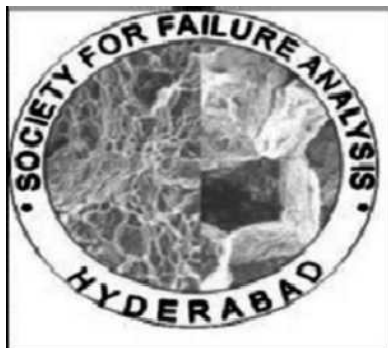




SFA Newsletter

Seasons Greetings!

[About SFA](#)

[Objectives](#)

[Local centers](#)

Welcome you all to join as members of SFA! Please find the membership form inside; kindly fill in and contact Secretary of SFA through email.

Experts and experiences:

- V.N.Satish Kumar, Swati Biswas and Jivan Kumar, GTRE, Bengaluru



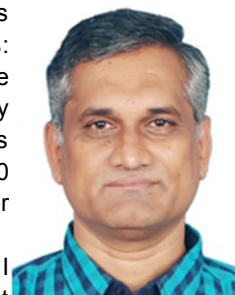
Message from our President

Dear readers, Warm season's greetings! As the Year 2018 comes to an end I am happy to find the 19th issue of SFA newsletter rolling out coinciding with New Year 2019! We celebrate another year beginning. Let us look back and appreciate the knowledge we gained and the experiences we had and learn from the mistakes we made. As you begin to live a more positive life, it simply makes sense that you take a look at your dreams and goals to see if you are living in a way that will best allow you to accomplish them.

SFA which made its beginning in 2008, is completing a decade of existence. Its contributions in spreading knowledge and concerns on failure analysis to academia, industries and Government establishments in various forums are well appreciated by many. The recent success story of SFA is: organizing the international conference, ICONS 2018 which is 2nd in the series. The efforts, guidance and vision of the past presidents of our Society are aimed at making SFA into a leading professional body. With the efforts of ten registered local Chapters, the society has grown currently to 1000 plus members, and is continuing to inspire and serve as a common forum for individuals, institutions, organisations and industries.

While I extend hearty New Year Wishes to You and your near & dear ones, I also pray to Almighty for your Prosperity, Peace and Happiness, I recollect the quotation of Francis Bacon, "For better it is to make a beginning of that which may lead to something, than to engage in a perpetual struggle and pursuit in courses which have no exit". I congratulate all authors for their contributions and news on various events.

Best wishes to all the readers!



Dr. B P C Rao
President, SFA

B P C Rao

From the Desk of Editors

Dear readers:

Happy New year 2019!

You are glancing through the 19th issue of the Newsletter of Society for Failure Analysis (SFA). Our Society has completed a decade of existence. Thanks to the efforts of many chapters.

The activities are progressing well during the past few months, with the conduct of the flagship inter-quadrennial ICONS 2018 by SFA, Chennai.

The successful conduct of one-day workshops at SRM University, Chennai and VIT, Vellore is worth mentioning.

We solicited articles for the current issue from failure analysis experts of our country who had worked on many case histories.

We thank the authors from GTRE, Bengaluru who made a brief technical contribution which is an interesting case study. We take this opportunity to appeal to the Indian industry to use SFA as a forum to share their experiences on trouble shooting. A great way to add content to this newsletter is to include a calendar of upcoming events. The details of important forthcoming international and national events are included; so also the books recently published on the topics of

the subject.

We value your comments, which really boost our enthusiasm to perform better. Therefore, as always, your views and comments, mailed to swati@gtre.drdo.in or param@igcar.gov.in are welcome. We wish you all free from failures and a joyful life!

You may visit our web site for your comments/suggestions or any queries : www.sfaindia.org

(P .Parameswaran
& Swati Biswas)

Editors

31-12-2018



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Editors of Newsletter:

Dr.P.Parameswaran, IGCAR
 Ms.Swati Biswas, GTRE

Aims and Objectives of Society for Failure Analysis

The aims and objectives of the Society shall be:

To serve as National Society to promote, encourage and develop the growth of "Art and Science of Failure Analysis" and to stimulate interest in compilation of a database, for effective identification of root causes of failures and their prevention thereof.

To serve as a common forum for individuals, institutions, organizations and Industries interested in the above.

To disseminate information concerning developments both in India and abroad in the related fields.

To organize lectures, discussions, conferences, seminars, colloquia, courses related to failure analysis and to provide a valuable feed back on failure analysis covering design, materials, maintenance and manufacturing deficiencies / limitations.

To train personnel in investigation on failures of engineering components and their mitigation.

To identify and recommend areas for research and development work in the Country relating to failure analysis.

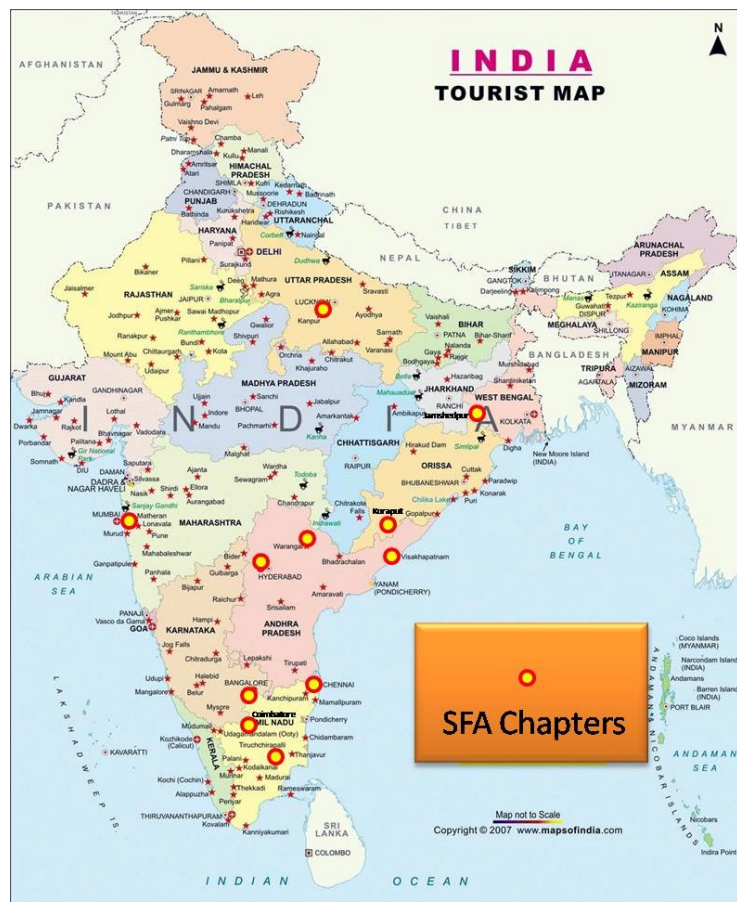
To establish liaison with Government, individuals, institutions and commercial bodies on failure analysis, methodologies and to advise on request.

To cooperate with other professional bodies having similar objectives.

To affiliate itself to appropriate international organization(s), for the promotion of common objectives and to represent them in India.

To organize regional chapters in different parts of the country as and when the need arises.

To do all such other acts as the Society may think necessary, incidental or conducive to the attainment of the aims and objectives of the Society.





Workshop on Failure Analysis of Materials for Engineering Applications held at SRM University, Chennai on 1st Sept 2018

One Day “Workshop on Failure Analysis of Materials for Engineering Applications” was organized by the Department of Physics in association with the Society for Failure Analysis-Chennai Chapter, on 1st September 2018 at Hi Tech Hall-1, TRP Auditorium, SRM University, Ramapuram campus. About 70 participants comprising of faculties, research scholars, engineering students attended the workshop and were enlightened on the topic of importance of failure analysis of materials. Welcoming the gathering, Dr.L.Sudha, Professor and Head, Department of Physics, SRM Institute of Technology, Ramapuram Campus, Chennai briefly mentioned on the importance of understanding the materials in details recalling the classical failures due to ductile to brittle transitions in steel ships during world war II. Following this, Dr.P.Parameswaran, Vice chairman of SFA, Chennai chapter, Scientist-G & Head, XRD and Surface Engineering, Metallurgy and Materials Group, IGCAR, Kalpakkam explained the importance of the workshop to the audience. The Chief Guest of the function, Dr. C.K.Mukhopadhyay, Head, Non-destructive Evaluation Division, IGCAR, Kalpakkam inaugurated the workshop, and gave Keynote address. Dr.V.Subbiah Bharathi, Dean (E&T)

gave his presidential address and enlightened the gathering about the importance of innovation and relevance which are key factors in avoiding failures.

The first technical session was on the topic “Microstructural Integrity in Understanding Early Failures in Engineering Materials” by *Dr. P. Parameswaran* Scientist-G & Head, IGCAR, Kalpakkam.

The second technical session was on the topic “Fatigue, Fracture and other Mechanical Damage Mechanisms in Understanding Early Failures of Engineering Materials”, by Dr.V. Karthik*, Scientific officer - G, Metallurgy and Materials Group, IGCAR, Kalpakkam.

The third technical session was on the topic “Non-Destructive Evaluation and Early Detection of Materials Failures”, by Dr. C.K. Mukhopadhyay, Head, Non-Destructive Evaluation Division, IGCAR, Kalpakkam.

The fourth and final technical session was on the topic “Case Studies of Engineering Materials Failures”, by Dr. G. D. Janaki Ram, Professor, Metallurgical and Materials Engineering, IIT Madras, Chennai.

The event concluded with a valedictory function with feedback from delegates and distribution of certificates to all the participants



Dignitaries, Dr Mukhopadhyay, Dr.Subbiah Bharathi, Dr.V.Karthik, Dr.P.Parameswaran and Dr.L.Sudha lighting the lamp during Inaugural function of the workshop.

Group photo of the participants of the workshop.





One day workshop conducted by Society for Failure Analysis (SFA), Tiruchirappalli chapter on 17th March 2018

One day workshop was organised by SFA Tiruchirappalli Chapter on "Materials' Performance in Complex Service Environments" on 17th March 2018, the venue being the Institution of Engineers(India) Building, BHEL,Tiruchirappalli.

In the inaugural function, Dr.Raman Sankaranarayanan, Vice Chairman of SFA Tiruchy Chapter and Professor, Dept of MME, NIT, Tiruchy welcomed the chief guest, the faculties and the participants. He talked about the technical knowledge gained by the students and industrial participants from such workshops through interaction and knowledge sharing.

This was followed by the address of Dr P.Parameswaran, Head, XRDSSES, PMD, IGCAR, Kalpakkam and All India Council member, SFA who briefed about the origin of SFA and its activities spread over various Chapters. He also brought out the details of the one day workshop which would have an impact on the delegates gathered from industries as well as the students of engineering. He observed that the awareness of materials' performance in complex service environments is essential to all engineers who are involved in materials' selection, manufacture and service. He further highlighted the need to know the root cause analysis of failure in industrial components in minimising the failures and extending the performance life of components.

Dr R.Vaideeswaran, Chairman, SFA Tiruchirappalli Chapter and former Sr.Manager, BHEL, Tiruchirappalli in his presidential address highlighted SFA activities of Tiruchirappalli and its contributions to engineering colleges and industries in the past three years. He stressed the role of this society and its interactions with multifarious sectors of the industries. Then the chief guest Dr. T.A.Daniel Sahayaraj, Deputy Director of Boilers, BHEL, Tiruchi &

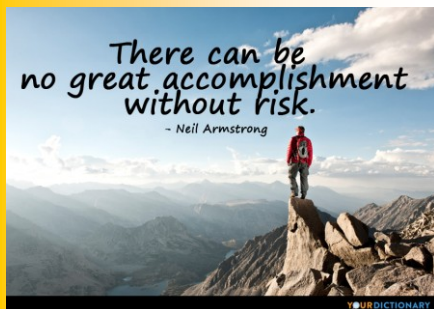
Thirumaiyam,Tiruchirappalli spoke on the various improvements in boiler industry by way of improved design and materials' choice based on their past performance and quoted some cases of performance failures. Dr.K.Santhy, joint, secretary proposed vote of thanks.

The morning session was about materials' characterisation. It began with a lecture by Dr.P.Chakravarthy, Dept of Aerospace Engineering, Indian Institute of Space Science and technology, Trivandrum who spoke about the use of light weight aerospace materials and their performance in various service environments and cited a few case studies in flights and war planes.

Dr.K.Santhy, faculty of materials science and engineering, CARE College of institutions, Tiruchy brought about the various tools for materials characterisation used in failure analysis with special emphasis on micro examination and metallographic structures.

Sri.S.S.Ananthan, Consultant and Ex DGM, BHEL, Tiruchy detailed the salient features of NDT techniques in finding out the structural integrity of components and its role in failure analysis. He further covered the importance of right choice of NDT in assessing the performance of components in severe service environments.

During post-lunch session, Dr.S.M.Ganesan, Sr.Scientist, Corrosion and Material Protection Division, CECRI, outlined the life assessment of aged sub- sea pipelines. He described the internal and external control monitoring of oil pipelines using remotely operated and automated unmanned vehicles, LINKPIPE tool and CRACKWISE automated procedures. Dr.P.Parameswaran, Scientist G, IGCAR, Metallurgy and Materials Group, Kalpakkam talked about the





materials performance in complex service environments in nuclear reactors particularly in the event of sodium-water reactions and the role of microstructural examination and metallography in finding out the root cause of those failures. Dr.R.Vaideeswaran, Consultant and Sr.Manager (Rtd), BHEL, Tiruchy dealt with the importance of design and process parameters in high temperature and high pressure boiler components in minimising failures. touching upon a series of case studies related to fabrication and welding. He outlined the metallurgical problems encountered in Stainless steel, Duplex SS and super Duplex SS castings when they were employed in oil fields like temper embrittlement, loss of subzero toughness, and the importance of PREN and CPT for meeting corrosion

resistance..

The programme was attended by nearly 35 participants drawn from various engineering colleges and industries in and around Tiruchirappalli. Participation certificates were given to all the delegates who during the feedback session requested SFA Tiruchi to organise a workshop wherein hands on training or exposure to examination using metallography over two or three days in future. In general, the workshop was well received by the participants who wanted to have more such workshops and appreciated the efforts of SFA, Tiruchirappalli chapter towards enriching the participants by way of knowledge sharing and value addition. Vote of thanks was proposed by Dr.K.Santhy, Joint Secretary, SFA, Tiruchirappalli Chapter.



Above: Address by Dr .Vaideeswaran, formerly of BHEL, Trichy and Chairman, SFA, Trichy Chapter; seated from L to R: Prof. S.Raman, Dr.P.Parameswaran, Dr.T.A.Sahayaraj and Dr.K. Santhy

Below: Group photo of participants





One day workshop on Engineering Failure Analysis by SFA, Chennai at VIT, Vellore on 28th Oct. 2018

SFA, Chennai Chapter organised a one day workshop on Engineering failure Analysis on 28th oct, 2018 at VIT, Vellore campus. Thanks to the efforts put up by the host, school of mechanical engineering, VIT, Vellore. The event began with a brief inauguration where in Prof. K.Padmanabhan welcomed the gathering and spoke on the importance of the subject and the opportunity created by the event in bringing experts and young students of mechanical engineering together. He appealed to the students to interact with the experts and informed that a quiz would follow after all the lectures were delivered.

The first speaker of the event was Dr.P.Parameswaran, IGCAR, Kalpakkam who spoke on the importance of materials, their heat treatment and processing and how microscopy analysis would serve in correlations to ensure failure free service.

The second speaker was Dr.P.Raghuthama Rao, formerly of CEMILAC, Bangalore. He discussed on the quality of military aircrafts and explained how quality assurance would benefit from failure analysis.

The final talk was delivered by Prof Nageswara Rao, Emeritus Professor, VIT, Vellore. He spoke on his experiences highlighting on the studies related to bursting of gun barrels. The workshop was well received by 150 students who joined with rapt attention and several intriguing questions at the end.

A formal valedictory vote of thanks was proposed by Dr.Rijesh, faculty of Mechanical Sciences, VIT, Vellore. .



Welcome address by Prof.K. Padmanabhan, VIT, Vellore. Seated are: Dr.P.Parameswaran and Dr.P.Raghuthama Rao





2nd General Body Meeting of Society for Failure Analysis (SFA) held on 9th June 2018 at CEMILAC, Bengaluru

Dr S S Kale, Vice-Chairman, Local Chapter Bengaluru extended a warm welcome to all the dignitaries and members present during the 2nd Annual General Body Meeting of SFA. He, extended special welcome to Dr K Tamilmani Past President, SFA. He in brief narrated the activities of SFA Bengaluru Local Chapter and SFA Hqrs.

He further added that, on the occasion of the 10th (decennial) year AGM Meeting on 09th June 2018 SFA in association with CEMILAC, DRDO conducted a One day National Seminar on 'Software Failure Analysis' in order to disseminate the knowledge on failure analysis of Aviation software. More than 100 delegates participated in the Seminar. The participants included scientists and engineers from DRDO, DPSUs (like HAL and BEL), Private industries and officers from IAF. The Seminar provided an excellent opportunity for all the stake holders in military aviation to assimilate and share their knowledge & rich experience. The programme included on Keynote lecture and seven technical lectures. The keynote speaker, Dr K Karunakar, Former PD(IV&V) & Emeritus Scientist, ADA presented the genesis of IV & V in military aviation software. The Speakers identified for the

seminar have vast expertise in aerospace industries. He then requested Shri P Jaypal, President SFA to address the gathering.

Shri P Jaypal, President SFA at the outset welcomed the gathering and thanked all the members of SFA family for support in upbringing SFA to present stature. He further added that the Society has entered into 10th year of its existence and has grown with 1000 plus valued members. He further added that, over a decade, SFA along with its eleven (11) Local Chapters have made valuable contributions in promulgating knowledge and concerns on failure analysis to numerous academia, industries and Government establishments in various forums. Further he added that during the years SFA conducted varied, interesting and noble Events, Seminars & Workshops for general awareness throughout the years. He added that this year also SFA Chennai Chapter along with IGCAR, IIT Madras, IISc Bengaluru and InSIS is geared up to hold the quadrennial International Conference, ICONS-2018, 2nd in series and requested good participation from all the members. He then congratulated the event organisers and requested to



Sri.P. Jaypal, President SFA addresses the gathering during the EC & AGM held during 9th June 2018





continue the same.

He extended his gladness to all Past-President of SFA for their valuable guidance and visionary support and building SFA to a leading professional body. He with gratitude stated that EC members having faith on him extended a seat of President SFA during 2015. He took the baton from Dr T Jayakumar. He had a wonderful experience and challenging task. During the tenure Koraput Local Chapter was revamped and started functioning effectively. Various Local Chapters have done commendable work worth remembering. He highlighted that to recognise the outstanding contribution of practicing Engineers, Scientist and Academician in the field of failure Analysis SFA Award has been constituted and member should participate more and more.

Shri S K Jha, General Secretary presented brief on activities in detail and highlighted the recommendations of Executive Council taken during 11th EC meeting. The report presented by General Secretary was passed by Dr K Tamilmani, Past President SFA and seconded by Shri G Gouda, Chairman Local Chapter, Bengaluru.

Shri B Jana, Hon Treasurer presented in detail SFA accounts position including Income-Tax details. The report presented by Treasurer was passed by Dr K Tamilmani, Past President SFA and seconded by Prof R C Prasad, Vice president.

The President SFA, Shri P Jayapal then expressed his intention of relinquishing the position and in his place, he suggested nomination of Dr B P C Rao, IGCAR, Vice President SFA. He further stated that EC has accepted the nomination now it is requested GB to approve. He also informed that the council has considered other suitable names from the existing list of Vice president and Chairman of Local Chapter. The GB unanimously accepted this proposal and showed their appreciation to Shri P Jayapal.

As per the recommendations of EC there are certain changes in the category of Vice President and

Members. For the ease of work EC after discussion with nominated President, proposed Dr.P.Parameswaran, IGCAR as new General Secretary. Shri B Jana accepted to continue as a Hon Treasurer.

To appreciate and recognise the efforts put in by the Local Chapters in furtherance of the cause of SFA, the President SFA felicitated all the Local Chapters on this occasion.

Further to this, occasion of 2nd GBM was chosen for Annual SFA Award which was awarded by President SFA. The following are the list of awardees for the year 2017 under different categories: SFA LIFE TIME ACHIEVEMENT AWARD (01):

Dr K Tamilmani, Past President SFA, Bengaluru

NATIONAL FAILURE ANALYST (NFA) (02):

a) **Dr R R Bhat, DGM, HAL (F&F) Division, Bengaluru**

b) **Dr Sandip Kumar Bhattacharyya, Chief, Scientific Services, Tata Steel Ltd, Jamshedpur**

This was followed by address of Dr K Tamilmani, Past President SFA who appreciated the efforts of Shri P Jayapal and his team for the commendable work in taking SFA further towards its professional growth. He wished SFA to rise further under new leadership of Dr.B.P.C. Rao.

This was followed by the address of Shri P Jayapal who congratulated the awardees and the rep of chapters present during the occasion. President, SFA once again thanked all the members present for fruitful discussions made. He conveyed his concerned about very lean attendance during GB meeting. He once again thanked all Past-President of SFA for their valuable guidance and visionary support and building SFA to a leading professional body. He extended his thanks to the SFA family members for the unconditional support on all occasions during his tenure as President SFA. He extended his special thanks to Dr K Tamilmani for his valuable presence and active participation on this occasion.

He then requested all the members of SFA to take society to further heights and extend all out support to Dr B P C Rao, IGCAR as a new President SFA. AGM ended with Vote of Thanks by Shri S K Jha, General





Group Photo of Life time award winner, Dr Tamilmani with the President, council members and other two NFA award winners: Dr. R. R.Bhat and Dr.Sandip Kumar Bhattacharya.



Dr.B.P.C Rao takes over as the President of SFA as Sri.P.Jayapal, outgoing President, Sri.B.Saha, Vice President, SFA, Dr.P.Parameswaran, Hon. Secretary and Sri S K Jha, Outgoing Secretary join the moment at CEMILAC, Hyderabad on Nov 21st, 2018 in presence of august gathering of Council members (photograph below).





Glimpses of SFA 2nd Award Ceremony held on 9th June 2018 at CEMILAC, Bengaluru during General Body Meeting of SFA



President Sri Jayapal presents SFA awards for 2017 to eminent members:

Life time achievement award:

Dr.K.Tamilmani, formerly of CEMILAC & Past President SFA.

National Failure Analysts:

(1) Dr.R.R.Bhat, HAL, Bengaluru

(2) Dr.Sandip Bhattacharya, Tata steel



Chapters awarded for their excellent contributions to SFA



Chennai Chapter



Hyderabad Chapter



Mumbai Chapter



Jamshedpur Chapter



Koraput Chapter

The President, Sri.P.Jayapal presents mementoes to selected Chapters for their excellent performance in steering the activities of SFA





Failure analysis of stud pinion housing of an aero-engine

Satish Kumar VN, Swati Biswas, Jivan Kumar
Materials Group, Gas Turbine Research Establishment, DRDO, Bengaluru

* Corresponding Author E-mail: swati@mail.qtre.drdo.in

Introduction

During assembly of a developmental aero-engine, one of the studs (MJ8X1.25) pinion housing failed while tightening at a torque level of 15Nm. The stud pinion housing is used to assemble the intermediate casing with the pinion housing. After observing this failure of this stud, one more stud was intentionally over torqued to fail. The stud failed at 28 Nm. Both the studs were taken up for metallurgical examination to establish the reason for failure. These studs were manufactured using GTM Su 718 material, a precipitation hardened nickel based corrosion and heat resistant superalloy. After machining, the parts were subjected to aging treatment.

Observations

1. Visual

The photograph of the failed stud and intentionally failed stud is shown in Fig.1. Both the studs were fractured into two pieces.

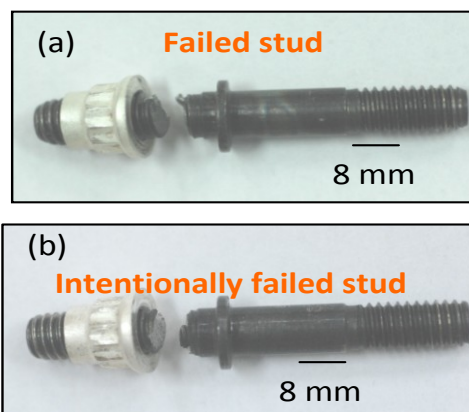


Fig.1 Photograph of the submitted studs; (a) failed stud and (b) intentionally failed stud

2. Stereo Zoom Microscopy

Both the studs were observed under Stereo Zoom Microscope (SZM). The fractured surface of the failed stud revealed brighter grainy structure compared to the intentionally failed stud. The SZM macrographs of both the studs are shown in Fig.2. From the macroscopic features on the fractured surface of the studs, it appeared that both of them failed by overload.

3. Scanning electron microscopy

3.1 Failed stud

The fractured surface of the failed stud was cleaned using ultrasonic cleaner and studied under scanning electron microscope (SEM). The fractured surface at higher magnification showed presence of dimples (Fig. 3). This confirmed that the stud has failed by over load.

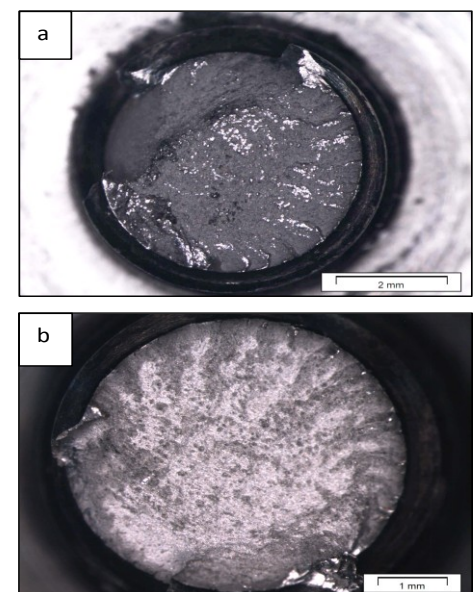


Fig. 2. Fractured surface of the studs; (a) Failed stud; (b) Intentionally failed stud

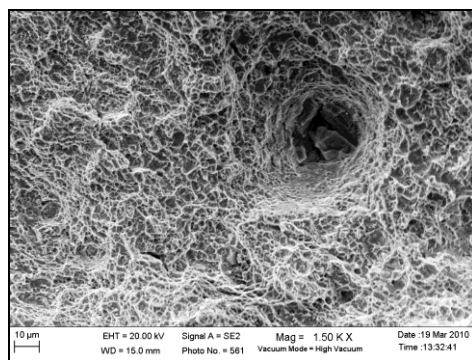


Fig. 3 Fractured surface under SEM showing the presence of dimples

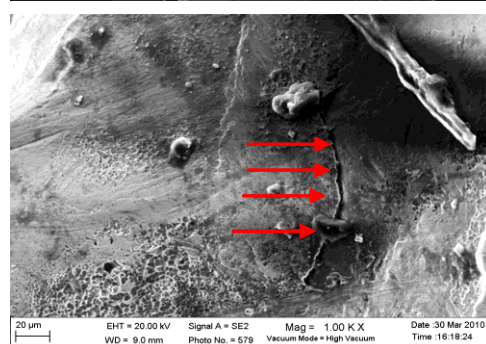
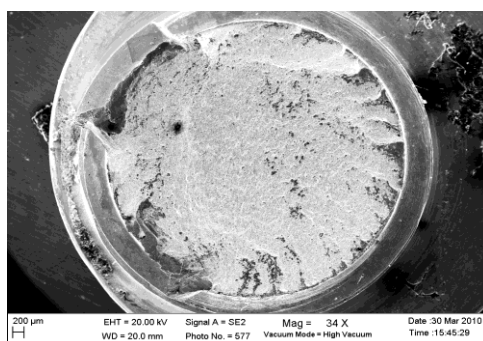


Fig. 4 Fractured surface under SEM; arrows indicate the fold

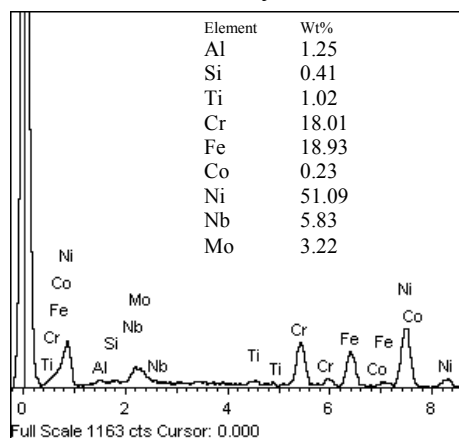


Fig. 5 Energy dispersive spectrum of the fractured surface

Further analyzing the fractured surface under SEM, one of the regions revealed presence of a forming defect (Fig. 4), which revealed features of 'fold' in the stud. Semi-quantitative elemental analysis (using energy dispersive spectrum (EDS)) of the stud showed presence of Ni, Fe, Cr, Al, Si, Ti, Cu, Nb & Mo (Fig. 5). Composition analysis result indicated that the stud material was GTM-SU-718. The standard composition of GTM-SU-718 is given in Table 1.

Table 1. Chemical composition of GTM-SU-718

Sl. No.	Element	Weight%
1	Al	0.30-0.70
2	Ti	0.75-1.15
3	Cr	17.0-21.0
4	Mn	0.35 max
5	Fe	Bal
6	Ni	50.0-55.0
7	Mo	2.8-3.3
8	C	0.02-0.08
9	Si	0.35
10	Cu	0.30
11	Co	1.0 max
12	Nb	4.75-5.50

3.2 Intentionally failed stud

The fractured surface of the intentionally failed stud was cleaned using ultrasonic cleaner and studied under scanning electron microscope (SEM). The fractured surface at higher magnification showed presence of dimples (Fig. 6). This revealed that the stud has failed by over load.

No material forming defect was observed in the stud unlike the observation made in case of the failed stud. Semi-quantitative elemental analysis (using energy dispersive spectrum (EDS)) of the stud (fractured surface) showed presence of Ni, Fe, Cr, Al, Ti, & Mo (Fig. 7).

All Birds find shelter during a rain. But Eagle avoids rain by flying above the Clouds. Problems are common, but attitude makes the difference.



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Hardness

The hardness on both the studs found to be 42 ± 1 Rc, which indicated that they are in solution treated & aged condition.

Conclusions

1. Fractographic features indicated both the studs failed by overload.
2. Forming defect resembling fold was found in the failed stud. Presence of this defect appeared to be the reason for failure of this stud at lower torque level.

Acknowledgements

The authors would like to express their gratitude to DRDO and Director, GTRE for giving permission to publish the work. The support extended by Technical Director and Associate Director is also acknowledged.

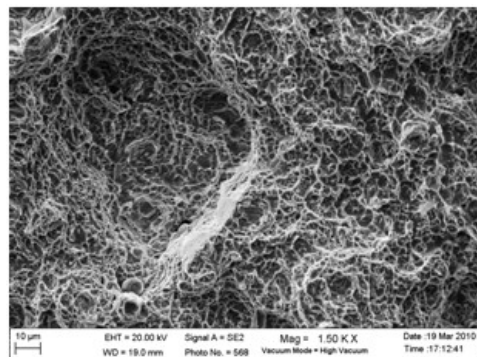


Fig. 6. Fractured surface under SEM showing the presence of dimples

Element	Weight%
Al	0.63
Si	0.29
Ti	1.11
Cr	18.45
Mn	0.29
Fe	18.37
Ni	51.22
Nb	5.97
Mo	3.67

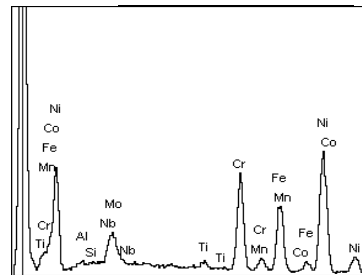
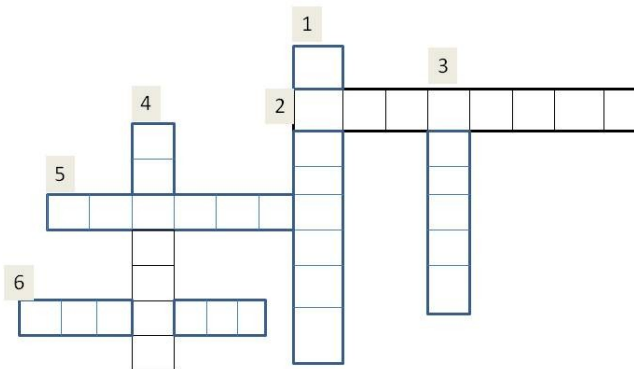


Fig. 7 Energy dispersive spectrum of the fractured surface



Cross word puzzle on failure analysis terminology



ACROSS

- (2) Material, save and hide separation [8]
- (5) Lanthanum and sodium set leak closed [7]
- (6) Hydrogen in star makes metal less bright [7]

Down

- 1) Make a pit 'n' gain an art [8]
- 3) Meal under Ne light makes hard substance on teeth [6]
- 4) Go for Ca over tin for decorative purpose [7]

Answers on P17





Society for Failure Analysis

Society for Failure Analysis
C/O Regional Centre for Military
Airworthiness (Materials), CEMILAC
Kanchanbagh, Hyderabad - 500058

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- Endorsement by SFA Member:

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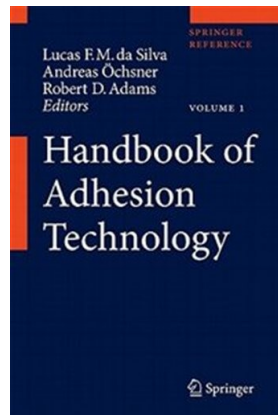
If elected, I agree to accept and abide by the Rules & Regulations/ Terms & Conditions of Society for Failure Analysis and to promote its aims and objects.

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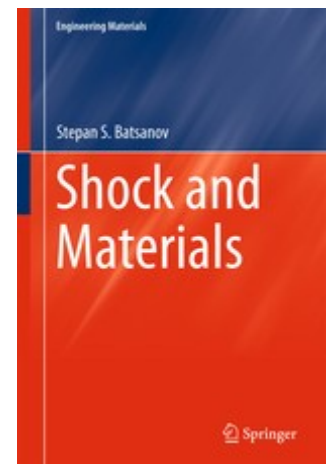
Books



Adhesives have been used for thousands of years, but until 100 years ago, the vast majority was from natural products such as bones, skins, fish, milk, and plants. Since about 1900, adhesives based on synthetic polymers have been introduced, and today, there are many industrial uses of adhesives and sealants. It is difficult to imagine a product-in the home, in industry, in transportation, or anywhere else for that matter-that does not use adhesives or sealants in some manner. The Handbook of Adhesion Technology is intended to be the definitive reference in the field of adhesion. Essential information is provided for all those concerned with the adhesion phenomenon. Adhesion is a phenomenon of interest in diverse scientific disciplines and of importance in a wide range of technologies. Therefore, this handbook includes the background science (physics, chemistry and materials science), engineering aspects of adhesion and industry specific applications. It is arranged in a user-friendly format with ten main sections: theory of adhesion, surface treatments, adhesive and sealant materials, testing of adhesive properties, joint design, durability, manufacture, quality control, applications and emerging areas. Each section contains about five chapters written by internationally renowned authors who are authorities in their fields. This book is intended to be a reference for people needing a quick, but authoritative, description of topics in the field of adhesion and the practical use of adhesives and sealants.

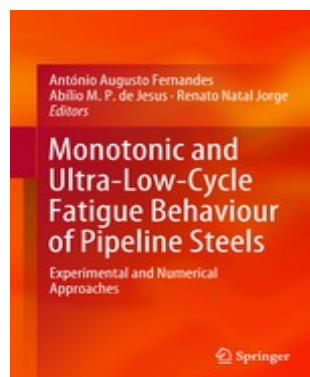
Shock and Materials. Authors: Batsanov, Stepan S.

This book highlights how the properties and structure of materials are affected by dynamic high pressures generated by explosions, projectile impacts, laser compression, electric discharge or ball milling. Starting with the basics of shock-wave physics and an outline of experimental techniques, it then surveys dynamic compressibility and equations of state of various substances, phase transitions and syntheses of novel compounds under shock. It covers various industrial applications including hardening of metals and grinding (fragmentation) of solids, saturation of solids with defects for use as catalysts, production of superhard materials (synthetic diamond, BN (boron nitride)) and nanomaterials, especially nanodiamond, and discusses state-of-the-art techniques such as combining dynamic and static compression to obtain monolithic materials.



Monotonic and Ultra-Low-Cycle Fatigue Behaviour of Pipeline Steels: Experimental and Numerical Approaches, Editors: Fernandes, António Augusto, de Jesus, Abílio M.P., Natal Jorge, Renato (Eds.)

This book covers the development of innovative computational methodologies for the simulation of steel material fracture under both monotonic and ultra-low-cycle fatigue.. Monotonic and ULCF tests of pipe components were performed (buckled and dented pipes, elbows and straight pipes). ii) New constitutive models for both monotonic and ULCF loading are proposed. Besides the Barcelona model, alternative approaches are presented such as the combined Bai-Wierzbicki-Ohata-Toyoda model. iii) Developed constitutive models are calibrated and validated using experimentally derived testing data. Guidelines for damage simulation are included. The book could be seen as a comprehensive repository of experimental results and numerical modeling on advanced methods dealing with Ultra Low Cycle Fatigue of Pipelines when subjected to high strain loading conditions.





Events in the pipeline



ICEFA 2019 : International Conference on Engineering Failure Analysis, France, October 29 - 30, 2019

The third International Conference on Structural Integrity ICSI2019 will take place in Madeira, Portugal, 2-5 September 2019. The event will take place at Hotel Casino Park. Symposia list availability was updated as follows:

A. Fatigue Crack Growth – experimental, theoretical and numerical approach organized by Grzegorz Lesiuk;

B. High Strain Rate Testing of Engineering Materials and Structures organized by José Xavier, Giuseppe Catalanotti, Hannes Koerber and Fabrice Pierron

C. Structural Health Monitoring organized by Hernani M. R. Lopes, José V. Araújo dos Santos, Pablo Moreno-García

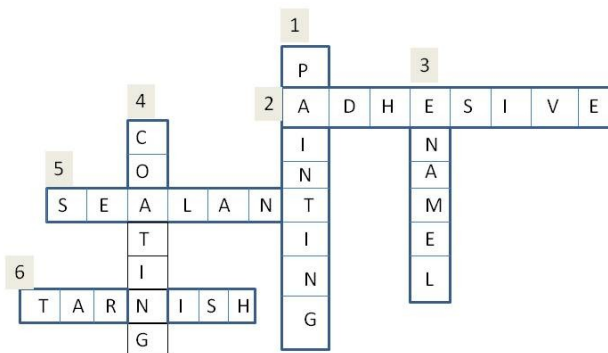
D. International Symposium on Structural Integrity of iron&steel Bridges (ISSI-Bridges 2019) organized by Stéphane SIRE, Grzegorz LESIUK, José A.F.O. CORREIA

E. NDE methods and techniques serving structural integrity assessment organized by Peter Trampus, Paulo Tavares

F. Degradation Mechanisms in the Operation of Metal Structures organized by Vladimír Chmelko, Miloslav Kepka

For more details, check www.icsi.pt

Answers to cross word:



ACROSS

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Events by SFA :

- 1) Understanding failures in Engineering materials @ Tyagarajar college of Engg., Madurai, May, 2019
- 2) National conference on Failure Analysis (NCFA 2019): 18-19, Oct. 2019
- 3) Engineering Failures- Characterisation & Prevention" @ IIT Kharagpur, to be announced.

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