

# Chapter News Letter


**Editor**
**Yogesh V. Dandekar**
**Chapter Office Bearers**

 Udayan Pathak  
Chairman

 Louis F Vaz  
Secretary

 Ruta Barve  
Jt. Secretary

 Rahul Gupta  
Vice Chairman

 Yashwant Gowaikar  
Treasurer

**Chairman, News Letter Committee**
**Louis F. Vaz**

## EDITORIAL . . . ✍



**Yogesh V. Dandekar**  
Assistant Professor  
Cummins College of Engineering  
for Women, Nagpur

Dear readers,  
Greetings to all!

*The best of our work comes out when you are pushed to the wall. The world is pushed to the wall right now - Madan Gowri, Famous YouTuber, India*

*Lockdown proved that it is not the barrier for those who work, but is the chance to enhance your skills, gain the knowledge and it is a perfect*

*time to try the things you could not have managed to do earlier due to various reasons.*

*Yes, many of us witnessed the COVID19 effects individually or as a part of team in our organizations we are working in and we will have to face number of challenges ahead in the post-covid era. Same was the case of our ASM International, Pune Chapter. We as a team, proved that there is no barrier like lockdown to stop us from various activities like Lecture Series, FDP and online Training Programs and many more. All these having a great response and enthusiastic participation. We perfectly used various platforms to conduct these programs using latest technology. We took maximum advantage of this technology to reach out to the students, faculty and technocrats pan India.*

*We are happy to share that in the newsletter we are publishing, an interview of Mr. Vishram Jamdar, Chairman, BoG, Visvesvaraya National Institute of Technology (VNIT), Nagpur. Mr. Jamdar nicely explained about the scope of Material Science in the Research and challenges to Indian students to bring latest technology in the country. He focused on making the students self-reliant as well as industry ready.*

*We are pleased to introduce 1st woman Metallurgist from Government Polytechnic, Nagpur, Dr. Rashmi Baxi. Dr. Baxi has thrown light on her success story from a girl student to the successful technocrat. We are confident that her journey will definitely inspire budding women engineers.*

*A technical article on the theme of this newsletter "Oriental Metallurgy" Dr. Vijay Didolkar put up his study on traditional metallurgy as described in Rigveda and its relevance through the non-rusting Iron Pillar in Delhi.*

*We request the readers to please go through the issue and hope that readers will definitely enjoy it.*

**Editor**  
**Yogesh V. Dandekar**

## Shrikant Joshi declared as 2020 Class of Fellow ASM (FASM)

ASM Pune Chapter Member Shrikant Joshi is a Professor in the Department of Engineering Science at University West, Sweden with nearly 30 years of experience in areas spanning Surface Engineering, Laser Materials Processing and now also Additive Manufacturing. He is a Chemical Engineer by academic training, having obtained his M.S. and Ph.D. degrees from the Rensselaer Polytechnic Institute and University of Idaho, respectively, in USA. Prior to moving to Sweden, he has had long stints as a Scientist at the Defence Metallurgical Research Laboratory (DMRL) and the International Advanced Research Centre for Powder Metallurgy & New Materials (ARCI) in India. Shrikant's past work has attempted to bridge basic research, technology development and its transfer for industrial implementation. His current areas of research are solution & solution-powder hybrid thermal spraying and additive manufacturing. His work has led to many industrial applications, over a dozen patent submissions and more than 180 publications in peer-reviewed journals. He has also received several awards coveted by including the 'Superconductivity Annual Prize', the Award and the Year Award. He is Indian National Engineering Academy of



### Citation

**"For sustained contributions in the fields of advanced surface engineering and laser materials processing, and mentoring young professionals."**

ASM is excited not only to honor him with our Fellow designation, but to be able to do so at our first annual International Materials, Applications, and Technologies (IMAT) conference. ASM has reinvented its annual meeting, exhibit, and technical conference to bring together the entire ASM community as well as align with the industries and members that support the organization. ASM anticipate conferring this honor upon Shrikant Joshi at the Convocation of Fellows to be held during the ASM Awards Dinner on Tuesday, September 15, in Cleveland, OH.

## Welcome New Team- India National Council (INC)



**Dr. Ashok Kumar Tiwari**  
Chairman



**Mr. V Babu Sathian**  
Vice-Chairman



**Mr. Suhas Sabnis**  
Secretary



**Dr. Vivek Singhal**  
Treasurer

We are happy to inform you, a new team of ASM India National Council was elected unanimously. The new Team will take baton very soon. We are sure, new team will take INC activities to very high level and make ASM activities dynamic in India.

**Dr. Ashok Tiwari**, Director, M/s Chemi Chem Mumbai a Defence metallic component manufacturer. He is M Sc Tech. (IITB) PhD. (IITB) MBA. He had about 15 years .Ind. experience at different steel plants in India and Botswana, South Africa. He also had teaching experience at Mumbai University and Gabrone University (South Africa).

He is member of various professional bodies like IIM, IIF, ASI, SSPC , ASM International. He served as past Chairman of ASM India (Mumbai) Chapter and currently is Vice Chair of ASM India National Council.

**Mr V. BABU SATHIAN**, Founder & Managing Director, M/s. Process Pumps (I) Pvt Ltd., M/S Cathodic Control Company Pvt Ltd., M/s. Allcast Industries. He is B.Sc., B.E., M.E (IISc), FIIM. He has keen interest in the science of Corrosion and its prevention and Foundry practice of special materials including super alloys. He has published several technical papers at the various national and international conferences and symposiums. Designed and developed new products and processes making use of simple innovative processes and technology. He also served as Chairman of the organizing committee - IISc Global Alumni Conference 2015, NMD ATM 2010 and Metx 2011. He is regular invitee to the council of trade organisations like Peenya Industrial Association, KASSIA, FKCCI and BCCI etc. He also served as Chairman, ASM Bengaluru Chapter.

**Mr Suhas Sabnis**, Consultant, is B Tech (Met) & M Tech (High Temp Ceramic) IIT B. He has rich industrial experience. He worked in Macneill&Magor Ltd., Crompton Greaves Ltd., L&T before starting his own consultancy Metsol Consultants.

He served ASM India (Mumbai) chapter various capacities as Treasurer, Secretary and Chairman. Since 2012, he is serving as Executive Director of ASM India (Mumbai) Chapter. He was instrumental in organising Materials Camp for India (Mumbai) & Gujarat Chapters.

**Dr. Vivek Singhal**, GM R&D, Stay Sharp Diamond Tools Pvt Ltd. is BTech from NIT Srinagar, PhD from IITB. He also served as Head Materials in Global R&D Centre of Crompton Greaves. Under his leadership, six new low cost high performance steel grades developed for Electrical motor applications, nano materials based power equipment, improved casting and welding surface finish, sealing and painting finish improvements were done.

## Upcoming Events

Topic	Speaker	Date
Latest Trends in Cutting Tools	Mr S K Sagdeo	14 <sup>th</sup> Aug at 7 pm on Ring Central forum
Powder Metallurgy	Mr N L Chandrachood	TBD
Contribution of Materials in Improving Performance of HVAC	Mr P Ghate	TBD

Above programs will be online using Ring Central Platform. Members will get invite and link. Non-Members please contact [asm.pune@gmail.com](mailto:asm.pune@gmail.com) for invite & link.

## Past Events

### i) Online FDP on Renewable Energy at Cummins College of Engineering for Women Nagpur in association with ASM International Pune chapter.

Department of Mechanical Engineering Maharshi Karve Stree Shikshan Samstha's Cummins College of Engineering for Women had organised seven days online Faculty Development programme on 'Renewable Energy Sources: A Way Ahead' in association with ASM International Pune Chapter and ISHRAE Nagpur chapter from 15 May to 21 May 2020. The programme was inaugurated by Dr Bharat Kale, Director, Centre for Materials and Electronics Technology Pune, in the online presence of eminent office bearers of ASM international Pune Chapter, Dr. B. P. Joshi, Principal, Cummins College, Nagpur. Chairman of MKSSSS's Nagpur Prakalp Shri Milind Ji Kukade. Mr. Udayan Pathak, FASM & Chairman ASM International Pune Chapter, briefed about the ASM activities. Many members from ASM were present during this week long FDP. Dr. Kale briefed the audience on Hydrogen as Potential Fuel. Various speakers from industries, academia have shared their views on various renewable energy related topics. Mr. Narendra Ahir, Dy. General



Photo: Dignitaries during inauguration of FDP

Manager from Nagpur Metro talked on renewable energy scenario in India on 16 May. Mr Prashant Kumar Tripathi from Mahindra Electric Mobility Ltd Bangalore delivered lecture on e-vehicle and design for battery in e-vehicle. Dr Sandip Joshi, Ph.D from VNIT in Solar Energy and Dr Rajesh Manerikar, international expert and consultant on waste management fuel shared view on Solar thermal and Sustainable Biofuel respectively on 18 and 19 May. Dr Brijesh Patel from MATS Raipur gave expert talk on Wind energy capabilities and application on 20 May. Seventh day online session was concluded with talk on 'Power Generation from Geothermal energy' by Mr. Pranav Ambaselkar, BEE Energy Auditor and expert in geothermal energy. All the sessions were conducted online using Microsoft Teams platform supported by MasterSoft IT Solutions Nagpur. More than 3200 participants from more than 15 states and 4 countries have registered for the programme. 70% faculties, 15 % Ph.d Scholar, 10 % Industry persons were amongst the participants registered for the FDP. Everyday more than 1100 participants have attended the sessions with keen interest. This program got an unparalleled response of more than 3500 registration throughout India and from 7 other countries as well.

### ii) 03 Day Global Online Proficiency Improvement Programme (oPIP) on 'Metallurgy for Non-Metallurgist' from 26th to 28th May 2020

In Proficiency Improvement Programme Series, a 03 Day Global Online Proficiency Improvement Programme on 'Metallurgy for Non-Metallurgist' was conducted at thru Ring Central from 26th to 28th May 2020.

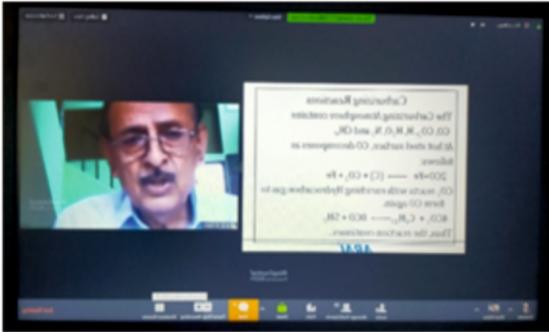
The speakers for this PIP were as below:

- |                      |                         |
|----------------------|-------------------------|
| • Mr. Udayan Pathak  | • Ms. Ruta Barve        |
| • Mr. S G Kulkarni   | • Mr. Rahul Gupta       |
| • Mr. B R Galgali    | • Mr. Sudhir Phansalkar |
| • Mr. Vineet Marathe |                         |

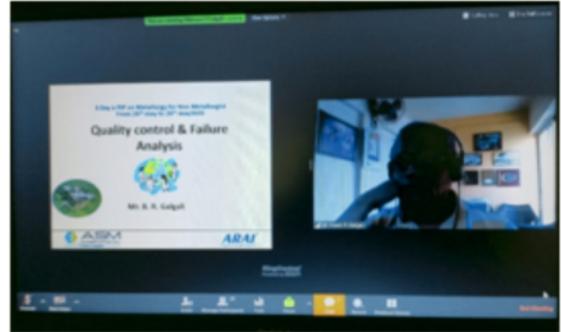
Below Topics Covered during the online training programme

- |   |   |
|---|---|
| • Making of Steels and Metal Forming Process          | • Heat - Treatment of Steels & Case Hardening |
| • Strengthening Mechanisms                            | • Solidification of Metals                    |
| • Heat – Treatment (Microstructures & its properties) | • Quality Control & Failure Analysis          |
| • Steel and Cast Iron                                 | • Joining of Metals                           |
| • Non Destructive Testing                             | • Testing of Mechanical Properties            |
| • Non-Ferrous Metals & their Applications             |   |
| • Panel Discussion and Q&A                            |   |

Total 45 participants attended this workshop. The feedbacks from the participants are consolidated and the same is attached. The average ranking by the participants of this PIP is 8.9 out of 10.



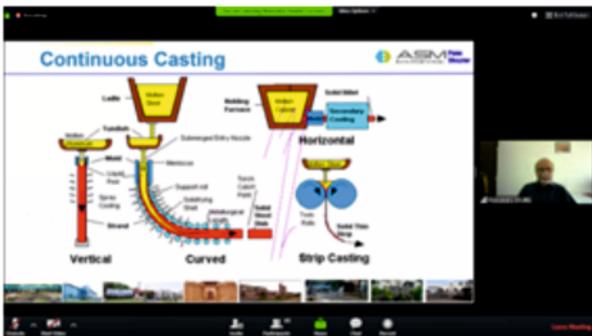
*Mr. S.G.Kulkarni speaking on heat-treatment*



*Mr. B.R.Galgali on QC and Failure Analysis*

**iii) An online series of Expert Talks by various ASM International Pune Chapter members was held in collaboration with Government Polytechnic, Nagpur**

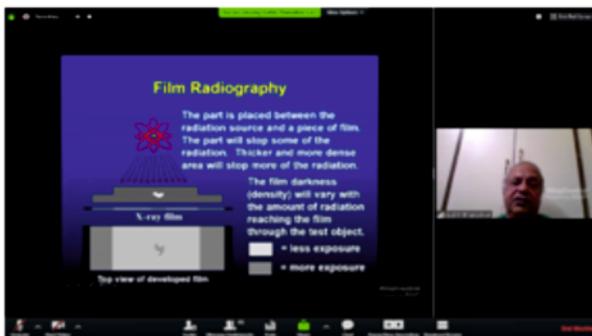
Prof. Vanashree Humne along coordinated the event. It was inaugurated by Dr. Dipak Kulkarni, Principal, Government Polytechnic, Nagpur. On the Ring Central online platform almost 150 students from various polytechnics and Engineering colleges attended the event. Total 20 sessions on different technological topics like welding, non-destructive testing, solidification of metals, metallography, iron and steel making, non-ferrous metallurgy, corrosion perspective in design, quality control, forging technology, career opportunities, casting technology, metallurgical thermodynamics and communication skills were discussed.



*Mr. Shukla's lecture on Steel Making*



*Deepak Kulkarni*



*Mr. Phansalkar's lecture on Non-Destructive Testing*



*Miss Vanshree Humne lect...*



*Dr. Suresh Yavalkar- Jt. Direct...*



*Photo: Online workshop participants*



*Kalyan*



## KNOW OUR MEMBERS



Satish Venkataraman

Satish Venkataraman has done his BE in Electronics. He has with him around 15 years of experience in instrumentation and around 15 years of experience in addressing solutions to industries pertaining to heat treatment automation.

He is now Regional manager in PMA Controls India Limited, Chennai since 2005. PMA specializes in providing automation solutions to any kind of furnaces, heating lines, galvanizing lines and Paint booth.

PMA now has the capability of giving part as well as whole solutions including supply and support for Controllers, scanners, thyristor power controllers, sensors from GHM range, Special PLC range and also our UPC range of furnace solutions, H2 sensors, gas and dew-point analyzers, Waukee and atmosphere engineering flowmeters,

Protherm controllers, Marathon probes, Active PLC and heat-treatment related softwares, Endo gas injectors and so on.

Satish Venkataraman may be contacted on Email: [venkataraman.satish@gmail.com](mailto:venkataraman.satish@gmail.com)

Mobile: 9323407181 (whatsapp no) / 9969632781

## Volunteer yourself for your Chapter!

For more efficient working & expanding network of your ASM International Chapter, please support your chapter by offering your time. Lot of avenues to choose areas of your liking. Options are - Membership Development, Education Programs, Students Outreach, Member Service, Website, News Letter, Technical Program and Social Events. Contact ASM International Pune Chapter [asm.pune@gmail.com](mailto:asm.pune@gmail.com)



★★★★★ FIVE STAR CHAPTER

### ASM International Pune Chapter

Guruprasad, 37/4/A, 6th cross Lane, Prabhat Road,  
Pune 411004, Maharashtra, India.

Phone #: 91 - 020-25674455 / 0808.

E-mail: [asm.pune@gmail.com](mailto:asm.pune@gmail.com)

Web: [www.asmpunechapter.com](http://www.asmpunechapter.com)

## EULOGY

Mr. Sudhir M. Phansalkar, a long time ASM Pune Chapter's active and dedicated volunteer, passed away in Pune on 12th July 2020 after a brief illness. The news came as a sudden bolt from the sky to all of us since he had very recently conducted a series of on-line lectures for students as well as for ASM Training program.

I had known Mr. Phansalkar for the past 40 Telco) Pune and later at Spicer Pune. He was a colleague. He very ably handled various Vendor procured items, Induction hardening etc. As a matter of fact he qualified himself as After leaving Tata Motors in 1995 he carried out Fasteners etc. before joining Spicer as a Chief conducting several Training programs on His long association with ASM International member helped the Chapter to become a most also globally. His most notable contribution was



Sudhir M. Phansalkar

organized number of Materials Camps in association with Materials Engineering Dept. College of Engineering Pune very successfully. In spite his busy schedule as a businessman in recent years, he could always find time for these activities. His premature departure is a big loss to Pune Chapter and has caused a vacuum in many activities.

May his soul rest in peace!

years, first as a colleague at Tata Motors (earlier silent but very dependable and knowledgeable functions like metallurgical quality control of operations, Nondestructive testing activities 'Level -3' expert of ISNT, which is a rare honour. different tasks in Saudi Arabia, Right Tight Metallurgist. Simultaneously, he was Nondestructive testing techniques.

Pune Chapter as an executive Committee vibrant and active chapter not only in India but in the area of Student Outreach whereby he

by Dr. Prabhakar G. Renavikar, FASM

## Women Metallurgist Speaks

Dr. Rashmi Baxi is the among the first 2 women metallurgists from Government Polytechnic, Nagpur. Our student from Cummins College of Engineering for Women, Nagpur Ms. Krishna Lokhande tried to make her speak about her achievements as a woman Metallurgist and she shared her entire journey at the end suggested to women in this field to choose their career and hardship needed to establish the self in the community.

Here are the glimpses of interview of Dr. Rashmi Baxi madam—

### Krishna:

According to the MoSPI (Ministry of Statistics and Programme Implementation), Govt. Of India (2019), Out of the total students pursuing general plus technical/ professional education, enrolment of students into Mechanical field is 8.4% out of which only 0.43% are females. Even less goes for the Metallurgy field where only 0.1% pursue it and out of which 0.024% are females. Even less % could be thought of at your times. So, both of them being challenging fields, how did you think of entering those? Please brief us about your educational journey right from beginning.

### Dr. Rashmi:

I would start by putting forth the scenario at those times after 12th. There were no private colleges. If at all you do not manage to get into NITs or IITs then Diploma was the option. Honestly, I was a bit farther from entering the former and hence I chose to opt for a diploma in Metallurgy. Having the option to change the stream, I did not do so and continued with it. I also did an internship in the core completing my diploma, I did a to core Metallurgy in the Quality that staying a diploma holder educational profile. Therefore, I education and opted for the marking there was very rigid 60% in each subject for so and then did a 1 year job in the teaching. I was from college to pursue an It was a very exciting phase Mechanical subjects like heat engineering metallurgy, nano simultaneously along with my Metallurgy labs for Mahindra. In this way, I was simultaneously working for both Mechanical and Metallurgy fields. Also, speaking about the Industry perspective, I got a chance to work in Quality domain and then I got a chance to take training programmes for industries like Ashok Leyland and so on.



*Dr. R. N. Baxi*



*Ms. Krishna Lokhande  
Student, Final year BE Mechanical,  
Cummins COEW, Nagpur*

Metallurgy domain. After job for almost 1.5 year related Department. Then I realized could be a stagnation for my decided to pursue further Bachelor's Degree. The with tough subjects requiring passing. But, I managed to do internship. Then I opted for a fortunate to get permission M.Tech degree simultaneously. when I was teaching core transfer, machine drawing, technology, etc and co- teachers was setting up

### Krishna:

Could you please elaborate on your exposure to Industrial Experience? What exactly was your role?

### Dr. Rashmi:

After completing my diploma in Metallurgy, I took a job for more or less 18 months. The job profile was of a Quality Manager of the engine's inner cylinder liners. Cylinders were produced by centrifugal casting. Further company permitted me to pursue higher education. With this, I had total industrial technical experience of 11 years. Later, I took over teaching as a profession at one Engineering College in Nagpur and now have 19 years of experience. Meanwhile in the drive, I contributed into Research and Development for three years as a Research scholar in the area of polymeric materials at MME, VNIT, Nagpur. After this, I mentored a UG level project for the session 2010-11 that was sponsored by IEDC and Motorola Solution Foundation (conducted by the Foundation for Advancement of Education and research 2011-12). It was a great journey where I was into (i) Collaborative research work with academic institutions and industry (SJS Plastiblends Pvt. Ltd. Aurangabad) (ii) Instrumentation handled during research. Visited Knowledge Village and R&D centers at Dubai during 2011. During that, I had secured various memberships of Professional Societies, Life member ISTE, Institution of Engineers (India) and life member in institution of Metals. During this, 10 major papers were published based on computer metallographic examination, Automated inspection of printed patterns of ceramics tiles, manufacturing of radiator's enhanced technology, virgin PET-PBT and post consumer PET-PBT blends, characterisation of poly blends and mercerized and citric acid surface fiber reinforced

composite. I was also offered as Faculty resource person . This was a glimpse of my exposure to Industries including my parallel journey of a professor.

**Krishna:**

While working on the shop floor in the core industries, did you at any point feel that gender is a limitation to field work?

**Dr. Rashmi:**

Frankly, yes. I was not offered heavy tasks rather I was not fully prepared for doing so and neither for adjusting with the shifts. Also, I felt that for the same post, more work could be extracted from male candidates. So, these were few limitations I felt at that time.

**Krishna:**

As you had also been into teaching, did you feel that educational institutes somewhere lacked in making students industry-ready or self-employable?

**Dr. Rashmi:**

Speaking in terms of private colleges, I don't think that educational institutions are solely responsible. I have noticed that the advancements in technology and updation in University syllabus do not go hand in hand. And ofcourse, institutions and students do not have a choice but adopt it. And this is not what is required to make the students employable. We will have to get adaptable to advancing technologies and redesign the syllabus. Autonomous colleges can certainly work in this direction but till then educational institutes can give more and more exposure to the industrial environment to students and ask them to work on practical real life problems.

**Krishna:**

Now, coming to students, what skills according to you should they possess to stand apart in this cut-throat competitive market?

**Dr. Rashmi:**

I would certainly ask students not to think big but first sharpen their basics. Now, when I speak about basics, I mean it both in terms of technical and way of living. For example, in every Engineering educational institute, I saw the Smithy process carried out traditionally where a lot of energy loss takes place and a lot of work input is required. Even a smith man can do it. So, what is the difference? We, as Engineers, should think of making it energy-efficient. This was just one example. I can give you many such examples which could be improvised by applications of basic. I personally did rural based projects. I think, starting from small things like applying basic technical knowledge to reduce efforts and then moving on to big things could be of great help. Students should not only depend on educational institutes but always update themselves by learning through society and self-learning.

**Krishna:**

Do you find any difference in metallurgy at your times and now? And, what is the future of it?

**Dr. Rashmi:**

Yes. I find a wide difference. Also, one of the major differences is that the word Metallurgy has become outdated and is replaced by Materials Engineering. This itself has widened the scope of the stream. The area of focus is not only metals but also ceramics, polymers, composites, etc. Also, the hurdles for diving into it are reducing. It can now be defined as 'Anything in Everything'.

**Krishna:**

What is your advice to the budding minds aspiring to take up with challenging fields like Materials Engineering or Mechanical Engineering? Would you like to leave a special note for females?

**Dr. Rashmi:**

I would like to be frank here. I would advise that if you are really interested and passionate about taking materials engineering only then you should go for it. Because many times I have seen that, students compromise on stream for prestigious institutions. Certainly, that wouldn't help. Also, taking up these streams demands not running behind high packages initially but hardship. Certainly, automation industries won't demand much of the later but the initial learning process should take place through immense hardship as per my opinion.



## SPECIAL APPEARANCE

### An interview with Shri. Vishram Jamdar

Established in 1960, Visvesaraya National Institute of Technology, Nagpur is one of the leading institutes in India. The institute is the alma mater of our special guest for this edition of News-Letter Shri Vishram Jamdar, Chairman, Board of Governance, VNIT, Nagpur. Shri. Vishram Ramchandra Jamdar is renowned industrialist, educationist, spiritual thinker & a reputed writer. His association with the world of industrial work started way back in 1972 & he has given the tireless service with more than 48 years to various industrial sectors of the region.

Shri. Vishram Jamdar is a reputed industrialist of central India and is directly associated with ISO Certified industries viz, M/s. Kinetic Gears, M/s. Garuda Yantra Nirmitee Pvt. Ltd., M/s. Mahalasa Enterprises Pvt. Ltd., M/s. HTW Industries, M/s. KG Transmission and many more. He has received the prestigious 'ZED Certification' (Zero Defect and Zero Effect) for the industrial unit 'Kinetic Gears' from Ministry of Micro, Small and Medium Enterprises. Earlier Shri. Jamdar was a member of Board of Governors of VNIT for ten years (2002-2012), since its inception in 2002 as VRCE and the Chairman, Board of Governors VNIT Nagpur from Sept-2014 to Sept-2017.

Further, he has been selected as the Chairman, Board of Governors VNIT Nagpur from July 2018. His contribution and technical excellence was aptly acknowledged by the Udyog Gaurav Award by HRD Ministry, Import Substitute Award by Defense Ministry, Best by MSFC, he is also a recipient Award' by Quality Council of elevated him to the position of with Finance Minister, GOI (in

Shri. Vishram Jamdar has an President of Laghu Udyog as a member of working Group

Shri. Vishram Jamdar has articles & books on Indian

Our student Ms. Maithili College of Engineering made towards the current industry

His valuable advice is a take away for all the budding engineers and entrepreneurs.



*Vishram Jamdar, Chairman, BoG, VNIT, Nagpur*



*Ms. Maithili Mandavgane*

Entrepreneur of Maharashtra of 'Economics of Quality India (in SSI Category) which member of Pre Budget meeting MSME sector).

honour to work as the National Bharti for three years and also on Labour formed by PMO.

authored numerous snippets, Philosophy, Culture & History.

Mandavgane from Cummins Vishramji to speak on his view scenario and MSME sector.

**Let's witness his interview by Maithili —**

**Maithili:**

Sir, you are a leader, an industrialist, an educationalist, a writer, an entrepreneur and a spiritual thinker. How did you shape up such a versatile personality?

**Vishramji:**

My journey started way back in 1972 when I started my first venture 'Heat Treat Well'. I had a tough time those days as I had to fight departments like MSEB, MSFC, etc and in addition to that various industrial issues. And, when you successfully fight through the circumstances, society looks up to you as a leader. So, initially I never thought of becoming a leader but I was made a leader by my colleagues. And the strong point is, many of them started with the industrial sectors and failed. But, I successfully managed to prevail with 5 of my units still working. Of them, my 1st unit is Heat Treat Well, 2nd is Kinetic Gears and 3rd is Garuda Yantra Nirmiteepvt. Ltd. Later in 1999, both of my sons joined the units and their higher aspirations led to further development of the units. This is how I could establish myself well as an industrialist.

Journey to becoming an educationalist was parallel. I was associated with Government Polytechnic and used to visit it as an external examiner. Also, I was frequently invited to deliver guest lectures there and thus I stayed connected with the Govt. Polytechnic and subsequently Govt. Polytechnic could get Autonomy. Eventually, as a recognition to my efforts and post, I was appointed as a board member and also Chairman of Board. In the meantime, in 2002 when VRC got converted into VNIT. I was

appointed as a Board Member there as I was affiliated to both the industrial and educational sector. I was a member of the board of governors of VNIT for 10 yrs. (2002-2012) and then I was appointed as Chairman of the board of governors of VNIT in 2014. This tenure was for 3 yrs. But, recognising my relentless efforts and good work I was reappointed as the Chairman. And this is my 2nd term. So, this is how I could successfully establish myself in these versatile domains.

**Maithili:**

That's indeed inspiring sir. So, having a wide experience of 40+ industries and at the same time affiliated to the educational sector, did you find any flaws in the latter to make the students ready to meet the requirements of the former?

**Vishramji:**

Well, I would like to correct you that I have an industrial experience of 40+ yrs. Which is usually wrongly interpreted. Coming back to your question, as I told you I had to play both the roles. And yes, certainly there has to be a development in the educational sector but at the same time I would also like to tell industries that do not expect a student to know everything. Give training to the student and make him industry- ready as per their requirements. As the student steps out of college, there is a wide spectrum of industries right from Nagpur to America and so forth. So, educational institutes are not actually expected to do so. But, yes students could be exposed to the industrial environment through industrial visits. So, it should be both ways. As, before putting a part into the machine, it has to be shaped, likewise industries should shape the students to fit their environment. Similarly, educational institutes should try to give maximum industrial exposure to the students.

**Maithili:**

Does industrial exposure imply hands-on experience? If yes, how could we ensure that?

**Vishramji:**

Yes certainly it implies hands-on experience. But, it could not be achieved in a day or two. So, my thought to this is, there should be a separate considerable slot for industrial experience. And if it is possible for industries to actually provide the students with work it is well and good. But if not, then students should keenly observe and equip themselves with appropriate knowledge.

**Maithili:**

That's indeed insightful sir. Coming to your other dimension as an Entrepreneur, could we request you to shed light on making students self-employable. What role is expected to be played by educational institutions here?

**Vishramji:**

I agree with the point that there is a need for self-employment. For this, educational institutions should organise entrepreneurship courses for the students aspiring to pursue entrepreneurship. As a Chairman of VNIT, the 1st thing which I did was to design an entrepreneurship course. And this course is a tremendous success yielding 5-6 successful startups every year. I had this vision from the start which was to make a job-provider than a job-seeker.

**Maithili:**

Your profession is also related to metallurgy whose scope has now widened to material sciences. Despite this, the trend amongst the student's mentality is similar since starting. As only a few reputed institutions like NITs and IITs offer the course, students go for it just for the sake of getting into a reputed institution. So how should this be dealt?

**Vishramji:**

As you have rightly said that the scope of Metallurgy has widened and only few institutions offer the course, I would always suggest that students should take it by choice and not by any compulsion. I personally took it by choice and believe me there as there are relatively very few Metallurgical Engineers, there is a huge respect for him. And yes, for any manufacturing industry to sustain successfully, there is always a need for a metallurgical engineer.

**Maithili:**

That's very true sir. Could you please elaborate the scope of Metallurgical Engineering into industry? Please shed light on the R & D and Q & A aspect with respect to it.



**Vishramji:**

Yes. We have already discussed that the scope of metallurgy has now extended to material sciences. Materials can be broadly classified into Metals and non- Metals. Now, Metallurgy can be broadly classified into Extractive Metallurgy, Mechanical Metallurgy and Physical Metallurgy. Speaking in terms of R & D, if one is extracting Gold, it's extraction is accompanied by some other metal as well. So, it has happened now that the elements in the periodic table have been extended up to 132 by the grace of extractive metallurgy. Also, if you consider an example of manufacturing of gear, it's ultimate behavior under loading conditions will be determined by composition of various alloys, shape, heat treatment conditions, etc. of the material.

When we speak of material sciences, in addition to metals it also deals with non-metals like rubbers, plastics, ceramics, etc. and also composites. The scope of R & D in Non- metals now has reached to such an extent that now it is possible to replace a heart valve. There are many such examples which once seemed impossible are now possible due to advancements in R & D in Material Science. So, there is a wide scope.

**Maithili:**

If one has to carry on research on any material which is say newly developed, it has also to be accompanied by investments in it's manufacturing as well as recycling process. As you stated above, if it has to be applied in the human body, virtual simulations come into role. Is our Country ready to spare the amount to get equipped with these?

**Vishramji:**

Certainly, our country as of now is not well equipped with these technologies. But what I would suggest here is to go to that country which is advanced in that technology. Learn it there, come back and open up the enterprise regarding the same.

**Maithili:**

While setting up or running an industry with metal powders as waste products spilled into water bodies, what will you comment on pollution in riverines due to exposing undesired byproducts from various metal industries, textile, pigments, etc industries?

Metals and minerals available in the environment so in what form it is being exposed, that it is pestilent to aquatic existence? What can be done?

**Vishramji:**

Few years ago, in a periodic table, a certain number of elements were discovered, and presently there are elements which are imposed with too little work on. Due lack of information that harms nature to some extent. Majorly industries around us were metal industries and material industries, in olden days in search of efficiency and quality least concern was addressed towards the environment. They were not very cautious about it. With an example of foundry, I can share that scrap in shops was thrown away after the machining process, but today there is a wide scope you can buy that scrap from a steel industry and can make your own foundry shop. That way you reuse the residue as a resource. So it will be raw material for you to extract products out of it.

See there are n.. number of metal(material) industries, which are applying this, meanwhile this also makes the process economic. I don't advise any industry to let their waste mix with nature, and pollute it. And also it has been banned now. But extracting useful elements from these and producing many new worthy products by innovative ways can introduce the green maiden market. Such projects are coming now, so that can come up with better solutions for society.

Also beneficial for the concern of non degradable substances. This allows us to investigate in a wide domain and offers research over metals, materials, recycling methods and sustainability.

**Maithili:**

What is your advice to the budding generation aspiring to pursue Metallurgy and Material Sciences as a career?

**Vishramji:**

My first advice is to take up the stream by choice. Explore every dimension of it. Think of making yourself employable. But while doing so, be concerned about the sustainability aspect.



## Technical Article: The Delhi iron pillar: A rustless wonder

### History:

The Delhi iron pillar situated at Mehrauli, Qutub Minar garden, New Delhi, India is a wonder depicting the skillfulness possessed by the metallurgist since the ancient times. The pillar is able to stay away from the rust despite being made up of 98% Iron even in seasonal humid environmental conditions. The pillar was supposed to deteriorate due to corrosion after a certain period of time due to contact with moisture but even after 1700 years of its existence it is found to be rustless.

Scholars date the making of the pillar during the reign of king Chandragupta 2 between 375 - 413 A.D. Its fabrication and manufacturing were done in 319 A.D. as evident from inscription in Sanskrit language. The length of pillar is 7.2 m out of which 6.7 m is above the ground level and 0.5 m is below the ground level. Its upper diameter is 290 mm and lower diameter is 420 mm respectively.

### III. Inscription:

The six lines inscription on the pillar was written around 340 A. D. Using the Brahmi language.

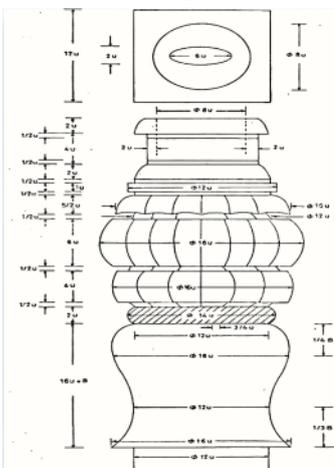
It reads "He on whose arm fame was inscribed by the sword, when in battle in the Vanga countries, he kneaded (and turned) back with (his) breast the enemies who, uniting together, came against him; ... he, by the breezes of whose prowess the southern ocean is even still perfumed. He who, having the name of Chandra, carried a beauty of countenance like (the beauty of) the full moon, having in faith fixed his mind upon (the God) Vishnu, (had) this lofty standard of the divine Vishnu set up on the hill (called) Vishnupada".

### IV. Pillar age:

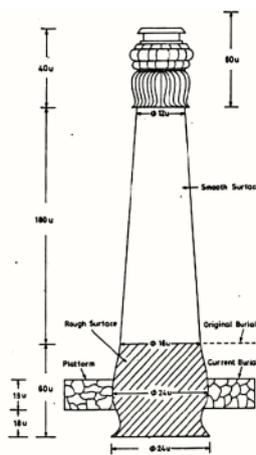
It is about a 1700 years old structure.



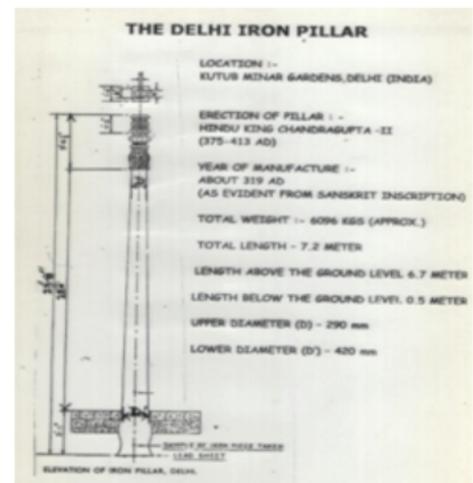
Image source: Internet



Relative dimensions of the decorative bell capital of the Delhi iron pillar.



Relative dimensions of the Delhi iron pillar. The unit U measures 1" and is equal to 1 angulam.



### Chemical composition:

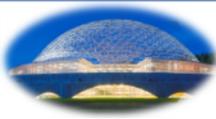
The most significant aspect of the Delhi Iron Pillar is that there is no sign of any corrosion in spite of its exposure to atmosphere for about 1700 years.



SR. NO.	AREA OF PILLAR	LENGTH (FEET ' AND INCHES")	LENGTH (METRES)
1.	Total length	23' 6"	7.16
2.	Below ground portion up to ht. of raised pedestal	3' 1"	0.94
3.	Cylindrical portion exposed to view	17'	5.18
4.	Height of Capital with decoration	3' 5"	1.04
5.	Diameter at the pedestal base	16.7"	0.424
6.	Diameter at the top below Capital	11.85"	0.301
7.	Diameter at the base underground	24.59"	0.625
8.	Topmost square	1'	0.305
9.	Diameter of iron cylinder fitted at the top	8"	0.203
10.	Length of slot or groove for flag staff	6"	0.152
11.	Depth of slot for flagstaff	1' 3"	0.381

**AVERAGE CHEMICAL COMPOSITION OF THE DELHI IRON PILLAR BY WRANGLEN**

SR. NO.	NAME OF ELEMENT	ELEMENT SYMBOL	AVERAGE COMPOSITION ( OUT OF 100% )
1.	CARBON	C	0.15
2.	SILICON	Si	0.05
3.	MANGANESE	Mn	0.05
4.	PHOSPHORUS	P	0.25
5.	SULPHUR	S	0.005
6.	NICKEL	Ni	0.05
7.	COPPER	Cu	0.03
8.	NITROGEN	N	0.02
9.	IRON ( BALANCE )	Fe	99.395



**CHEMICAL COMPOSITION OF THE ENAMEL LIKE COATING ON THE DELHI IRON PILLAR BY GHOSH**

SR. NO.	NAME OF ELEMENT	ELEMENT SYMBOL	AVERAGE COMPOSITION ( OUT OF 100% )
1.	MAGNETITE	FeO <sub>4</sub>	67.0
2.	IRON OXIDE	FeO	13.1
3.	MOISTURE	H <sub>2</sub> O	14.8
4.	IRON PHOSPHATE	FePO <sub>4</sub>	1.7
5.	SILICA	SiO <sub>2</sub>	3.1
6.	MAGNESIUM OXIDE	MgO	0.2
7.	CALCIUM OXIDE	CaO	0.1

**So, what makes the pillar corrosion free?**

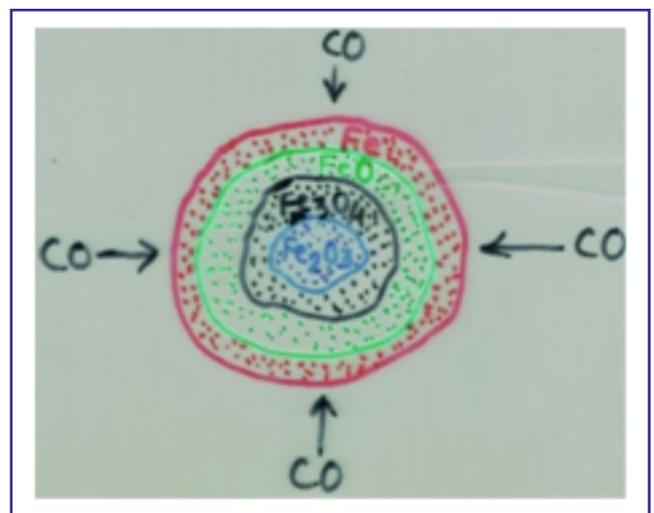
The structure is a heterogeneous structure at both macroscopic and microscopic level. The corrosion is resisted by the formation of **passive protective film** at iron rust interface. The film is formed due to raw slag, unreduced iron oxides and wetting and drying cycles of weather. Also, the high phosphorus content due to absence of lime in the furnaces (which were used to make pillar) and particular repartition act as a catalyst in formation of film of Misawite (amorphous iron oxyhydroxide). The film which has emerged over years is one-twentieth of mm.

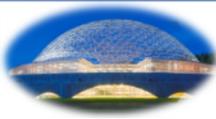
Main body of the Delhi Iron Pillar is shaped by Vertical Forging. Horizontal cracks are present on the surface. Forged welding results in significant volume fraction of entrapped slag inclusion in matrix along with slag envelopes around individual Iron pieces. Carbon percentage shows variations since pillar was forged, welded from several sponge-Iron pancakes varying in compositions. Carbon% and Pearlite is low in surface layers of pillar due to surface decarburization. Solubility of phosphorus is much higher in Ferrite than Pearlite. Hence, concentration of phosphorus is more in surface layers due to the absence of Pearlite at surface as a result of surface decarburization. High phosphorus in Iron as solid solution with Ferrite increases atmospheric corrosion resistance.

**Recent Works:**

- Recent work on the reduction of Magnetite throws fresh light on the formation of the porosity in the reduced Iron.
- Considerable pitting and fragmentation of particles take place during reduction of Magnetite to Wustite by solid Iron.
- Due to density differences between FeO<sub>4</sub>, FeO and metallic Iron, the porosity is also a function of :
  - PITTING
  - SLITTING
  - CRACKING
  - FRAGMENTATION
- During the formation of Wustite, 3-D growth of Iron nuclei and sintering of these nuclei leading to pore networks the extent of which depends up on time and temperature.

All the above findings suggest that sponge iron pieces obtained after reduction are in fact agglomerates of reduced iron particles containing a large amount of porosity.





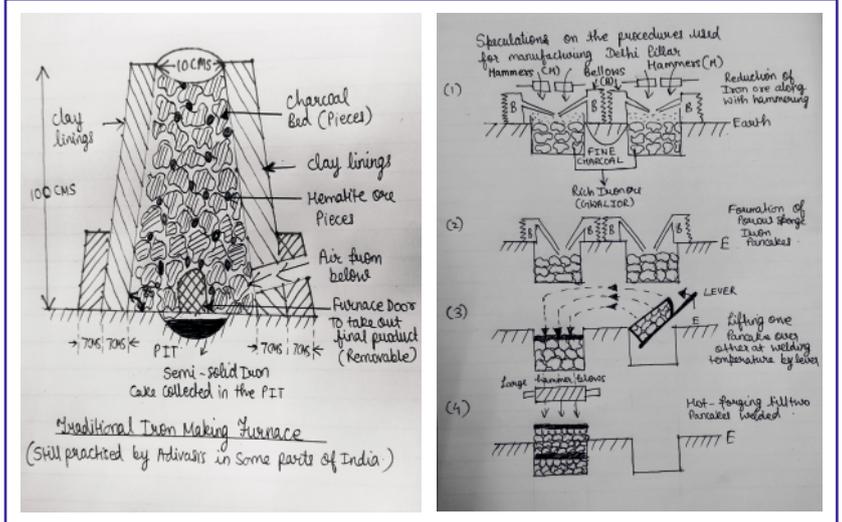
Traditional Iron making furnace structure as per Rigveda, Mandal: 9, Sukta: 112 and Mantra: 2 is still practiced by adivasis in some parts of India. It is reasonable to propose that this technique of forging porous sponge Iron pieces was known to the INDIANS as early as the VEDIC PERIOD. (4500 B. C.) since ample references to Iron/ Steel products are mentioned in VEDAS.

**Speculations on the procedures used for manufacturing of the Delhi iron pillar: -**

1. The author and his Vijnana Bharati team, Nagpur, conducted scientific experimentation on the furnace in 1997 and were able to produce corrosion resistant iron.
2. Sources: - explained in metallurgy in Sanskrit literature – book published by Sanskrita Bharati, New Delhi. yr:2000– by, Dr. V. K. Didolkar, VNIT, Nagpur

**I. Environmental factors:**

1. Dry and unpolluted atmosphere of DELHI till the early 1900.
2. Atmospheric corrosion of Iron is significant only if;
  - a. Relative humidity exceeds 70% ( for DELHI from July to September).
  - b. Large mass and large heat capacity of the pillar contribute to excellent corrosion resistance.



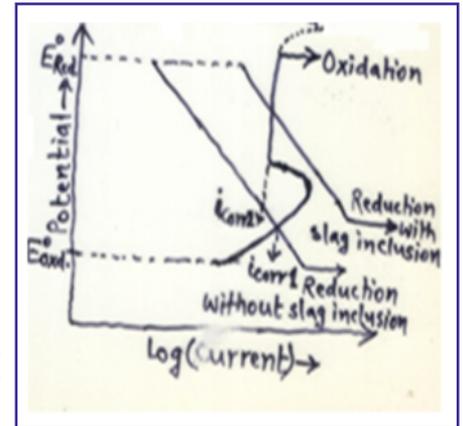
(E.g.):- The KONARK and PURI Iron beams because of the humid/ saline environment had already deteriorated much earlier. The DHAR Iron pillar, situated at west of Indore, state M. P. had already broken down into 3 pieces much earlier. The ACHALESHWAR temple pillars, MOUNT ABU, RAJASTHAN lasted for several centuries have deteriorated earlier. The MOOKAMIGA temple, KOLLUR ( KODACHADRI hills, KARNATAKA ) Height: 9.76m, Sq. Cross-section: 10-12cm, Above sea level: 1450m lasted only for a few centuries and now deteriorated early.

THE PRESENCE OF SUCH CORROSION RESISTANT ANCIENT INDIAN IRON OBJECTS/MONUMENTS IN HUMID/ WET AREA IS A MAJOR ARGUMENT AGAINST THIS THEORY.

**II. Compositional factors:**

1. Heterogeneous structure:
  - a. Non homogeneous structure at both macroscopic and microscopic levels, due to the presence of entrapped slag inclusions, which would be Cathodic to nearly pure Iron matrix.
  - b. Sites for oxygen reduction reactions, lead to atmospheric corrosion, as per the latest knowledge about corrosion.
  - c. In fact, Delhi Iron Pillar can be considered as Composite rather than a pure metal.
2. Mixed potential theory:
  - a. Slag inclusions in pillar are ideal sites for Cathodic reduction reactions and the Wrought Iron Matrix for Anodic Oxidation reaction sites.
  - b. Under equilibrium corrosion conditions –  
Anodic Reaction Rates = Cathodic reaction rates, as postulated by Mixed Potential theory, originally proposed by WAGNER & TRAUD.
  - c. It is assumed that Anodic Polarisation Curve for Wrought Iron matrix of Delhi Iron Pillar would exhibit active-passive behaviour as shown in the Evan's Diagram as follows;
  - d. Cathodic reduction reactions that occur on Cathodic sites ( slag inclusions ) result in demand of electrons that drives the corrosion of the Anodic matrix.
  - e. The Cathodic reactions in atmospheric corrosion would generally be Oxygen consuming reduction of Oxygen given by –

- i.  $O_2 + 4H + 4e^- \rightarrow 2H_2O$  (Acid solution)
  - ii.  $O_2 + 2H_2O + 4e^- \rightarrow 4OH^-$  (neutral and alkaline)
  - iii. Hydrogen evolution -  $2H + 2e^- \rightarrow H_2$  (Acid solution)
  - iv.  $2H_2O + 2e^- \rightarrow H_2 + 2OH^-$  (neutral and alkaline solution)
- reaction ii. to larger extent and reaction iv. to smaller extent.



## II. Compositional factors:

Main body of Delhi Iron Pillar is shaped by Vertical Forging ( presence of horizontal cracks on pillar surface ). Final finishing of rough pillar is done in horizontal position ( presence of smooth surface finish and decarburised layer ).

Forge welding results in significant volume fraction of entrapped slag inclusion in matrix ( along with slag envelopes around individual Iron pieces )- seen by Visual Examination.

Carbon percentage shows variations since pillar was forge – welded from several sponge-Iron pancakes varying in compositions.

Micro structure of inner pillar material ->-Ferrite and Pearlite-phases with entrapped slag inclusions. Carbon% and Pearlite is low in surface layers of pillar due to surface decarburisation. 'P' content of pillar- 0.28% ( 0.18% as elementary in solid solution and balance as Phosphate slag ).

Solubility 'P' is much higher in Ferrite than Pearlite. Hence, concentration of 'P' is more in surface layers ( due to the absence of Pearlite at surface as a result of surface decarburisation ).

High 'P' in Iron ( as solid solution with Ferrite ) increases atmospheric corrosion resistance since 'P' in Ferrite Oxidises to Phosphate which acts like an Anodic inhibitor – promoting formation of protective surface film even at low concentrations. Ancient INDIANS knew that high P% gave better corrosion resistance.

Low Sulphur and low Manganese practically eliminates MnS inclusions which are known as sites of pitting corrosion.

## Conclusion:

1. It is reasonable to believe that Delhi Iron Pillar was made by successive hot forging of directly reduced Sponge Iron blocks in a die. This procedure is very similar to current powder forging techniques with the difference that the latter is not usually used to make a long product by joining pieces together.

The ancient INDIANS, rather than making preforms from Iron/ Steel powder via die compaction and sintering, produce the preforms directly from Iron ore.

Thus 'Powder Production', 'Powder Consolidation' and 'Sintering' steps were combined.

2. It should not be assumed that the technique of forging porous Sponge Iron pieces became prevalent in INDIA only in the IIIrd century A. D., since ample references to Iron/ Steel products are mentioned in VEDAS.

3. Thus, it reasonable to propose that this technique of forging porous Sponge Iron pieces was known to the INDIANS as early as the VEDIC PERIOD. (4500B. C.)

4. Low 'S', absence of 'Mn' and presence of high 'P' are prime factors.

5. Mode of manufacture and slag content of Iron, forming a 3-D envelope of slag/ Oxide around metal, reducing the number of corrosion initiating sites.



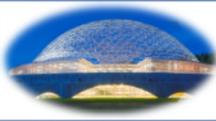
Dr. Vijay K. Didolkar



Ms. Vaidehi Lule  
Student, Third year BE Mechanical,  
Cummins COEW, Nagpur

### Dr. Vijay K. Didolkar

BE (1974), ME (1976) Metallurgy, PhD (1996) VNIT Nagpur  
Associate Professor, VNIT, Nagpur, Chief Editor, Bhartiya Bauddhik Samopada since 1999, Sec. General, Vijnana Bharati for 5 years, Currently working on Material Development Project under DRDO



## From Chairman's Desk:

I am extremely delighted to interact with you, through this column. We at ASM Pune Chapter had initial hit of Covid-19 pandemic and lockdown. We were forced to cancel our **'Women's Day Special'** program organised by Women @ Materials Engineering Committee. However, we bounced back quickly. Our Chapter has many activities, which received unparalleled response during this period. **'Faculty Development Program (FDP)'** that was organised by newly added Chapter Sustaining Member MKSS Cummins College of Engineering for Women Nagpur was super duper hit. It is an excellent example of Collaboration. ASM Pune Chapter and Indian Society of Heating, Refrigerating and Air Conditioning Engineers (ISHRAE), Nagpur Chapter collaborated with our Chapter Sustaining Member to create a record. You can go through the detailed report in this issue. Sincere congratulation to Prof. Prasanna Mahankar, Prof. Yogesh Dandekar and entire organising team for their hard work and making a record. MKSS management under leadership of Mr. Milind Kukde also helped and guided team for this success.

During lockdown due to current Covid-19 Pandemic, students, parents & teachers were distressed. We decided to support them. Principal Deepak Kulkarni and Vanshree Humane of Govt. Polytechnic Nagpur not only uphold our idea of **'1<sup>st</sup> ASM online Lecture Series'** for **Polytechnic students**, but also roped in Govt. Polytechnic Pune & Kolhapur. I am proud to tell you, ASM Pune Chapter is the **First Global Chapter** attempting this **effective** use of **Ring Central** Video Conferencing App. We faced some issues of intrusion. But with support of Ms Nicole Hale from ASM HQ, our Secretary & Ring Central Administrator, Louis Vaz handled this very efficiently. Secretary and Director Technical Education, Maharashtra Govt. along with parents of students appreciated our lecture series is part of this news letter. Chivate and his entire team of speakers for Our **Iconic Monthly Technical Lecture** talking on **'AI & Materials Engineering'** in Ring Central Meeting invite, we had We were lucky to have ASM Past President Canada.



Udayan Pathak, FASM

June is very action filled month for Chapter our Balance Sheet, submit Annual Chapter Quarter. In spite of Covid-19 pandemic Gowaikar and office executive Ratna took sheet to EC. EC pointed out some minor ready by Jun end. Our Chapter Health

Executive Committee suggested to submit **Award Essays** on – **Innovative Programing, Students Outreach & Communication**. Jt. Secretary Ruta, Students outreach Committee Chair Dattareya Chivate and Chapter Secretary Louis Vaz worked closely and supported for finalising essay on Innovative Programing, Students outreach and Communication respectively. Executive Committee, particularly Dr Prabhakar Renavikar gave us crucial inputs for making these essays seamless. We submitted all three essays **well in time**, after thorough checking. We are hopeful for the favourable outcome. Covid -19 pandemic lockdown helped us to enhance our skills of remote working through Video conferencing tool. Membership Development Committee, News Letter Committee started their meetings on Ring Central platform. Our new members are actively volunteering in Chapter activities. Prof Yogesh Dandekar from Cummins College of Engineering for Women Nagpur took responsibility of editing this news letter. He also gave an idea of News Letter dedicated to theme. The theme of this news letter is **Oriental Metallurgy**. We look forward for participation from many more new faces in volunteering.

With all these pluses, I am expecting **severe shortfall** in **Chapter revenue**. In current situation, we will not be able to arrange conference, which is one of the major source of Chapter Revenue. Class Room Training Programs also look difficult. Under this situation, we are focussing on **maximizing revenue** through **online Training Programs**. We are planning and announcing various Training Program. Please leverage your business contacts, network and get maximum delegates for these programs.

ASM India National Council, apex body of Indian ASM Chapters had election last month. This time, in the wider interest of Council, Executive Committee decided to support Bangluru Chapter nominee this time. Our Chapter will have opportunity of nominating Vice Chairman in 2022. Introduction of the new committee of INC is included in the issue.

Let us all Maintain Physical Distance – Avoid unnecessary Gatherings in Public places – Stay Safe.

initiative. Detailed report on this 21 days Please join me in congratulating Dattatreya this success.

**Series** resumed with **Dr. Rahi Walambe** Ruta did a great job. In spite of some issues attendance of 35 people joining this lecture. Prof Ravi Ravindran joining us from

Executive Committee. We have to complete Health Report and Award Essays to Head lockdown, our Treasurer Yeshwant special efforts and presented Trial Balance corrections. Final Balance Sheet will be Report was submitted well in advance.



### Thermal-Mechanical Simulator Solutions

#### A Complete Line of Systems to Advance the State of the Art in Material and Processing Research

Whether you need to characterize new materials, optimize existing processes, explore new production techniques, or simulate the conditions of new applications. Gleeble system will help you costs, shorten development times, and open the door to new ideas, processes and profits.



### Elemental Analysis - Precise and Reliable!

#### Competence in Elemental Analysis

- Stationary Spark-Spectrometers
- Mobile & Portable Spark-Spectrometers
- Analysis Automation
- CS/ONH Analyzers



### Thermo Scientific Niton XRF Analyzer

#### The Niton XL2 – the practical solution from the pioneer in handheld XRF instrumentation.

- Analyze metal alloys for scrap recycling or final product QC
- Carry out grade control, plant operations, and near-mine exploration
- Screen electronics and consumer goods for lead



### Nanomechanical & Nanotribological Tests

- Nanoindentation (both quasi-static and dynamic)
- Nano-impact and fatigue
- Nano-scratch and wear
- Nano-fretting

Authorised Distributors:



#### Branch Office

- Mumbai • Pune • Nagpur • Kolhapur • Ahmedabad
- Rajkot • Delhi • Kolkata • Chennai • Coimbatore

#### International

- Sri Lanka • Bangladesh • Nepal • Dubai

101, New Udyog Mandir No. 2,  
Mogul Lane, Mahim (W), Mumbai 400016.  
Maharashtra, INDIA. Tel: 022 24464748  
email: mumbai@dts-india.com  
website: www.dts-india.com

# Cleanliness Analysis for Contamination Estimation

## Particle Size Analysis System

- 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



Model - CLEAN-EST

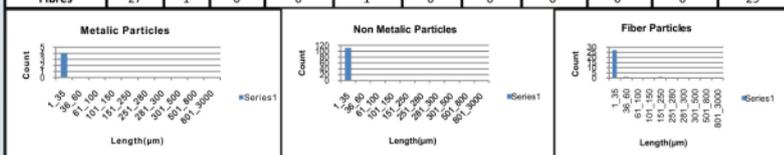
### PARTICLE TEST REPORT.

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



**METATECH**  
INDUSTRIES  
[www.metatechind.com](http://www.metatechind.com)

Corporate Office : 476, Narayan Peth,  
Cosmos Bank Building,  
Off. Laxmi Road, Pune - 411030. India  
Tel.: +91-20-24450530 / 312 |  
Fax : +91-20-24450312  
Email : meta@metatechind.com