ASM INTERNATIONAL PUNE CHAPTER

Issue No. 55, July 2026

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Gunesh Deshmukh

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ISSUE NO. 55, JULY 2026

EDITORIAL

ASM INTERNATIONAL

Editorial

Greetings from the ASM Pune Chapter!

It gives me immense pleasure to share this bimonthly edition of the ASM newsletter as a Guest Editor.

The July 2026 issue of the newsletter is a blend of in depth technical knowledge sharing, professional engagement, and outreach activities.

The featured technical article on fracture mechanics based estimation of fatigue life in induction hardened shafts addresses a topic of strong industrial relevance. Induction hardened shafts are widely used in automotive, off highway, and industrial applications. While fatigue failure is often treated as a surface dominated phenomenon, cracks do not always initiate at the outer surface. In induction hardened components, microstructural gradients and residual stresses can shift initiation sites below the surface—requiring different approaches to evaluation and design. This technical paper covers:

- A reliable fatigue life evaluation framework for induction hardened shafts using a fracture mechanics based, total life analysis approach.

- An outline of clear sequence of steps for performing total fatigue life assessment, from identifying potential crack initiation locations to estimating crack growth and final failure.

Beyond the technical article, this newsletter also captures the vibrant professional ecosystem fostered by the ASM Pune Chapter. The technical talks on Industrial Energy Efficiency Policies in India, plasma assisted diffusion heat treatment, and pulse plasma nitriding illustrate the breadth of innovation taking place in materials processing and surface engineering. These sessions serve as valuable platforms for cross pollination of ideas between industry experts, researchers, and young professionals.

The International Women's Day celebration under the theme 'Give to Gain' reminds us that technical excellence is strongest when coupled with inclusion, mentorship, and collective growth. Student outreach programs, materials camps, and academic engagement initiatives further demonstrate the chapter's commitment to nurturing future materials engineers by strengthening their foundation and connecting them with industry practice.

Looking ahead, the forthcoming Materials and Manufacturing Technology (M&MT) 2026 Conference, with its focus on defence materials and the integration of AI ML in materials science, signal an exciting future. Data driven materials engineering, digital twins, and predictive modelling will increasingly shape how we design, process, and qualify materials.

I hope readers find this issue both informative and thought provoking.

Thank you for your engagement & continued support to the ASM Pune chapter.

John Deere
Gunesh Deshmukh

Technical Article

Fracture mechanics-based estimation of fatigue lives of induction hardened shafts

Dr. Rakesh Goyal, Mr. Gunesh Deshmukh

1. *John Deere Enterprise Technology & Engineering Center, India*
   GoyalRakesh@JohnDeere.Com
2. *John Deere Pune Works, India*

Abstract:

Induction-hardened shafts exhibit strong through thickness gradients in hardness and residual stress, enabling high surface strength but permitting subsurface fatigue initiation at the case core transition. An integrated methodology has been proposed that combines Glinka’s total-life (strain-energy) approach for local elastoplastic response with a crack-growth framework (UniGrow) to evaluate competing surface and subsurface crack paths under variable amplitude loading. The method incorporates residual stress superposition, critical plane assessment, stress gradient effects, and short crack behavior. It predicts the controlling failure locus and total fatigue life, guiding geometry, material, and induction hardening process decisions for durable shaft design.

Introduction

Fatigue failure in metal components is conventionally considered as a surface dominated phenomenon, owing to the propensity for fatigue cracks to nucleate at sites of maximum local stress also known as hot spots that coincide with geometric stress concentrators (e.g., fillets, shoulders, keyways, oil holes) and surface condition (e.g., machining marks, grinding chatter, surface defects, or corrosion pits). Under cyclic loading, irreversible micro plasticity accumulates at these features, facilitating crack initiation and early growth. For homogeneous, through hardened steels and many wrought alloys, this understanding forms the strong basis for fatigue design methodologies based on notch mechanics, surface finish factors, and mean stress corrections.

However, fatigue cracks do not always initiate from the outer surface and hence require different approaches to their fatigue life evaluation and design. Components with material property gradients, more specifically those produced by induction hardening (IH), can undergo different modes of failure under fatigue loading. Induction hardening process helps to create a hard, medium or high carbon martensitic or bainitic structure at the case through fast and localized austenitization followed by quenching, while intentionally retaining a relatively softer, tougher core. The resulting through thickness gradients in hardness, yield and ultimate strength, and residual stress (typically compressive at the surface with balancing tensile stress in the subsurface transition) fundamentally alter both the locus of crack nucleation and the kinetics of short crack growth. Under certain loading and processing conditions, fatigue cracks in induction hardened shafts may initiate below the surface, particularly within the case–core transition where tensile residual stresses, microstructural discontinuities, or inclusion clusters combine with high stress gradients to create a critical environment for damage evolution, refer Figure 1.

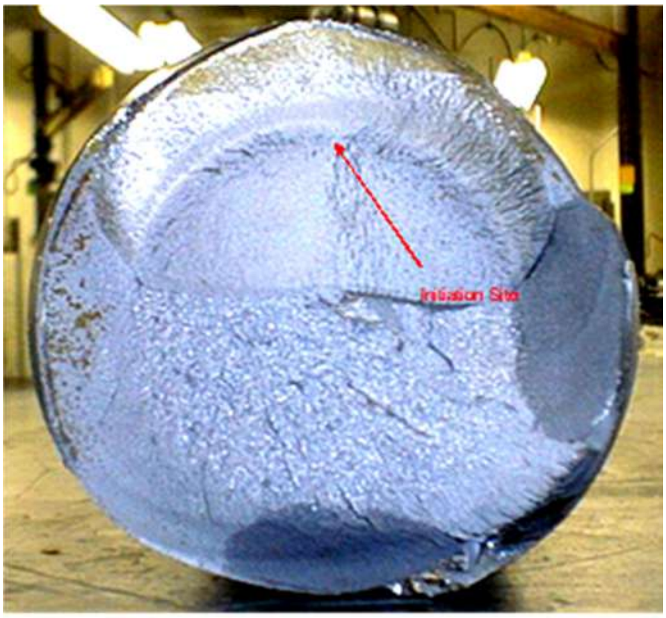


Figure 1: An example of Induction hardened shaft with fatigue crack initiation from case-core interface subjected to cyclic loading conditions

These complexities necessitate fatigue evaluation approaches that differ significantly from those used for homogeneous materials. The objective of this paper is to present a structured methodology for the fatigue life assessment of induction-hardened shafts, integrating microstructural characterization, residual stress measurement, defect sensitivity and elastic–plastic fracture mechanics within a unified framework suitable for engineering design.

1. **Challenges in modelling of Induction hardening fatigue failure mode**

The industrial application for use of induction hardening (IH) offers economic benefits. Rather than selecting a costly, uniformly highstrength alloy for the entire component, IH enables selective surface hardening with the stringent requirement for wear, pitting contact fatigue, and bending or torsional fatigue, while keeping a ductile core that provides overall toughness to the component. By adopting this strategy, it also helps to keep the component size and weight under control which would otherwise increase significantly for an alloy with uniform sectional properties to meet the same design goals. Induction hardening sees common application in automotive drivelines, off highway power transmission shafts, gear and spline interfaces, and hydraulic pump, or motor rotors. The IH process outcome variables such as case depth (often specified as effective hardened depth), surface hardness, retained austenite content, and residual stress stability under service thermo mechanical cycles governs performance as much as the nominal loading and geometric detail.

From an engineering mechanics standpoint, induction hardening introduces several modelling and assessment challenges that are not adequately captured by traditional homogeneous material stress life (S–N) or strain (ε–N) approaches, refer Figure 2:

1. ***Material property gradients***: The fatigue relevant properties such as cyclic yield strength, hardening behaviour, threshold stress intensity factor, and crack growth parameters vary continuously from hardened surface to soft core. Absolute fatigue life prediction thus requires spatially resolved material models, or, at minimum, some logical approach to account for variable micro hardness

   and microstructural maps. Such gradients influence both initiation and early crack growth, making classical single-curve S–N methods insufficient.
2. ***Residual stress profile:*** Induction hardening produces the beneficial compressive residual stresses at or near the surface which increases the endurance limit and delay crack initiation. To satisfy equilibrium, tensile residual stresses develop in the case–core transition and deeper regions of the core. Accurate prediction therefore necessitates superposition of initial residual stress with service stresses, consideration of mean stress effects (e.g., Goodman, Gerber, Smith Watson Topper) and where relevant, modelling of residual stress relaxation. There is also an additional issue related to accounting for internal stress due to notch/crack tip plasticity which is more pronounced for the overload events.
3. **Internal stress** due to notch/crack tip plasticity which is more pronounced for the overload events.

4. ***Stress gradient and notch sensitivity:*** Induction hardened shafts often have geometric stress raisers (steps, grooves, keyways or fillets) resulting in steep elastic–plastic stress gradients across the hardened case. Notch root stress redistribution methods (such as Neuber or Glinka) and FEA based critical plane assessments become necessary to capture local driving forces for fatigue crack initiation.

5. ***Initial crack size:*** Even though no macro crack is expected in the metallurgical sound induction hardened shaft, material microstructure or manufacturing defects such as near surface burns, quench cracks or inclusion clusters in the transition zone can also dominate initiation. A defect tolerant methodology is needed to account for known or measurable defects in the form of initial crack to calculate the short crack elastic–plastic driving forces to enable reconciliation of small defect behaviour with long crack fracture mechanics.
6. ***Multi-axial and contact loading:*** Real life applications frequently involve combined bending and torsion, superposed with contact stresses at splines or bearings. Multi-axial fatigue criteria and contact mechanics are typically required for holistic analysis in such cases.

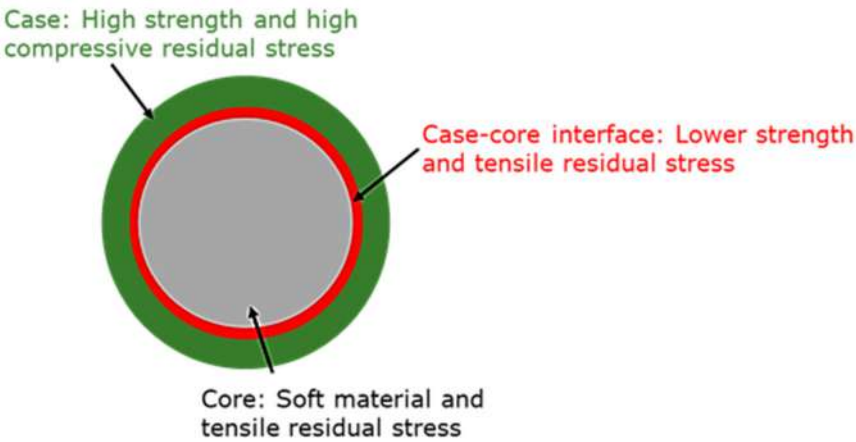


Figure 2: Gradient of material properties and residual stress across a section of an induction hardened shaft (Note that sketch is only for illustration, not to the scale)

Given the large number of complexities mentioned above, a reliable fatigue life evaluation method for induction hardened shafts is needed which can systematically integrate multiple parameters

- Information related to hardness and retained austenite profiles, microstructural mapping of case/core, inclusion assessment obtained through metallurgical characterization
- Residual stress distribution preferably measured using NDT methods like Xray diffraction or neutron diffraction which can help with deeper section profiles
- Elastic–plastic structural finite analysis incorporating detailed geometrical parameters such as keyway root notch radius
- Material crack growth properties measured using standardized methods such as ASTM E647 to understand fatigue threshold and crack growth behaviour for the simulated case and core conditions as produced by IH process.

Theoretical formulation

Traditional fatigue evaluation methods, such as the stress-life (S–N) or strain-life (ε–N) approaches are inherently oriented toward surface-initiated fatigue mechanisms. These methods rely on applied surface stress amplitudes and empirical corrections for mean stress, surface finish and size. However, they do not provide a direct means to evaluate fatigue cracks that initiate from subsurface regions of a component. This limitation becomes significant in induction-hardened shafts, where fatigue cracks may initiate at the case–core interface, a location that is not accessible visually and becomes detectable only after the crack has grown sufficiently to either break through the surface or cause catastrophic fracture. An additional challenge arises from the fact that multiple cracks may initiate simultaneously: one at the surface and another within the case core transition. Only the crack that continues to propagate (i.e., that encounters a favorable combination of applied stress, residual stress, and local material properties) dictates the ultimate failure. Not all initiated cracks will grow. Thus, a robust methodology must identify which potential crack path is critical for a given loading and microstructural condition. These considerations justify the use of a fatigue crack growth-based approach, which provides two key advantages:

- It evaluates not only the peak stress at a hotspot but also the full stress distribution along a potential crack path, including surface, transition zone, and deep interior regions.
- It naturally incorporates residual stress effects, both compressive and tensile stress, into the crack-tip driving force, enabling a physics-based comparison between surface-initiated and subsurface-initiated cracks.

To illustrate this, consider the induction-hardened shaft cross-section (along its length) shown schematically in Figure 3. The shaft has diameter dp and case depth tc. The induction-hardening process introduces a high compressive residual stress at the surface, which transitions to a tensile residual stress in the case core interface region and central core. This balancing of compressive and tensile regions satisfies equilibrium but creates a highly non-uniform residual stress field.

Figure 3 also shows a plot for the applied bending stress, which is maximum at the surface and decreases linearly toward the neutral axis, becoming nearly zero at the shaft center. High-fidelity finite element analysis (FEA) is typically required to accurately represent this applied stress distribution, especially in the presence of geometric features such as fillets, shoulders, snaps, or keyways.

The interplay between residual stress and applied stress produces significantly different cyclic stress histories at the surface and at the case-core interface.

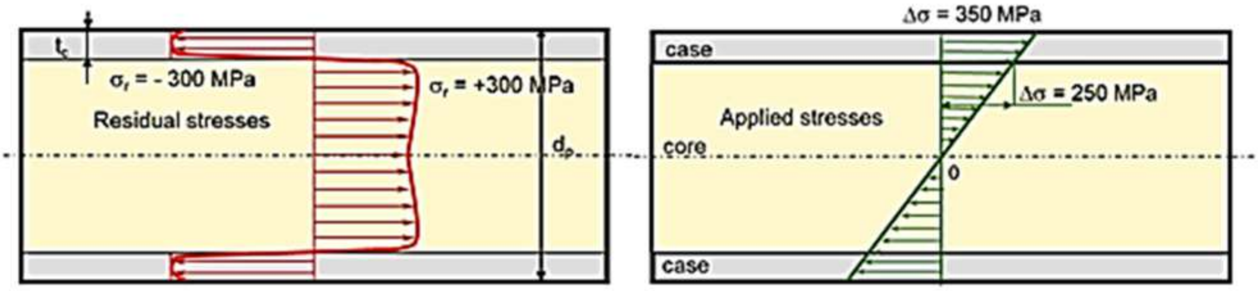


Figure 3: Residual stress distribution along the section diameter of induction hardened shaft (left) and typical stress distribution from externally applied pure bending load (Note that sketch is only for illustration, not to the scale)

As shown schematically in Figure 4, the tensile residual stress in the transition zone shifts the local mean stress upward, making the cyclic stress more damaging from a fatigue standpoint. The opposite occurs at the surface, where compressive residual stress reduces the effective mean stress and delays crack initiation.

Even though case layer benefits from high compressive stress but has very high stress from the applied load as compared to the case-core region (Figure 3). Another factor to consider, as described in the previous section, is the variable material properties across the section, with case being hard and strong whereas core being soft and relatively poor fatigue properties.

Considering this complex interaction between multiple variables involved, it is difficult to conclude whether the crack will initiate simply by looking at the stress values and material properties, and more importantly, if the failure will happen from the surface or from the case-core transition. This explains the needs for performing detailed fatigue crack growth analysis for the potential cracks initiating from both the locations (surface and case-core transition) to evaluate which location is more critical for design so that design solution (including any material or heat treatment changes) is appropriate to address the situation.

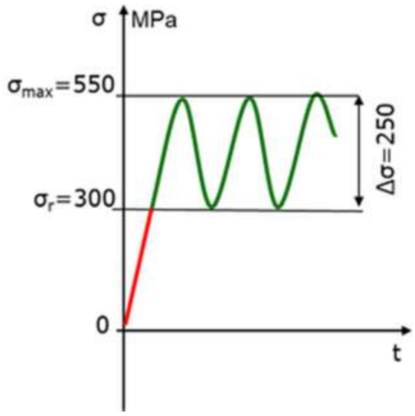


Figure 4: The resultant cyclic stress history at the case-core interface

1. **Total fatigue life-based methodology**

Fatigue crack-growth (FCG) approaches offer a powerful route to predict fatigue life under variable-amplitude loading, particularly for components such as induction hardened shafts where competing surface and subsurface failure modes may exist. Unlike traditional total-life methods (S–N or ε–N), which rely on empirical correlations between stress/strain amplitude and cycles to failure, the FCG method provides a mechanistically consistent framework that models the entire fatigue process by explicitly evaluating crack propagation under the combined influence of applied stresses, residual stresses, and material resistance.

However, classical linear elastic fracture mechanics (LEFM) based FCG analysis requires the initial crack size as an input. For sound induction-hardened shafts, where no macroscopic crack exists a priori and the microstructural condition varies with depth, defining this initial flaw size experimentally is impractical. This limitation motivates the use of total life FCG models that do not require an explicit initial crack size.

One such approach is the UniGrow total fatigue life model [1-2], which has been applied successfully to metals with nonuniform microstructures and residual stress fields. Unlike conventional LEFM formulations, the UniGrow model replaces the need for an initial crack size with a material characteristic length, denoted ρ*, derived from monotonic and cyclic material properties. In this formulation, the entire fatigue life, including both crack initiation and propagation stages, is modeled through a single crack-growth simulation beginning from the intrinsic material length scale ρ* and extending to final fracture. If a pre-existing flaw is known, such as a nonmetallic inclusion, quench crack, or grinding burn detected during inspection, its actual size can be directly used as the initial crack length in place of ρ*. This allows the methodology to seamlessly handle both sound materials and materials containing measurable defects.

A defining feature of the UniGrow model is the use of a two parameter crack driving force, ***delta K*** which accounts for both: the stress intensity factor range, ***K max*** and the maximum stress intensity factor, ***delta K = K max - K min*** together with the residual stress effects left behind the crack tip. The residual stress generated during cyclic plastic deformation is transformed into an equivalent residual stress intensity factor, K max and incorporated directly into the total driving force, equation (1).
The total driving force is expressed as:

$$\Delta\kappa = (\Delta K + K_r)^{1-p}(K_{max} + K_r)^p$$

where p is the material parameter related to the cyclic deformation and cracktip plasticity.

The total driving force, Δκ is subsequently related, equation (2), to the fatigue crack growth rate da/dN.

$$da/dN = C \cdot (\Delta\kappa)^{\gamma}$$

Parameters C, γ, and p can be found from the Manson-Coffin and Ramberg-Osgood material properties or the experimentally generated fatigue crack growth data per ASTM E647. This dual calibration capability is particularly valuable when case and core specific properties are required, or when extensive fracture-mechanics testing is impractical. Figure 5 shows the detailed chart with sequence of steps to be used for performing fracture mechanics based on total fatigue life analysis.

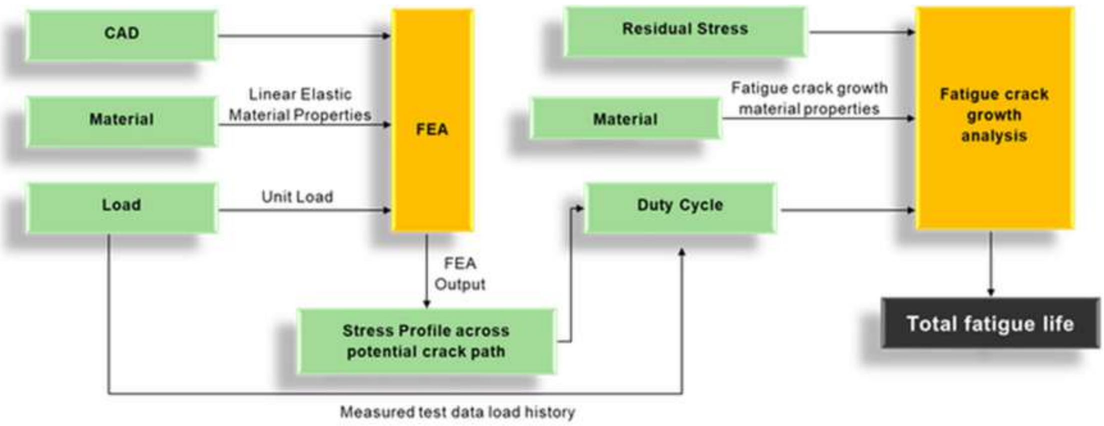


Figure 5: Detailed flow describing sequence of steps for total fatigue life analysis

Summary Remarks:

Fatigue crack growth based on total life analysis has been proposed in this work for fatigue life evaluation of induction hardened shaft. Such an analysis enables:

- Evaluation of both surface initiated and subsurface initiated cracks, allowing for a complete understanding of competing failure mechanisms in induction hardened shafts.
- Calculation of the crack tip driving force, Δκ, along the entire crack path, capturing the evolving influence of local stresses, residual stresses, and crack geometry.
- Incorporation of residual stress superposition, including both beneficial compressive residual stresses at the surface and detrimental tensile stresses in the case–core transition region.
- Explicit consideration of short crack behavior, which is critical for accurate life prediction in materials with strong property gradients, such as induction hardened steels.
- Identification of the critical crack path, i.e., the location (surface or subsurface) that leads to the shortest predicted fatigue life and therefore governs the design.

In summary, crack growth analysis is the only rigorous framework capable of definitively answering the fundamental design question of whether the shaft will fail from the surface or from the case-core transition. The ability to distinguish between these competing failure modes is essential, as it directly influences engineering decisions related to geometry optimization, material and steel grade selection, induction hardening process parameters, and quality assurance measures. By identifying the governing fatigue mechanism, engineers can implement targeted changes that enhance durability, improve reliability, and ensure consistent fatigue performance across varying loading spectra and manufacturing conditions.

References:

1. A.H. Noroozi, G. Glinka, S. Lambert, A study of the stress ratio effects on fatigue crack growth using the unified two-parameters fatigue crack growth driving force, Int. J. Fatigue 29 (2007) 1616-1634
2. S. Mikheevskiy, G. Glinka, T. Cordes, Total life approach for fatigue life estimation of welded structures, 3rd International Conference on Material and Component Performance under Variable Amplitude Loading, VAL2015, Procedia Engineering 101 (2015) 177 – 184

Technical Lectures

In the series of technical talks, the third tech talk of the year was on 19th February conducted in an online mode. Before starting the talk, the new executive committee of ASM Pune Chapter was announced. After a brief overview of last year's activities and conferences held by ASM International Pune Chapter for the last 8 years, the lecture was started by **Mr. Aditya Chunekar** on *'Industrial Energy Efficiency Policies in India'.*

Mr. Chunekar started with an overview about India's rising industrial energy consumption and CO2 emissions. Besides major energy consumption by India's thermal power plants, the sectors of steel, cement and aluminium consume the maximum amount of energy. Mr. Chunekar also explained about regulatory and institutional framework, the Perform, Achieve and Trade (PAT) scheme, the Carbon Credits Trading Scheme (CCTS), renewable consumption obligation and shared a case study.

Executive committee members, individual members and students from ASM Material Advantage (MA) Chapter i.e. a total of twenty-three participants were present during this Tech Talk Session.

The session was informative and interactive and ended with a question-and-answer session. The vote of thanks was given by **Ms. Anika Raykar**, a student from the MA Chapter of CCOEW, Pune.

The next Tech Talk by **Dr. Nirav Jamnapara** (*Senior Scientist in IPR*) was held on the 5th of March at PYC Gymkhana followed by the M&MT 2026 flyer launch and a networking dinner. The topic was *'Plasma assisted diffusion heat treatment: process and application studies'*. **Dr. Nirav Jamnapara** is also an associate professor at the Homi Bhabha National Institute (HBNI) and a director at IPR Plasmatech Innovation Foundation.

Another ASM Tech Talk session was held at Hotel Kalasagar, Vallabhnagar, near Bhosari Metro station. This program was sponsored by **NNGi Bangalore**. There was an excellent presentation delivered by **Mr SK Subramanian** *(Technical Advisor- NNGi)* on the Topic - **PULSE PLASMA NITRIDING FOR SURFACE TREATMENT**. Mr. SK Subramanian is a M Tech from IIT Chennai with over thirty-nine years of Industrial experience at Bosch, Murugappa group and Sundram Fasteners Limited. For the past fourteen years, he is associated with Nathan and Nathan Global Inc. as a Technical advisor and Consultant. He is supporting PVA Industrial Vacuum systems GmbH for business development of their products in India.

Mr. D. G. Chivate has welcomed the NNGi team- **Mr V Vyankat Subramanian (Director)**, Mr SK Subramanian and the participants. **Mr Chiplunkar** shared ASM Pune chapter's introduction and encouraged everyone to become a member of ASM Pune chapter. **Arun Adiverekar** spoke about the Tech Talk initiatives and its progress/achievements in last one and a half years at ASM Pune chapter through the joint efforts of ASM Technical Committee.
The lecture was about **Pulse-Plasma Nitriding (PPN)** which has several advantages over conventional processes of salt-bath nitriding, gas nitriding and also plain-plasma nitriding. The PPN process and its applications. A total of twenty-two participants were present for the talk and six joined online. The vote of thanks was delivered by **Mr Rahul Gupta. Mr Galgali** shared news about the upcoming **M&MT 2026 conference.** The program was followed by Snacks /Hi- Tea.
We have recorded all the sessions and the videos available with ASM office. Interested members can get the same from the Office by requesting through mail to ASM office.

International Women's Day celebration

The International Women's Day 2026, or IWD 2026 celebration was held on the 8th of March 2026.
As part of the International Women's Day celebrations, the ASM International Pune Chapter & GDC Tech Forum jointly organized Women's Day celebration which included **Keynote Speech by Ms Swathi Ramesh**, *VP Projects at Alphacraft Pvt Ltd* followed by a panel discussion centred on this year's theme, ***"Give to Gain."*** The session brought together accomplished women professionals from the metallurgical, die casting, and engineering sectors to share their journeys, perspectives, and insights with the audience.
The panel was moderated by **Ruta Barve**, *Secretary of the ASM Pune Chapter and Founder of Mettle Consultancy Services.* The discussion explored how personal commitment, professional investment, and collective support contribute to both individual growth and industry advancement.

Distinguished Panelists:

The distinguished panelists included:

- **Aishwarya Jadhav**, *Business Associate at Machine Tech*, with experience in foundry operations and manufacturing management.
- **Dr. Manisha Kulthe**, *Head of the Department of Metallurgy and Materials Engineering at COEP Technological University*, *Pune*, with extensive experience in teaching, research, and academic leadership in materials science.
- **Meha Shah**, *Business Development Executive at Sipra Engineers Pvt. Ltd.,* representing the new generation of professionals engaged in global engineering business development.
- **Sayali Hitesh Patil***, Senior Manager – Operations at Machine Tech*, with expertise in financial planning, MIS, and international operations.
- **Swati Jagtap**, *Head of Operations at Assertive Industries LLP*, bringing over 16 years of industrial experience in wiring harness manufacturing and die casting operations.

Discussion Highlights

The conversation was structured around the central idea that giving—through effort, knowledge sharing, mentorship, and support—creates opportunities for growth and collective progress.

Panelists reflected on their early career experiences and the investments they made in building technical credibility in traditionally male-dominated industrial environments. They shared how persistence, continuous learning, and the willingness to take on challenging responsibilities helped them gain professional confidence and recognition.

The discussion also explored the evolving role of women in metallurgy, die casting, and manufacturing industries. Panelists emphasized the importance of mentorship, supportive workplace cultures, and inclusive leadership in enabling more women to pursue and sustain careers in engineering and manufacturing.

A particularly engaging segment of the discussion connected the theme **"Give to Gain"** to metallurgical processes, with panelists drawing parallels between professional growth and processes such as forging, heat treatment, and alloying—where transformation occurs through deliberate input of energy, effort, and time.

Conclusion

The panel concluded with a shared reflection that when individuals and organizations consciously invest in supporting women's growth, the benefits extend beyond individuals to strengthen teams, industries, and communities. The session served as an inspiring reminder that *giving—whether through knowledge, opportunity, or encouragement—is not a subtraction but a multiplier for progress.*

Ruta Barve

Secretary

To become an ASM Pune chapter member, interested participants can contact:

Mr. Vaibhav Chiplunkar (Mobile-7350799376)

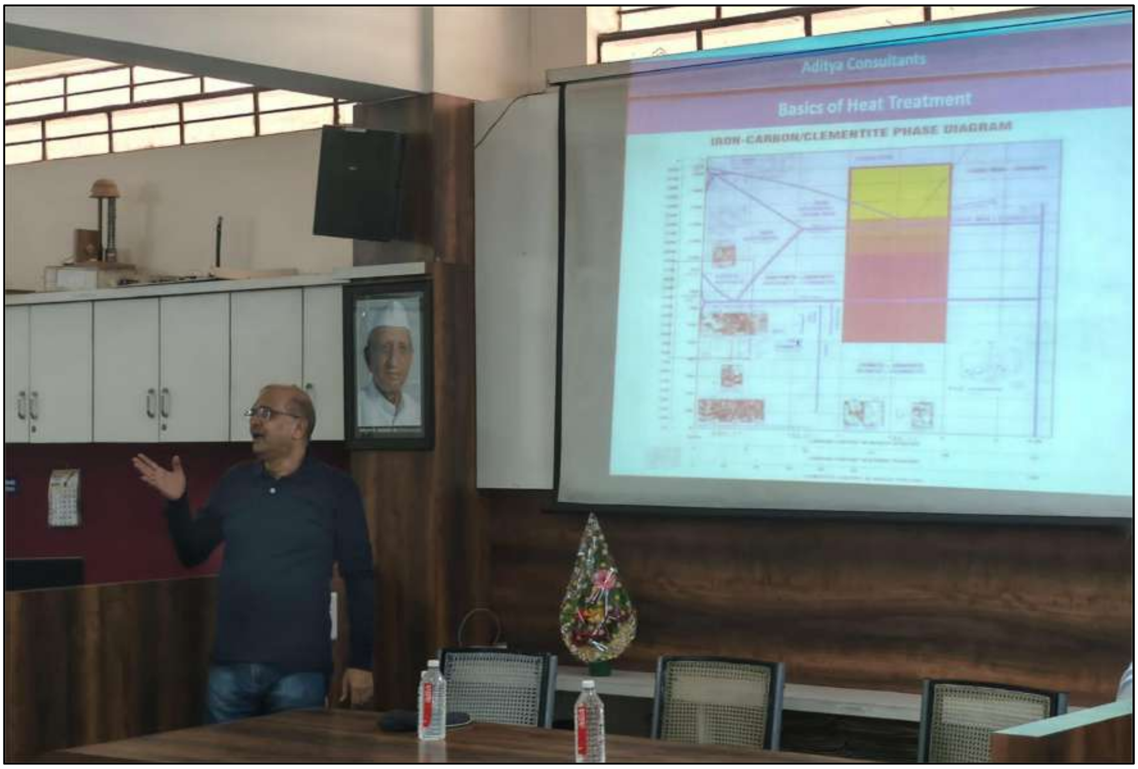
(Chairman - Membership Development Committee)

Students Outreach

Mr. Deepak Kulkarni visited ***COEP*** on the *29th of January 2026* to give a presentation explaining ASM International Students chapter initiatives to the students. A total of 82 students and 4 faculty members attended, showing an excellent response.

Expert Talk on Industrial Heat Treatment Conducted at K K Wagh Institute of Engineering Education & Research

The *K K Wagh Material Advantage Student Chapter of K K Wagh Institute of Engineering Education & Research (KKWIEER)*, Nashik, successfully organized an expert talk on **"Industrial Heat Treatment"** for mechanical engineering students on Saturday, April 25, 2026, at 11 am.



The session was delivered by renowned metallurgist and industrial consultant **Mr. Deepak Kulkarni**, who shared his extensive industrial experience and practical knowledge in the field of heat treatment and metallurgical engineering. The expert talk focused on the fundamentals and industrial applications of heat treatment processes used in manufacturing industries. The session covered important topics such as theory of heat treatment, heat treatment processes, hardening, tempering, annealing, normalizing, case hardening, metallurgical inspection, heat treatment defects, corrective actions, vacuum furnaces, nitriding systems, and industrial practices followed in modern heat treatment industries.

Mr. Kulkarni explained the significance of heat treatment in improving mechanical properties such as hardness, ductility, fatigue resistance, impact resistance, and strength of engineering materials. He also guided students on the practical challenges faced in industries and the importance of metallurgical analysis in ensuring product quality.

Mr. Jayant Khairnar graced the occasion by his presence. The program was organized under the guidance of **Director Dr. K. N. Nandurkar**, whose continuous encouragement and vision support technical and industrial exposure activities for students. The event was mentored by **Dr. P. J. Pawar** and received valuable guidance from **Prof. Pawan Rahane**, Faculty Mentor of the Material Advantage Student Chapter.

During the program, **Dr. P. B. Kushare, Head of Mechanical Engineering Department**, felicitated the guest speaker and appreciated the efforts of the student chapter in organizing technical activities that bridge the gap between academics and industrial practices. He encouraged students to actively participate in such expert sessions to strengthen their practical understanding and industrial readiness.

The event witnessed enthusiastic participation from students and faculty members of the Mechanical Engineering Department. Students actively interacted with the expert during the question-and-answer session and gained valuable insights into industrial heat treatment technologies, furnace systems, material properties, and quality control techniques used in manufacturing industries.

The program was coordinated by the K K Wagh Material Advantage Student Chapter team, including Student Chair Member **Anish Patwardhan** and Student Vice Chair **Sakshi Desale**. The session concluded with a vote of thanks expressing gratitude to the guest speaker, management, faculty members, and participants for making the event successful and informative.

Material's Camp

A students' **material camp** was held on the 20th of February at Government Polytechnic Pune over two days, 20th and 21st of February. **Rahul Gupta, Hemant Zaveri, Vineet Marathe, YS Gowaikar, D G Chivate, Sandip Hanse and Mrs Vaijayanti Datar** were the faculty conducting various legs of the camp.
The first day started with an inauguration function by **Dr Arole** and lectures about corrosion, non-destructive testing, casting and pyrometry. The second day covered metallography practices, heat treatment process, welding and mechanical properties. This was followed by a quiz and a presentation by the students.

Photo of Material's camp at GPP

Materials and Manufacturing Technology (M&MT 2026)

M&MT 2026 conference launch event was held on the *5th of March* along with the Tech talk by **Dr. Neeraj Jamnapara**. The conference and exhibition will be held on the **8th and 9th of October** and its theme will be **Defense materials and AI-ML in materials science engineering.**

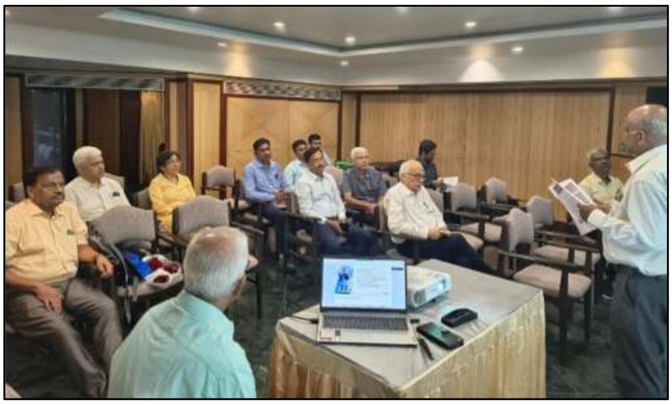



Photo of Launch Event

Apart from this, ASM International Pune Chapter successfully organized a **Curtain Raiser event** held on the *20th of May at PYC from 6.30 pm to 10 pm.* This event brought together *67 dignitaries* from the industry and academia to share practical insights on the growing impact of Artificial Intelligence across manufacturing and metallurgical industries.

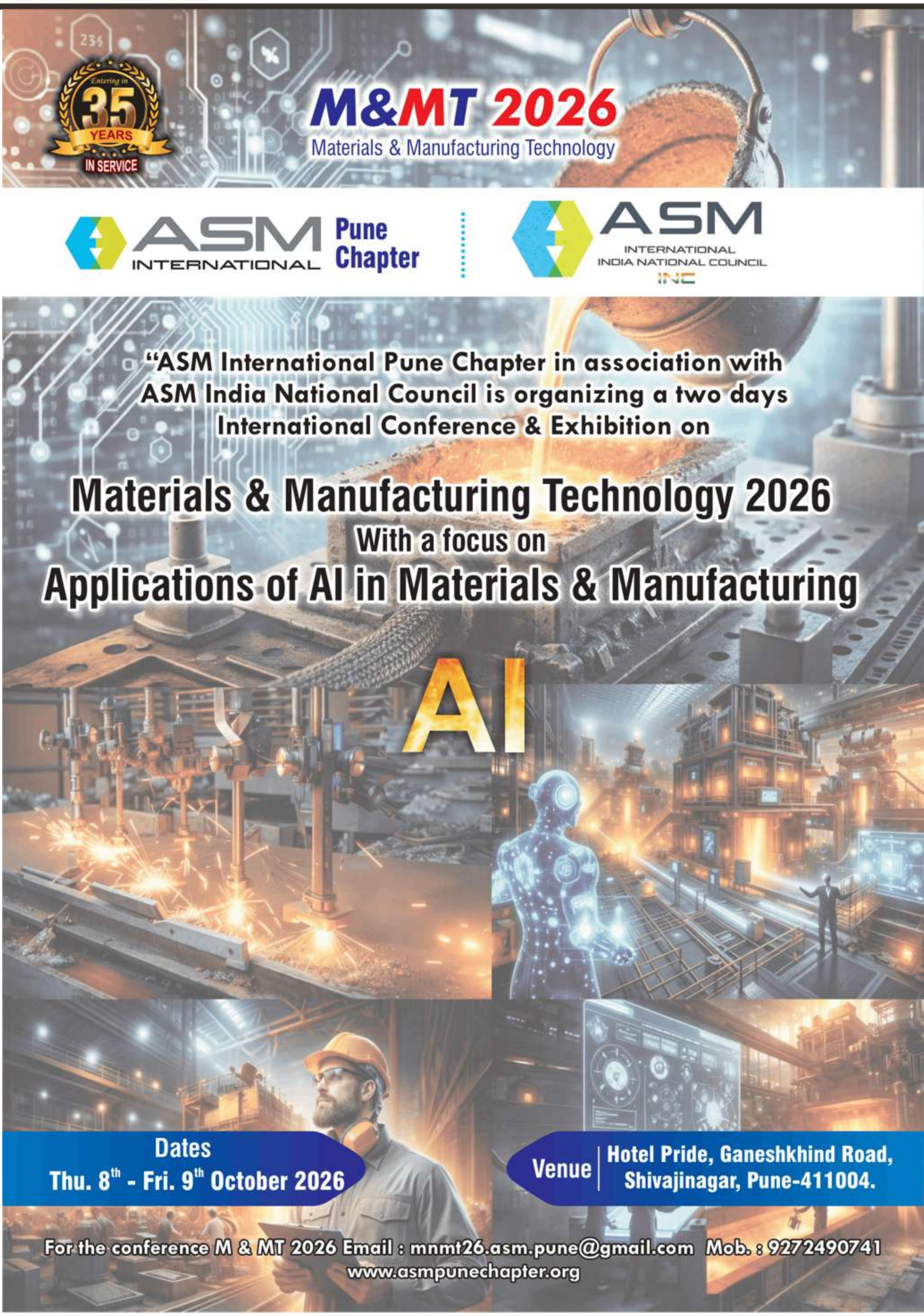
Dr. Rajkumar Singh, *Senior Director, KCTI, Bharat Forge Ltd.*, delivered an insightful session on **Artificial Intelligence and Its Various Applications in Manufacturing.** He outlined a structured roadmap for AI implementation, emphasizing the importance of identifying high-value business problems, ensuring data readiness, building cross-functional capabilities, and addressing challenges related to scalability, ethics, governance, and workforce adoption.

Dr. Satyam Sahay, *Head – Advanced Engineering & AI Transformation, John Deere India*, presented several industrial applications of AI in metallurgical and manufacturing environments, demonstrating how AI-driven solutions are improving productivity, quality, process optimization, predictive maintenance, and decision-making.

Dr. P. V. Sivaprasad, *Former Senior R&D Expert, Swerim, Sweden*, showcased the concept of Smart Manufacturing Platforms and Digital Twins. He highlighted how integrating sensor data, process models, analytics, and machine learning can create intelligent manufacturing ecosystems that enhance process robustness, quality control, condition monitoring, and operator decision support.

The event provided participants with a comprehensive view of AI adoption strategies, real-world implementation experiences, and emerging digital manufacturing technologies, setting the stage for deeper discussions at **M&MT 2026** and reinforcing the critical *role of AI in shaping the future of materials and manufacturing industries.*

Photo of Curtain Raiser Event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M&MT 2026

"Artificial Intelligence (AI) and Machine Learning (ML) are transforming the very foundation of modern manufacturing, redefining how materials are designed, produced, and optimized. In today's rapidly evolving technological environment, industries that embrace AI gain unprecedented advantages like higher precision, faster decision-making, maintenance capabilities, and significant cost and energy efficiency. This conference seeks to deepen the understanding of AI and ML applications specifically within material manufacturing and metallurgical processes, drawing insights from organizations that have already integrated these technologies. By showcasing real industrial case studies, we aim to highlight how AI is no longer optional but essential for staying relevant and competitive.

This Conference will bring together pioneering users who have successfully implemented AI, along with industry experts who are shaping the next wave of AI-driven innovation. Their experiences covering implementation journeys, challenges faced, and success stories will offer valuable guidance to industries aspiring to adopt these transformative technologies. By uniting experienced practitioners, solution providers, and new adopters, the conference aspires to accelerate AI adoption across Indian industry, strengthening its global competitiveness and preparing it for the future of intelligent manufacturing."

Topics

- **Heat Treatment**
- **Forging**
- **Foundry**
- **Failure Analysis**
- **Metallography**
- **Generative AI for Mold & Die design**
- **Additive Manufacturing**
- **Metallurgical Quality Control**
- **Predictive Maintenance of Furnaces**
- **Automation**
- **Steel Making & Alloy Designing**
- **Virtual Assistance through AI**
- **Other metallurgical processes**

Call For Papers on above topics
last date for submitting the Abstract: 31/05/2026

Posters presentation competition for MA Chapter students on above topics last date of abstract submission 31/05/2026

M&MT 2026

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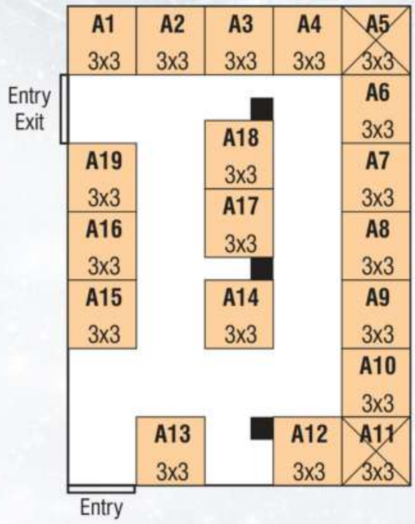

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Contact :
For the conference M & MT 2026
Mob.: 9272490741
Email : mnmt26.asm.pune@gmail.com

ASM INTERNATIONAL PUNE CHAPTER
'Guruprasad ', 37/4/A, 6th lane, Prabhat Road,
Pune – 411004, Maharashtra, India.
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