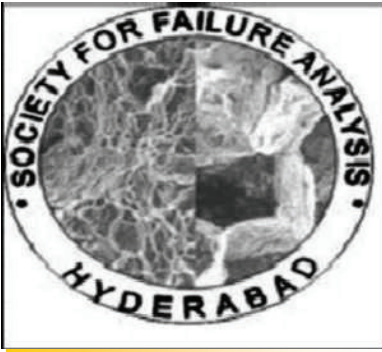




About SFA

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:



Dr T Jayakumar, outgoing President greets the incoming President, Sri.P..Jayapal

Message from our President

Dear friends and colleagues,

Greetings to all of you on the eve of New Year 2016! At the outset I appreciate all the founder members who have taken efforts to sustain the Society through various activities. Indeed the guidance and constant motivation of past presidents- Dr.Reddy, Dr.K.Tamilmani and Dr.T. Jayakumar in nurturing the activities, thus the Society, its growth over these years is matter of pride. I thank all of you for giving me the fine opportunity to serve the society as President at this juncture. I would sincerely appeal to all of you to contribute in the Society's activities by initiating a few technical events-be it a technical talk or a one day event- bringing out the expertise in a visiting faculty or expert or a few experts. This would contribute to the knowledge dissemination mission of the Society which was the seed sown during the fall of National conference on Failure Analysis (NCFA) in 2006, from which our Society sprouted. It is time that we meet again by organizing the series event NCFA in the year ahead which would provide opportunity to meet and interact with the experts around our nation. We would also plan to take effort to host an international conference on Failure Analysis in the next two years which would provide ample scope for us to showcase our efforts in the field.

Looking forward to your active participation and cooperation in all our activities, efforts in bringing many more into our umbrella and spread the mission of fail-safe design, practices, production and service,

With Best wishes to all the readers!

*Yours sincerely
(P Jayaypal)*

From the Desk of Editors

Warm greetings! We are happy to present you the fourteenth issue of the newsletter of Society for Failure Analysis (SFA).

Among the efforts taken to build the society over the last few months, activities by our local centres at various places, organizing workshops for inspiring the young engineering students along with various other professional bodies are some of them. These efforts have really yielded fruits that currently in the last few months, centres of SFA at Coimbatore and Chennai organized a national event and an international event respectively. We provide a glimpse of the programs conducted at these places in this issue as reports.

We have solicited articles from experts in the important area-wear and failure analysis.

We thank the authors for their contributions which are truly significant as far as SFA is concerned.

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 along with; 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 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

Kalpakkam

31-12-2015 (P .Parameswaran)

Editor

We encourage you to join the society, Kindly fill up the application form (enclosed at the end of the newsletter) and contact secretary:, post your application with draft to Sri.Jana, Treasurer, SFA, RCMA (Materials), CEMILAC, Kanchanbagh, Hyderabad, 500 058



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Editors of Newsletter:

Dr.M.G.Pujar, IGCAR
 Dr.P.Parameswaran, IGCAR

About the society**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.

Know your
local
centers





First Annual General Body Meeting of SFA

Date & Time: 12th May '15, 1:30PM
Venue: DRDO Auditorium, DRDO Township, Hyderabad

Highlights of the 1st AGM of SFA-India:

- 1) Dr.M.Srinivas, Vice President, SFA Welcomed the members present and extended a special welcome to Dr.Reddy, Past and founder President, SFA and Dr.Malakondiah, former Director, DMRL. Briefly recollecting how SFA was started, he appreciated the efforts of Dr. Venugopala Reddy, founder President and Dr Tamilmani, Past President in nurturing the Society. He then requested Dr.Jayakumar, President to address the gathering. Dr.Jayakumar, the President welcomed the gathering on his behalf and recalled his journey as the President of SFA looking back where he took the torch from Dr.Tamilmani, former President.
- 2) He then briefed about the activities in terms of inauguration of chapters, conducting ICONS-2014, several workshops and clinic at various places that took place during the period he took over as the SFA President.
- 3) He thanked all the chapters who began a chapter and generated awareness on the subject area. However, he expressed his concern that action is needed to improve the performance of weak chapters.
- 4) Dr.Jayakumar thanked the head quarters for efforts to get complete audit done which is

necessary before going to Annual General body meeting of SFA. He appreciated the efforts of Sri Jana, Treasurer in meticulously completing the same. Looking at the financial position, he informed the EC that the Society continues to insist on self-sufficient proposals from chapters. He further suggested that in the near future, a small office space for SFA could be thought about. Since a sum of around 20 lakhs has been provided to SFA following the events of ICONS and NDE-events, held at Kalpakkam thus making current financial position of SFA to about 35 lakhs, it provides an interest of two lakhs or more per year for (i) initiating awards, (ii) supporting to young professional to foreign trips in terms of registration to conference and any other useful professional activity considered by EC or the awards' committee. He further informed that the next EC can consider at length on the subject. He informed the EC that NCFA-2015 is being planned in Dec 2015 and requested good participation from all the members.

5) He then requested Dr.P.Parameswaran, Joint Secretary to present the detailed Secretary's report. The Secretary's report was passed by Dr.Kamat, Chairman, SFA Hyderabad chapter and seconded by Dr.B.P.C.Rao, Vice chairman, SFA Chennai.

6) This was followed by a presentation of Sri Jana, treasurer on the audited account and some of the issues regarding audit. Following this deliberation, the treasure's report was passed by Prof R C Prasad and seconded by Dr.Komal Kapoor, Secretary- Hyderabad Chapter





7) The President, Dr Jayakumar then expressed his intention of relinquishing the position and in his place, he suggested nomination of Sri.P.Jayapal, CE, CEMILAC for the GB to consider. Further he has informed that Dr. Srinivas, Vice president has also expressed to relinquish from the vice president position. He also informed that the Council has recommended three members namely- Dr.Eswaraprasad, currently Hon.Secretary and Dr.B.P.C.Rao, Vice Chairman, SFA, Chennai Chapter and Dr.Yadav, DRDO may be considered as Vice Presidents in addition to Dr. Bhounik and Prof. R.C Prasad who are already the Vice Presidents of SFA. The GB unanimously accepted this proposal and showed their appreciation in the usual manner. Prof. Prasad Vice President suggested the members that it would be better to include a few lady members in the executive council. Accordingly Dr.M.Sujatha, NAL, Bengaluru, and Dr.Swati Biswas, GTRE, Bengaluru were included as lady members of EC.

8) After discussion, Dr.A.Venugopal Reddy, Founder President formally announced the new EC body. The list of members is as follows:

President (1):

Shri.P.Jayapal, CE(A), CEMILAC

Vice Presidents (7):

Dr.S.K.Bhounik, NAL, Bengaluru

Dr.M.Srinivas, DMRL, Hyderabad

Prof.R.C.Prasad, PIIT, Mumbai

Dr.D.R.Yadav, DRDL, Hyderabad

Dr.N.Eswara Prasad, RCMA (Mat), Hyd

Dr.B.P.C.Rao, IGCAR, Kalpakkam

Prof.T.Srinivasa Rao, NIT, Warangal

General Secretary (1):

Shri.S.K.Jha, CEMILAC, Bengaluru

Joint Secretaries (3):

Shri.P.D.Bahukhandi, Former IOCL, Mumbai

Dr.P.Parameswaran, IGCAR, Kalpakkam

Dr.Kulvir Singh, BHEL R&D, Hyderabad

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B.Jana, RCMA(Mat), Hyd

Members(21):

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Prof. M.K.Mohan, NIT, Warangal

Dr. S.Tarafdar, NML, Jamshedpur

Shri M.S.Velpari, HAL (F/F), Bangalore

Dr. K.P.Balan, DMRL, Hyderabad

Shri R.K.Satpathy, RCMA (Koraput)

Shri.B.B.Jha, IMMT (RRL), Bhuvaneshwar

Prof.K.SrinivasaRao, AU, Visakhapatnam

Dr. Vivekanand Kain, BARC, Mumbai

Shri.A.K.Jha, VSSC, Thiruvananthapuram

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Dr. G.D.Janaki Ram, IIT-M, Chennai

Dr. Sandeep Bhattacharyya, Tata Steel

Dr. R.Eswaran, BHEL, Tiruchirappalli

Dr. M.Sujatha, NAL, Bengaluru

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Dr. Komal Kapoor, NFC, Hyderabad

Dr. Swati Biswas, GTRE, Bengaluru

Shri YS Gowaikar, Metatech, Pune

ShriS.D.Lagavankar, RCMA, Nasik

9) This was followed by the address of Shri.Jayapal who told the GB that he would sustain the activities of the Past Presidents and see that SFA would further spread and grow in the years ahead. Dr.Reddy, Past President spoke a few words of appreciation for Dr.Jayakumar who spearheaded the Society for the last three years making excellent contributions, organising an international conference, ICONS-2014, bringing out regular newsletters, conducting several workshops and raising the membership touch the figure of one thousand.

10) AGM ended with Vote of Thanks proposed by Shri B.Jana.





The technical symposium following the AGM began with the lighting of lamp by the dignitaries. This was followed by a brief honour to Dr.Jayakumar, immediate Past President by Dr.G.Malakondiah, former Director, DMRL. The GB members joined the occasion by giving a standing appreciation.

12) The symposium began with the first speaker of the symposium presentation on the importance of failure analysis, drawing excellent

examples from the history and projecting a case of how design faults catastrophically bring down large structures. The second lecture was given by Prof R C Prasad who looked at a holistic view of how fracture mechanics, alloy making, manufacturing, heat treatment and service environment play on the life of engineering components. The symposium ended with a vote of thanks to the speakers, the members and the special invitees of 25 under Graduate and post graduate students of MJIT Hyderabad.

Failure is not falling down but refusing to get up.

Chinese Proverb



Dr Jayakumar, The President SFA addresses the first AGM



Dr.Jayakumar shaking hand with the incoming President, Sri.Jayapal.



Sri.P.Jayapal, CE, CEMILAC addresses on taking charge as the President during the Annual GB meeting



**Failure Analysis and NDE based Failure Prevention in Steel Wire Ropes***W. Sharatchandra Singh, B.P.C. Rao and P. Parameswaran**Metallurgy and Materials Group, IGCAR, Kalpakkam**bpcrao@igcar.gov.in***1.0 Introduction**

Non-destructive evaluation (NDE) plays a vital role in failure analysis as it enables detection and characterization of defects and flaws such as fatigue cracks, stress corrosion cracking etc. in operating as well as failed components. The quantitative information about the size, shape and location of defects acquired from NDE methods are important for fracture mechanics calculations in predicting the remaining life of the components and ensuring even the growing defects are well within the safe limits. Also, NDE helps in failure analysis in predicting the likely sequence of events and hence, the chain of cause and effect, as well as human factors. NDE can avert catastrophic failures of engineering components and structures in many industries and thus, ensures their safety, availability and profit.

Steel wire ropes are widely used for transportation of materials and men in mining hoists, cranes, elevators and aerial transportation. These ropes are

usually multi-stranded and subjected to fatigue loading, abrasive wear, corrosion, etc. leading to rope failure. Failure of the ropes also occurs due to inter-strand nicking, martensitic embrittlement etc. [1]. In wire ropes, two type of defects viz. localized flaw (LF) and loss of metallic cross-sectional area (LMA) are generally formed (Fig. 1a). LFs are external and internal discontinuities such as broken wires (Fig. 1b), cracks and corrosion pitting caused by fatigue, inter-strand nicking or martensitic embrittlement. LMAs are distributed defects such as missing of wires caused by corrosion and abrasive wear.

Detection of defects in wire ropes is essential for preventing premature failures of ropes and also for effective planning of life extension and life management programs. Nondestructive detection of defects in wire ropes is challenging due to heterogeneous structure of the rope,





“Do not judge me by my successes, judge me by how many times I fell down and got back up again.”

Nelson Mandela

multiplicity and uncertainty of broken wires and complicated working environment. Among various NDE techniques, visual and magnetic flux leakage (MFL) techniques are widely used for detection of defects in steel wire ropes. Although visual inspection is simple and does not require special instrumentation, it does not guarantee wire rope safety as it may miss critical defects such as subsurface cracks. On the contrary, the MFL technique is capable of detecting both LF and LMA type of defects in wire ropes within a depth of about 5 mm [2].

This article presents a GMR (giant magneto-resistive) sensor based magnetic flux leakage technique for prevention of failures in 64 mm



(a)



(b)

Fig.1a) Local flaws and loss of metallic area and b) breakage of wires in multi-stranded steel wire ropes

diameter steel wire rope through detection of defects and details of failure analysis carried out on a failed wire rope. This type of wire rope is used to transport coal with the help of buckets in mining industry. The rope is stationary while buckets carrying coal move along the rope as shown in Fig. 2a. The schematic of the cross-section of the wire rope is shown in Fig. 2b. The rope has 8 layers of stranded wires of different diameters. The width of the outer surface of the Z-wire is 6.45 mm.

2.0 GMR based MFL technique

In this MFL technique, two split-type saddle coils are used for magnetization of the rope. As compared to the traditional

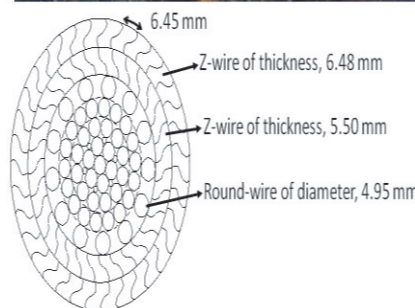


Fig. 2 a) Photograph of the wire rope with bucket carrying coal (b) the cross-section of double locked wire rope

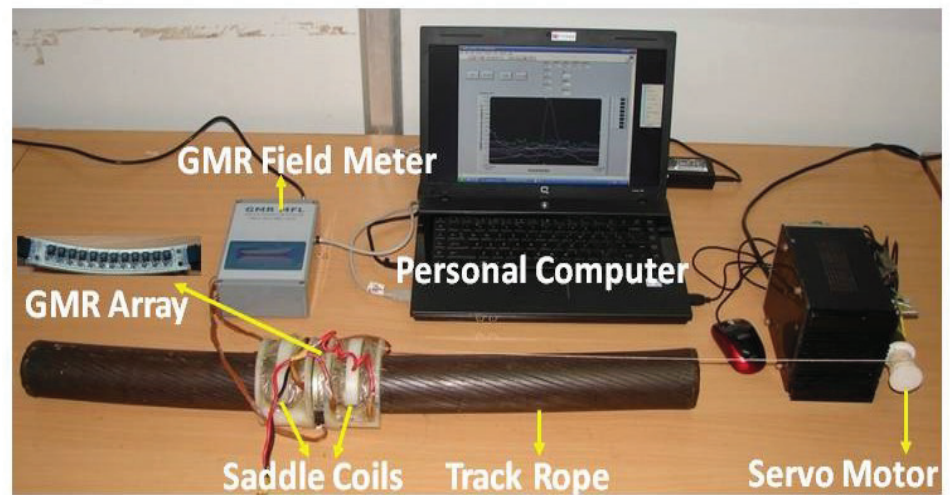


Fig. 3 Measurement set-up

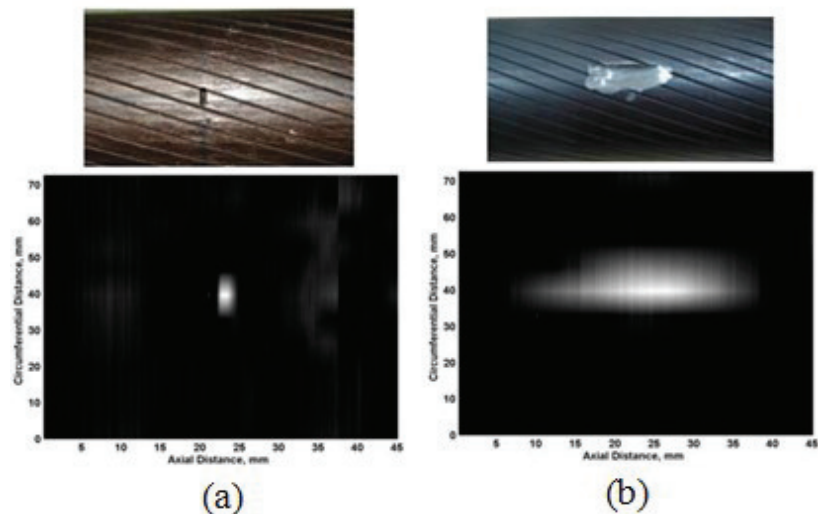


Fig. 4 MFL images of a) a circumferential LF and (b) an axial LMA

encircling solenoids or Helmholtz coils used for magnetization, the saddle coils are localized and are convenient to move freely over the supporting towers. The axial component of leakage magnetic flux from defects is detected using a flexible array of 12 GMR sensors. 3D-nonlinear finite element modeling has been

performed to optimize the magnetizing current, inter-coil spacing of the saddle coils and location of GMR sensor array within the saddle coils [3].

3.0 Failure analysis of a failed wire rope

Recently, failure of a wire rope was noticed. Fracture surfaces of the failed wire rope were examined using scanning electron microscopy

You always pass failure on your way to success-Mickey Rooney



(SEM). In addition, the cross-sections of the fracture surfaces were examined by optical microscopy and macrohardness values were taken. Detailed failure analysis revealed that the wire rope was failed due to decarburized layers that form due to improper heat treatment procedure followed during manufacturing stage. Decarburised layers to a depth of 40 microns were observed by metallography as typically shown in Fig. 5 [4]. Due to fatigue loading, cracks are initiated in the decarburized layers, which act as metallurgical stress raisers.

Therefore, in order to prevent premature failures of the wire ropes as a remedial measure, it is essential to follow proper heat treatment procedure of wire ropes (i.e. to control furnace atmosphere by checking the relative partial pressures of CO_2 and CO or to lower the annealing temperature for a given furnace atmosphere) during manufacturing to avoid formation of decarburised layers on the outer surface of the wire ropes. Further, periodic inspection using MFL and visual techniques is recommended for early detection of damage in the wire ropes

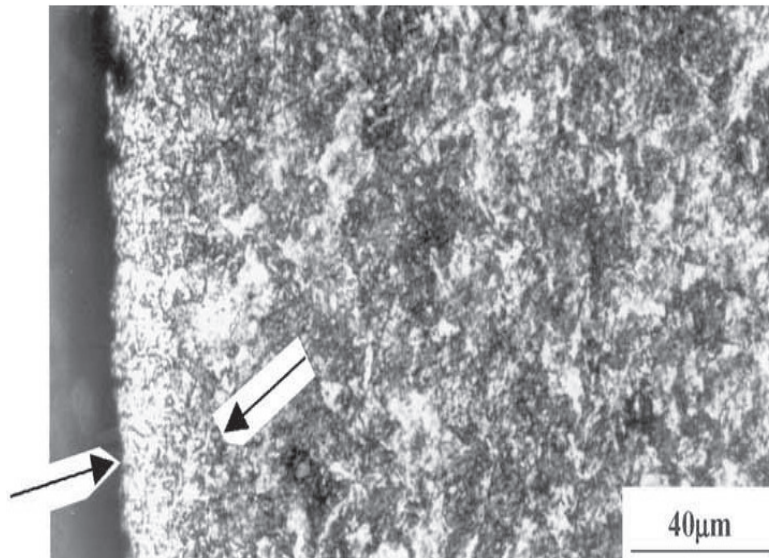


Fig. 5 Optical micrograph of the transverse section of wire rope (arrows refer to the decarburized layer)



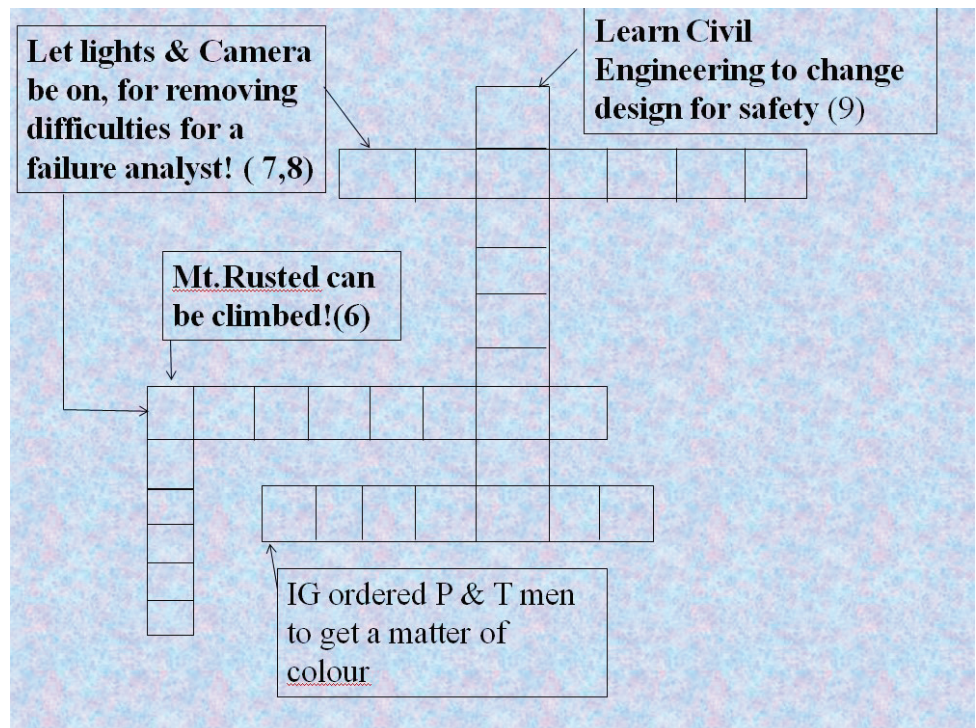


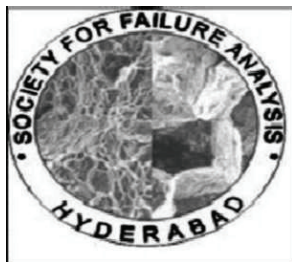
4.0 Summary

The proposed magnetic flux leakage technique can be used as an effective NDT tool for prevention of premature failure of the steel wire rope as it enables reliable detection and imaging of localized flaws and loss of metallic cross-sectional area type defects in the wire rope. Further, the proposed technique is sensitive to accumulated stress and deformations prior to crack formation. Thus, through periodic

inspection of wire ropes using this technique in conjunction with visual inspection technique is expected to result in enhanced safety of the wire ropes, and also by incorporation of corrective measures that employ e.g. in-situ metallography and hardness measurements towards extension of life of the wire ropes, as demonstrated through a failure analysis.

-----XX-----





Society for Failure Analysis

Application Form

Society for Failure Analysis

C/O Centre for Military Airworthiness & certification, RCMA (Materials)
Hyderabad 500 058

Phone: 040-24340750; 24348377;
Fax : 040-24341827
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Affix a passport
size photograph

Please ✓ applicable

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First

Middle

Last

2. Date of birth

3. Father's Name/ Husband's Name

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Fax:

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5. Academic & Professional Qualifications:

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6. Address for correspondence

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7. Professional Experience:

8. Endorsement by SFA Member

Name	Membership No.	Signature

9. Primary Field of Interest: (please mark 1,2,3 in the in order of preference)

Strategic ☐	Power ☐	Foundry ☐	Welding ☐	Heavy industry ☐	transport ☐
Design & Failures ☐	Quality control ☐	Petrochemical ☐	Consultancy / services ☐	Materials and manufacturing ☐	Education ☐

10. Name of the Chapter you intend to be attached

(Please refer to Chapters' list)

11. Subscription details:

Payment should be made by cheque / DD favoring "Society for Failure Analysis", payable at Hyderabad. Outstation cheques not accepted.

Amount Rs. Cheque / D.D. No Dated

Bank Name Branch

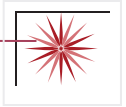
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12. Declaration by the applicant

If elected, I agree to accept to pay the prescribed yearly subscription, to abide by the rules of the Society and to promote its aims and objects.

Signature of the Applicant

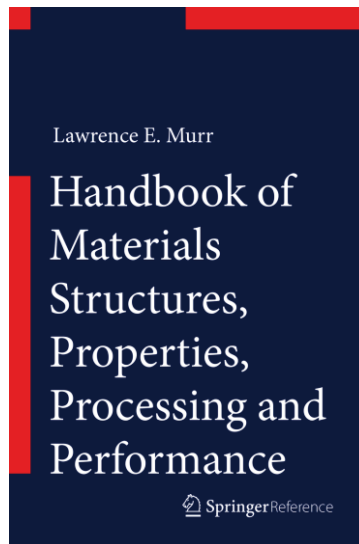
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Failure Knowledge Database	
HOME 100 Selected Cases About Failure Mandates JAPANESE	
Case Details	
Scenario	100 Selected Cases (PDF)
Case Name	Burst of Steam Turbine Rotor in Fossil Power Plant
Pictograph	
Date	June 19, 1974
Place	Gallatin, Tennessee, USA
Location	the Tennessee Valley Authority ,the Gallatin No.2
Machinery	The burst component was an IP-LP turbine rotor made of a Cr-Mo-V steel (ASTM A470, ClassB). The rotor was forged from an air melted ingot in 1954, followed by austenitization heat treatment conducted at 955°C. The unit was base loaded at 225MW from May 1957.



Characterization & Evaluation of Materials

Home > Materials > Characterization & Evaluation of Materials



SPRINGER
REFERENCE

Handbook of Materials Structures, Properties, Processing and Performance

Murr, Lawrence E.

2015, XIV, 1152 p. 784 illus., 155 illus. in color. In 2 volumes, not available separately.

Available Formats:

Print (Book) 429,00 €
(gross) price for India

ISBN 978-3-319-01814-0

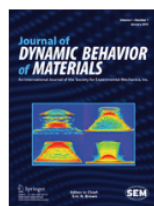
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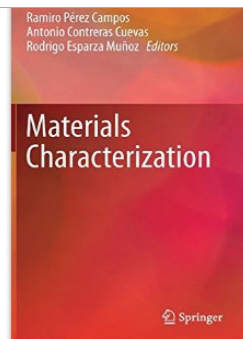
ISSN: 2199-7446 (print version)

ISSN: 2199-7454 (electronic version)

Journal no. 40870



Covers the science and engineering of material and structural response to dynamic loading focused on high strain-rate, impact, blast, penetration, shock response, and extreme conditions.



by Ramiro Pérez Campos (Editor), Antonio Contreras Cuevas (Editor), Rodrigo Esparza Muñoz (Editor)

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CF-7

January 19-22, 2016

Indira Gandhi Centre
for Atomic Research
Kalpakkam, India

**7th International Conference on
Creep, Fatigue and
Creep-Fatigue Interaction**

Let lights & Camera be on, for removing difficulties for a failure analyst! (7,8)

Learn Civil Engineering to change design for safety (9)

Mt.Rusted can be climbed!(6)

IG ordered P & T men to get a matter of colour

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Forth coming SFA events* for the current year (2015-16)

- 1) One day event by SFA Coimbatore at Mahalingam College of Engg and Tech., MCET, Pollachi – 13th Feb., 2016
- 2) One day event On Engg Failure Analysis by SFA, Chennai-march 2016

*The exact dates would be added as and when the program gets finalized;

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<http://link.springer.com/search?query=engineering+failure+analysis%2C+2015+articles&facet-discipline=%22Materials%22>

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