ASM INTERNATIONAL Pune Chapter

Chapter News Letter

Issue No. 22 | June 2018

Editor
Louis F. Vaz

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EDITORIAL...

Welcome Dear Readers to this issue.

A 3 day failure analysis program was conducted by Ms.Debbie Aliya in Pune. This year we had two students materials camp, one at Pune and the other at Kolhapur We then had a 3 day program for Metallurgy for non-metallurgists. . As a first, Two lectures for "Students Outreach" was given by Mr.Udhyan Pathak in two colleges in Pune.. A one day workshop on CQi9 standard was held in Chakan, Pune.Mr. Vikas Dhamankar a active member of ASM, Pune is featured in our "Know our Member" column.

3D printing has got a very big future, so, we have included a technical article on 3D printing in this issue Happy reading, and your views are most welcome.

Louis F. Vaz - Editor

Workshop on Practical Failure Analysis and Case Studies

ASM International, Pune Chapter and ASM International, India Chapter Jointly conducted a Two Day Workshop on Practical Failure Analysis and Case Studies on 22nd and 23rd January 2018 at Hotel Pride, Pune.

The faculty for this workshop was Debbie Aliya, the owner of Aliya Analytical, Inc.,USA, which specializes in failure analysis and prevention. In the workshop M/s Aliya first taught the participants the basic steps that have to be taken to do a complete and quick failure analysis. They also learned the basic damage categories, and methods to distinguish fatigue fracture from overload, and to determine the type of loading(axial, bending, torsion or ,shear) which caused the conditions that allowed fracture. A criteria for evaluating safety factors based on the crack appearance was presented for fatigue. The importance in understanding, how to recognize brittle and ductile features at macro and microscales was also presented. The workshop dealt on the subject of Damage Categories, viz. Deformation, Wear, fracture and Corrosion.

Special techniques were demonstrated to overcome some of the limitations usually encountered when evaluating dirty, damaged fractures and brittle materials. "Traditional" surface appearances linked with fatigue and overload was also shown.

From the two day workshop, the participants learnt how to perform a visual examination of a damaged assembly or component How to classify damage, in the service of failure prevention (deformation, fracture,wear, corrosion, complex and thermal degradation). How to recognize if unanticipated loads or environmental conditions contributed to the demise of the component, and how to tell if the component was loaded in a manner not according to design.

60 Participants attended the workshop, and went back with a lot of learning experience on failure analysis.

Mr. Prem Arora of India Chapter opening the workshop

Debbie Aliya during her presentation

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STUDENT INTERACTION

As a part of Students Interaction, Mr. Udayan Pathak of ASM Pune Chapter, delivered "Expert Lecture" for Third Year Production Students of AISSMS College of Engineering Pune on 30th March 2018. The topic was Heat Treatment of Gears and Springs. Dr. Sandeep Wankhade, Lecturer Production Engineering organised the lecture.

A Second lecture was delivered on 13th April 2018, by Mr. Udayan Pathak of ASM Pune , at Maharshi Stree Shikshan Sanstha Cummins College of Engineering for Second Year Mechanical Students and the Topic was Failure Analysis – Basics and Case Studies'". Prof Sunil Divekar of the college organized the lecture.

Mr. Udayan Pathak delivering his lecture

STUDENT'S MATERIALS CAMP IN KOLHAPUR

A Three day Student's Material Camp was held for the first time in Kolhapur, on 17th 18th and 19th April 2018. The Camp was organized jointly by ASM Pune Chapter, Government Polytechnic, Kolhapur and Dhatu Tantra Prabodhoni. On the first day the students were introduced to metallogaphy, mechanical testing, Non Destructive Testing and a topic on corrosion. The students were also taken to various foundries and factories in Kolhapur.

Eighteen students participated in the camp. Mr D. Chivate was the co-ordinator from ASM Pune Chapter. He was ably supported by Mr. Sudhir Phansalkar, Mr.Rahul Gupta and Mr.Y. Gowaikar all ASM Pune Chapter members.

Mr. Chivate explaining heat-treatment

Mr. Gowaikar with a group of students

STUDENT'S MATERIALS CAMP IN PUNE

ASM, Pune Chapter organised a Three Days Student's Materials Camp in association with ARAI and Metallurgy Department, College of Engineering, Pune on 14th, 15th and 16th May 2018.

Mr. Usgaonkar addressing the students

Students and mentors at ARAI

The Chief guest for the Inaugural ceremony was Mr. Usgaonkar, HR Head ARAI, Pune

The camp provided a unique opportunity to X, XI and XII students to explore & to understand the world of Material Science. and see the applications & use of Materials in everyday life. It was a great fun learning experience, to understand the behavior and properties of Materials.

The students were very enthusiastic to see the life demos of 3D printing, heat-treatment, welding mechanical testing and metallography. They were shown around Tata Motors and ARAI.

3D Printing being demonstrated

Mr. V. Marathe explaining the welding process

METALLURGY FOR NON-METALLURGIST

ASM, International, Pune chapter and ARAI, Pune jointly conducted a 3-Day Proficiency Improvement Programme on 'Metallurgy for Non-Metallurgist' at ARAI-FID, Chakan, Pune from 02nd to 04th May 2018.

The aim of the programme was to enable participants to gain an understanding of the fundamental of metallurgy; and bridging the gap between theory and practice.

The training provided concise knowledge of metallurgy with a focus on industry applications for working professionals/engineers of design, maintenance,, manufacturing,, service,, sales and purchase background.

The speakers for this PIP were Dr. P G Renavikar, Mr. Rahul Gupta, Mr. Sudhir Phansalkar, Mr. S G Kulkarni, Mr. Y. S. Gowaikar, Mr. Vineet Marathe, Mr. B R Galgali & Mr. N A Sakle. A total of 13 participants from Industry attended this PIP.

The participants and faculty

Mr. B.R Galgali giving his presentation

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CQI 9 SPECIAL PROCESS HEAT TREAT SYSTEM ASSESSMENT

ASM, Pune Chapter conducted a one day workshop on CQi9 standard at Courtyard by Marriott, Chakan on 6th April 2018.

Mr. P. M. Kulkarni was the principal faculty and spoke at length and in details about the standard, it`s importance and benefit to the heat treatment plants catering to the automotive industry and the need for them to adopt and imbibe the standard. He also discussed in depth about the benefit of the heat treatment system assessment.

Mr..H.K.Zaveri, the other faculty, spoke about the need and importance of calibration vis-a-vis cqi9 standard.

Considering the tremendous response to this workshop, the chapter is thinking of conducting some more workshops.

Mr. P.M Kulkarni giving his presentation

Mr. H.K.Zaveri conducting one session

Also the chapter has received a few requests from the industry to conduct in-house workshop for their personnel on commercial basis. The chapter is actively considering these requests.

3D PRINTING

What is 3D printing?

3D printing or additive manufacturing is a process of making three dimensional solid objects from a digital file.

The creation of a 3D printed object is achieved using additive processes. In an additive process an object is created by laying down successive layers of material until the object is created. Each of these layers can be seen as a thinly sliced horizontal cross-section of the eventual object. 3D printing is the opposite of subtractive manufacturing which is cutting out / hollowing out a piece of metal or plastic with for instance a milling machine.3D printing enables you to produce complex (functional) shapes using less material than traditional manufacturing methods.

How Does 3D Printing Work?

It all starts with the creation of a 3D model in your computer. This digital design is for instance a CAD (Computer Aided Design) file. A 3D model is either created from the ground up with 3D modeling software or based on data generated with a 3D scanner. With a 3D scanner you're able to create a digital copy of an object.

History of 3D Printing

In the history of manufacturing, subtractive methods have often come first. The province of machining (generating exact shapes with high precision) was generally a subtractive affair, from filing and turning through milling and grinding. Additive manufacturing's earliest applications have been on the toolroom end of the manufacturing spectrum. For example, rapid prototyping was one of the earliest additive variants and its mission was to reduce the lead time and cost of developing prototypes of new parts and devices, which was earlier only done with subtractive toolroom methods (typically slowly and expensively). However, as the years go by and technology continually advances, additive methods are moving ever further into the production end of manufacturing. Parts that formerly were the sole province of subtractive methods can now in some cases be made more profitably via additive ones.

However, the real integration of the newer additive technologies into commercial production is essentially a matter of complementing subtractive methods rather than displacing them entirely. Predictions for the future of commercial manufacturing, starting from today's already-begun infancy period, are that manufacturing firms will need to be flexible, ever-improving users of all available technologies in order to remain competitive.

Materials

Six types of materials can be used in additive manufacturing: polymers, metals, concrete, ceramics, paper and certain edibles (e.g. chocolate). Materials are often produced in wire feedstock (filament), powder form or liquid resin. All seven previously described 3D printing techniques, cover the use of these materials, although polymers are most commonly used and some additive techniques lend themselves towards the use of certain materials over others.

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3D Modeling Software

3D modeling software come in many forms. There's industrial grade software that costs thousands a year per license, but also free open source software, like Blender, for instance..

3D modeling software is often made to suit the functions of the user's industry. This has resulted in the rise of software suited to specific niches. As a result, there are software applications on the market that cater to aerospace or transportation, furniture design or fabrics and fashion among many others.

When you have a 3D model, the next step is to prepare it in order to make it 3D printable.

Slicing: From 3D Model to 3D Printer

You will have to prepare a 3D model before it is ready to be 3D printed. This is what they call slicing. Slicing is dividing a 3D model into hundreds or thousands of horizontal layers and needs to be done with slicing software.

Sometimes a 3D model can be sliced from within a 3D modeling software application. It is also possible that you are forced to use a certain slicing tool for a certain 3D printer.

When your 3D model is sliced, you are ready to feed it to your 3D printer. This can be done via USB, SD or Wi-Fi. It really depends on what brand and type 3D Printer you have. When a file is uploaded in a 3D printer, the object is ready to be 3D printed layer by layer.

3D Printing Industry

The 3D printing industry encompasses many forms of technologies and materials. When most people think of 3D printing they are thinking of a simple desktop FDM printer but that's not the entire picture. 3D printing can be divided into metal, fabrics, bio and a whole host of other industries. For this reason, it's important to see it as a cluster of diverse industries with a myriad of different applications.

3D printing is becoming more and more intertwined with the day-to-day operations of businesses. In terms of outlook, CEOs definitely see 3D printing as a benefit. Most expect a

72% rise in spending for 2018 and 55% expect one in 2017. At this stage, most companies are primarily focusing on research and development and prototyping.

The most used materials are plastics, which generally means FFF / FDM are the dominant forms of 3D printing as of 2017 with SLS coming in second. Although, over the years metal printing has been climbing. This is to be expected since there is massive amounts of R and D being put into the metal side of additive manufacturing. Company's like Google and General Electric have been investing in various technologies over the course of the year, possibly having seen the future potential of metal printing.

Examples & Applications of 3D Printing

Applications include rapid prototyping, architectural scale models & maquettes, 3D printed prosthetics and movie props.

Rapid Prototyping

Manufacturers have long used 3D printers in their design process to create prototypes. Using 3D printers for these purposes is called rapid prototyping.

Why use 3D Printers for Rapid Prototyping?

In short: it's fast and cheap. For example, Nike uses 3D printers to create prototypes of running cleats. They used to spend thousands of dollars (and wait weeks) on a prototype before they could hold it in their hands. Now, the cost is only in the tens or hundreds of dollars, and changes can be made instantly on the computer and the prototype reprinted on the same day.

Rapid Manufacturing

Besides rapid prototyping, 3D printing is also used for rapid manufacturing. Rapid manufacturing is a new method of manufacturing where companies are using 3D printers for short run / small batch custom manufacturing. In this way of manufacturing the printed objects are not prototypes but end user products.

Automotive

Car manufacturers, restorers and repairers have been employing 3D printing for a long time. Automotive industry experts only expect the use of AM technologies to grow in the coming years. Companies are using it to produce not just parts, but tools and interior elements. It has also enabled on-site development, leading to a decrease in dependence on foreign manufacturing.

Koenigseg use carbon fiber parts in their One:1 car. Thanks to a Dimension SST 1200es 3D Printer the company saved 40% of the cost and the parts were developed 20% faster than traditional methods. Similarly, Audi is using 3D metal printing to produce spare parts. They are in the midst of basically disrupting their own supply chain by printing spare parts on demand with a metal printer.

Even though large-scale manufacturers are the dominant users of 3D printing, other types of automobile enthusiasts are making their mark as well. Motorcar engineers all over the world are using printed parts to restore old cars. One such example is when Australian engineers printed out parts to bring a delage Type-C back to life. In doing so, they had to print parts that were out of production for decades and they succeeded.

Aviation

The aviation industry currently uses 3D printing in many different forms. Boeing have been exploring the potential of printed parts and airplanes for a long time. Back in 2015 it was estimated that Boeing had more than 20,000 3D printed parts implemented in their airplanes. Boeing is also utilizing metal printing. The 787 uses tons of printed titanium parts, saving the company 2 – 3 million per plane.

Similarly, on the 3D printer supplier side, there are companies carving out a niche in making machines specifically for airplane production. One such machine is Stratasys' H2000, which uses an infinite build mechanism.

3D Printing is also freeing up designers who are looking to rethink the basics of airplanes. Airbus and its engineers have been working to develop airplane frames and shapes that mimic those found in nature. This is allowing companies to produce light-weight aircrafts with better aerodynamics.

Aerospace

If you want to see 3D printing applied in the wildest ways imaginable, look no further than the aerospace industry. From materials to concept printers they are doing some of the most interesting, cutting edge research in the entire field, all for the purpose of making interstellar exploration more habitable.

Space travel requires an ultra durable exterior. Multiple organisations, such as NASA, have been working to perfect the shielding on shuttles using 3D printers. This has enabled them to produce 4D programmable materials that react to conditions in very specific ways. Such a prospect would be impossible with traditional method. Researchers have also been working on ways to make materials more accessible. Northwestern university presented a concept for a means of turning extraterrestrial soil into printable parts. The printing methods that they developed allows for printers to create goods out of abundant materials. Similarly, researchers at the University of Ottawa took this idea a step further by proposing self-replicating printers that process lunar soil. These printers, while still a concept, could lead to exponentially decreasing the amount of construction materials and equipment necessary for a lunar mission. In fact, they could just leave the printer there to build more machines.

Construction

Can you print buildings? – you sure can. There are not many of them, but companies like Apis Cor are producing

fascinating results. The company claims it can print a house within 24 hours. Currently, it lends out its machinery to various other firms.

Similarly, countries like China are experimenting with contour crafting. A project by Shanghai based WinSun uses recyclable materials to print houses for $4,800 dollars per unit. In this case, all the parts are printed separately first and later on assembled.

Since bigger construction projects require a massive build area, companies have had to think outside the box. On-site Robotics, for example, have been working with the concept of increasing build volumes by mounting printers on cables and monitoring the process with drones. These concepts are rapidly evolving over time, but they have a long way to go.

Architecture

Architects were one of the early adopters of 3D printing technology. When architects need to present their work as a physical scale model, 3D printing will always be a quick and efficient way to do it. 3D printers help cut down manpower and time when it comes to visualizing designs for clients.

Product Design

Even though prototyping is still the number one use of printers, there are many instances of companies producing end user products with 3D printers.

Furniture

Companies like Steelcase are looking into printing furniture and investing loads of money into new techniques to do it. Along with MIT, they showed off a fantastic new and quick way to UV-cure plastic into desired shapes. They hope to leverage this into a furniture manufacturing technique.

These printers also allow for materials to be reused. Dutch designer Dirk van der Kooij's 3D printed chairs are printed within a few hours. He uses recycled plastic from old refrigerators to create his Endless Chair, a durable and stylish piece of furniture.

Lighting

Additive manufacturing has also enabled the development of optics for bulbs and LEDs. Luxexcel's work in printing optics is already being used for various LED lamps and arrays. It's altering the way we project and produce light.

Accessories / products

3D printers are great for making trinkets and tiny add-ons for our daily lives. Jewelery printing is perhaps the best example of this. This is another niche within 3D printing. Printers like the Solidscape S300 are ideal for creating the wax molds one uses to produce jewellery. Solidscape actually has a whole line of these sorts of machines, indicating that the market is there.

Medical

The outlook for medical use of 3D printing is evolving at an extremely rapid pace as specialists are beginning to utilize 3D printing in more advanced ways. Patients around the world are experiencing improved quality of care through 3D printed implants and prosthetics never before seen. Even 3D printing pens are helping out in orthopaedic surgery.

Bio-printing

As of the early two-thousands 3D printing technology has been studied by biotech firms and academia for possible use in tissue engineering applications where organs and body parts are built using inkjet techniques. Layers of living cells are deposited onto a gel medium and slowly built up to form three dimensional structures. We refer to this field of research with the term: bio-printing.

Dental

Dentists are embracing 3D printed goods in a rapid pace. AM has allowed dentists to make bite splints, night guards, retainers, dentures and crowns. In fact, there's a whole market for dental printers like the EnvisionTEC Vida. These printers allow dental professionals to craft appliances in the exact shape that clients need them in for a fraction of the usual cost.

Types of 3D Printing Technologies and Processes

There are several ways to 3D print. All these technologies are additive, differing mainly in the way layers are build to create an object.

Some methods use melting or softening material to extrude layers. Others cure a photo-reactive resin with a UV laser (or another similar power source) layer by layer.

To be more precise: since 2010, the American Society for Testing and Materials (ASTM) group “ASTM F42 – Additive Manufacturing”, developed a set of standards that classify the Additive Manufacturing processes into 7 categories according to Standard Terminology for Additive Manufacturing Technologies. These seven processes are:

1. Vat Photopolymerisation
    1. Stereolithography (SLA)
    2. Digital Light Processing (DLP)
    3. Continuous Liquid Interface Production (CLIP)
2. Material Jetting
3. Binder Jetting
4. Material Extrusion
    1. Fused Deposition Modeling (FDM)
    2. Fused Filament Fabrication (FFF)
    3. Contour Crafting
5. Powder Bed Fusion
    1. Selective Laser Sintering (SLS)
    2. Direct Metal Laser Sintering (DMLS)
6. Sheet Lamination

7. Directed Energy Deposition

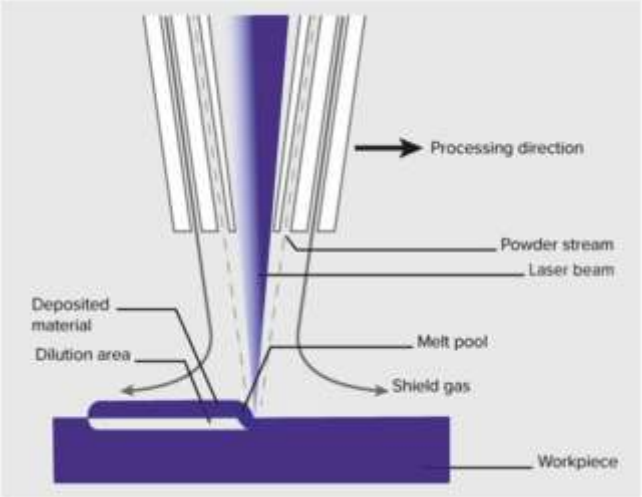
We will only go in detail only with “Directed Energy Deposition”

Directed Energy Deposition

This process is mostly used in the high-tech metal industry and in rapid manufacturing applications. The 3D printing apparatus is usually attached to a multi-axis robotic arm and consists of a nozzle that deposits metal powder or wire on a surface and an energy source (laser, electron beam or plasma arc) that melts it, forming a solid object.

The worldwide 3D printing industry is expected to grow from $3.07B in revenue in 2013 to $12.8B by 2018, and exceed $21B in worldwide revenue by 2020. As it evolves, 3D printing technology is destined to transform almost every major industry and change the way we live, work, and play in the future.

....courtesy :https://3dprinting.com



Directed Energy Deposition with metal powder and laser melting. Image source: Merlin project

Know Our Members

Mr. Vikas V. Dhamankar is currently working as Associate General Manager & Heading Heat Treatment + Metallurgy at M/s Indo Schottle Auto Parts Pvt. Ltd. Pirangut, Pune, A Group Company of SFS Intec, which is a Globally preferred company in Precision Manufacturing & Cold Forging Technology.

VIKAS V. DHAMANKAR

As a Head Metallurgist, since last 6 years,he is responsible for all 5 Plants of M/s Indo Schottle, out of which 3 Plants are in Pune & 2 Plants are in Belgaum.His Qualification is DMET & he has also done a Diploma in Materials Management.

He has over 23 years of experience in establishing various Conventional as well as Vacuum Heat Treatment Processes on Forged as well as machined parts. He is well conversant with Steel Manufacturing, Cold & Hot Forging Processes,Induction & Laser Hardening etc. Apart from this, he is well versed with various types of Surface Treatments such as Diamond Like Coating, TiN Coating etc.

Training at Italy helped him for successful commissioning of Vacuum Furnace -“Infracarb Process” at M/s Fiat India Automobile (P) Ltd. , Ranjangaon , as one of the major tasks. He was associated with the Transmission Plant of company for almost 5 yrs.

Prior to that, while working with M/s Bharat Forge, Vikas has built the foundation of his career under the leadership of Mr. Suhas Gode(AVP – MQC).

He was associated with the Company for almost 8 years. He has also contributed in the projects like “Direct Quenching of Forgings; Effect of Ni/Cu Ratio &Trace Elements like As,Sb,Sn in Plain 'C' steels on Heat Check Formation during Forging ; Effect of Forging Temp. On Quench Cracking; etc”.

Vikas has also worked with companies like

M/s Cummins India Ltd., Kothrud, Pune&

M/s Tata MotorsLtd.,Pimpri, Pune, with whom he started his career.

Vikas is having an exposure of IATF 16949, AS 9100, ISO14001, OHSAS 18001, CQI & NADCAP requirements.

While handling various projects, for Technical discussions, he has globally travelled to various Customers as well as Suppliers.

In his overall career, he has got an exposure to handle forged / machined parts of Ferrous, Non-Ferrous, Stainless Steel & Tool Steel material& it's various Heat Treatment as well as Surface Treatment Processes. He has developed the components required for typical applications likeAutomotive, Aerospace, Defence, Industrial, Locomotive, Off-highway, Fuel Injection System, Hydraulic System, Turbo Chargeretc.

His contribution in New Product development& problem solving is remarkable. In each Organisation, with his Focused Improvement Approach, he has made successful stories.

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Particle Size Analyzer

- Suitable microscope as per particle size distribution
- Motorised X Y stage
- Stage scanning function, as per desired program
- Software segmenting particles of metals, non metals and threads, as per size


Test Report

MILIPORE FILTER PAPER ANALYSIS REPORT

Customer :	Devitech	Date	10.9.2012
Sample ID:	R1	Magnification	500
Test Method	ISO 16232	No Of Field	9
Filter Paper Size:	47 mm	User	-

Particle Size Analysis

Size Ranges	0-5	5-15	15-100	100-200 µm	200-400 µm	T-Count
Metalic	0	0	4	0	0	4
Non Metalic	0	0	156	13	0	170
Fibres	0	0	0	0	0	0
Total Particle including all type						174

Metalic Particle		Non Metalic Particle		Fibre	
Minimum	14.4 µ	Minimum	12.34 µ	Minimum	0
Maximum	94.35 µ	Maximum	196.16 µ	Maximum	0
Mean	42.84 µ	Mean	37.49 µ	Mean	0
Std. Dev.	28.31 µ	Std. Dev.	33.53 µ	Std. Dev.	0
count	4	count	170	count	0
Field count	9	Field count	9	Field count	9

Note: All result in Micron

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32 Yrs in Service

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