

GOT RESIDUAL STRESS

ASM INTERNATIONAL RESIDUAL STRESS TECHNICAL COMMITTEE

A VISION OF RSTC FROM OUR CHAIR

Dear Fellow Scientists, Engineers, and Materials Enthusiasts,

Please allow me to introduce myself as the new Chair of the ASM Residual Stress Technical Committee (RSTC) starting from fall, 2022 - my name is James Pineault - I have been working on the characterization and measurement of residual stress in materials for over 30 years now and counting. As you may know, this is an area of study that can be very interesting, often challenging, and ultimately quite satisfying.

When I heard the ASM RSTC was forming roughly 2 years ago I was intrigued by the idea, attended the first meeting, then decided to stick around to see what would happen next. Led by Dave Furrer and supported by an enthusiastic membership and ASM staff, the vision and activities of the RSTC began to develop and the various subcommittees and projects began to take shape. One of the seemingly most daunting challenges we undertook was to start a new ASM Residual Stress Measurement Handbook. Since the last one was published over 20 years ago, it seemed timely to revisit and improve upon those ideas in light of the most recent developments in our field, of which there are many. As you may also know, Mike Hill our Past Chair, continued to further the RSTC's goals throughout his term, diligently building on the foundation Dave laid.

JAMES PINEAULT

Chair of RSTC

James Pineault, B.Sc.Hons.Phys., P.Phys., graduated from the University of Waterloo. Residing in Windsor, he is currently Laboratory Director of Proto Mfg. facilities in both the U.S. and Canada with over 31 years' experience in XRD testing for defense, aerospace, automotive, and other industries. He has authored and co-authored numerous published scientific papers on XRD applications.



Backing up a bit, my first experience with ASM was at a conference in Indianapolis in 1991 - fresh out of school, I was all ears and eager to learn as much as I could from the already established researchers in the field of residual stress measurement - many of the talks at that conference were eye opening and I particularly remember taking notes when a young lady by the name of Beth Pardue (now Snipes) shared a number of very pragmatic tips and strategies on how to improve residual stress measurement accuracy when using the x-ray diffraction method.

With researchers each bringing a unique set of skills and experiences to the table, it is my firm belief that forums like the ASM RSTC are critical to the exchange of ideas, personal growth, and professional development. Moreover, In light of that enlightening moment for me personally in 1991, I believe it is important that we individually and as a group, be able to pass along key information to younger scientists. Sir Isaac Newton famously said "the reason I have seen so far is because I was standing on the shoulders of giants". Thus, it is incumbent upon us to improve the current state-of-the-art with a solid foundation so as to enable the next generation to be able to take it to the next level. I believe groups like the ASM RSTC are well positioned to do just that.



Chair – James Pineault,
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Vice chair – Beth Snipes,
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Secretary – Seung-Yub Lee
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Often times, many of us may be quite focused on our particular area of study and may feel that our world is sometimes limited, which can be very frustrating. Groups like the ASM RSTC foster diversity, support interdisciplinary collaborations, facilitate the dissemination of different ideas, novel approaches, and current best practices which have the potential to offer solutions to a problem one may not have come up with in a vacuum or in a limited peer group.

Having the opportunity to explore and understand the potential of various residual stress measurement methods is important since many are generally complementary i.e., each method typically samples different regions or volumes in a material. While certain methods are destructive, some are semi-destructive, and others are non-destructive. A clear understanding of the strengths and limitations of a given method is important for selecting/specifying which method (or methods) will provide the data needed for the analysis at hand. I also believe that learning how best to harmonize data obtained from various methods seems like a next logical step in the state-of-the art; not a lot of formal work has been done in this area as of yet. Knowledge regarding what works, what doesn't work, analysis/collection strategies, current best practices, practices that have fallen out of favor, awareness of standards, are all very important and are integral to the integrity of the residual stress measurements and analyses one may undertake. (Continue next page)



X-RAY DIFFRACTION RESIDUAL STRESS MEASUREMENT IN FAILURE ANALYSIS

J.A. Pineault, M. Belassel, M.E. Brauss

X-ray diffraction (XRD) residual-stress analysis is an essential tool for failure analysis. This article focuses primarily on what the analyst should know about applying XRD residual-stress measurement techniques to failure analysis. Discussions are extended to the description of ways in which XRD can be applied to the characterization of residual stresses in a component or assembly and to the subsequent evaluation of corrective actions that alter the residual-stress state of a component for the purposes of preventing, minimizing, or eradicating the contribution of residual stress to premature failures. The article presents a practical approach to sample selection and specimen preparation, measurement location selection, and measurement depth selection; measurement validation is outlined as well. A number of case studies and examples are cited. The article also briefly summarizes the theory of XRD analysis and describes advances in equipment capability.

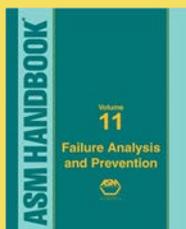
(Vision, continued)

As incoming Chair of the ASM RSTC, over the next year I envision continuing to invite engineers, scientists, and international experts to give interesting technical talks so that they can share their findings, experiences, and perhaps unique perspectives with the committee membership and the residual stress community at large. I hope that these will include presentations by students, as well as by both young and seasoned professionals. As a group it will be important to continue to promote upcoming relevant shows and symposia, as well as look for opportunities to collaborate with other like-minded groups. It will also be useful to continue to network, advertise, and produce the ASM RSTC newsletter with the goal of keeping people informed, and growing the membership so as to increase the depth of the pool of knowledge the membership brings to the table. Further development of the subcommittees and staying the course on the new ASM Residual Stress Measurement Handbook are very exciting to me as well. Finally, I believe it will be most important to focus on education, and continue to help steer committee activities such that the ASM RSTC is the Go-To resource for residual stress related information and community support.

I look forward to working with you all, and seeing you at the monthly meetings, as we continue to develop the ASM RSTC over this coming year and beyond!

Link to the Article (free access until June 30, 2023)

<https://doi.org/10.31399/asm.hb.v11.a0006768>



Reference:

Ref: J.A. Pineault, M. Belassel, M.E. Brauss, "X-Ray Diffraction Residual Stress Measurement in Failure Analysis", *ASM Handbook*, Vol. 11, *Failure Analysis and Prevention*, Materials Park, Ohio, 2021. pp. 221-239.

Upcoming Conferences



AeroMat, Mar. 14 - 16, 2023 (Fort Worth, TX USA)
<https://www.asminternational.org/web/aeromat-2023>

ICF 15 (Int Conf Fracture), Jun. 11, 2023 (Atlanta, GA USA)
<http://www.icf15.org>

Residual Stress Summit (America), TBD
<https://rssummit.org/>

Denver X-Ray Conference, Aug. 7-11, 2023, (Lombard, IL USA)
<https://www.dxcicdd.com>

8th ICLPRP, October 22-27, 2023 (Gyeongju Korea)
<https://www.iclprp2023.org>
Abstracts due by Mar. 31, 2023

Fatigue Design, Nov. 29-30, 2023 (Paris)
<https://fatiguedesign.org/>

Highlights

The British Society for Strain Measurement.

A workshop will be held at the National Physical Laboratory UK, on 24th May 2023 in conjunction with The British Society for Strain Measurement.

The workshop will cover diffraction methods for measuring residual stress; mostly laboratory based X-ray methods.

The emphasis will be on the practical aspects of the techniques particularly in helping ensure good practice for difficult samples.

Methods for layer removal/depth profiling will also be discussed.

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Student Outreach Subcommittee (New)

Chair: Joe Rasche
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Members in the News – Dave Furrer

Our own Dave Furrer has been elected Fellow of TMS. Dave has been cited "For his efforts to champion, develop and implement data curation, analytics, and computational tools and methods for materials and manufacturing process design and control." TMS, The Minerals, Metals and Materials Society, is a professional society that connects engineers and scientists in these areas who work in industry, academia, and government.

Equally impressive, Dave has also been selected to the National Academies of Engineering. The public release notice from NAE cites:

" Furrer, David U., senior fellow discipline lead, Materials and Processes, Pratt & Whitney, East Hartford, Conn. for development and industrial implementation of computational modeling tools enabling efficient material/process/product design of legacy and emerging aerospace alloys." Dave's career in Materials and Manufacturing Process Engineering has focused on "development and utilization of modeling tools to support enhanced decision making, optimization and controls."

Dave is past president of ASM and founding member of RSTC along with other ASM technical committees. He is Senior Technical Fellow Discipline Lead at Pratt & Whitney. He has excelled in these technical areas, moved technology forward, and tirelessly worked to help his colleagues and associates use and expand upon his hard work and knowledge. Congratulations, Dave, on these much-deserved recognitions!