K_I



$$K_I = \sigma\sqrt{\pi a \beta}$$

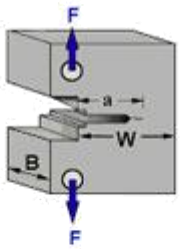
Where :

K_I	is the fracture toughness in $MPa\sqrt{m}$ $(psi\sqrt{in})$
s	is the applied stress in MPa or psi
a	is the crack length in meters or inches
B	is a crack length and component geometry factor that is different for each specimen and is dimensionless.

Plane-Strain Fracture Toughness Testing

When performing a fracture toughness test, the most common test specimen configurations are the single edge notch bend (SENB or three-point bend), and the compact tension (CT) specimens. From the above discussion, it is clear that an accurate determination of the plane-strain fracture toughness requires a specimen whose thickness exceeds some critical thickness (B). Testing has shown that plane-strain conditions generally prevail when:

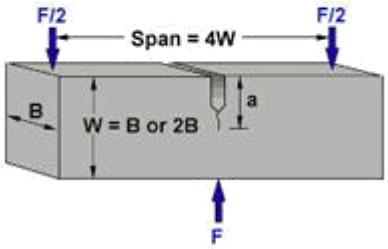
$$B \geq 2.5\left(\frac{K_{IC}}{\sigma_y}\right)^2$$



CT Specimen

Where :

B	is the minimum thickness that produces a condition where plastic strain energy at the crack tip in minimal
K_{IC}	is the fracture toughness of the material
s_y	is the yield stress of material



SENB Specimen

We are currently developing testing capabilities for Fracture toughness of plastics by Compact Tension method in accordance with ASTM D5045.

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TECHNICAL ARTICLE

OUT OF AUTOCLAVE

Autoclave molding technique employs an autoclave to provide heat and pressure to the composite product during curing. This process is mainly used in applications requiring high strength to weight ratio components such as aircraft parts, marine, military, space craft and missiles. However, the disadvantages of the method include limitations on the size of the part because of the size of the autoclave. The autoclave molding technique is also costly because of the rate of production is low and requirement of skilled labour.

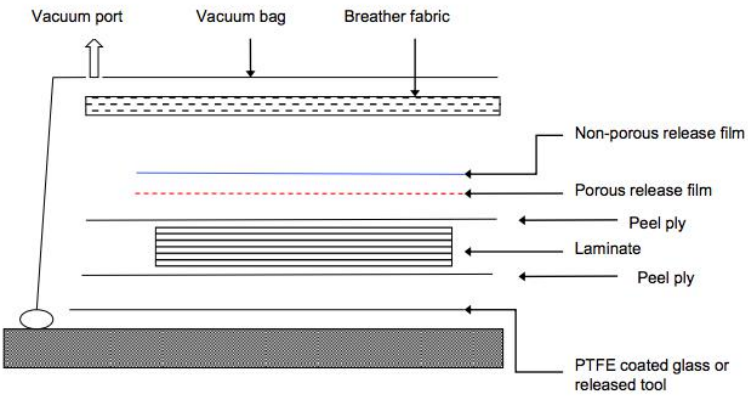
Due to the above limitations of the autoclave molding technique, Out Of Autoclave (OOA) techniques were developed. One of the most widely cited OOA benefits is the potential to reduce high capital and operating costs.

Out of autoclave includes any composite production technology that doesn't use an autoclave. That definition encompasses thermosets and thermoplastics and processes such as resin transfer molding. However, the aerospace industry prefers a narrower definition, that is OOA is only thermoset prepreg under vacuum bag only (VBO) curing.

Contrary to the early autoclave prepreg systems, OOA prepregs directly have the right amount of resin; they are ''no-bleed systems''.

Other advantages of OOA technologies are the potential for a higher degree of part integration: for example, the co-molding of skin, stiffeners and spars in the same operation, which leads to an overall reduction in the total process cycle, with increased production rates.

Fine Finish has a wide range of prepreg systems from epoxy resins to cyanate esters for high temperature applications.



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PROFICIENCY TESTING

ONGOING PT PROGRAMS

Sr. No.	PT Scheme No.	PT Item	Month / Year
1	FFOPL-PT-020 (i, ii, iii, iv)	Tensile, Ultimate tensile strength, yield strength and % elongation of metal	January 18
2	FFOPL-PT-021	Chemical testing of metal by Spectrometry	January 18
3	FFOPL-PT-008 (v)	Compression set of rubber	January 18
4	FFOPL-PT-012 (i)	Oxidation induction time	February 18
5	FFOPL-PT-006 (iv)	Short beam strength	February 18
6	FFOPL-PT-001 (xi)	Charpy Impact	February 18
7	FFOPL-PT-009 (i)	Shore D hardness	March 18
8	FFOPL-PT-008 (iii)	Shore A hardness	March 18
9	FFOPL-PT-001(xviii)	Ash content of plastic	April 18
10	FFOPL-PT-008(ix)	Carbon black percent	April 18
11	FFOPL-PT-024	Coal PT	May 18

For more details, please contact on 02265012228 / 27412923 or on *proficiency.testing@finefinish.net/qm-pt.rmp@finefinish.net /kishore.prabhu@finefinish.net*

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TRAINING & CONSULTANCY

Fine Finish Training School has conducted training programs on-

- ✓ Laboratory Management System and Internal Audit ISO/IEC-17025:2005/2017
- ✓ Uncertainty of Measurement
- ✓ Method Validation
- ✓ General requirements for Proficiency Testing ISO/IEC 17043:2010

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FORTHCOMING TRAINING PROGRAMS

Sr. No.	Course Code	Days	Title of Course	Date	Venue	Non Residential	Residential
1	FFOPL/LMTS/ 10/17-18	Two	Measurement of Uncertainty	Jan 29 to Jan 30, 2018	Fine Finish Training School	₹. 10,000/-	₹. 13,500/-
2	FFOPL/LMTS/ 11/17-18	Four	Laboratory Management System and Internal Audit as per ISO/IEC 17025:2005 & Proposed changes to ISO/IEC 17025:2017	Feb 5 to Feb 8, 2018	Fine Finish Training School	₹. 14,000/-	₹. 21,200/-
3	FFOPL/LMTS/ 12/17-18	One	Method Validation	Feb 26, 2018	Fine Finish Training School	₹. 9,200/-	-
4	FFOPL/LMTS/ 13/17-18	Four	General requirements for Proficiency Testing as per ISO/IEC 17043:2010	March 12 to March 15, 2018	Fine Finish Training School	₹. 14,000/-	₹. 21,200/-
5	FFOPL/LMTS/ 14/17-18	One	Electrical Insulation	March 30, 2018	Fine Finish Training School	₹. 9,200/-	-

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DSIR Recognized R&D Centre	Plot No.29, New Chemical Zone, M.I.D.C., Taloja-410 208, Navi Mumbai, Maharashtra, India.	+91 22-2741 1329	karishma.prabhu@finefinish.net
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