



WELCOME

The ASQ Reliability Division is the largest group in the world promoting reliability training and education.

This newsletter covers professional development opportunities, plus division activities, information and news.

Chair's Note



Marc Bangart
Chair, Reliability
Division of ASQ
marc@asqrd.org
Q1, 2016 Newsletter

Chair's Message

2016 is off to a good start for the Reliability Division! We had a successful RAMS conference in Tucson in spite of the severe weather on the East Coast. We also had our first face-to-face leadership team meeting in conjunction with RAMS.

I would like to thank all our members for their continued membership in the division. We certainly appreciate it and as a volunteer leadership strive to ensure we provide member value.

This year we have a renewed focus on delivering of member value. We have several efforts planned to include development of a searchable publication library on www.asqrd.org and development of online courses. Please stay tuned!

Interested in being involved in your division? We continuously recruit new volunteers. Please send me an email at marc@asqrd.org if you are interested.

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Division Budget Update

ASQ-RD Treasurer's Financial Summary for 2015

John Bowles, 2015 ASQ-RD Treasurer(bowles@cec.sc.edu)

James Breneman, 2016 ASQ-RD Treasurer (weibullman@gmail.com)

The division continued to have a strong balance sheet (Statement of Financial Position) with over \$52,700 in its checking and ASQ Investment Program accounts. Investments in ASQ's reserve fund program were over \$98,200. There is also a \$3,500 advance on the balance sheet for the RAMS 2016 seed money and a \$3,500 advance for ASTR 2016 seed money.

Membership revenue for the twelve months (ended December 31, 2015) was \$22,293.

Investment income for the twelve months (ended December 31,2015) was \$1,129.

Total division revenue from all sources for the twelve months (ended December 31, 2015) was \$80,568.

Expenses for the twelve months (ended December 31,2015) were \$89,840.

The net deficit (net loss) for the twelve months (ended December 31, 2015) was \$9,272.

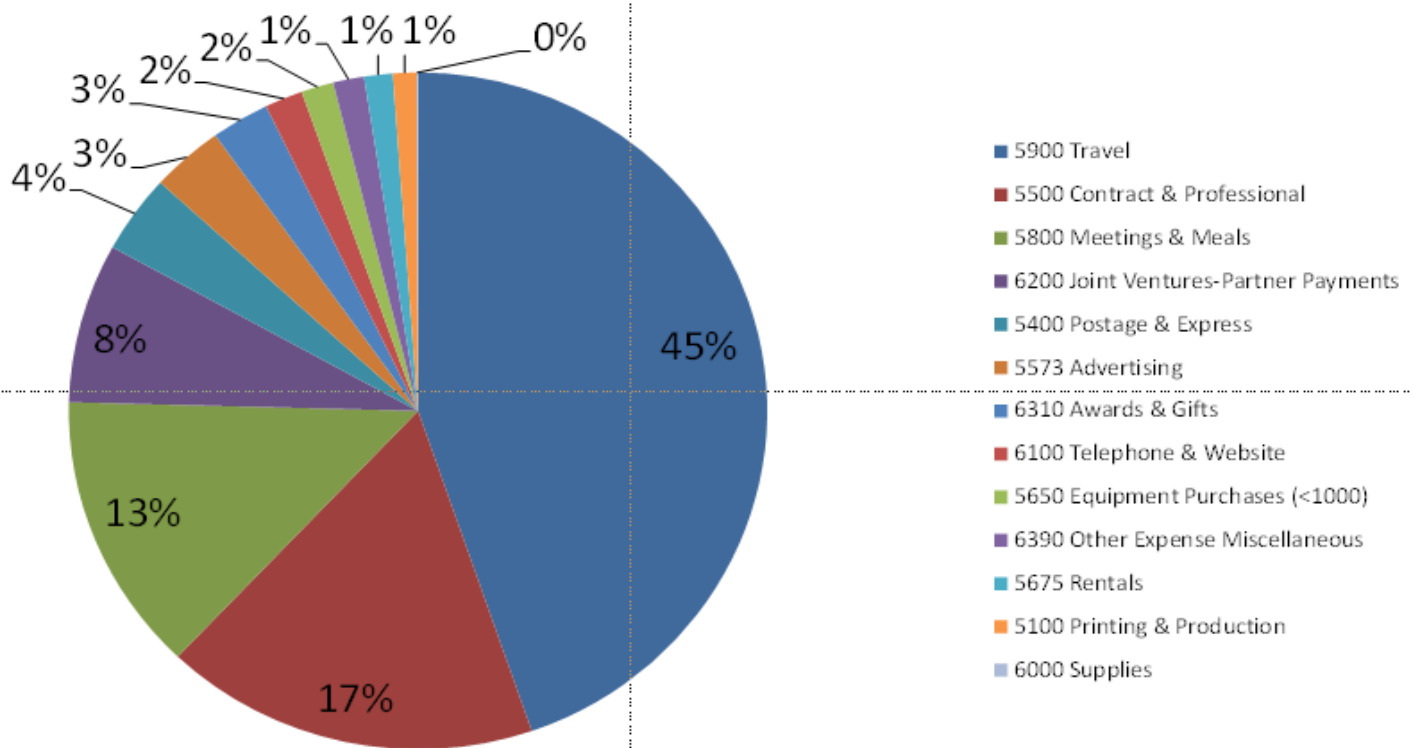
A breakdown of the Income and spending categories is on the next page.

The 2016 Budget is illustrated to the right: 

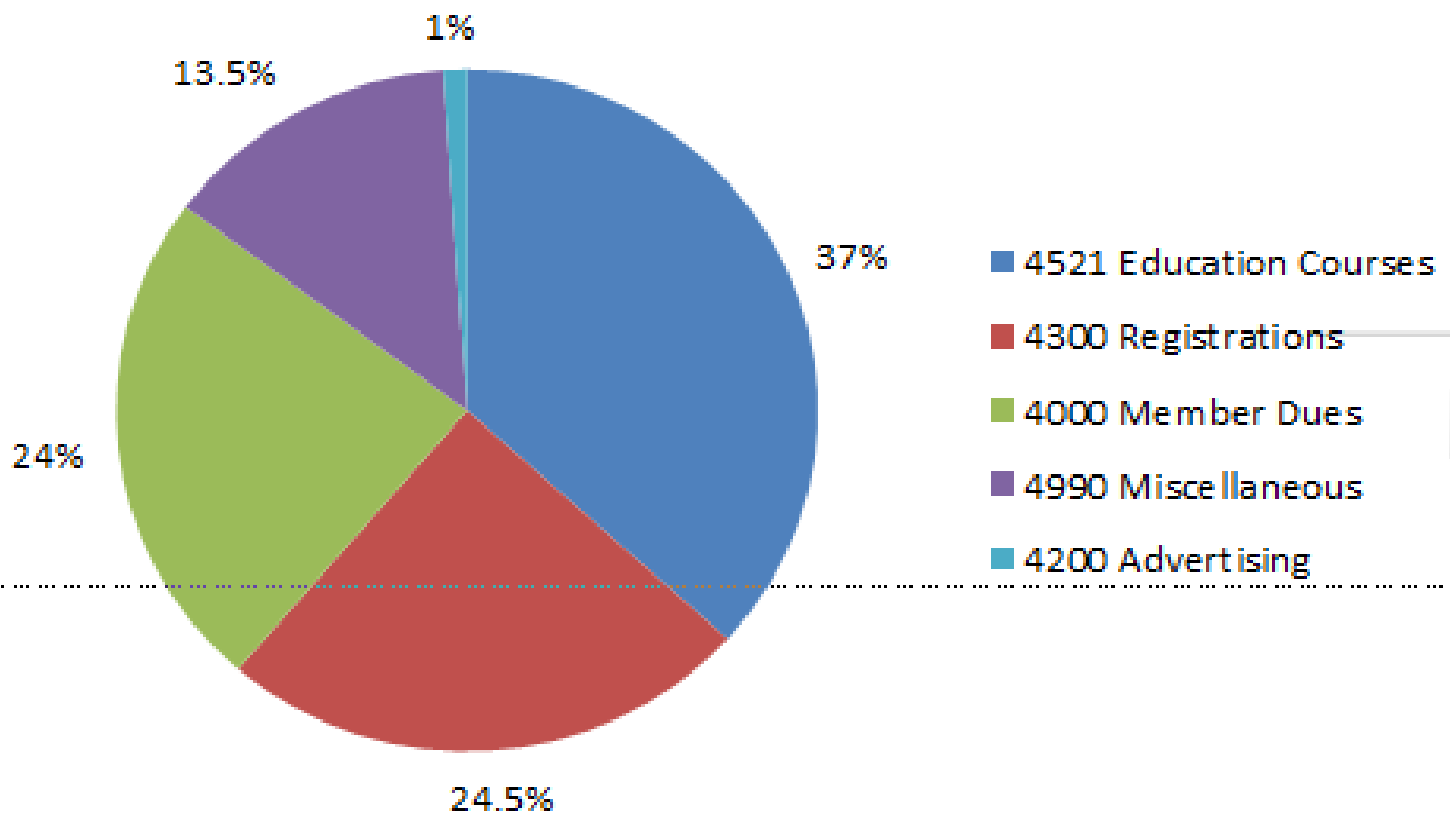
1. Note that income from "Education/Courses" will be down from 2015.
2. Spending on on-line education in reliability will increase in 2015.
3. Travel will continue to be our largest expense.

		2016
ACCOUNT	DESCRIPTION	Budget
REVENUE		
4000	Dues	\$22,000
4100	Retail_Sales	\$1,000
4200	Advertising	\$500
4300	Registrations	\$17,000
4370	Workshops/Tutorials	
4521	EDUCATION/COURSES	\$25,000
4871	INTEREST	\$200
4990	Mis cellaneous	\$7,000
TOTAL REVENUE		\$72,700
		2016
ACCOUNT	DESCRIPTION	Projected Expenses
EXPENSES		
5100	Printing & Production	\$250
5280	Promotional Giveaways	
5400	Postage & Shipping	\$1,500
5500	Contract & Professional	\$10,000
5573	Advertising	\$5,000
5650	Equipment Purchases	\$500
5675	Equipment Rentals	\$500
5704	EXHIBIT BOOTH RENT	\$1,000
5800	Meetings & Banquets	\$13,000
5900	Travel	\$32,000
6000	Supplies	\$150
6100	Telephone	\$1,500
6100	WEBSITE HOSTING/INTERNET FEES	\$1,000
6200	Partner Payment	\$7,000
6310	Awards & Gifts	\$2,000
6390	Other	\$500
TOTAL EXPENSES		\$75,900

ASQ-RD 2015 Spending by Category



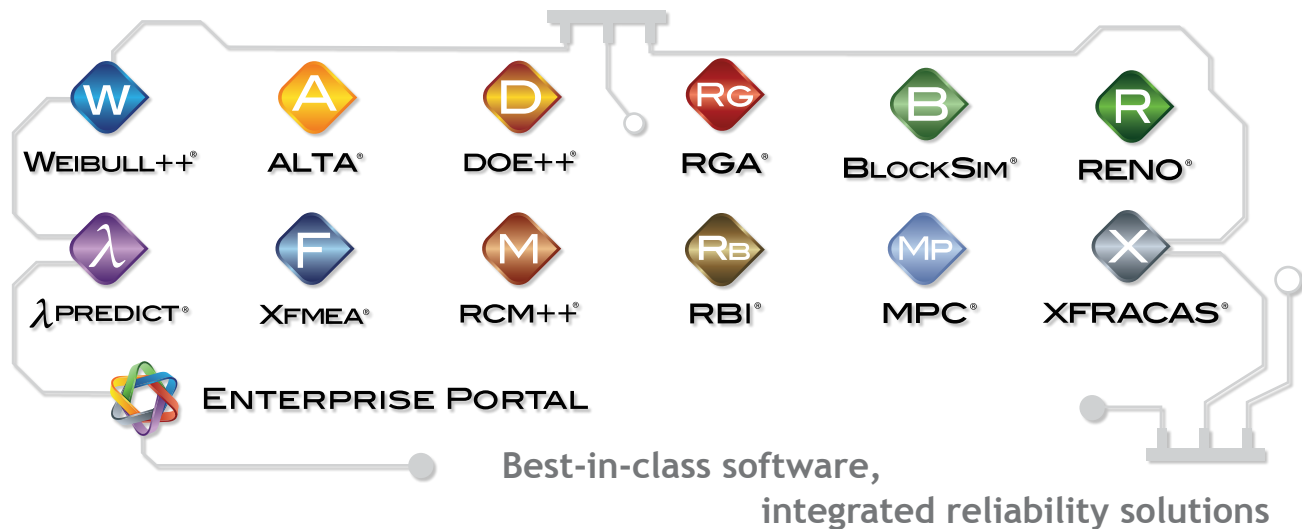
ASQ-RD 2015 Income by Category





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E-mail: Info@ARSymposium.org

Phone: 1.888.886.0410 or +1.520.886.0410

The Symposium will take place at:

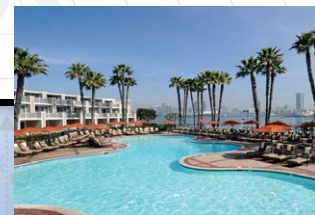
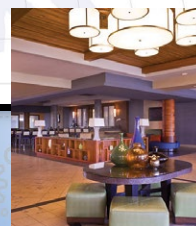
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2017 CALL FOR PAPERS & TUTORIALS

<http://rams.org>

The Annual Reliability and Maintainability Symposium

January 23 - 26, 2017

Rosen Plaza Hotel

Orlando, Florida

2017 Theme: “R&M: Managing Emerging Challenges and Risks”

The 63rd Annual Reliability & Maintainability Symposium (RAMS®) will be held in Orlando, Florida in 2017. The theme for RAMS® 2017 is “R&M: Managing Emerging Challenges and Risks.” Recent technological advances across various industries and disciplines coupled with rapid globalization have been creating tremendous opportunities for the advancement of mankind, businesses, and global economy. At the same time they are also posing new challenges and risks. The effective utilization of R&M principles and processes is critical across the lifecycle of products in managing emerging challenges and risks. The 2017 theme offers a broad umbrella of opportunities for papers and tutorials that address the overall criticality of R&M in the design, development and support process, and how R&M can be applied in managing emerging challenges and risks through lessons learned, analyses, modeling and simulation, and training. Equally as important is the discussion of the classical nature of R&M approaches, spanning all technologies and disciplines in the focus to optimize performance in a cost-effective manner. Reliability and Maintainability implementation becomes a competitive advantage throughout the product life cycle to improve product quality and reduce life cycle cost, given effective application and intentional approaches. We want to learn more about your accomplishments in effective implementation of R&M in your day-to-day quest to improve your business and your accomplishments in managing emerging challenges and risks.

With this in mind, we invite you to share your theoretical or practical findings as documented by research results, engineering studies, success stories, lessons learned, R&M based analyses and simulations, or R&M discoveries at the RAMS® 2017 in Orlando, FL. Tell us how you are designing, optimizing, and supporting systems (both hardware and software) by applying reliability and maintainability concepts. Tell us how you are managing emerging challenges and risks by applying reliability and maintainability concepts. Tell us how you are using reliability and maintainability in your other pursuits.

RAMS® is the premier forum for sharing your experience, knowledge, and roadmaps to success. Make your contribution to the advancement of the R&M discipline and participate in the rich exchange of ideas and solutions. We want you to contribute your unique experience to our synergistic symposium sponsored by nine professional societies. Plan to submit your paper or tutorial now.

RAMS® seeks to provide your peers with a mix of papers and tutorials. Papers are the best medium to document advancements in the state-of-the-art, and those accepted and presented will be published in the Proceedings. A short technical presentation with discussion period (approximately one-half hour) will be given for each paper at the Symposium. Papers accepted and presented, oral or poster, will be submitted to IEEE Xplore®. Tutorials provide more fundamental exposure to R&M topics, and their technical depth ranges from introductory through intermediate to advanced. Tutorials are presented in two-hour in-depth sessions at the Symposium. Examples of the most recent written papers and tutorials are available in the 2016 Proceedings and the 2016 Tutorial Notes.

The process for presenting a paper or tutorial at the RAMS® 2017 begins with your submission of an abstract. Your submittal should address topics pertinent to Reliability and Maintainability that are relevant to our theme, such as:

Accelerated Life Testing	R&M Applications in Aerospace
Big Data and IoT Applications in R&M	R&M Applications in Health Care
Business Process Improvement	R&M Applications in Infrastructure Management
Design Optimization Using R&M Techniques	R&M Applications in Manufacturing
Discrete Event Modeling & Simulation	R&M Applications in Service
Economic Models for R&M	R&M Applications in Supportability
Equipment Diagnostics and Prognostics	R&M and Quality Appl. in Communications Design & Mfg.
FMEA	R&M Management
Fault Tolerance and Safety Critical Systems	Reliability Modeling
Fault Tree Analysis	Reliability Growth Analysis
Human Reliability	Repairable Systems
Knowledge Based Training	Risk Analysis and Management
Life Data Analysis	Security and Dependability Analysis
Maintenance Models and Methodologies	Software Reliability and Testing
Physical Reliability Models	System Safety Analysis
Prognostics and Health Management	Warranty Data Analysis and Management
Quality Appl. in Electronics Design & Mfg.	(See RAMS® website or recent <i>Tutorial Notes</i> for other topics)

We look forward to receiving your abstract and seeing you in Orlando, Florida!

Suprasad V. Amari, General Chair, RAMS® 2017

ABSTRACT SUBMISSION DEADLINE — Friday, April 15, 2016



RAMS 2017: CALL FOR PAPERS & TUTORIALS

The 63rd Annual Reliability and Maintainability Symposium

January 23-26, 2017

Rosen Plaza Hotel - Orlando, Florida, USA

Symposium Theme: “R&M: Managing Emerging Challenges and Risks”

The 63rd Annual Reliability & Maintainability Symposium (RAMS®) invites abstracts for papers and tutorials from practitioners and researchers. RAMS® is the premier event for the reliability, availability, and maintainability engineering discipline, which brings tutorials, panels, technical presentations, exhibits, CEUs, certifications, and networking into a four-day program and delivers the best value to participants and reliability professionals. The process for presenting a paper or tutorial at the RAMS® 2017 begins with your submission of an abstract. Your submittal should address topics pertinent to Reliability and Maintainability that are relevant to symposium theme. For more detail, please visit: www.rams.org

PAPERS - present your paper in a half-hour session at the Symposium and discuss and share your research experience with other reliability professionals. The papers presented during symposium will be submitted to IEEE® Xplore for publication.

TUTORIALS - share your knowledge and experience with other professionals. Topics range from introductory to advanced, and are presented in two-hour, in-depth sessions at the Symposium.

ABSTRACT SUBMISSION DEADLINE: Friday, April 15, 2016

Best Paper Award Winners

RAMS

It is great privilege to announce the 2015 Best Paper award winners! In 2015 we had several papers presented by ASQ Reliability Division members at RAMS. ASQ RD Chair would like to congratulate John Holmes with his paper titled “Safety Integrity Level Requirements in Deepwater Drilling – Where Safety Meets Reliability”. The paper discusses key challenges relating to data collection and calculation of safety critical reliability – well worth the read! Log into ASQRD.org to access the paper today!

Quality Engineering Journal (QE)

The Division has been supporting the Quality Engineering journal for several years. It is directed to professionals in all engineering and management fields interested in quality improvement and reliability. The winning paper titled “A Practitioner’s Guide to Analyzing Reliability Experiments with Random Blocks and Subsampling” was written by Jennifer L.K. Kensler, Laura J. Freeman and G. Geoffrey Vining. Please join us in congratulating them!



Dates	Location	Courses	Instructor(s)
July	Portland, OR	-Introduction to Reliability Engineering/Statistics (two day course)	Trevor Craney Marc Banghart
August	Charlotte, NC	-CRE Preparation Course (two day)	Jim Breneman / Mohammad Pourgol-Mohammad
September	Pensacola Beach, FL @ ASTR	-Accelerated Life Testing	Jim McLinn.

To find out more about any of these courses and to register for one or more, go to url:

<http://www.asqrd.org/2016-courses/>

Announcement for ASQ RD Best Paper for RAMS2016

It is great privilege to announce the RAMS2016 Best Paper award winners! After careful review of all the papers presented by ASQ RD members at RAMS2016, the following paper is awarded the ASQ RD Best Paper of RAMS2016, held in January 2016 in Tucson, AZ. The title of the selected paper is: "Joint Maintenance and Inspection Optimization of a k-out-of-n System", by Vladimir Babishin, MEng, PhD Student, Ryerson University, Sharareh Taghipour, PhD, Ryerson University. The paper discusses a framework for optimum maintainability process of a k-out-of-n system with components whose failures follow a non-homogeneous Poisson process with power law intensity function. Please join us in congratulating them!

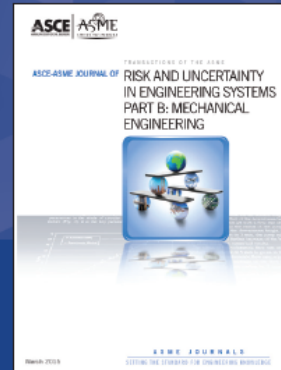


ASCE-ASME JOURNAL OF RISK AND UNCERTAINTY IN ENGINEERING SYSTEMS, PART B: MECHANICAL ENGINEERING

TIMELY, ACCESSIBLE, HIGH IMPACT

The ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems, Part B: Mechanical Engineering presents state-of-the-art research and best practices for ensuring a full discussion on risk and uncertainty related issues. The journal is a forum for researchers and engineers to address risk, disaster and failure-related challenges due to many sources and types of uncertainty in planning, design, analysis, construction, manufacturing, operation, utilization, and life-cycle management of existing and new engineering systems. Challenges abound due to increasing complexity of engineering systems, new materials and concepts, and emerging hazards (both natural and human caused). The journal, along with its companion journal on civil engineering (Part A), will serve as a medium for dissemination of research findings, best practices and concerns, and for the discussion and debate on risk and uncertainty related issues.

The American Society of Mechanical Engineers (ASME)



EDITOR

Bilal M. Ayyub, PhD
University of Maryland, USA
ba@umd.edu

GET INFORMATION AND SUBMIT PAPERS AT:

www.asce-asme-riskjournal.org

Wilks Tolerance Limit for Affordable Monte Carlo Based Uncertainty Propagation (Part 1 of 3)

By: Mohammad Pourgol-Mohammad, Ph.D, P.E, CRE, mpourgol@gmail.com

As systems and their models become more complex and costly to run, the use of tolerance limit uncertainty characterization is gaining popularity. For example in very complex models containing several uncertain parameters (each represented by a probability distribution function), classical Bayes' and bootstrap Monte Carlo simulation may become impractical. Often in complex computer-based models in which calculation of values require significant amount of time and effort, the traditional Monte Carlo simulation is not possible. Wilks Tolerance limit is used in these cases

A tolerance interval is a **random** interval (L, U) that contains with probability (or confidence) b at least a fraction g of the population under study. The probability and fraction b and g are analyst's selected criteria depending on the confidence desired. The pioneering work in this area is attributed to Wilks [1-2] and later to Wald [3-4]. Wilks Tolerance limit is an efficient and simple sampling method to reduce sample size from few thousands to around 100 or so. The number of sample size does not depend on the number of uncertain parameters in the model. There are two kinds of tolerance limits:

Non-parametric tolerance limits: Nothing is known about distribution of the random variable except that it is continuous

Parametric tolerance limits: The distribution function representing the random variable of interest is known and only some distribution parameters involved are unknown.

The problem in both cases is to calculate a tolerance range (L, U) for a random variable X represented by the observed sample, $x_1, \dots, x_m$, and the corresponding size of the sample.

Consider g **tolerance limits** L and U for **probability level** b of a limited sample S_1 of size N, the probability b that at least γ proportion of the X's lie between L and U is obtained in another indefinitely large sample S_2 will from [1-4]

$$p \left(\int_L^U f(x) dx \geq \gamma \right) = \beta \quad (1)$$

ASQ Reliability Division

Call for Instructors

The Division is looking to expand its cadre of Reliability and Maintainability instructors! If you are interested in teaching and reside in the USA or Europe please send your resume and course abstract to our education chair, Trevor Craney at trevor.craney@shell.com. Instructors may be required to provide a short sample course via WebEx.



CALL FOR PAPERS

\$1000 Annual Award for Best RELIABILITY Paper

The winner of the fourth annual award for the time period July 2014 – June 2015 has been granted. Congratulations to Jennifer L.K. Kensler, Laura J. Freeman and G. Geoffrey Vining for their paper entitled, “A Practitioner’s Guide to Analyzing Reliability Experiments with Random Blocks and Subsampling.”

Continuing in 2015-2016 & 2016-2017, the ASQ Reliability Division will administer a \$1000 annual award for the best Reliability focused paper published in Quality Engineering. Published papers will be evaluated for the four issues on the July-June calendar.

Note – to be eligible for the award, at least one of the authors for a paper must be a member of the ASQ Reliability Division or hold a valid subscription to www.ASQRD.org when their paper is published.

For more information: Rong.Pan@asu.edu

To submit papers for publication: <http://mc.manuscriptcentral.com/lqen>

ASQRD.ORG — Providing Member Benefit

- **Wealth of Reliability Education and technical content right at your fingertips!**
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 - Short courses on topics such as FMEA, Fundamentals of Reliability Engineering and understanding reliability from a Quality Engineering perspective
 - RAMS part proceedings (2007 to present)
 - Reliability Review Journal (2006 – 2010)
 - Newsletters
- **Visit us today at ASQRD.org!**

Benefits	ASQ Reliability Division	ASQRD.org
Cost	\$146	\$20
ASQ membership	✓	
Discount on CRE exam	\$159	
Eligible to hold position of ASQ-RD elected officer	✓	
Eligible to hold position of ASQ-RD appointed (DMC or RC) position	✓	
Eligible to hold position of ASQ-RD appointed position	✓	✓
ASQRD.org Members Only access	✓	✓
Discounts for ASQ-RD sponsored conferences & training events	✓	✓
Eligible for ASQ-RD annual best paper awards (RAMS & QE)	✓	✓

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and Chinese translations.

English webinars:

1. Creative and innovative design solutions and problem fixes - the path less traveled, March 2016, Dave Auda
2. Quality: A Loggie's Perspective, April 2016, Lloyd Muller
3. Why 400,000 Patients Die Each Year from Poor Practices in Hospitals: Proven Reliability Strategies for Increasing the Survival Rate, May 2016, Dev Raheja
4. Test sampling and retesting for design changes, June 2016, Andre Kleyner
5. System theoretic process analysis (STPA), July 2016, John Thomas
6. Using the Poisson and the Binomial in support of product (including software) Service reliability, August 2016, Norma Antunano
7. A Practitioner's Guide to Analyzing Reliability Experiments with Random Blocks and Subsampling (best paper), September 2016, Jen Kensler
8. Software FMEA, October 2016, Ann Marie Neufe
9. Weibull Analysis II, November 2016, Jim Breneman
10. Sample Size considerations in Statistical Experiments, December 2016, Jorge Luis Romeu
11. Physics of Failure, accelerated testing and reliability-Thermodynamic Degradation Science, January 2017, Al-ec Feinberg

ASQ- Reliability Division Webinar Series

Reliability division offers free Webinars in English, Spanish, and Chinese featuring leading international practitioners, academicians, and consultants. Enhance your reliability knowledge. For more information, click here: <http://asqrd.org/webinars/>

The ASQ Reliability Division Webinar Series remains popular. Since the Webinar and Short Course programs were first offered in November 2010, the Reliability Division has provided 130 webinars providing nearly 11749hours of professional development to its members at no cost. The most recent topics included webinars on:

- Finding Causes that Checklists Don't Find
 - Effective Reliability Test Plan Development
 - Empirical Limit Testing, The Benefits Of Discovery and Comparisons Instead of Assumptions and Predictions
- In addition, to date we have provided Recertification Units RU's to over 5835 individuals.

Webinar Outreach

Executive Producer & Speaker Manager

David Auda
davidauda@yahoo.com

Chinese Host

Frank Sun
franksun99@yahoo.com
Wendai Wang
wendaiw@gmail.com

English Host

David Auda
davidauda@yahoo.com

Kiruthika Sundarrajan

Spanish Hosts

Ernesto Primera
ernesto.primera@gmail.com

Data Analyst

Mark Durivage
mdurivage@hotmail.com

Video Editor

Marc Banghart
marc@asqrd.org

Webinar Support

Elaheh Rabiei
elirab@umd.edu

For previously recorded webinars on topics relevant to reliability engineers delivered by subject matter experts. Visit : <http://www.asqrd.org/past-webinars>

Other Information

LINKS

ASQ-RD new website

<http://www.asqrd.org/>

For up to the minute news and reminders of what's going on in the Reliability Division world.

Tech Briefs

<http://www.linkedin.com/groups?about=&gid=3994573>

ASQ Reliability Division (1500+ members on LinkedIn)

<http://www.linkedin.com/groups?about=&gid=1875217>

Upcoming Events

Click on Reliability Calendar for a current calendar:

<http://www.asqrd.org/>

1. **RAMS:** [url: www.rams.org](http://www.rams.org/) (page 6)

2. **Fall technical Conference (FTC):**
url: <http://asq.org/conferences/fall-technical/>
(page 8)

ASQ Learning Institute™ Spring Training

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[2014 Learning Institute Training Catalog](#)

International Courses

[See ASQ courses offered outside of the United States and Canada.](#)

CRE Exam Information and Facts

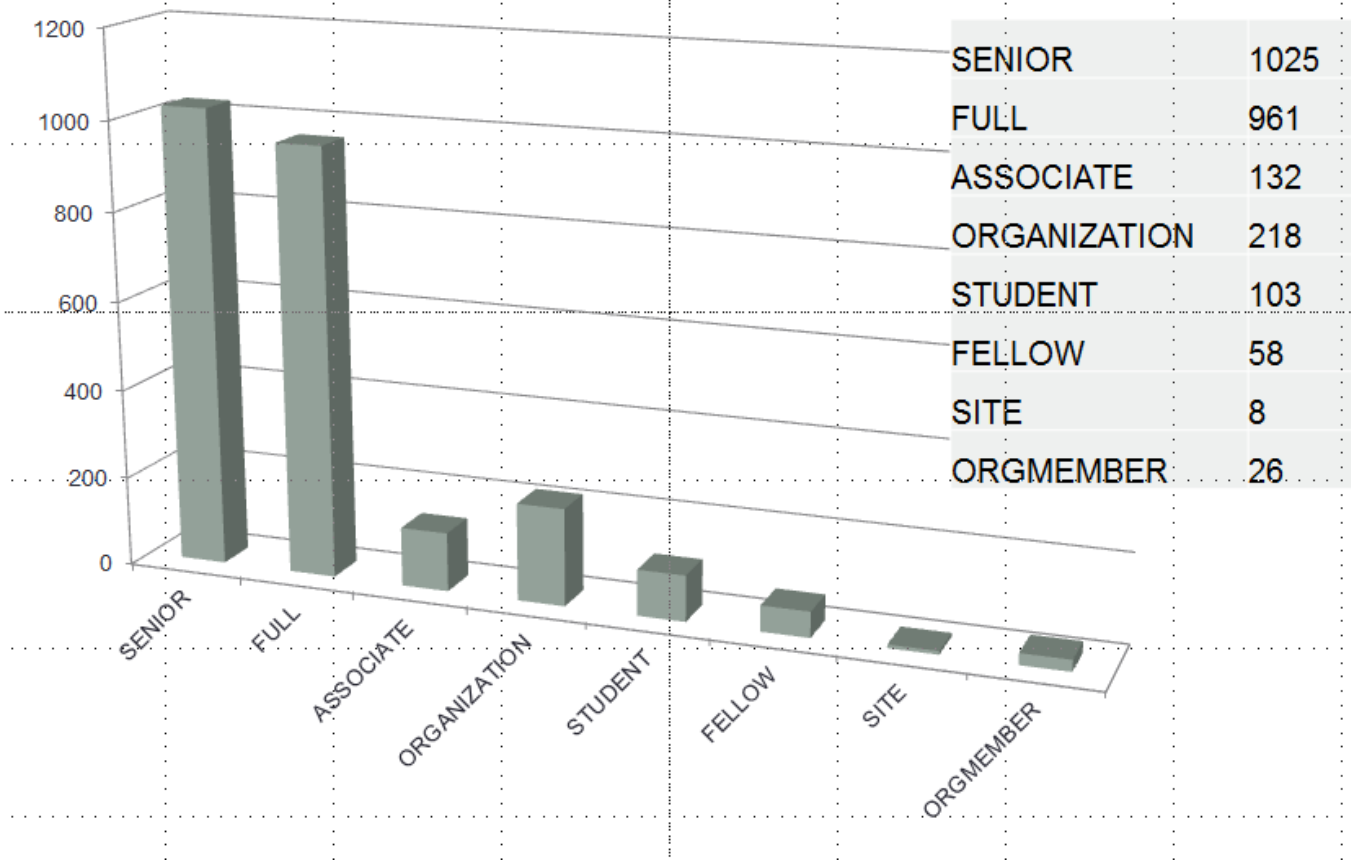
Current CRE statistics:

The total number of CREs as of the March 2015 exam was 5,961. Local ASQ Sections and international organizations host exams all over the world. You will be asked to designate a preferred examination site on your application. If you are not a member of ASQ, please [find the Section that is closest to your location](#). If you live in a country other than the United States, Canada or Mexico, international certification affiliates administer certification exams. [Find an international certification exam location](#). ASQ will make every effort to accommodate your request. ASQ offers some [translated certifica-](#)

The ASQ certification exam dates (by type of certification) is at :

<http://prdweb.asq.org/certification/control/dates>

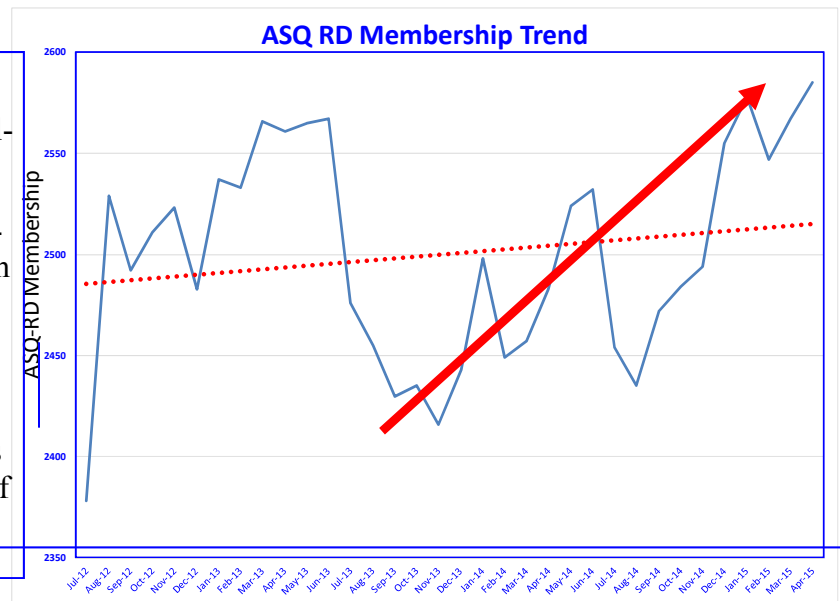
RD Membership by Type



ASQ-RD Membership is climbing!

While off to a rocky several years, ASQ-RD membership now seems to be on an upward slope; especially since late 2013.

Possible reasons are the ASQ-RD webinars, publications in Reliability, and Social media to better inform Reliability professionals of upcoming events, new techniques, ASQ-RD website for instant access to information and our instructor-led course offerings. Whatever may be the cause(s), we on the ASQ-RD leadership team will continue to look for better ways to inform, educate, and drive home the importance of Reliability as a vital feature of any Quality process.



Regional Councilors

ASQ Regional Councilors

Region 1	Mohammad Pourgol-Mohammad mpourgol@gmail.com Boston, MA
Region 1	Hari Cheedella hari.pc@stanadyne.com Windsor (Hartford), CT
Region 2	OPEN
Region 3	OPEN
Region 4 (Canada)	James Li james.li@ca.transport.bombardier.com Kingston, ON
Region 5	Deniz Eroglu rderoglu@gmail.com Washington, DC
Region 5	Craig Hillman chillman@dfrsolutions.com Washington, DC
Region 6A	Colleen Ackermann cackermannaz@yahoo.com Crescent Valley (North Central Nevada), NV
Region 6A	Dock Brown dockbrownseattle@yahoo.com Seattle, WA
Region 6B	Syed Hussain bhassanpk@yahoo.com San Francisco, CA
Region 7	OPEN
Region 8	Gary Josebeck garyjosebeck@gmail.com Greensburg (Pittsburgh), PA

ASQ Regional Councilors

Region 9	Ha Dao ha.dao@emerson.com Dayton, OH
Region 10	James McLeish jmcleish@dfrsolutions.com Rochester Hills (Detroit), MI
Region 11A	Ramesh Gulati ramesh.gulati.ctr@us.af.mil Chattanooga, TN
Region 11A	Sinan Meric sinan.meric@gmail.com Murfreesboro (Nashville), TN
Region 11B	JD Solomon Raleigh, NC jd.solomon@CH2M.com
Region 12	Dan Burrows d1c1b1@hotmail.com Tinley Park (Chicago), IL
Region 13	Mitchell Rausch (only partial duties) mitchell.rausch@gmail.com Kansas City, MO
Region 14A	Norma Antunano normaantu@aol.com Austin, TX
Region 14A	Cheryl Tulkoff ctulkoff@dfrsolutions.com Austin, TX
Region 14A	Sidhartha Pingali pingalisidhartha@gmail.com Houston, TX
Region 14B	Brad Beaird bbeaird@novationcontrols.com Tulsa, OK

Regional Councilors

ASQ Regional Councilors

15A

Bill Barto
bbarto@LCE.com
 Orlando, FL

15A

Tim Adams
tim.adams@nasa.gov
 Melbourne (Kennedy Space Center),
 FL

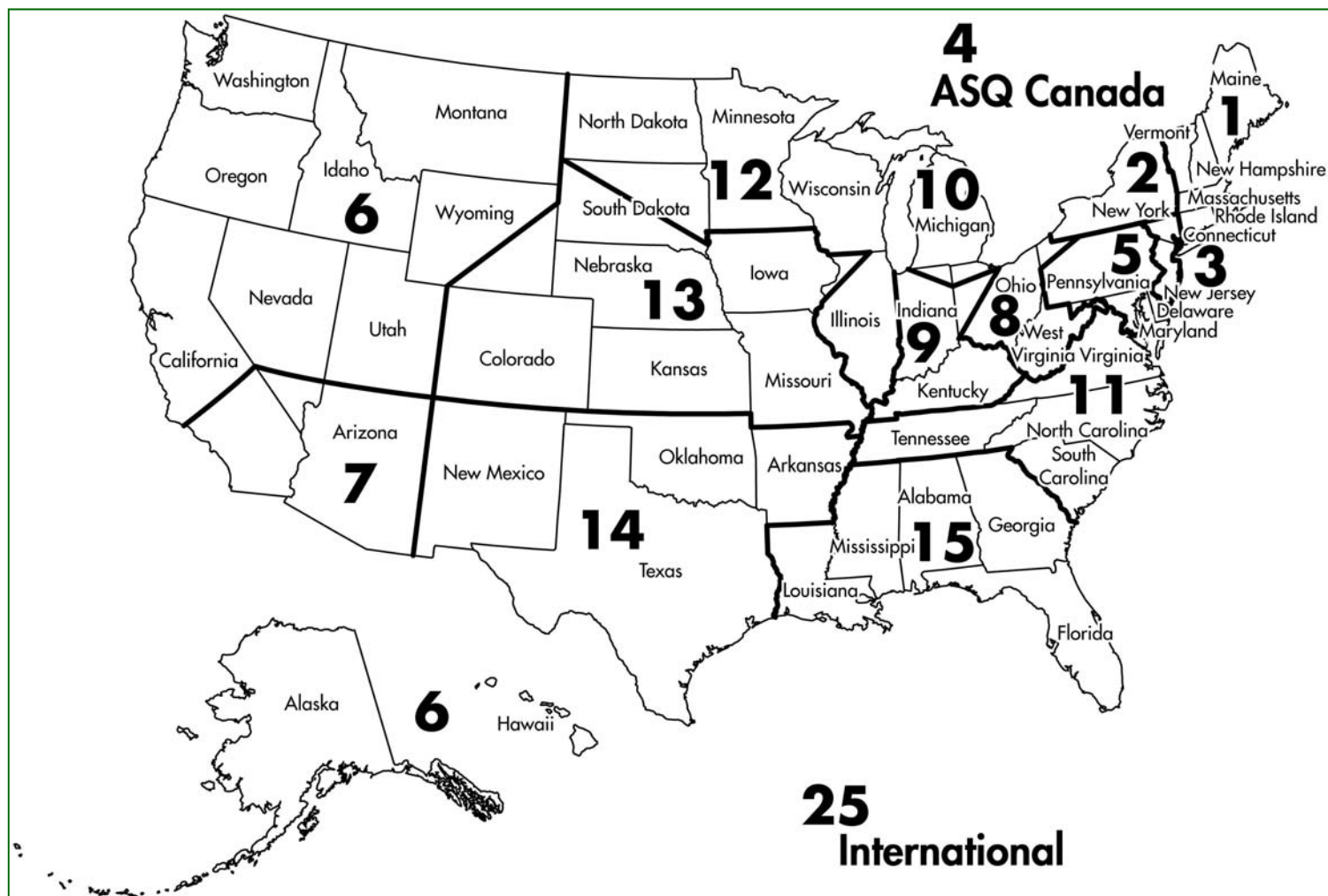
ASQ Regional Councilors

15A

David Jennings
jennings8878@yahoo.com
 Atlanta, GA

15B

Angleat Shelikoff
angleat.shelikoff@us.af.mil
 Eglin AFB/Ft. Walton Beach, FL



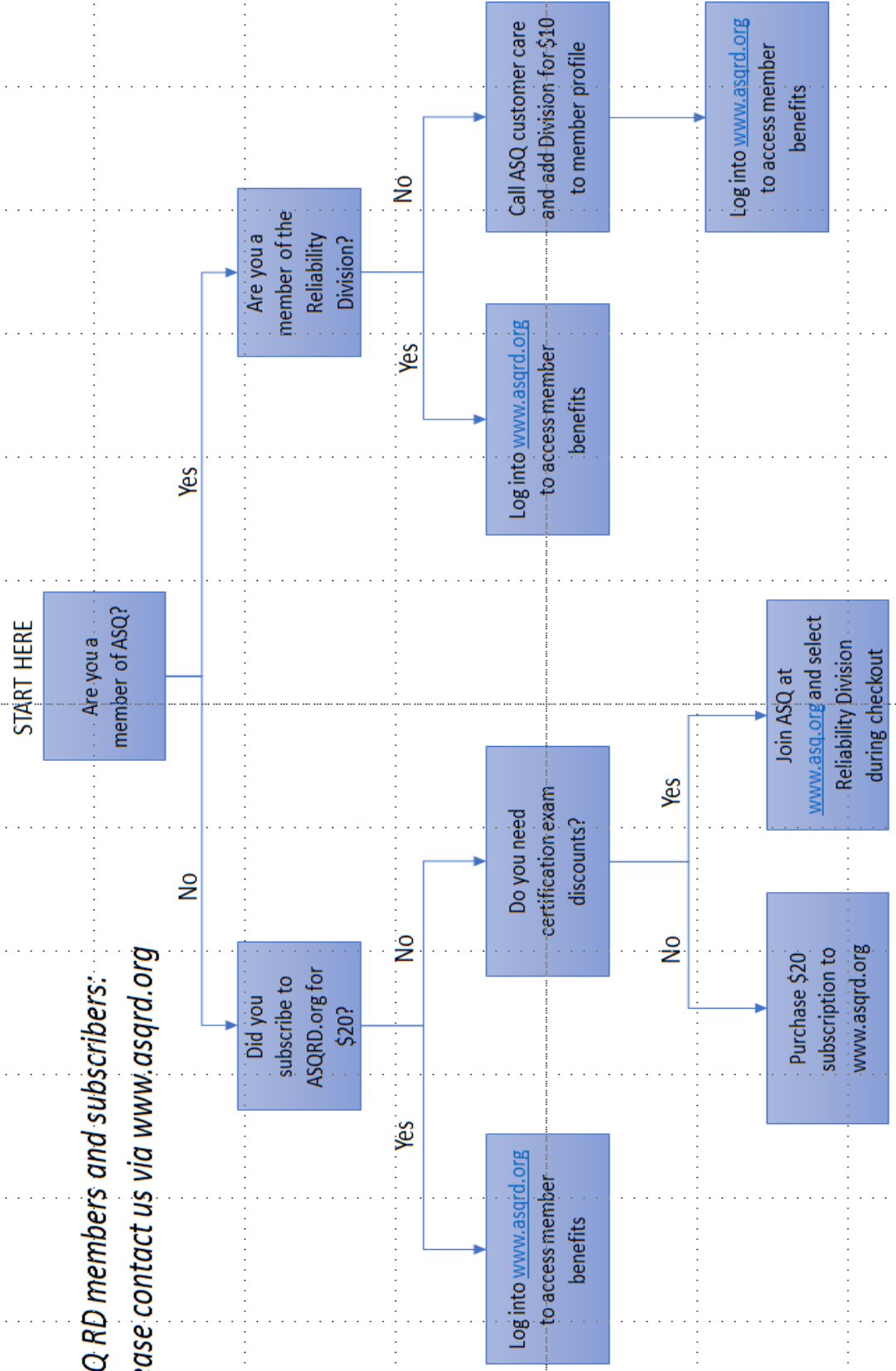
By: Mohammad Pourgol-Mohammad, Ph.D, P.E, CRE, mpourgol@gmail.com

Health data is mostly collected through sensors mounted on different locations in the system. Optimization of sensor network has a significant influence on the reliability of system health prognostics process. In the process of sensor network optimization, various placement scenarios are determined as constraints for sensors. The scenarios are comparatively analysed based on different objective criteria like: i) the uncertainty of sensor information, ii) system failure probability and iii) the economic risk of sensor failure. Augmented FMEA and FTA method is developed for predicting failure causes in a condition monitoring process. The potential location of sensors is then determined. Due to the potential places of sensors, different scenarios are derived for sensor placement. Sensor information uncertainty index is determined through estimating sensor detection probability and prior information about component state. Considering prior information about component state, system is simulated through Bays-Monte Carlo method. By estimation of sensor detection probability, updated failure causes distribution are calculated. The variance of the result is obtained in next stage as the information uncertainty index. For determining the sensor reliability index, sensors are considered as system components. In this case, functional model of each scenario is developed and the scenario with less top event probability is selected as the optimal one. Dynamic index of sensor reliability is determined considering “Priority AND” gate for evaluating the effect of time dependencies of both sensors and components failure on the optimal sensor placement. Because of that, PAND gate is added to the fault tree between all sensors and their corresponding components to develop the failure model of each sensor placement scenario. For calculating the probability of top event, a Monte Carlo-based algebraic approach is proposed. In algebraic approach, temporal operator “BEFORE” is proposed for calculating the probability of “PAND” gate. The result of using “BEFORE” operator is an analytical solution for probability of each cut sequence. Because of the complexity of analytical solution in practical problems, a Monte Carlo simulation is utilized on the solution. Then the probability of each cut sequence is calculated. Consequently the probability of top event for each scenario is obtained. Finally, all scenarios are ranked based on top event probabilities. Eventually, economic risk index is determined based on sensor malfunction probability and corresponding quantifiable potential losses through both failure costs and maintenance expenditure.

Optimal sensor placement of scenarios is categorized to three independent categories. First situation is occurred when sensors expected life are much more than mean lifetimes of other system components. In this case, the magnitudes of risk indexes are close to each other for different scenarios. Therefore, the risk of sensor failure is not a good criterion in such situation. Second situation is occurred when sensors and other components of the system are in the same order of magnitude of reliability or amount of uncertainty indexes are close to each other for all scenarios. The uncertainty index is not a proper criterion in such situations. However, sensor reliability index and economic risk index are suitable criteria for prioritizing scenarios in such situation. Third situation is occurred when the magnitude of indexes significant-

A Helpful Flowchart!!

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