Bharath
INSTITUTE OF HIGHER EDUCATION AND RESEARCH
(Declared as Deemed-to-be University under section 3 of UGC Act, 1956)
(Vide Notification No. F.9-5/2000 - U.3, Ministry of Human Resource Development, Govt. of India, dated 4th July 2002)
Accredited by NAAC
NATIONAL ASSESSMENT AND ACCREDITATION COUNCIL
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173, Agaram Road, Selaiyur, Tambaram,
Chennai - 600 073. Tamil Nadu.

Ref No.SMS-2018-O-10

Date: 17/04/2019

TO

Mr. Saravana Kumar,

Asst. Professor/Mechanical,

BIHER.

BHARATH INSTITUTE OF HIGHER EDUCATION & RESEARCH
(Declared as Deemed to be University U/S 3 of UGC Act.1956)
17 APR 2019
OFFICE OF THE DEAN-RESEARCH
Selaiyur, Chennai-600 073. INDIA

Thro: Concern Head of the Department

Greetings!!!

We are happy to announce that the Research Advisory Committee has approved your proposal for Seed Money Scheme-2018 which was presented by you. You are requested to complete the proposal and send the progress report to the Dean Research in the prescribed time period.

Title of the Project: Qualitative Analysis of Composite materials through NDT testing

Seed Money Amount: Rs.1, 00,000/- (Rupees One Lakh Only)

Approved on: 17/04/2019

Payment details:

Voucher No.10 **Dated: 19/04/2019**

With Regards

Dean-Research

Bharath University

SELAIYUR, CHENNAI - 600 073, TAMIL NADU, INDIA.

CASH / PAYMENT VOUCHER

Date 19/04/18

V.No. 10

Debit _____ Amount

Rs. 1,00,000/-

PAID TO Mr. Saravana Kumar

RUPEES one lakh only

TOWARDS Seed Money scheme - 2018

Authorised by **Finance Manager** **Cashier/Accountant** **Payee's Signature**

PROPOSAL SUBMISSION

1. Details of principal Investigator

Name	: Mr. A. Saravana Kumar
Designation	: Assistant Professor
Highest Qualifications	: M.E
Department	: Mechanical Engineering
E-mail	:askumarwins@gmail.com
Contact no	: 7200715181
Date of Joining	: 11-02-2016

2. Details of Co- principal Investigator

Name	: Dr. R. Venkatesh Babu
Designation	: Professor
Highest Qualifications	: Ph.D
Department	: Mechanical Engineering
E-mail	: rvbaboo76@gmail.com
Contact no	: 9962598499
Date of Joining	: 05-Dec-1997

Technical details

1. Introduction:

Composite materials/structures advance product reliability, efficiency and higher basic properties (strength and modulus). Their use of load-bearing systems in ships, wind turbines, shipping, medical devices and so forth is becoming highly challenging. Composite materials production is a multivariable task requiring multiple processes where many forms of defects inside a composite component can exist, which poses major safety issues in operation. Structural integrity identification and assessment are complicated since composites are typically non-homogeneous and anisotropic. Deficiencies and losses can occur at different levels at many locations, making it impossible to trace all damage sites that can contribute to complex injury mechanisms. Besides, the accumulation of damage within a composite is directly connected to the component's true strength, rigidity and resilience. Robust and secure composite NDT (non-destructive testing) is also vital to reducing safety issues and repair costs to reduce process interruption and downtime opportunities. Both technical and industrial engineers are involved in these aspects. In terms of product performance, cost-efficient-efficiency, and the production of superior basic properties, composite materials/structures are progressing. Applications to aerospace, wind turbines, shipping, medical equipment and so forth are rising demands. Robust, reliable and non-destructive composite testing is also necessary to minimize safety risks and repair costs. Many non-destructive monitoring approaches have been based on various quality assurance standards during the life cycle of a composite component.

Robust and durable composite structures and structural non-destructive testing (NDT) are crucial to reducing safety issues and repair costs. Several techniques for acoustic emission, optical processes, ultrasonic waves, thermography or terahertz, have to date been utilized in NDT. There are variations of methods to test materials or parts, and non-destructive methods are important for many applications. The field of Non-Destructive Assessment (NDE) or Non-Destructive Testing (NDT) qualitative research includes the detection and characterization of damages on the surface and interior of materials without breaking away or otherwise modifying the material. In other terms, NDT refers to the assessment and testing process of products or parts for characterization or identifying faults and weaknesses in comparison with any criteria without changing the initial characteristics or damaging the product being evaluated. NDT procedures offer a cost-efficient way of inspecting a sample for individual investigation or can be applied to the entire material for checking in a manufacturing quality management system.

The study of composite materials has a broad array of NDT techniques. Composite NDT can be used in the manufacturing, production of pipes and pipes, storage containers, aerospace military and defense,

characterization of nuclear industries and composite defects and various compound NDT techniques, including ultrasonic testing, thermo graphic testing, infrasound testing, X-ray testing, visual testing, etc. composite NDT.

2. Review of status of Research and Development in the subject

- Non-destructive testing and evaluation of composite materials/structures: A state-of-the-art review

  Bing Wang, Shuncong Zhong, Tung-Lik Lee, Kevin S Fancey, Jiawei Mi,

  Visual Testing (VT) – (VI - Visual Inspection) can be the most basic NDT form used in many situations. This will save time and resources by eliminating other assessments or eliminating the need for different testing forms. The greatest benefit of visual inspection is its swift operation. The other value of visual inspection is the relative cost-effectiveness of the operation. No equipment is required for visual inspecting, but the intrinsic downside is to this method. Compare to VT and UT technique, UT route is more accuracy compare to all other routes.

- Applications of Frequency Modulated Thermal Wave Imaging For Non□destructive Characterization, Kollam, Kerala, 2008

  R.Mulaveesalaa, & S.Tuli

  Checking thermography (TG) is also known as thermal images. The thermographic inspection of thin parts can affect a material's thermal conductivity by the presence of defects. When defects pass below a part surface, they appear to create less heat fluctuation than deficiencies that can be seen closer to the part's surface. Deficiencies with a diameter less than their depth in the component cannot, commonly speaking, be found by this examination. The thermal radiation changes in the region due to a fault, such as delamination or impact effect. This method of inspection has both benefits and drawbacks. A bonus is that a large surface of a component may be inspected. The second gain is the fact that it does not have to pair, unlike many other inspections. This makes it easier to test pieces where only one side of the component can be examined. The drawbacks to such an inspection include the need for sensitive and costly equipment, the need for highly qualified inspectors to operate the system, and the lack of clarity of defects if they slip too far below the object's surface. Infrared Thermography Experiments (IRT) are based on thermal radiation recording produced by an infrared camera by a specimen's surface. Compare to TG and UT technique, UT route is more accuracy compare to all other routes.

- Eddy Current Non-destructive Testing for Carbon Fiber- Reinforced Composites. Journal of Pressure Vessel Technology, 135(4), 041501-041501. Koyama, K., Hoshikawa, H., & Kojima, G. (2013)

Machinery and magnetism are used to identify and analyze cracks, defects, degradation or other material conditions by electromagnetic research methods (ET). ET causes electrical, magnetic or both currents in an object of test and observes the electromagnetic susceptibility. Electromagnetic (EM) approaches include Eddy Current Evaluation (CE), Remote Field Checking (RFT), Magnetic Flux Leakage (MFL) (ACFM). The underlying physics is fundamentally different in each such technique as those defined by various partial differential equations (PDEs). Compare to ET and UT technique, UT route is more accuracy compare to all other routes.

- Ultrasonic guided waves in solid media. Cambridge, Cambridge University Press, 2014 J.L.Rose

The Ultrasonic Research system involves a circuit, transducer system, and display systems for transmitters and recipients. Based on the signal's data, it is possible to obtain break position, fault duration, orientation and other characteristics. Ultrasonic research has benefits, including scanning speed, good resolution and defect detection capabilities, and field uses flexibility. The drawbacks include setup problems, the need to scan a component correctly, and a reference sample to ensure correct results. This test method can be used in a mounting line that must consistently test the same component configuration. In various implementations, there are two ultrasonic NDT methods widely used: pulse-echo and transmittal. To detect internal faults in the material, these methods use high-frequency waves in order from 1-50 MHz. Ultrasound experiments in three modes, propagation, projection and spreading backward. All use several transducers, cables and frequencies.

2.1 International Status: NIL

2.2 National Status: NIL

3. Progress/achievement so far,

a) Reference papers was collected.

b) Literature survey was studied.

c) Proposal work has been started in the AA7075 alloy based composite materials are analysed through qualitative techniques

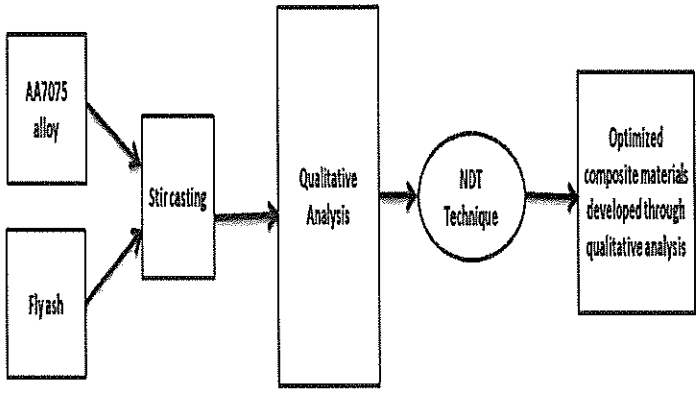
4. Work Plan:

4.1 Methodology:

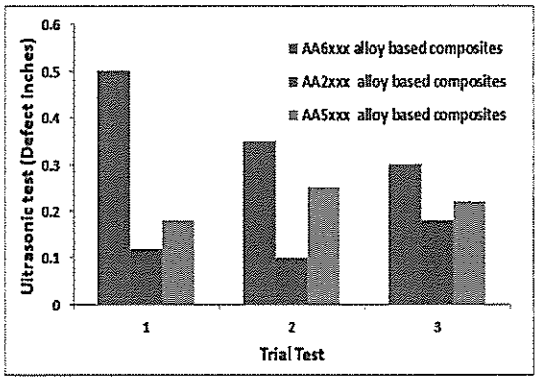
The main objectives of the qualitative analysis of AA7075/fly ash composites are as follows,

- To exact the ash from waste materials and to prepare the particles form of powder.
- To fabricate the AA7075/fly ash (5%, 10% and 15%) composites through the stir casting method.
- To examine the qualitative analysis of AA7075/fly ash composites through NDT testing.
- To analysis the performances of composites through a novel non-destructive ultrasonic testing method
- To identify the qualitative analysis based optimized materials for industrial applications.

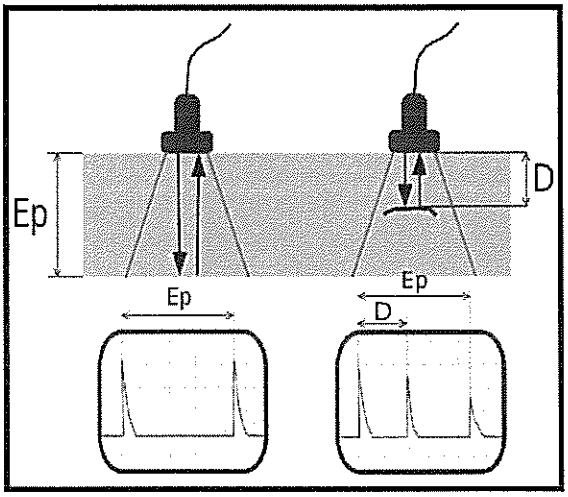
Block Diagram



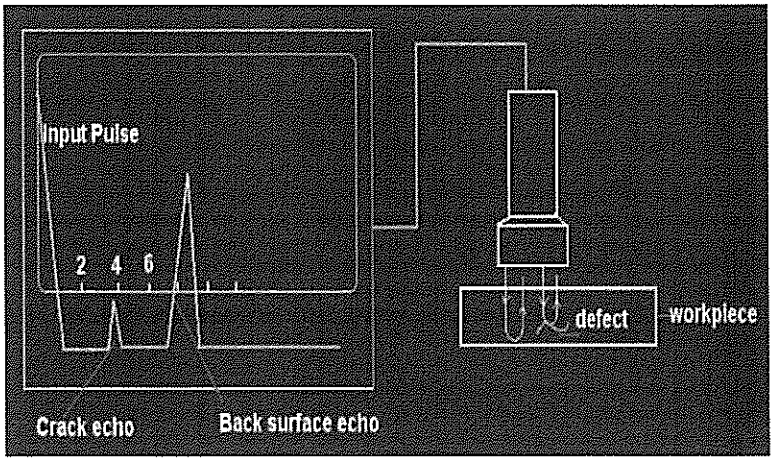
Optimized composite materials developed through qualitative analysis



Ultrasonic test (Examine the Defects)



Ultrasonic process

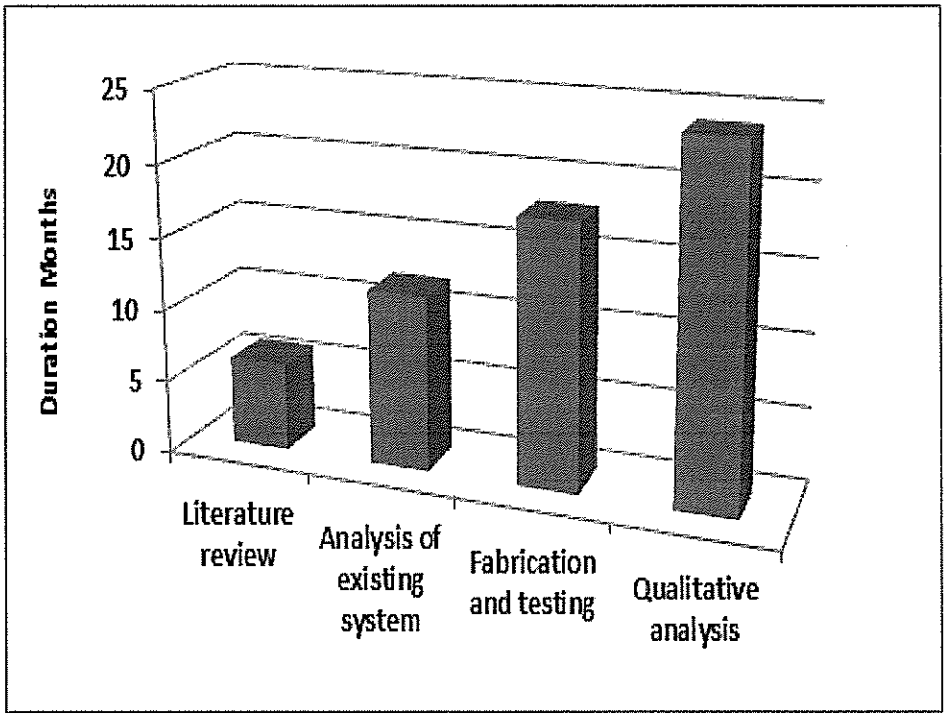


Identifying the defects through Ultrasonic process

4.2 Time Schedule of activities giving milestones through Bar diagram.

Work plan (including detailed methodology and time schedule)

Sl. No	Activity/Milestone	1st Year		2nd Year	
1	Literature review	**1-6**			
2	Analysis of existing system		**7-12**		
3	Fabrication and testing			**13-18**	
4	Qualitative analysis				**19-24**



4.3 Expected outcome within the time period of Seed Money Scheme

a) Prototype Hardware design can be implemented within the time period of Seed money Scheme.

b) For a real time qualitative analysis field work can be done within the time period of Seed money Scheme.

5. Suggested Plan of action stating the name of funding agency where the project will be communicated for financial support within the time period of project.

Nil

6. Bibliography: Nil

7. List of Projects submitted/implemented by the Investigators (Separate for Pi and Co-PI) : Nil

7.1 Details of Projects submitted to various funding agencies:

Sl. No	Title	Cost in lakhs	Month of submission	Role as PI/ Co-PI	Agency	Status
	NA	NA	NA	NA	NA	NA

7.2 Details of Projects under implementation

Sl. No	Title	Cost in lakhs	Duration	Role as PI/ Co-PI	Agency
	NA	NA	NA	NA	NA

7.3 Details of Projects completed during the last 5 years

Sl. No	Title	Cost in lakhs	Duration	Role as PI/ Co-PI	Agency
	NA	NA	NA	NA	NA

8. List of publications published by the Investigators, if any:

a) Co - Principal Investigator

S.No	Author names	Title of paper	Name of Journal	Vol (issue)	Page no.	Year
1.	Dr.K.P.Ashok, Dr.R. Venkatesh Babu,	A study of heat transfer in porous media on a stretching sheet	International Journal of Mechanical Engineering and Technology	Volume 9, No. 8 (2018)	241-246	2018
2.	Dr.K.P.Ashok, Dr.R. Venkatesh Babu,	Knowledge structure of computational mechanics: Heat mass transfer	International Journal of Mechanical Engineering and Technology	Volume 9, No. 8 (2018)	247-252	2018
3.	Dr.K.P.Ashok, Dr.R. Venkatesh Babu, Dr.V.Balambica	A review of heat transfer in compression ignition engine by applying various injection pressure	International Journal of Mechanical Engineering and Technology	Volume 9, No. 11 (2018)	604-607	2018
4.	Dr.K.P.Ashok, Dr.R. Venkatesh Babu, Dr.V.Balambica	A study on diesel engine performance depends on BP and BSFC by applying different injection pressure	International Journal of Mechanical Engineering and Technology	Volume 9, No. 11 (2018)	599-603	2018
5.	G.Balakrishnan, D. Sastikumar, P. Kuppusami, Dr.R. Venkatesh Babu Dr.J.I.Song	Microstructural and mechanical properties of Al2O3/ZrO2 nanomultilayer thin films prepared by pulsed laser deposition	International Journal of Mechanical Engineering and Technology	Volume 124, No. 2 (2018)	158	2018

6.	Dr. G.Balakrishnana Dr.R. Venkatesh Babu Dr.K.S.Shinc Dr.J.I.Song	Growth of highly oriented γ- and α-Al2O3 thin films by pulsed laser deposition	Optics & Laser Technology	Volume 56, (2014)	317-321	2014

9. Budget

SI.No	Equipments	Quantity	Amount in INR
1	Ultrasonic testing setup	1	65,000
2	Consumables (Like Aluminum alloy, Furnace, Die)	As per requirement	20,000
3	Travel support for the purpose of research work	-----	5000
4	Contingency	-----	5000
5	Others	-----	5000
	Total		1,00,000

10. Name of at least two subject experts from the Institute and one from the outside Institute with their contact details:

a) Dr.S.Prakash – Associate Professor, Department of Mechanical Engineering, AVIT Kancheepuram, Chennai – 603 104.

b) Dr.C.M.Meenakshi – Associate Professor, Department of Mechanical Engineering, BIHER, Chennai - 600073.

CERTIFICATE FROM THE INVESTIGATOR

Project Title – Qualitative Analysis of Composite materials through NDT testing

It is certified that

1. I do hereby agree to submit a complete proposal for financial support to the external funding agency within the time period of SMS-2018.
2. I undertake that spare time on equipment procured in the project will be made available to other users.
3. I agree to submit a certificate from institutional Biosafety Committee, if the project involves the utilization of genetically engineered organisms. I also declare that while conducting experiments, the Biosafety Guidelines of Department of Mechanical Engineering, GOI would be followed in to.
4. I agree to submit ethical clearance certificate from the concerned ethical committee, if the project involves field trials/ experiments/exchanges of specimens, human & animal materials etc.
5. I agree to abide by the terms and conditions of SMS-2018, BIHER, and Chennai.

Name and signature of
Principal investigator

Name and signature of
Co-Principal Investigator

Date: 20/03/2019
Place: Chennai – 73

Forwarded by Head of the Department

Signature of the Head

PROJECT EVALUATION FORMAT

Name of the Principal investigator	Mr. A. Saravana Kumar
Name of the Co-Principal investigator	Dr. R. Venkatesh Babu
Name of the Department	Mechanical Engineering
Recommendation of the evaluation committee	Yes / Recommended
Financial allocation recommended	Rs. 1,00,000/- (One lakh only)

SI. No	Equipments	Quantity	Amount in INR
1	Ultrasonic testing setup	1	65,000
2	Consumables (Like Aluminum alloy, Furnace, Die)	As per requirement	20,000
3	Travel support for the purpose of research work	----	5000
4	Contingency	----	5000
5	Others	----	5000
	Total		1,00,000

Name and Signature of the Research Advisory Committee members with date

(Dr. P. Naveenchandran)