2018 GUANGBIN YANG RELIABILITY SYMPOSIUM

Sponsored by:

ASQ Automotive Division
The Global Voice of Quality™

Hosted by:

OAKLAND UNIVERSITY

Organized by:

FCA
FIAT CHRYSLER AUTOMOBILES

THURSDAY, AUGUST 30, 2018,
7 AM – 5 PM
ENGINEERING Center
OAKLAND UNIVERSITY
ROCHESTER, MICHIGAN

Registration Link

2018 Symposium Chair's Message

Welcome to the 2018 Guangbin Yang Reliability Symposium (GYRS). I'm honored to serve as the chair for Guangbin Yang Reliability Symposium (GYRS), which is a result of collaboration between several professional societies, industries, and universities who have a passion for reliability.

Attendees will have the opportunity to learn through keynote speaker, presentation sessions, poster and expo sessions, and interaction and networking with other professionals. This year, there will be eight speakers from industry and academy with variety topics which will satisfy the range of attendees from novice to seasoned expert. For the first time, the GYRM 2018 symposium will have the poster session in which students and experts from industries can present the results of their practical works. In addition, the expo session will feature sources of tools and expertise carefully selected to be consistent with the content of the symposium.

We are looking forward to have more participants in the next year GYRS. If you are interested in participating at GYRS 2019, please contact me at mohammad.Hijawi@fcagroup.com, or Mohammadsadegh Mobin, Ph.D. at mobin.sadegh@gmail.com. Be sure to contribute your expertise and experience in reliability by submitting an abstract for the oral or poster presentation consideration!

I would like to thank ASQ Automotive Division for sponsoring, Oakland University for hosting, FCA US LLC for organizing, and all volunteers who worked hard all year to have a symposium that will provide a unique learning experience for all attendees.

Please contact **gyrs2018@gmail.com** if there is a question. We hope you get best out of this year symposium.

Best regards,

Mohammad Hijawi, Ph.D.
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GYRS 2018
GUANGBIN YANG RELIABILITY SYMPOSIUM

Dr. Guangbin Yang
Biography

Walter P. Chrysler Technical Fellow Dr. Guangbin Yang (August 22, 1964 - June 12, 2013) was a premier product life cycle reliability engineering and test expert, a patient teacher, and a valued colleague and good friend to many of us in the Greater Detroit area and beyond. He was the husband of Ling Jin and father of Benjamin and Laurence.

Born in Jiexi, Guangdong, China, Guangbin graduated with a Bachelor of Science in Mechanical Engineering from Hangzhou Institute of Electronics Engineering, received a Master of Science in Mechanical Engineering from Zhejiang University in Hangzhou, and a Ph.D. in Industrial Engineering from Wayne State University in 2000. Guangbin made numerous contributions to reliability modeling, test planning, and data analysis. He authored over 60 publications including book, chapter, and technical papers, including Life Cycle Reliability Engineering (2007), Heuristic Degradation Test Plans for Reliability Demonstration (2013), and Accelerated Degradation Test for Rapid Reliability Evaluation (2012). His career included positions at Yazaki, Ford Motor Company, and Chrysler, LLC.

Guangbin Yang was also a Senior Member of the Institute of Electrical and Electronics Engineers (IEEE), and the Chair of its Automotive Systems Committee. A Fellow of the American Society for Quality, Guangbin held editorial positions with the International Journal of Reliability, Quality, and Safety Engineering and IEEE, and was Program Chair for the International Society of Science and Applied Technologies International Conference on Reliability and Quality in Design. His recognitions include the Ford Powertrain Engineering Achievement Award, IEEE Reliability Society's "Engineer of the Year", and listings in Who's Who in America, Who's Who in Science and Engineering, and Who's Who in the World.

Event Program

7:00 – 8:00	Guest Arrival, Registration, and Continental Breakfast
8:00 – 8:05	**Symposium Chair Welcome Message** Dr. Mohammad Hijawi, Technical Fellow - Powertrain Quality Reliability Engineering, FCA US LLC.
8:05 – 8:20	**Keynote Speaker** Dr. Louay M. Chamra, Dean and Professor, College of Engineering, Oakland University.
8:20 – 9:55	***"Reliability Challenges in Autonomous Vehicle Fleets"*** Noah Lassar, Head of Reliability, Waymo.
9:55 – 10:30	***"Reliability Testing in Heat Exchangers"*** Dr. Julio Pulido, Sr. Director of Quality and Reliability, Nortek.
10:30 – 10:45	**Break,** Poster and Expo Sessions
10:45 – 11:20	***"Good FMEAs, Bad FMEAs, What's the Difference?"*** Carl S. Carlson, Reliability and FMEA Consultant, Carlson Reliability Consulting.
11:20 – 11:55	***"Machine Learning Meets Prognostics: Analysis of High-Dimensional Data Streams for Time-to-Failure Prediction"*** Dr. Kamran Paynabar, Assistant professor, Georgia Tech University.
11:55 – 12:55	**Lunch break,** Poster and Expo Sessions
12:55 – 1:00	**Sponsor Message** Ken Coll, ASQ Automotive Division Chair.
1:00 – 1:35	**"Strategies for Successful DMAIC Problem Solving"** Scott Sterbenz Six Sigma Master Black Belt Ford Motor Company
1:35 –2:10	***"Variance Estimate from a Single Emissions Test"*** John Phillips, Manager - Calibration Innovation and Technical Problem solving, FCA US LLC.
2:10 –2:25	**Break,** Poster and Expo Sessions
2:25 – 3:00	***"From Micro to Macro: Reliability Analysis and Failure prediction of Advanced High Strength Steels considering Material Microstructure Image Information"*** Dr. Qingyu Yang, Associate Professor, Wayne State University.
3:00 – 3:35	***"Applying Failure Prognostics to Reduce the Duration of Automotive Electronics Reliability Testing."*** Dr. Andre Kleyner, Global Reliability Engineering Leader, Aptiv.
3:35 – 5:00	Poster and Expo Sessions

Keynote Speaker

Louay M. Chamra, Ph.D., is Dean of the School of Engineering and Computer Science at Oakland University. He is responsible for shaping academic priorities and programs, attracting and supporting outstanding faculty, recruiting undergraduate and graduate students, and providing global education for students. Dr. Chamra spearheaded the construction of a brand new state-of-the-art $75 million engineering center. He promotes a diverse and enriching culture within the School of Engineering. Dr. Chamra leads an ambitious strategic plan, which resulted in increased student enrollment, faculty, and student advisors. Dr. Chamra was featured in DBusiness journal "The Faces of Detroit" recognizing the School of Engineering and Computer Science for their efforts to advance the economic strength of Southeast Michigan and to grow businesses, accelerate innovation, and prepare tomorrow's leaders through leveraging resources and building relationships.

ASQ Automotive Division Chair

Ken Coll is a Quality Manager for Continental Automotive, and has over 35 years of experience in the automotive industry as a Tier 1 supplier. He has developed and taught a variety of quality and problem solving courses and has worked extensively with QS 9000 and TS16949 quality standards. His career has spanned production and corporate facilities, and he has worked as a production worker, material handler, inspector, quality systems auditor, and quality engineer. Ken holds a B. A. degree in Management and Organizational Development from Spring Arbor University, an MBA from Northwood University, ASQ Quality Engineer Certification, is a Lean Six Sigma Master Black Belt, Design for Six Sigma Green Belt, and Problem Solving Master Trainer.

Presentation Abstracts

"Reliability Challenges in Autonomous Vehicle Fleets"

Noah Lassar, Head of Reliability, Waymo

The reliability and maintenance models that exist for personal car ownership need to be overhauled with the advent of fully autonomous vehicles being operated in fleets as a transportation as a service (TaaS). In personal car ownership, the burden and cost of maintenance is placed on the customer, who is responsible for both identifying when failures occur and getting the vehicle serviced effectively to resolve the failure. In this talk, we will explore both the challenges and the solutions needed to achieve high reliability in an autonomous TaaS fleet.

Speaker Biography

Noah Lassar is the Head of Reliability for Waymo, leading a reliability team that covers hardware test, vehicle test, fleet reliability, and data analytics and prognostics. Noah also acts as an advisor to Alta Motors, developer of high performance electric motorcycles. Prior to joining Waymo, Noah worked as the Manager of Reliability at Tesla Motors, where he developed and executed the reliability program for Tesla's Model S and the Toyota Rav4 EV. Noah received his Master's degree in Mechanical Engineering from Stanford University in 2004. When Noah is not working on reliability challenges, he enjoys exploring the world with his wife and two children.

"Reliability Testing in Heat Exchangers"

Dr. Julio Pulido, Sr. Director of Quality and Reliability, Nortek.

In today's competitive environment accelerated life testing is becoming a competitive advantage when time spent from conceptual stage to the final product development needs to be competitively small (project costs and development time) in order to be successful. Using accelerated life testing techniques for mechanical and structural applications have strong challenges when defining the loading but also the product life to represent actual field performance. The issue at hand; how new technologies should be evaluated to determine which life stress relationship better represent the component performance. Such common problems as well as some helpful strategies using accelerated life testing are presented for faster planning of structural mechanical testing of membranes used for heat exchangers used for cooling the data centers as well as application in microchannel. The paper reviews each element of the test planning process and how different life stress relationships can be effectively incorporated to allow to effectively and efficiently assuring time to failure calculation. The paper covers several testing techniques like DOE combined with accelerated testing and shows successes and pitfalls that could be avoided when the right tools were applied in a timely manner.

Speaker Biography

Dr. Julio Pulido is a Sr. Director of Quality and Reliability for Nortek. His responsibility is to drive the capability development of Design for Reliability and Quality Assurance at Nortek. He holds BS from the Federal University of Bahia, Brazil, MS from the Federal University of Rio Grande do Sul, Brazil, PhD from Federal University of Rio de Janeiro, Brazil, PhD Research at Duke University and MBA from Xavier University. His specialty is in the area of Structural Analysis, Design for vibration and Structural Reliability, and accelerated testing techniques. He has published over 90 works at different peer reviewed international Symposiums

"Good FMEAs, Bad FMEAs, What's the Difference?"

Carl S. Carlson, Consultant and instructor / GM Retiree

Failure Mode and Effects Analysis (FMEA) can anticipate and prevent problems, reduce costs, shorten product development times, and achieve safe and highly reliable products and processes. Stated simply, FMEA is an essential element in achieving reliability objectives for any project or program. However, it has to be done correctly: performed on the correct parts, by the correct team, during the correct timeframe, with the correct procedure. Frankly, there are mixed results with FMEA applications. Consider these questions: Why is there so much variation in the application of a tool that has been around for many decades? What can be done to help achieve more uniformly successful results? This interactive presentation will teach how to differentiate between high-quality and poor-quality FMEAs.

Speaker Biography

Carl S. Carlson is a consultant and instructor in the areas of FMEA and reliability program planning, with 35 years of experience in quality and reliability engineering and management positions, supporting clients from a wide cross-section of industries. He has authored over 100 technical papers and articles on quality and reliability subjects, and regularly teaches courses and tutorials to industry professionals. Prior positions include senior consultant for ReliaSoft, and senior manager for Advanced Reliability Group at General Motors. At GM, his responsibilities included FMEAs for North American operations, developing and implementing advanced reliability methods, and managing teams of reliability engineers. Mr. Carlson co-chaired the cross-industry team that developed the commercial FMEA standard (SAE J1739, 2002 version), served for five years as Vice Chair for SAE's G-11 Reliability Division, and was four-year member of RAMS Advisory Board. He holds a B.S. in Mechanical Engineering from University of Michigan, Senior Member of ASQ, and Certified Reliability Engineer. His book, *Effective FMEAs*, was published in 2012 by John Wiley & Sons.

"Machine Learning Meets Prognostics: Analysis of High-Dimensional Data Streams for Time-to-Failure Prediction"

Dr. Kamran Paynabar, Assistant professor, Georgia Tech University

Nowadays many capital-intensive assets used in the manufacturing and energy sectors are equipped with numerous sensors to monitor their physical performance, operational characteristics, and degradation behavior. However, the complex characteristics of the generated data streams including the high-dimensionality, volume, variety, spatio-temporal structure, and poor quality of the data, pose significant analytical challenges. In this talk, I will discuss how statistical and machine learning techniques can be used to develop scalable prognostics models for predicting the residual useful lifetime (RUL) of assets using a verity of degradation data streams. The first part of the talk focuses on building a tensor-based regression framework that utilizes degradation image streams to predict RUL, and provide advance warning of impending failures of industrial assets. Specifically, a (log)-location-scale tensor regression model is proposed in which the time-to-failure is treated as the response and degradation image streams as covariates. The second part of the talk deals with the missing data problem in prognostics. In practice, degradation data streams or time-to-failure observations contain significant levels of missing and corrupt observations. Inspired by the matrix completion, a new low-rank prognostics model is proposed that can effectively utilize the information of incomplete signals to not only predict the RUL but also impute the missing data. This talk is based on joint works with Xiaolei Fang and Nagi Gebraeel.

Speaker Biography

Kamran Paynabar is the Fouts Family Early Career Professor and Assistant Professor in the Stewart School of Industrial and Systems Engineering at Georgia Tech. He received his B.Sc. and M.Sc. in Industrial Engineering from Iran in 2002 and 2004, respectively, and his Ph.D. in Industrial and Operations Engineering from The University of Michigan in 2012. He also holds an M.A. in Statistics from The University of Michigan. His research interests comprise both applied and methodological aspects of machine-learning and statistical modeling integrated with engineering principles. His current research focuses on the analysis of high-dimensional complex data including multi-stream signals, images, point-clouds and network data, for system modeling, monitoring, diagnosis and prognosis. He is a recipient of the INFORMS Data Mining Best Student Paper Award, the Best Application Paper Award from IIE Transactions, the Best QSR refereed paper from INFORMS, and the Best Paper Award from POMS. He has been recognized with the Georgia Tech campus level 2014 CETL/BP Junior Faculty Teaching Excellence Award. He is serving as the chair of Quality, Statistics, and Reliability of INFORMS, and the president of Quality Control and Reliability Eng. of IISE.

"Strategies for Successful DMAIC Problem Solving"

Scott Sterbenz, Six Sigma Master Black Belt, Ford Motor Company

Six Sigma is not only meant to train problem solvers in common statistical methods; the intent is to also change the way they think about solving problems. However, the generic objectives listed in each phase of define, measure, analyze, improve, and control don't necessarily promote successful progression or completion of projects. This presentation focuses on the specific strategies and problem-solving objectives the Black Belt should focus on in each phase of DMAIC, ensuring success and efficiency in their projects. In addition, the objectives for each phase will be substantiated by real-world examples. At the end of this presentation, problem solvers will approach technical DMAIC projects much differently than in the past—and it will make solving those technical DMAIC projects much simpler, more effective, and more efficient.

Speaker Biography

Scott Sterbenz is a Six Sigma Master Black Belt at Ford Motor Company, using DMAIC and DFSS methods to solve quality and customer satisfaction issues. Scott is also a volunteer Technical Adviser for the United States Bowling Congress, the national governing body for the sport of bowling. There, he helps develop test plans and analysis methods to set specifications for bowling equipment and to conduct ground-breaking research. A Professional Engineer in Michigan, Scott holds a bachelor's and master's degree in Mechanical Engineering from Wayne State University in Detroit—valedictorian in both programs. Scott enjoys mountain biking and motorcycling, and has twelve certified 300 games and a high certified three-game series of 853.

"Variance Estimate from a Single Emissions Test"

John Phillips, Manager - Calibration Innovation and Technical Problem solving

Given a single emission test it is possible to estimate the variance of the emission mass per unit distance by utilizing the time history of the emissions collected at a one Hertz sample rate. The data is observed to be episodic in nature and non-parametric in distribution. Modern computer age statistical inference tools can accurately estimate the expected variance of the test result by replacing the unknown non-parametric distribution with a known estimate, and resampling from the estimated distribution with replacement, a process known as the non-parametric bootstrap. Utilizing a large number of such simulations produces an estimate of the variance, standard error, and other useful statistics. Measurements collected during a federal test procedure are analyzed to determine the variation of the single test.

Speaker Biography

John Phillips is a powertrain applications engineer and technical problem solver from the FCA Chelsea Proving Grounds. He studied electrical engineering at Stanford University in Palo Alto, California and Kettering University in Flint, Michigan. John has a varied background from the powertrain sensors, actuators, and exhaust after treatment supplier community before joining FCA in 2014. John has earned professional problem-solving certifications from the American Supplier Institute, Shainin LLC, the Advanced Integrated Technologies Group and the American Society For Quality. John is passionate about using data to provide useful information to guide decision making.

"From Micro to Macro: Reliability Analysis and Failure prediction of Advanced High Strength Steels considering Material Microstructure Image Information"

Dr. Qingyu Yang, Associate Professor, Wayne State University.

The microstructure of materials determines its behavior and critical failure and quality characteristics in various systems such as automotive structures, aircraft engine components, nanomaterial-based electric micro-devices, and artificial organs. However, in traditional reliability and quality research area, reliability analysis and product quality control usually start from macroscopic level without considering material microstructures. The problem becomes more critical in lightweight autobody manufacturing, where high strength steels (at 1~1.8GPa strength) are used or under development. This presentation will focus on a generic methodology to efficiently extract material microstructure information, and further incorporate it for reliability analysis and failure prediction. The developed methodology, which integrates reliability engineering, novel statistical models, and physical experiments, can fundamentally improve the accuracy of failure and reliability prediction and significantly reduce the maintenance cost.

Speaker Biography

Dr. Qingyu Yang is an Associate Professor in the Dept. of Industrial and Systems Engineering, the director of Reliability and Intelligent System lab, and the co-director of Material Process and Manufacturing lab at Wayne State University. He has done research on reliability data analysis, accelerated testing, repairable systems, destructive/nondestructive evaluation, engineering material reliability, fatigue testing, reliability test planning, warranty prediction, and optimal maintenance. Dr. Yang's research has been supported by agencies including NSF, DOE, DMDII, NSERC, VA, and industries including US Automotive Materials Partnership, Ford, and Fiat-Chrysler. He is the recipient of Institute of Industrial and Systems Engineering Trans. Best Paper Award (2011), Industrial and Systems Engineering Research Conference (ISERC) Best Paper Award (2009), and INFORMS Best Referred Paper Finalist Award (2017). He is the advisor and co-author of the ISERC Best Student Paper Awards (2015 and 2016). He is currently the Board Director of Quality Control and Reliability Engineering Division of the Institute of Industrial and Systems Engineering.

"Applying Failure Prognostics to Reduce the Duration of Automotive Electronics Reliability Testing"

Dr. Andre Kleyner, Global Reliability Engineering Leader, Aptiv.

Accelerated stress testing is an integral part of the automotive electronics validation process. However, since the durability tests are intended to represent the automotive mission life of 15 or more years, some of the tests are becoming prohibitively long and expensive. For example, a temperature cycling test designed to adequately represent an automotive field life/environment can easily take 2-4 months and even longer when the test units have high thermal masses, such as power electronics modules. The time and resource pressure becomes even more intense, when some of these tests are needed to be repeated due to a failure or a design change. Some of the longest stress tests, such as Power Temperature Cycling (PTC) and High Temperature Endurance (HTE) are monitored tests, which offers a mechanism to study product's wear-out behavior during the testing. This presentation will discuss an application of degradation analysis and prognostics to reduce the duration of the long durability tests, such as PTC and HTE. A case study of a power electronics controller will be presented and the opportunities and challenges of this approach will be discussed.

Speaker Biography

Andre Kleyner has 30 years of engineering, research, consulting, and managerial experience specializing in reliability of electronic and mechanical systems designed to operate in severe environments. He received the doctorate in Mechanical Engineering from University of Maryland, and Master of Business Administration from Ball State University. Dr. Kleyner is Global Reliability Engineering Leader with Aptiv, formerly Delphi and an adjunct professor at Purdue University. He is an ASQ Fellow, a CRE, CQE, and Six Sigma Black Belt. He also holds several US and foreign patents and authored over 40 professional publications including three books on the topics of reliability, statistics, warranty management, and lifecycle cost analysis. Andre Kleyner is also the editor of the Wiley Series in Quality and Reliability Engineering, books published by John Wiley & Sons.

Call for Presentations, Expo and Poster Sessions

2019 Guangbin Yang Reliability Symposium August, 2018

If you are interested in participating at next year's symposium, please contact:

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