

Council Office Bearers

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Mr. Panduranga B
Editor News Letter

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Chairman's Message



Since our last newsletter Bengaluru chapter had its AGM on 31st October 2020. The AGM was well attended. After the statutory reporting on Activities and the accounts of the chapter and passing of the same, deliberations were held to enlist opinions of the Chapters' members. Based on these deliberations the Chapter has decided to include Non-Metallic Materials also in its focus, a hitherto neglected area by our chapter. Concerns were also expressed about increasing the value being provided to the chapter's members. In this regard, my personal opinion is that we members are here, primarily to contribute to the industrial and academic communities with the knowledge and experience we have accumulated through decades in our professions. Nevertheless, most will agree, that for those who are actively engaged in the chapters activities, there is a wealth of experience available as value to be derived, that too without the trappings of a commercial business. In order to make the experience richer for both for us, members as well as the community we serve, it is necessary that the chapter membership grows. To this objective, I urge our members, and the council members in particular, to identify and approach prospective members for enrolment in the chapter. Our chapter is keen on enhancing our engagement with the academic community especially students. The pandemic situation has restricted our access to students. However, we will soon be announcing a programme to draw the interest of students in ASM's activities.

A recent highlight was the Chapter Chair along with INC Vice Chair Mr V Babu Sathian and Mr R B Dilip our Past Chair, visited our nonagenarian member Mr Narsaiah, to present the citation for 'Life Membership' Conferred by the ASM HQ. We are also Proud to announce our chapter receiving two Chapter Awards, details of which are presented in the newsletter.

Rahul Masurekar

About ASM International

ASM International formerly known as the American Society for Metals was established in 1913 as a professional body of heat treaters. It has since evolved as an international professional body of material scientists, engineers, R&D professionals and academicians with the motto of collecting & disseminating knowledge on Materials and Processes. The worldwide network of more than 38,000 individuals is led by members, guided by members' needs and fueled by members' participation.

About ASM Bangalore Chapter

ASM Bangalore chapter is actively involved in dissemination of materials centric knowledge among working professionals, researchers and academicians. ASM Bangalore chapter began its activities in the year 2006. Since then it has dedicated itself in spreading information based on materials among various stakeholders. Bangalore is a strategic center for several major automotive, aerospace, defense & R&D institutes and thousands of engineering professionals and it is imperative to educate & connecting the community in the field of Metals & Material science Technology. Under the able leadership of present chairman Mr. Rahul Masurekar – a well-known Industrialist and capable office bearers, ASM Bangalore chapter is gaining wide popularity by activity involving and supporting the technological up-gradation of Engineering community.

The Prime objectives of ASM Bangalore Chapter are

1. To disseminate materials centric information among professionals by organizing seminars, lectures, One/two days' workshops
2. To bring together Scientists, Intellectuals and Professionals working in the field of materials science to exchange ideas/knowledge/information.
3. To encourage and support student chapters among various Engineering colleges in the state of Karnataka and enlighten them, the importance of materials properties, selection and its application.
4. To Promote consultancy services by ASM members to solve industry problems in the area of materials.
5. To recognize and award ASM members for their contributions to field of materials science.

ASM Bangalore chapter has members with rich expertise and professional experience with deep insight to practical applications in the field of materials science & engineering. ASM Bangalore chapter offers consultancy in the broad areas of Material selection & Characterization, foundry practices, mechanical testing, forging, heat-treatment, failure analysis, Corrosion control, Nondestructive Evaluation (NDE), process simulation to name a few.

ASM Membership

A membership in ASM gives you every imaginable edge you seek in your career.

VISIT - <http://www.asmlrchapter.com/membership.php> - for Benefits and Forms

Or Call Membership Chair – Mr. Krishnadas Nair – 8879233440

Or write ASM Bangalore Chapter asmlr2015@gmail.com

Featured Articles:

Exfoliation Corrosion in Aluminium Alloy Part of an Aircraft



Vaisakhi Nandi and R. R. Bhat

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INTRODUCTION

Exfoliation corrosion is one of the various types of corrosion that can occur in aluminium alloys. Exfoliation corrosion is a special form of intergranular corrosion that occurs when corrosion propagates along intergranular paths parallel to the material surface. Exfoliation corrosion occurs predominantly in Al-alloys that have marked directional structures viz. sheet, plate, and extrusion products of 2XXX, 5XXX and 7XXX Al-alloys. Additionally, these alloys can have grain boundary microstructures (grain boundary precipitation or depleted grain boundary regions) that are sensitive to intergranular forms of corrosion. Exfoliation corrosion is generally observed under specific environmental conditions such as high humidity and salt containing environments. The present article depicts exfoliation corrosion failure of Al-alloy (AA 2024/AU4G1) part belonging to hydraulic system of an aircraft flying in coastal area.

BACKGROUND

Hydraulic oil leak was detected from Assembly Restrictor (One-way flow restrictor) of hydraulic system of a military aircraft at about 1360 component hours. Preliminary inspection showed hydraulic oil leak from chipped-off surface of end-fitting (Fig.1) of the Assembly restrictor unit. On strip examination of the assembly, linear crack was suspected on inner surface (I.D.) of end-fitting below the chipped-off surface. During laboratory investigation, the signatures of failure indicated towards failure/hydraulic leak due to exfoliation corrosion of the end-fitting. This is explained in the present article. The reason for corrosion and remedial measures suggested are also touched upon.

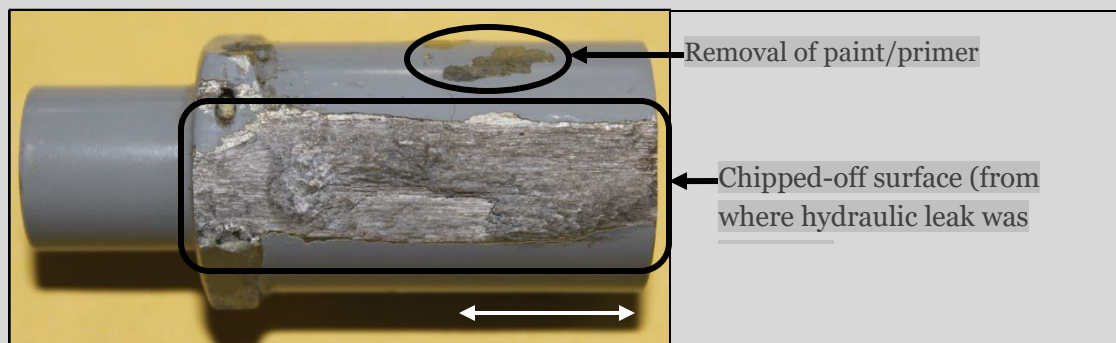


Fig.1: End-fitting of Assembly Restrictor of Hydraulic system of an aircraft

OBSERVATIONS

Material Analysis: Chemistry of the *end-fitting* that was examined by spectrometric technique conformed to Al-Cu-Mg alloy specification AU4G1. The part showed average hardness of 136 HV/0.3 kg load that is generally expected in this grade of material in T3511 temper (heat-treat) condition. The part was machined from extruded rod and showed completely elongated grain structure (Fig.2) in its longitudinal direction (The longitudinal direction of the part is indicated by double-headed arrow mark in Fig.1.)

Examination of defect location: Prima-facie, the defect in the *end-fitting* appeared to be corrosion. The defect location (chipped-off surface) was examined under **Scanning Electron**

Microscope (SEM). SEM analysis showed removal of material at the defect location in layered manner (Fig.3) that is a clear indication of corrosion by exfoliation.

Exfoliation corrosion is markedly directional and is characterized by attack of the elongated grains on a plane parallel to the rolled, extruded or forged surface. Corrosion product that forms has a greater volume than the volume of the parent metal. The increased volume forces the layers apart, and causes the metal to exfoliate or delaminate. This phenomenon was supported by optical microscopy study of sample cut across the defect location in the *end-fitting* (Fig.4).

Compositional analysis of the corrosion products at the defect location was carried out using *semi-quantitative Energy Dispersive X-ray Spectroscopy (EDS)* facility attached to SEM. EDS analysis showed that the corrosion products were predominantly oxides of aluminium with corrosive species like chlorine (Fig.5). This is typical of corrosion in marine/coastal atmosphere.

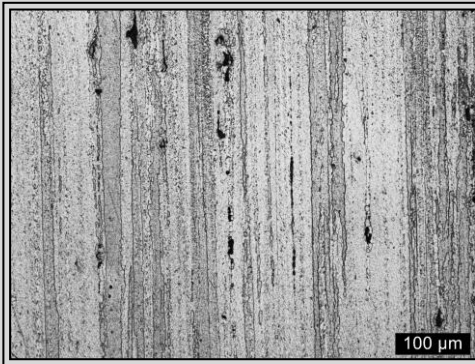


Fig.2: Photomicrograph showing markedly elongated grain structure in the *end-fitting* material (Mag: 200X, Etchant: Kellers reagent)

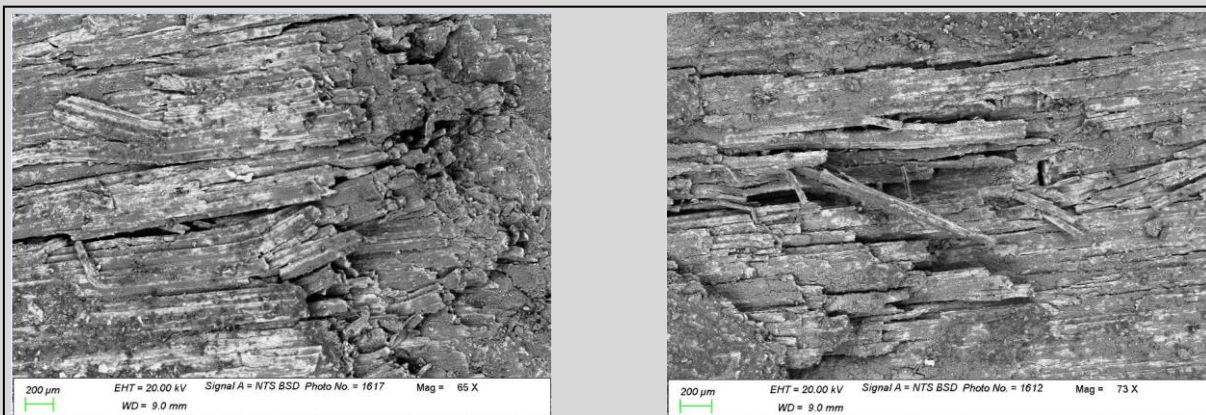


Fig.3: SEM images of the defect area showing layer-by-layer removal of material due to corrosion by exfoliation.

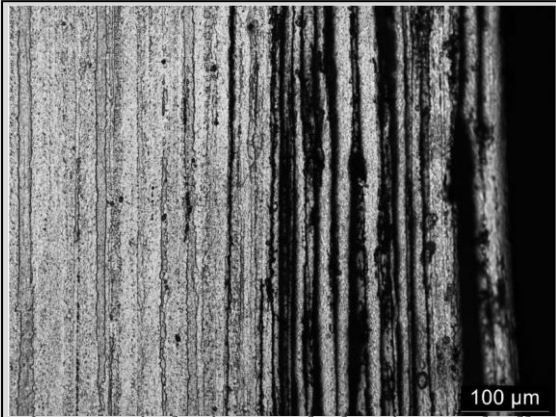


Fig.4: Optical micrograph showing markedly elongated grain structure in the *end-fitting* and layer-by-layer removal of material due to intergranular corrosion (Mag: 200X, Etchant: Kellers reagent).

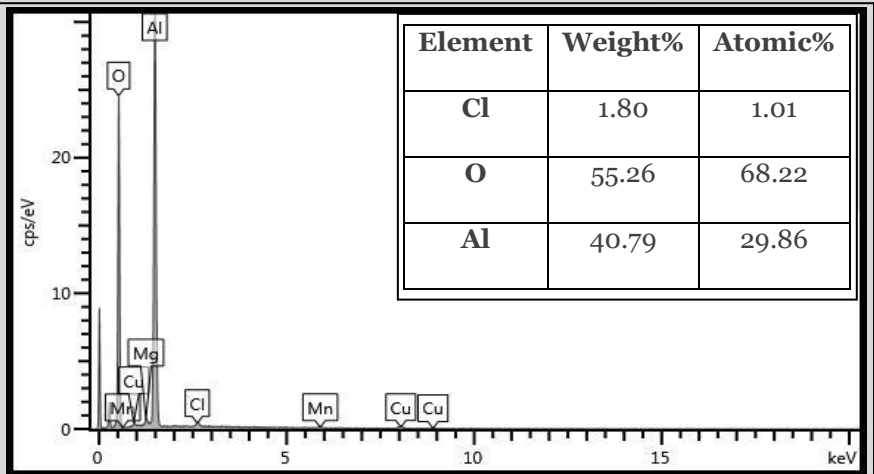


Fig.5: EDS spectrum of the corrosion products at the defect location in the *end-fitting*. These were oxides of aluminium consisting of corrosive species like chlorine.

The principal danger of exfoliation corrosion lies in the potential loss of an effective cross section. The same was observed in the present case wherein corrosion had started on the part surface (O.D.) and layer-by-layer removal due to exfoliation had caused thinning (Fig.6) of the wall of the *end-fitting*. Excessive thinning had resulted in puncture in the wall of the *end-fitting*. The puncture as observed on the I.D. surface of the part is shown in Fig.7 and this was responsible for the hydraulic oil leak from the *end-fitting*.



Fig.6: Thinning of the wall of *end-fitting* due to corrosion

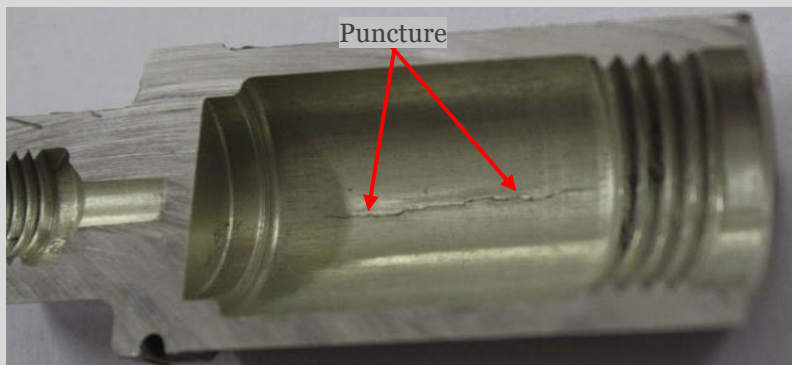


Fig.7: Puncture observed on I.D. of *end-fitting* due to corrosion

ROOT CAUSE ANALYSIS

The *end-fitting* was anodized and painted. The removal/loss of protective coating from the surface was the cause for exfoliation corrosion (One such location from where removal of paint/primer is noticed is indicated in Fig.1). It was not clear how the protective coating was damaged, but the assembly photograph [Fig.8] gave some indication regarding this.

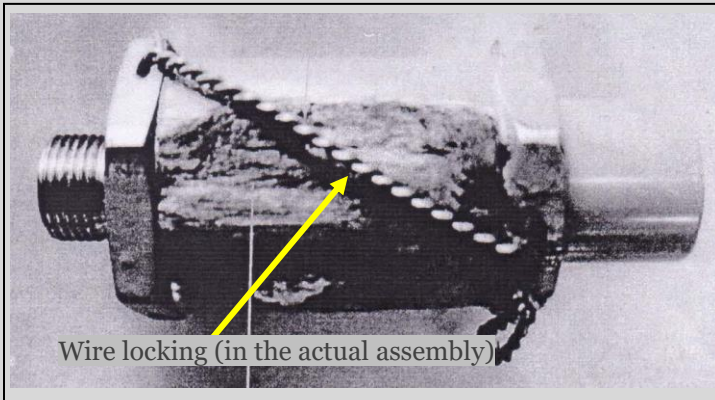


Fig.8: Wire-locking in the assembly had rubbed against the *end fitting* in the affected area. Because of this, the protective coating on the part got removed in localized area causing corrosion.

CONCLUSIONS

1. The *end-fitting* had failed due to exfoliation corrosion.
2. The material and microstructure of the *end-fitting* is prone to exfoliation corrosion (in marine/coastal environment) in absence or damage of surface protective coating.
3. Exfoliation corrosion had resulted in thinning of wall of the *end-fitting* that in-turn had caused puncture in the wall and subsequent hydraulic oil leak.

Recommendation: To prevent corrosion, particularly that caused by saline environment, it was recommended to ensure that there is absolutely no damage to the protective coating (that consists of the paint and the underneath anodized layer) on the surface of the part in-service.

About the Authors:

1. Dr. R. Raghavendra Bhat

Dr R.R. Bhat obtained his M.Tech. (Process Metallurgy) and Ph. D. (Metallurgical Engineering) from NITK Surathkal. Currently he is working as Chief Metallurgist in Central Materials and Processes Laboratory at Foundry and Forge Division of Hindustan Aeronautics Limited, Bangalore as Additional General Manager and Heads Central Materials and Processes Laboratory as well as Quality Engineering Department at Foundry and Forge Division.

2. Ms. Vaisakhi Nandi

Vaisakhi Nandi obtained her B.E. in Metallurgy from M.S. University, Baroda and M.Tech in Materials Science from IIT Bombay. She is currently Senior Manager (Lab) and is heading the Metallurgy testing area and leading the failure analysis team of the laboratory.

"Residual Stress- An Unique Parameter"

The functional requirements of modern-day components for Aerospace and Automotive applications are quite demanding. For superior performance, novel materials and new processing techniques are being employed. In the manufacturing scenario apart from the Conventional or Primary manufacturing processes such as Casting, Forging, Machining, Welding etc, secondary processes such as Heat Treatment, Surface modifications such as Coatings, Spraying, painting etc., are equally important and practiced.

During the primary manufacturing, components undergo stress and strains at every stage of manufacturing cycle. Some materials are made to relieve stress and some others don't, for example: Welded and forged components. The stresses which remain in a body even after removal of the load are called residual stress (RS). If RS values are greater than yield strength of the materials, components undergo plastic deformation such as distortion, warping etc and hence invite rejections from the quality assurance angle. If residual stress crosses the yield strength of a material then it may significantly affect the life of the component especially fatigue life. In many operations such as Shot peening is widely used in several fields to improve the fatigue strength of manufactured parts via the introduction of compressive residual stresses. Generally, components with compressive residual stresses are preferred over tensile residual stresses. Figure 1 and 2 shows schematic of principle of X-ray diffraction and XRD machine used in its measurement respectively.

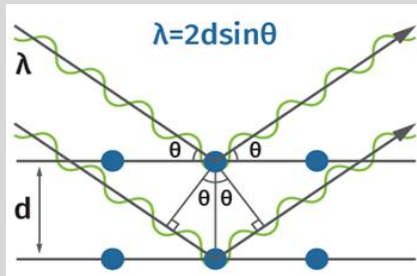


Fig 1: Illustration of the Bragg's law which describes X-ray diffraction from



Fig 2: Photo of X-Ray diffraction Equipment for measuring residual

Till date, attempts to comprehensively understand RS have taken back seat, but continued efforts are underway. Researchers have developed several Newer Theoretical models to measure RS in a material such as

1. A Displacement Based Analytical Model for thin sections of metals
2. Ilyushin's Simplified Elasto-plastic theory in case of Shot peening process.
3. Classical lamination theory (CLT) for the calculation of residual stresses in laminated composites.

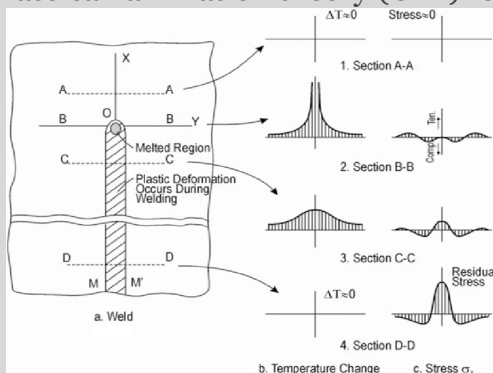


Fig 3: Contour plots of Residual stress field in a weld joints [3]

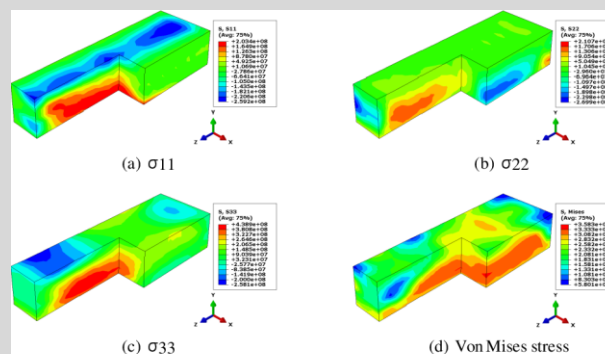


Fig 4: Contour plots of Residual stress field within Deposits in additive manufacture [4]

Some of popular experimental techniques to measure RS currently available are

1. X-ray diffraction to measure the RS at the surface/coatings (sin² ψ method) due to shift in the interplanar spacing (d)
2. Wire-cutting method to perform longitudinal residual stress measurements
3. Strain gauge or Hole Drill method of measuring Residual stresses.
4. Magnetic methods involving Barkhausen noise due to flux density change and
5. Ultrasonic methods involving time of flight principle

Many simulation softwares which simulate static and dynamic loading on a component such as ANSYS, NASTRAN and PATRAN are capable of measuring RS distribution and magnitude in materials both in longitudinal and lateral directions in a component. Process simulation soft wares such as DEFORM, SYSWELD and casting simulation softwares are capable of determining RS. Finite Element based Simulation software's greatly help in understanding evolution of RS. It is quite difficult to comprehensively investigate the residual stress distribution by experimental methods due to the limitations such as accessibility for measurement in critical areas, material type and cost, as a result, the finite element (FE) simulation cooperating with the experimental verification has been a trend to reveal the evolution of residual stresses. Figure 4 and 5 shows the residual stress contours of a typical weld joint and additive manufactured component using ANSYS respectively.

Currently research works in the following areas are underway:

Prediction of residual stress evolution, investigating the role of residual stress on the fatigue strength performance.

The understanding of the residual stresses, both in the coating and in the substrate, and the way they affect the Tribo-Mechanical performance of the system coating/substrate continues to be of great importance, especially for coatings deposited by new technologies

Determination of RS in additive manufactured components

Studies to explore the residual stress distribution developed by cold spraying.

investigate the significance of residual stresses in fatigue analysis of gas turbine blades in order to attain accurate fatigue life estimates

Numerical and experimental investigations to analyse the residual stresses generated at interfaces especially in metal matrix composites (MMCs), Carbon Fibre Reinforced Plastics (CFRPs).

Understanding the role of residual stresses in Non-Metals such as Engineering plastics, Composite materials, ceramics (such as in Concrete) and even in Biological structures are becoming noticeable in Research community. In view of extensive research works in the field of residual stresses and basic understanding of the concept of residual stress it is high time design Engineers take into account magnitude and depth of residual stresses at the time of designing a component.

Acknowledgements:

The authors would like to thank the members of Bangalore chapter of ASM International in supporting and active participation of three National Seminars on "Residual stresses" conducted in 2016, 2018 and 2020 in association with several research institutes and Engineering colleges in Bangalore

References:

<https://www.stresstech.com/stresstech-bulletin-12-measurement-methods-of-residual-stresses/>

<https://www.slideshare.net/N.Prakasan/measurement-of-residual-stresses-in-weldments>

Characterising the effects of high-pressure rolling on residual stress in structural steel welds. DOI-10.13140/RG.2.1.1094.3767

Residual Stress and Deformation Modelling for Metal Additive Manufacturing Processes, Heng Liu, Todd Sparks, Frank Liou, Proceedings of the World Congress on Mechanical, Chemical, and Material Engineering (MCM 2015) Barcelona, Spain –July 20-21, 2015 Paper No. 245

About Authors:



Prof. Dr. Nataraj J R

He is currently Secretary of ASM (I) Bangalore chapter and Associate Professor at RV College of Engineering, Bangalore with research interests in Engineering Materials



Prof. Dr. S. Seetharamu

He is Former Director of CPRI Bangalore and Executive committee member of ASM (I), Bangalore chapter. Currently Visiting Professor at RV College of Engineering, Bangalore



Prof. Dr. P. Sampathkumaran

He is Former Joint Director of Advanced Materials group of CPRI and Currently Visiting Professor for Sambhram Institute of Technology Bangalore

Cleanliness Analysis for Contamination Estimation

- Fully compliant with the latest standards (ISO 16232)
- Automatic system with complete filter paper scanning , classifying non metallic , metallic and fiber particles and measuring their size.
- Options with stereo and metallurgical microscopes .
- Measurement of height of particle.
- Easy to use and quick to perform.
- Report Development According to user requirement.
- Access to measured particle data for further data processing

Particle Size Analysis System

PARTICLE TEST REPORT.										
Customer	ABC									
Part No.	A124N	Recd Date:	04-Jun-18							
Report No.:	1672	Department :	QA Lab							
Sample ID:	ABC	Test Date:	05-Jun-18							
Analysis:	Particle	Standard Specification:	As per ISO 16232							
Magnification	100X	Filter paper Size:	47 mm							
No. of Fields :	5	Scanning Area	30 mm							

Particle Size Analysis											
Size ranges(µm)	1_35	36_60	61_100	101_150	151_250	251_280	281_300	301_500	501_800	801_3000	Total Count
Metallic	4	0	0	0	0	0	0	0	0	0	4
Non Metallic	111	3	0	0	1	0	0	0	0	0	115
Fibres	27	1	0	0	1	0	0	0	0	0	29

Metallic Particles			Non Metallic Particles			Fiber Particles		
Count	Length(µm)	#Series1	Count	Length(µm)	#Series1	Count	Length(µm)	#Series1
[Histogram]			[Histogram]			[Histogram]		



Model - CLEAN-EST



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Calendar of Events

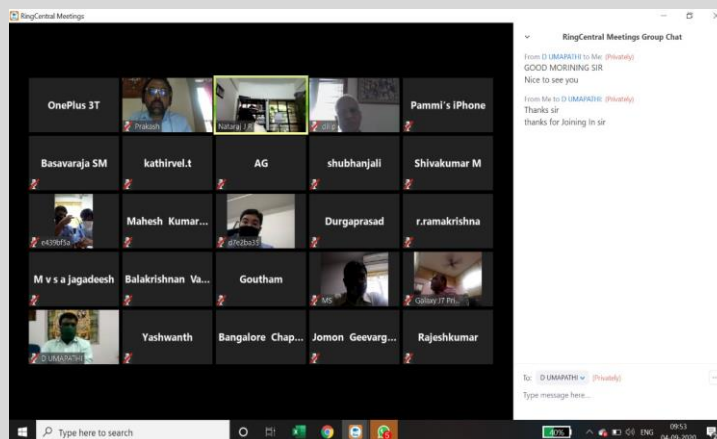
Workshops & Seminars

ONLINE TWO DAY WORKSHOP ON FORGINGS & CASTINGS – SEPTEMBER 4 & 5, 2020

Workshop – “Forgings”

SPEAKER	TOPICS
Mr. Rahul Masurekar- Chairman ASM BLR	About ASM International and Bangalore Chapter Activities
Mr. Basavaraj, Sansera Engineering Ltd	Introduction to steel forgings, current and advanced forging processes
Mr. Vijay Srinivas, Steer Engineering Pvt Ltd	Quality in Steel Forgings
Mr. Anil Kumar, Hindustan Aeronautics Ltd	Introduction to Nonferrous forgings (Al & Ti), current and advanced forging processes and Inspection and Testing of Al and Ti forgings, Defects and failure case studies
Date	September 4, 2020
Venue	Ring Central Meeting Platform
No of participants	For Forging only – 15 members For Castings and Forgings – 25 members

Participants were charged fee for participating in the workshop



ONLINE TWO DAY WORKSHOP ON FORGINGS & CASTINGS – SEPTEMBER 4 & 5, 2020

Workshop – “Castings”

SPEAKER	TOPICS
Mr. Rahul Masurekar, Chairman ASM BLR	About ASM International and Bangalore Chapter Activities
Mr. B. S. Govind, Ex-Independent Director and also in the audit committee of M/s Kirloskar Ferrous Industries Ltd.	Introduction to Cast irons, current and advanced foundry processes
Dr T.V.L Narasimha Rao, Sundaram Clayton Limited, Chennai.	Introduction to Al and Mg alloys, current and advanced foundry processes
Mr. B. S. Govind, Ex- Independent Director and also in the audit committee of M/s Kirloskar Ferrous Industries Ltd	Inspection and testing of cast irons, Types of defects and Defect Analysis
Dr TVL Narasimha Rao, Sundaram Clayton Limited, Chennai	Inspection and Testing of Al and Mg castings, Defect analysis and failure case studies
Date	September 5, 2020
Venue	Ring Central Meeting Platform
Workshop was well attended by 42 Participants and on chargeable basis	

Special Events & Highlights

Felicitations to Sri Narasaiah S., who was awarded Lifetime Membership by ASM Headquarters

Date / Venue

November 16, 2020

Special Programme

ASM Bengaluru Chapter Chairman Mr. Rahul Masurekar along with Ex-Chairmen Mr. V. Babu Sathian and Mr. R. B. Dilip visited the residence of Sri Narasaiah to felicitate him personally for the Lifetime Membership Milestone.



Technical Lecture / Talks

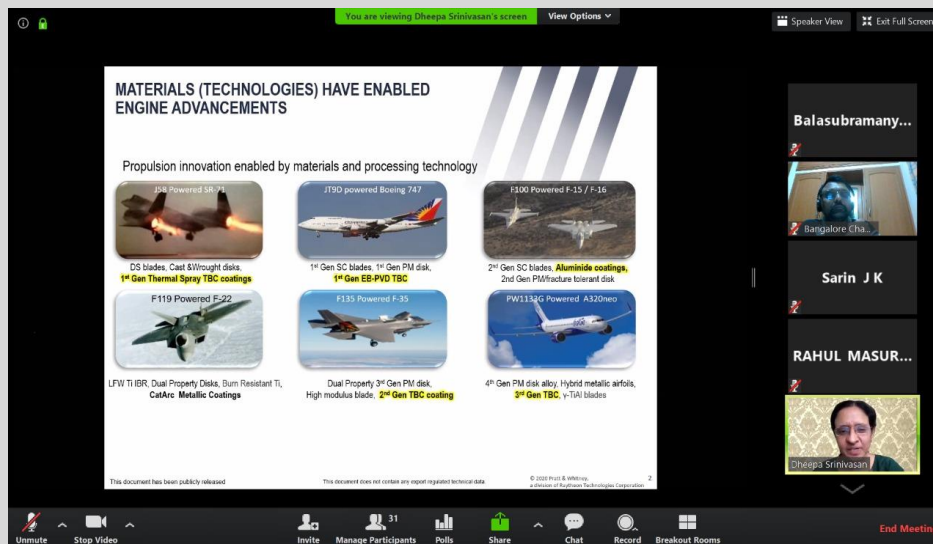
“GAS TURBINE MATERIALS”

Date / Venue	August 29, 2020 @ Ring Central Online Meeting Platform
Speaker / Programme	Dr. Dheepa Srinivasan, Chief Engineer Pratt and Whitney R&D Center, Bangalore









“Advanced Coatings Technologies for Gas Turbine”

Date / Venue	September 12, 2020 @ Ring Central Online Meeting Platform
Speaker / Programme	Dr. Dheepa Srinivasan, Chief Engineer Pratt and Whitney R&D Centre, Bangalore



MATERIALS (TECHNOLOGIES) HAVE ENABLED ENGINE ADVANCEMENTS

Propulsion innovation enabled by materials and processing technology

 <p>JR79 Powered SR-71 DS blades, Cast S/Tough disks 1st Gen Thermal Spray TBC coatings</p>	 <p>JT9D powered Boeing 747 1st Gen SC blades, 1st Gen PM disk 1st Gen EB-PVD TBC</p>	 <p>J300 Powered F-15 / F-16 2nd Gen SC blades, Aluminide coatings, 2nd Gen PM/fracture tolerant disk</p>
 <p>F119 Powered F-22 LFW Ti/IR, Dual Property Disks, Burn Resistant Ti, CatArc Metallic Coatings</p>	 <p>F135 Powered F-35 Dual Property 3rd Gen PM disk, High modulus blade, 2nd Gen TBC coating</p>	 <p>PW1133G Powered A320neo 4th Gen PM disk alloy, Hybrid metallic airfoils, 3rd Gen TBC, γ-TiAl blades</p>

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Technical Lecture / Talks

“Cold Spray - A New Emerging Reclamation and AM process”

Date / Venue

October 3, 2020 @ Ring Central Online Meeting Platform

Speaker / Programme

Dr. Srinivasa Rao Bakshi Associate Professor Department of Metallurgical and Materials Engineering Indian Institute of Technology Madras Chennai, India



The screenshot shows a Zoom meeting interface. On the left, a presentation slide titled "Cold Spray – A New Emerging Reclamation and AM process" is displayed. The slide lists the speaker as Srinivasa Rao Bakshi, Associate Professor & Head of the SMART Lab at IIT Madras. It also lists collaborators: Prof. M. Kamaraj, Prof. N. Okazaki, Dr. M. Fukunuma, and Dr. Gopi Chandran. On the right, a video feed shows Dr. Bakshi speaking. The Zoom control bar at the bottom includes options for Unmute, Stop Video, Invite, Participants (55), Share, Chat (3), Record, and Leave Meeting.

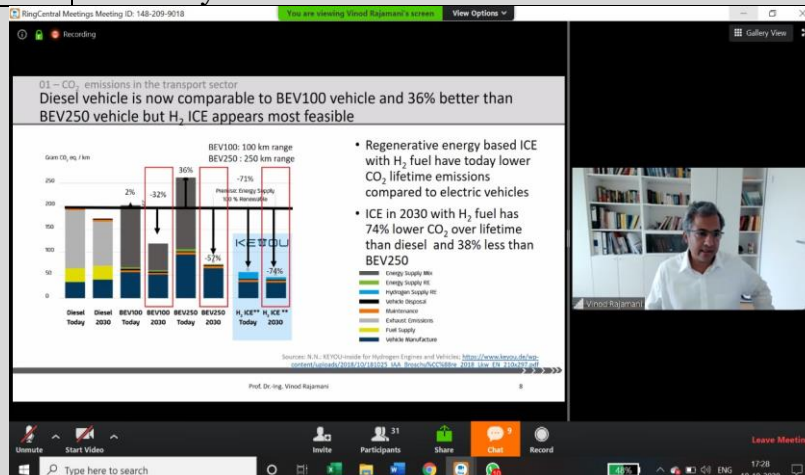
“Powertrain CO₂ Reduction through Material Selection”

Date / Venue

October 10, 2020 @ Ring Central Online Meeting Platform

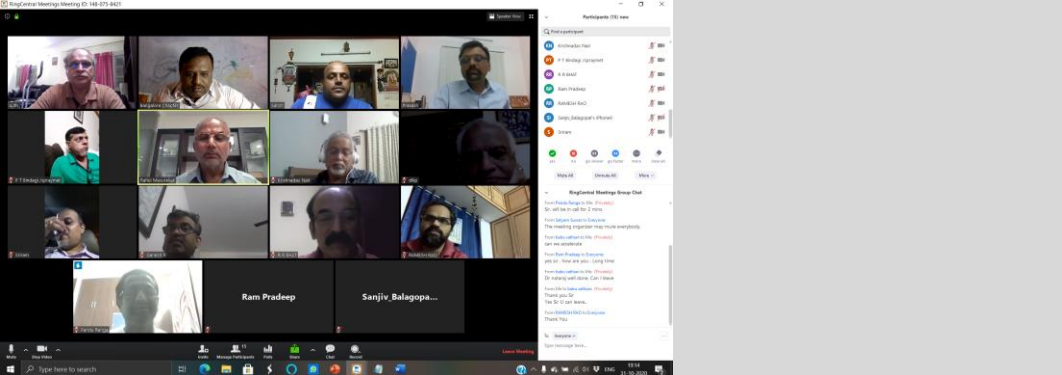
Speaker / Programme

Prof. Dr. Ing. Vinod Rajamani Professor, Department of Mechanical Engineering, University of Applied Sciences and Arts, Dortmund, Germany



The screenshot shows a Zoom meeting interface. On the left, a presentation slide titled "01 - CO₂ emissions in the transport sector" is displayed. The slide contains a bar chart comparing CO₂ emissions (g/km) for Diesel, BEV100, BEV250, and H₂ ICE vehicles in 2020 and 2030. The chart shows that H₂ ICE has the lowest emissions in 2030, with a 74% reduction compared to diesel. Text on the slide states: "Diesel vehicle is now comparable to BEV100 vehicle and 36% better than BEV250 vehicle but H₂ ICE appears most feasible". A legend identifies the components of the emissions: Energy Supply, Energy Supply ICE, Hydrogen Supply ICE, Vehicle Dispatch, Maintenance, Exhaust Emissions, Fuel Supply, and Vehicle Manufacture. On the right, a video feed shows Prof. Dr. Ing. Vinod Rajamani speaking. The Zoom control bar at the bottom includes options for Unmute, Start Video, Invite, Participants (31), Share, Chat (1), Record, and Leave Meeting.

“ANNUAL GENERAL BODY MEETING”

Date / Venue	October 31, 2020 @ Ring Central Online Meeting Platform
Speaker / Programme	Chairman Mr. Rahul Masurekar welcomed the members to the online meeting. Dr. J. R. Nataraj, Secretary, presented the chapter report from November 2019 to 31 st October 2020. Mr. Prakash Balasubramanian, Treasurer, presented the Treasurer’s Report for the Financial Year 2019-2020. The meeting was well attended by 30 members.
	



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HEAT TREATMENT FURNACES

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QUENCH FURNACE	TEMPERING FURNACE
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 Web : www.aswathyheattech.com



NOMINATION DEADLINE: FEBRUARY 1, 2021

Several ASM awards in various categories are up for grab?

ASM Bangalore chapter will be glad to nominate yourFew award categories are given below

Bradley Stoughton Award for Young Teachers

Dr. Stoughton's distinguished career in academia and his guidance inspired many of his students to outstanding metallurgical achievements. Established in 1952, the Bradley Stoughton Award for Young Teachers recognizes and fosters excellence in the teaching of materials science, materials engineering, design, and processing to help encourage young teachers in this field

Albert Easton White Distinguished Teacher Award

This award was created in recognition of Professor White, to honor his accomplishments as a teacher of metallurgy and his key role in the founding of the American Society for Metals (now ASM International). Established in 1960, this award recognizes unusually long and devoted service in teaching, as well as significant accomplishments in materials science and engineering, along with an unusual ability to inspire and impart enthusiasm to students.



indus furnaces

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Ovens & Other Allied Equipments for Heat Treatment.**

Contact Person: Mr. BABY P. THOMAS

MOB: +91 9845049837

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(ASM Awards Contd.)

International Student Paper Contest

The International Student Paper Contest Award recognizes the best technical paper with a graduate or undergraduate student as first author and that is also published in an ASM sponsored publication.

Marcus A. Grossmann Young Author Award

The Marcus A. Grossmann Young Author Award was created in 1960 in honor of Dr. Grossman's accomplishments and especially in recognition of his abiding interest in and encouragement of younger metallurgists and materials engineers. Candidates for the award consist of authors of papers published in Metallurgical and Materials Transactions during the calendar year preceding that in which the award is to be made and who are under 40 years of age.

Henry Marion Howe Medal

The Henry Marion Howe Medal is the oldest of the ASM Awards and Medals. Established in 1923 in recognition of Dr. Henry Marion Howe's many accomplishments, this medal is for candidates who are author(s) of papers published in Metallurgical and Materials Transactions during the calendar year preceding that in which the award is to be made.

For nominations, rules and history, Contact Below given addresses

ASM Awards Committee, c/o ASM (I) Bangalore Chapter

Email: asmblr2015@gmail.com ; Secretary ASM (I) Bangalore chapter (M): 9901150505

Events Calendar 2020-21

1. Memberships	Drive by Headquarter / India Task Force
2. Monthly Technical Talks	To improve consistency and Participation
3. Student Outreach	a) Events for Students – Talks + Industrial Visits b) Membership & Student Chapter Formation c) Support in Projects / Training d) Material Camps
4. Major Events	a) One/Two Days Workshops / Seminars b) Annual Get-together c) Annual General Body Meeting d) Hosting of INC Meeting / Visiting ASM Leaders e) Support to other ASM Chapters / Local Associations in their events.
5. Technical Talk	Every 2 nd & 4 th Saturday 5.00 pm on RingCentral meeting Platform.
6. Executive Council Meetings	Every 3 rd Saturday of the month on RINGCENTRAL Meeting platform This Qtr. – August 17, 2020; September 19, 2020; October 17, 2020

ASM International -Bangalore Chapter

Visit www.asmblrchapter.com for more details about ASM Bangalore chapter and membership

For Advertisement: Pl Call Editor - **Mr. Panduranga – Mobile: +91-9686971974**

Please mail your valuable suggestions/comments to : asmblr2015@gmail.com