ASM INTERNATIONAL

Bangalore Chapter – News Letter

Issue 2 : Aug 2020

Council Office Bearers
Mr. Rahul Masurekar Chairman
Mr. K S Subraya Vice Chairman
Mr. R. B Dilip Immediate Past Chairman
Dr. J R Nataraj Gen Secretary
Mr. Prakash Balasubramanian Treasurer
Mr. Panduranga B Editor News Letter

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Chairman's Message

We apologize for the delay of this issue of our Newsletter. As of now, we see the world is coming to terms with the new normal and witness efforts to make our places safer.

ASM Bangalore Chapter remains in a cruise mode with young team rolling our services for the community with regular events like the bi-monthly technical talks and workshops happening as scheduled.

Needless to mention all our events including Council Meetings continue to be in the virtual mode. We also observe that this has its own benefits of increased and widespread participation.

There has been a quantum shift in the caliber of our knowledge programmes as the list of topics and speakers herein the Newsletter will show.

In the meantime, we wish to announce two unique achievements of our Chapter. Firstly, we bagged two Awards at the Annual Awards Programme of ASM 2020, globally and secondly, Mr. Narasaiah, our nonagenarian member, was awarded the Life Membership Status by ASM Headquarter. With this motivation, we resolve to continuously endeavor in the pursuit of the objectives of ASM International in the months to come.

Rahul Masurekar

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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, researches 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.asmblrchapter.com/membership.php** - for Benefits and Forms

Or Call Membership Chair – Mr. Krishnadas Nair – 8879233440

Or write ASM Bangalore Chapter asmblr2015@gmail.com

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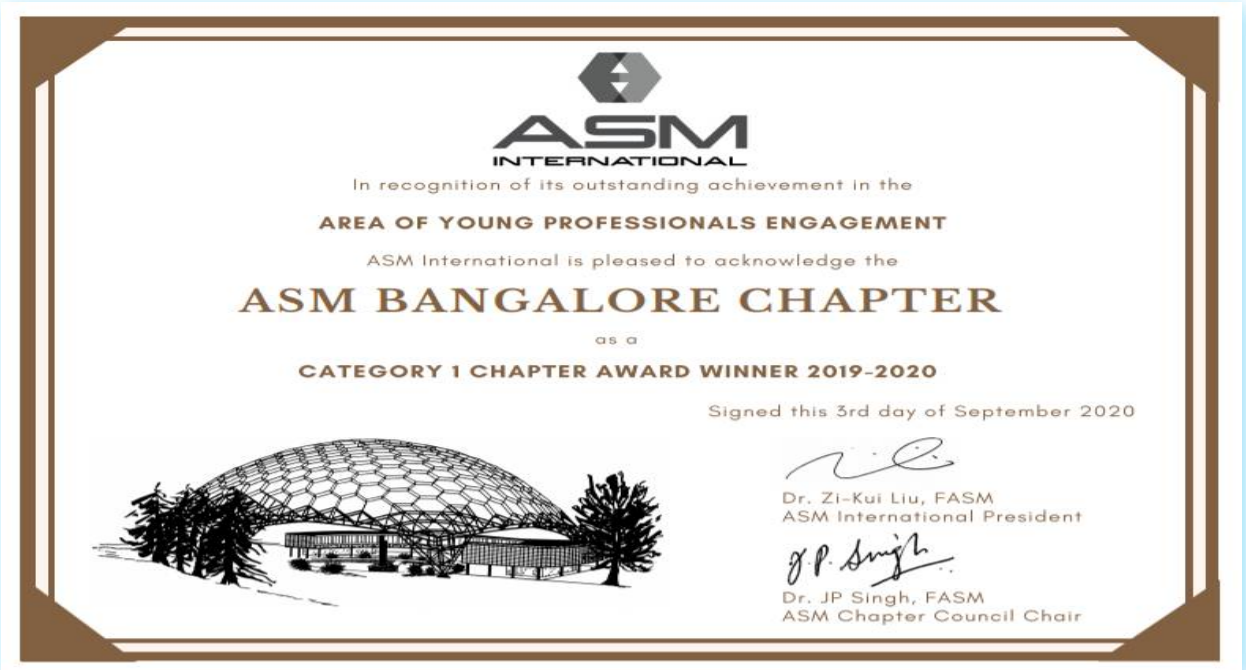
FEATHER IN THE CAP

Bangalore Chapter are Winners 2019-2020 **ASM INTERNATIONAL AWARDS** in Area of Communication & Young Professional Engagement – Each Award won includes a prize of $500



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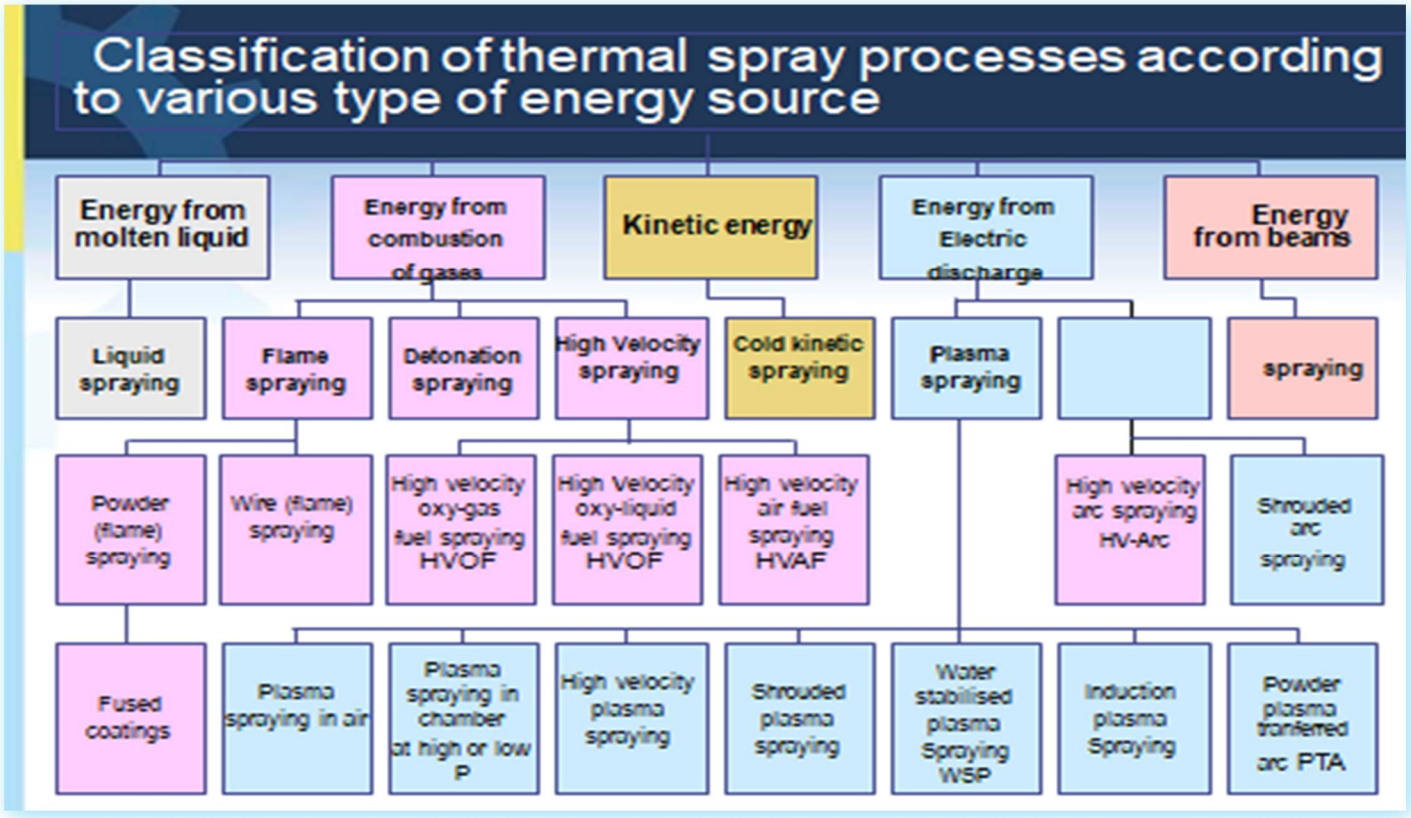
Featured Articles:

Cold Spray: A New Process to deposit soft Metals

By P. T. Bindagi Member - ASM Bangalore Chapter

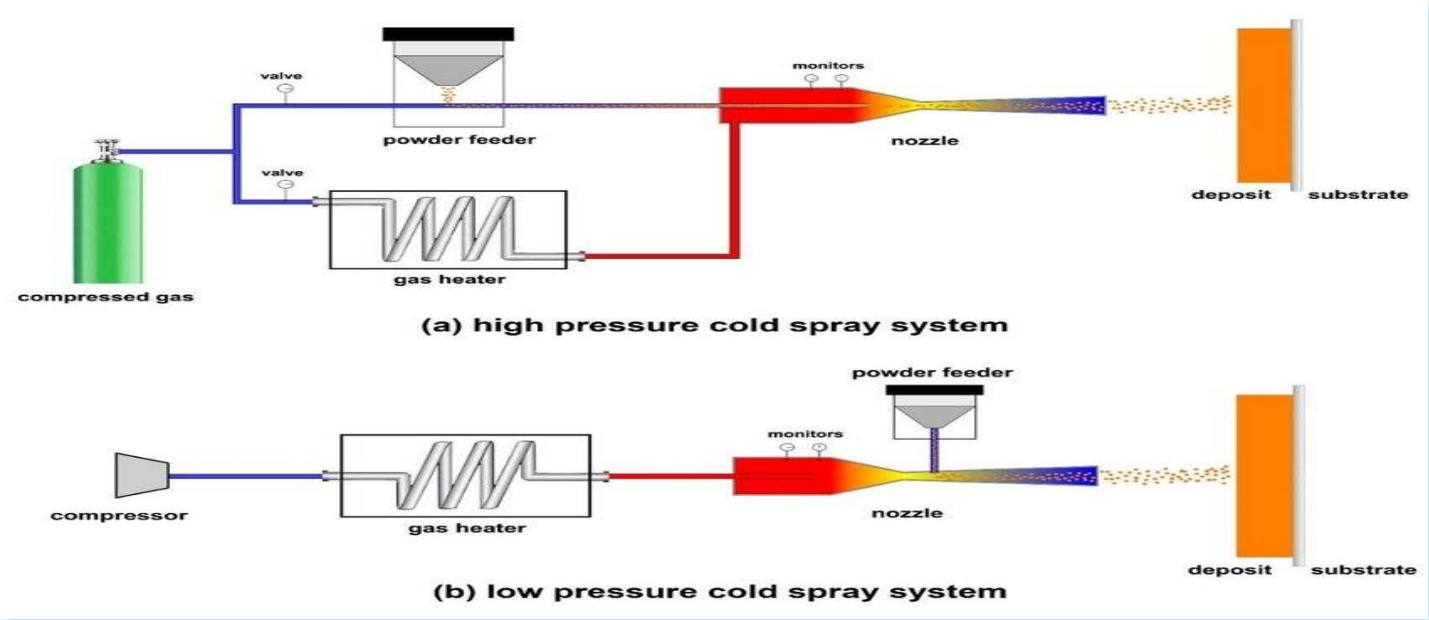
Background : Flame spray is a group of thermal spray processes that use fuel and oxidant or electrically generated plasma flame with high velocity to melt (or soften) metal and carbide powders to propel at high speed to deposit on to a substrate. Flame spray, more commonly known, as thermal spray has been a very dominant process for over 5 decades and across all industries: aviation, Oil and gas, steel making, automotive etc. However, there are some inherent deficiencies of flame spray especially arising out of flame heat, like over hating of fine particle, oxidation, residual stresses and decarburization due to overheating of carbides



Cold Spray is on such process that overcome these specific deficiencies & produce will bonded coatings equaling HVOF/HVAF

What is cold spray?

Cold spray is a relatively new technology belonging to the thermal spray technologies & a solid-state process in which the powder particles are accelerated to supersonic velocities and impacted upon colliding with the substrate to be coated. It uses pressurized carrier gas to accelerate metal to high velocities through a “De Laval” nozzle aimed at the point of deposition. When the metal powder particles collide with the part’s surface, the high kinetic energy causes plastic deformation creating mechanical interlocking and metallurgical bonding. There is heat generated during this interaction but not enough to melt the material. This unique attribute of Cold Spray, referred to as a solid-state process, enables the processing of metals that are prone to crack during the rapid solidification that is characteristic of most metal AM processes. The solid state also allows printing in an open atmosphere without excessive oxidation



Thanks to its low thermal input to the substrate, cold spray is suitable for temperature- or oxidation sensitive materials. In addition, phase changes and grain growth of the substrate do not occur. This is extremely beneficial when the sprayed object has undergone heat treatments to increase hardness, strength, or toughness, which would degrade when the thermal input to the substrate becomes too high. Furthermore, the other heat related issues in other, hot, thermal spray methods, such as thermal residual stresses or thermal shrinkage pose no problem in cold spray

Used for decades as a coating process, Cold Spray is now being used as a form of 3D printing to build large, standalone components. This is accomplished by mounting the Cold Spray hardware on a motion-controlled gantry to direct the deposition at the part, or by fixing the nozzle and moving the part. In some cases, both techniques are used to achieve even higher degrees of freedom. Positioning mechanics along with print speed, nozzle size, and toolpath strategy are some of the most important factors in determining what part densities (up to 95-99%) and geometries are possible with Cold Spray.

What are the applications?

Due to compressive stresses being formed during the plastic deformation of the powder particles, thick coatings, or material deposits, can be formed. Cold spray is therefore suitable to repair all kinds of metal parts. An example from the aerospace sector is found in magnesium gearboxes housings in helicopters. They corrode because of damaged coatings or severe environmental conditions, with oil leakage as a result. Without cold spray, scrapping of these housings was often necessary. Geometric restoration of these damages with cold spray reduces costs and the environmental footprint. Similar applications include restoration of moulds, die casts, or automotive components. Since large thickness deposits are possible, cold spray is also used as an additive manufacturing technique. It can be used to form completely new parts or to add features to existing objects. Compared to the longer existing additive manufacturing techniques, cold spray based manufacturing allows for a higher build rate. As a result, large(r) parts can be produced at relatively low costs.
The freedom of material selection makes the amount of applications immense. The range of metals that can be processed include steel, aluminium, copper, bronze, magnesium and many others including a large number of their alloys. Besides metals, also polymers, ceramics or metal matrix composites such as carbide-based blends (e.g. WC-Co or CrC-Ni) can be processed. All these materials allow for application of all kinds of functional coatings. Think of improvement of corrosion resistance, improved wear resistance, or other tribological properties that come with the application of a dedicated spray material

DESIGN / GEOMETRY CAPABILITIES

Due to Cold Spray's short history as an AM process, the geometry capabilities are still being explored and developed. That said, there are key process limitations, which inform the types of geometries that can be printed.

Size and Scale: Cold Spray, similar to wire metal AM processes, is inherently scalable to large parts. Because an inert printing environment is not required, there is no practical machine limit to part size other than the means of motion control.

Accuracy: The resolution, coupled with an accuracy of about +/- 1-3 mm for most parts, restricts Cold Spray to be used as a near-net-shape process for most applications. Any smooth or tight tolerance surfaces must be finish machined.

Surface Finish: The Cold Spray process results in a surface finish roughly 10-50 micron Ra, similar to a sand casting. The surface finish is dependent on the material, powder morphology (size and shape), and processing parameters.

Materials: Cold Spray uses metal powder as its primary feedstock. Similar to Powder DED and Binder Jetting, Cold Spray can utilize lower-cost powders than those required for PBF. However, these powders are still more expensive than most other material formats (including wire) due to their energy-intensive processing. Cold Spray has relatively low requirements for powder morphology – 5-45 microns is the typical range of powder size – although, for critical applications like those in commercial aerospace, powder quality is still very important.

MATERIALS: The following materials have been validated in some capacity for Cold Spray coating applications: **Stainless steels, Tools steels, Aluminum Alloys, Titanium Alloys, Nickel-based Alloys/Copper Alloys, Brass & Bronze, Tin, Zinc, Cobalt Alloys, and Mg Alloys etc.**

Spee3D Cold Spray copper printed and finished part and Cold Spray Aluminum 6061 Hydraulic Camlock

Material efficiency: In most processing conditions, at least 90% of the sprayed material is consumed in the part and the remainder rebounds and collects at the bottom of the printer. This can usually be reused. **Post-Processing:** A heat treatment is usually necessary to achieve good material properties. Any functional surfaces will have to be machined to smoothness and tolerance. **Consumables:** With most high-pressure systems, the carrier gas can be a costly consumable, especially if helium is used (other, slightly lower cost options would be nitrogen or argon with air possible in only some systems) the ends of the nozzles wear quickly, especially when spraying hard metals at high velocities. This can be a significant cost driver too.

Repair Applications: One of the original uses for Cold Spray technology, repair applications are now improved with multi-axis robotic 3d printing systems. These systems can achieve higher throughput and quality than what was previously possible with manual operation. The below image illustrates this capability.

Conclusions:

While still relatively immature as an AM process, Cold Spray shows much promise. It has already demonstrated value in quick, cost-effective near-net-shape production of aluminum and copper. Cold Spray will continue to see more demand for surface repair and coating applications. Cold Spray has a big competitive advantage in processing heat-sensitive materials that are incompatible with conventional melt-processes. It also has a high potential for field mobilization since the hardware is relatively lightweight and it can operate in open air. Despite the excitement around Cold Spray, there are clear technology challenges that will constrain its adoption such as geometry capability, density, and accuracy. The industry will be watching future development of Cold Spray closely with expectations of more independent data on part quality and development in applications representing larger commercial business opportunities.

About the Author:

Mr. P T Bindagi is a Metallurgist with 3 decades of experience in the field of surface engineering with specific expertise in thermal spray, plasma cladding and anti-corrosion treatments. He has served as Technical Manager for Oerlikon Metco for 12 years and has undergone technology training at USA, UK and Australia. Presently, he is the Promoter, Director of Spraymet Surface Technologies group with operations in Bangalore and Pune. He is an active member of ASM and has published many technical papers in technical business magazines.

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The Marvel Material of Twentieth Century-Cemented Carbide

By Vaishali Jagannath Prabhu – Member ASM – Bangalore Chapter

Cemented carbides play a crucial role in the field of Materials Engineering as they combine high hardness and strength with good toughness and constitute the most versatile hard material in engineering and tooling applications. Cemented carbides or hard metals as they are often called are composites made by "cementing" very hard hexagonal Tungsten Carbide (WC) grains in a ductile metal matrix of a tough Cobalt (Co) or Nickel (Ni) by liquid phase sintering. The high solubility of tungsten carbide in the solid and liquid cobalt binder at high temperatures provides a very good wetting of WC and results in an excellent densification during liquid phase sintering .Variations in WC particle size and metal binder percentage leads to broad band of property relationships and which ranges from high-strength steels on the tough side to ceramics on the hard and wear resistant side.

Cemented carbides are produced by Powder Metallurgy route. The powders are first milled to form a powder mix and spayed to obtain granules. Then green part is formed by different shaping technologies, in case of large lot sizes and comparatively simple geometries, the part is formed by cold die pressing to near net shape, Cylindrical shaped parts or parts with large length-to-diameter ratio are formed by extrusion. Large parts, such as rolls, hobs, are mainly produced by cold isostatic pressing. After shaping, the materials undergo a thermal treatment, called sintering, to form a dense, pore free body. Sintering is done either in vacuum or under hydrogen, Pressure-aided sintering has become a standard technology to produce defect-free materials of outstanding strength. Having precise controls in Green Compaction and Sintering would result in less material removal by subsequent precision grinding by diamond tools. The main properties used to characterize the mechanical properties of cemented carbides are hardness, transverse rupture strength and fracture toughness. Cemented carbide wear parts are used in wire drawing, cold and hot rolling, stone-working, working of wood and plastics, food and medical industries, compacting dies and punches, seal rings, needles, carbide feed rolls. Metal cutting they are used for machining automobile, aerospace, general engineering parts made of cast iron (cylinder blocks, cylinder heads) steels (shafts, bearings, axles), hardened steel (gears), stainless steels (valves, impellers, shafts), nonferrous metals (transmission covers, structural parts), super alloys (blades, blisks) or composites (structural parts) etc.

Hard Thin Coatings is one of the most significant developments in the history of cemented carbides, started in the early 1960s and still progressing to enhance the tool life and performance. The main requirements for coatings are high hot hardness, high wear resistance, low friction values, high thermal

and chemical stability and oxidation resistance. Coatings on cemented carbides are processed by technologies as chemical vapor deposition (CVD) formed at higher temperatures ~700-1100°C and Physical vapor deposition (PVD) formed at relatively low temperatures 400-600°C. The thickness of the coatings is in the range of 5-20µm for CVD and 2-8µm for PVD. The newest generation are multi-layer coatings with tailored properties for enhanced performance and tool life for respective applications. Several hard and super hard coatings used are TiN, TiC, TiCN, Al_2O_3, TiB_2, TiAlN, AlCrN, AlTiN, Hard Carbon, Diamond-like Carbon coatings and CVD Diamonds.

About the Author:

Mrs. Vaishali Jagannath Prabhu is a materials science engineer who served as a manager R&D for Kennametal India Ltd and as an engineer in Quest Global India. With over 12yrs of experience, she specializes in the field of Powder Metallurgy of cemented carbide, process and development, its applications and aerospace materials. She has authored and presented papers in various conferences, trained and guided students and has a keen interest in emerging material technologies.

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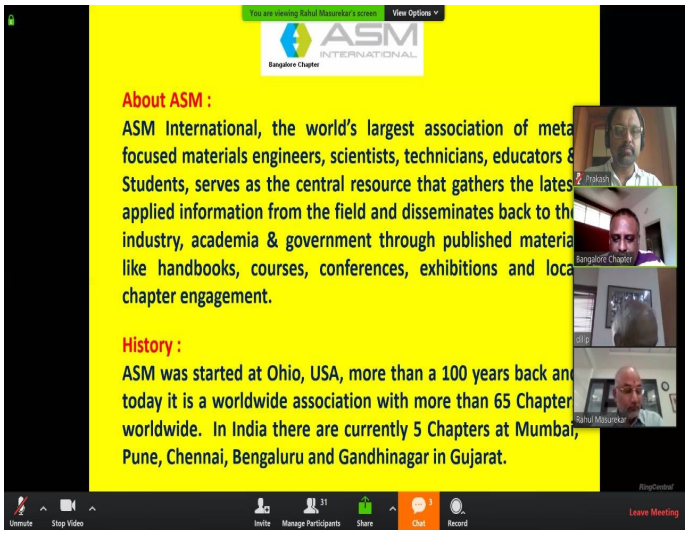
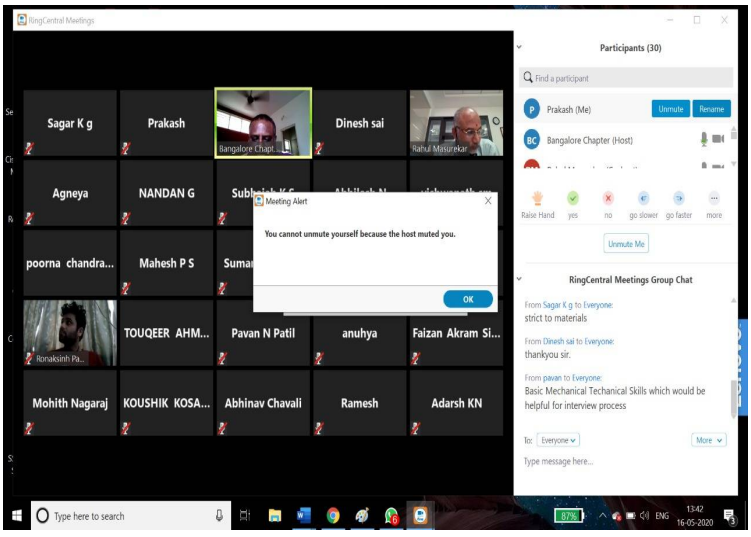
Calendar of Events

Workshops &Seminars

Online Half-a-day ASM Student Workshop on "Advanced Materials Processing"	
Date / Venue	May 16, 2020 @ Ring Central Online Meeting Platform
Speaker / Programme	a) Mr. Manoj Pillai Business Development Manager, Wipro 3D spoke on "3D Printing Technology" b) Mr. Ramesh S Rao, Research & Development, Kennametal India Ltd, spoke on "Powder Metallurgy: Synthesis, process and Applications" c) Dr. H N Narasimha Murthy Professor and Dean R&D, Mechanical Department RV College of Engineering, Bangalore, spoke on "Nanomaterials: Synthesis and Applications"
Highlights	The workshop received an overwhelming response of about 900 registrants but access was granted to only 100 participants due to connectivity issues and technical problems.





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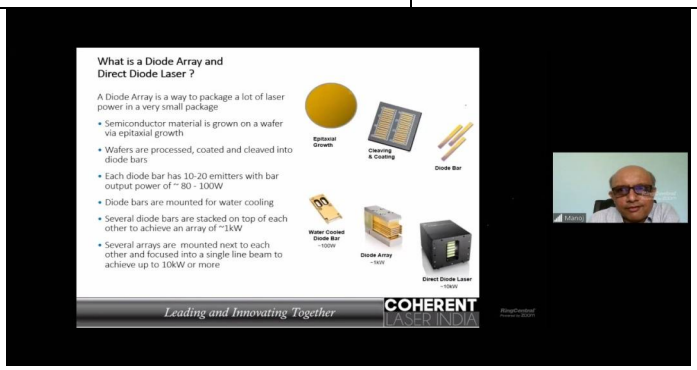
Special Events & Highlights

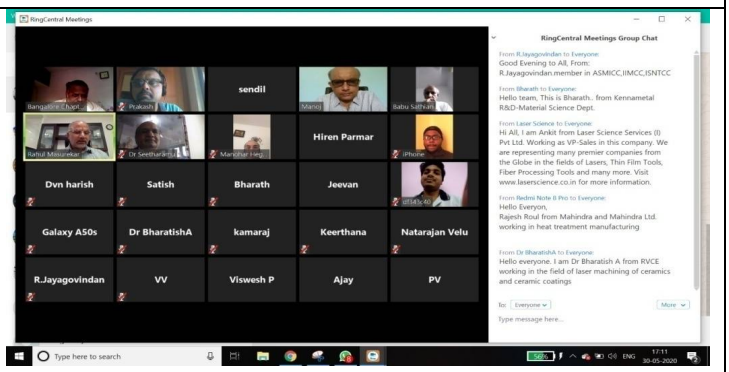
Felicitation of Mr. V. Babu Sathian on being elected unanimously as India National Council Vice Chairman (Designate)

Date / Venue	June 18, 2020 @ M/s. Process Pumps (I) Pvt. Ltd. , Peenya Industrial Area, Bangalore
Special Programme	The Office Bearers, immediate Past Chairman Mr. R. B. Dilip, along with few Executive Council Members of ASM (I) Bengaluru Chapter visited Mr. Babu Sathian's Office to felicitate him personally on the occasion of being elected unanimously as India National Council Vice Chairman (Designate).

"Material Processing by Laser Technology For Cladding and Hardening Applications"

Date / Venue	May 30, 2020 @ Ring Central Online Meeting Platform
Speaker / Programme	Mr. Manoj Rathod, Vice President (Sales) of Coherent Laser India Private Limited, Mumbai





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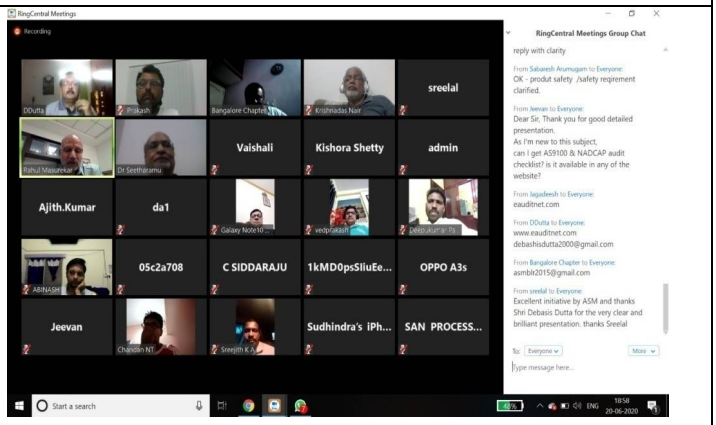
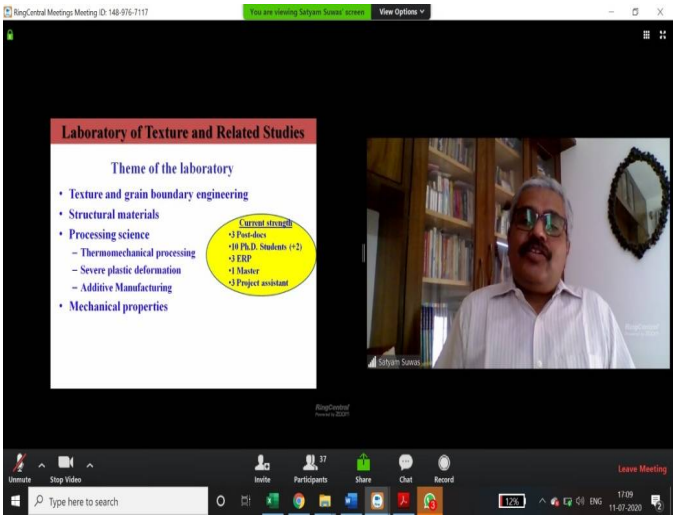
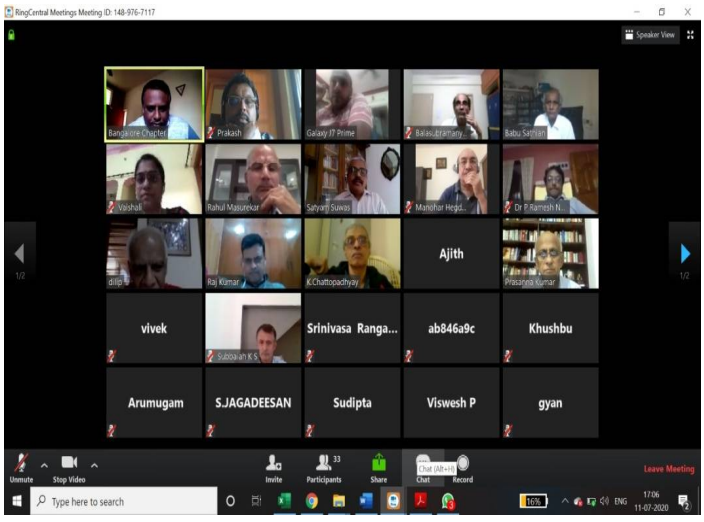
Technical Lecture / Talks

"AS9100 and NADCAP Certification for Aerospace MSMEs"	
Date / Venue	June 20, 2020 @ Ring Central Online Meeting Platform
Speaker / Programme	Mr. Debashis Dutta, Director & Aerospace Specialist, AIEA Aerospace Lead Auditor & Tutor, NQA Certification Ltd, Bangalore, India



"An academician's tryst with Industrial Research: Quest for New Materials and Processes"	
Date / Venue	July 11, 2020 @ Ring Central Online Meeting Platform
Speaker / Programme	Prof. Dr. Satyam Suwas, Department of Materials Engineering, Indian Institute of Science, Bangalore





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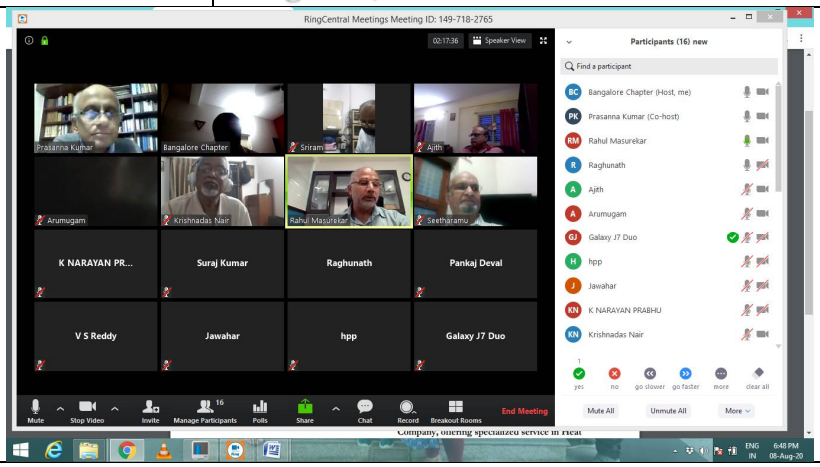
Talk 1: "Steel Materials in Automotive Components and General Engineering Applications" – An Overview on Metallurgy, Technology, Processing Methods and Challenges Faced"

Talk 2: "Heat Recovery from Safety Flames of SQFs – Sealed Quench Furnaces and from Compressors for Use in Heating Applications of the Value Stream"

Date / Venue	July 25, 2020 @ Ring Central Online Meeting Platform
Speaker / Programme	Mr. Sanjiv Balagopal Managing Director ; Mr. Ramanna P HOD, Heat Treatment ; Mr. Ramesha S GM-Technical ; of SAAB Engineering, Bangalore

"A Practical and Integrated Approach to Heat Treatment Simulation of Steels"

Date / Venue	August 8, 2020 @ Ring Central Online Meeting Platform
Speaker / Programme	Prof. Dr. T.S. Prasanna Kumar Retired Professor IIT Madras, India and Founder Director, TherMet Solutions Pvt. Ltd., Bangalore, India



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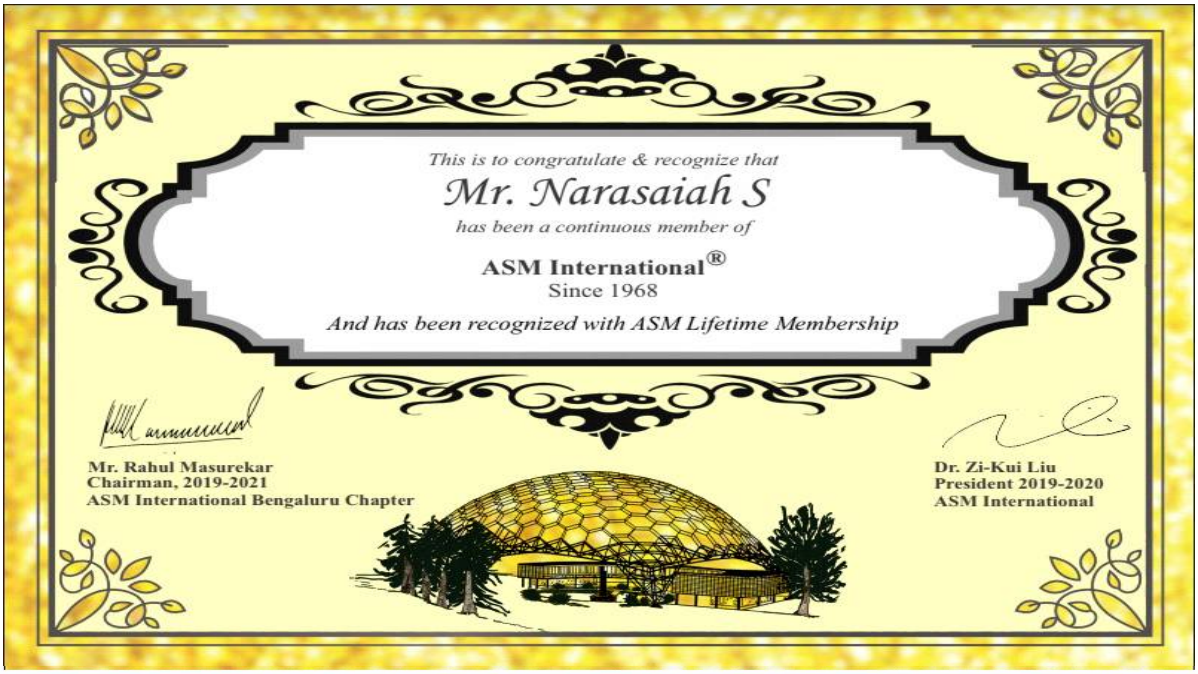
Events Calendar 2020-21

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 2nd& 4th Saturday 5pm if Webinar or Every 3rd Saturday 5pm
6. Executive Council Meetings	This Qtr. - May 16, 2020, June 27 2020 & July 18, 2020

Welcoming - New ASM Members *@ Bangalore Chapter*	
Mr. Ramesh S. Rao, M/s. Kennametal India Ltd.	Mr. Anshuman Dube, M/s. DUCOM
Mr. Mayur Acharya, M/s. Abhishek Alloys Pvt. Ltd.	Mr. Madan Raj S A, M/s. Spectrum Moulds

Sri Narasaiah S. awarded **Lifetime Membership** by ASM Headquarters



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