

largest profit in its history after implementing the quality assurance program.

REFERENCES

- [1] K. G. Lockyer, J. S. Oakland, C. H. Duprey, "Quality control in the U.K. chemical manufacturing industry: A study. Part I," *Int. J. Prod. Res.*, vol 19, 1981 May-Jun, pp 317-325.
- [2] E. M. Saniga, L. E. Shirland, "Quality control in practice: A survey", *Quality Progress* 1977 May, pp 30-33.
- [3] M. Barad, "Quality assurance systems in Israeli industries. Part I: Electric and electronics industries", *Int. J. Prod. Res.*, vol 22, 1984 Nov-Dec, pp 1033-1042.
- [4] W. K. Chiu, C. B. Wetherill, "Quality control practices", *Int. J. Prod. Res.*, vol 13, 1975 Mar, pp 175-182.
- [5] C. Ashpole, "Quality control in automated food processing", *Quality Assurance*, vol 8, 1982 Sep, p 81.
- [6] R. W. Graham, *Secondary Batteries: Recent Advances*, Noyes Data Corp. Park Ridge, New Jersey, USA. 1978.
- [7] C. L. Mantell, *Batteries and Energy Systems*, McGraw-Hill, 1970.
- [8] G. Smith, *Storage Batteries* 3rd ed., Pitman Publishing, 1980.
- [9] D. H. Harris, F. B. Chaney, *Human Factors in Quality Assurance*, John Wiley & Sons, 1969.

AUTHORS

A. A. Elimam; Applied Systems Dept.; Kuwait Institute for Scientific Research; P.O. Box 24885; 13109 Safat; KUWAIT.

A. A. Elimam (M'84) is a research scientist and head of Applied Systems Department of Kuwait Institute for Scientific Research (KISR) where he is working on industrial diagnosis, quality improvement, productivity studies, simulation and optimization of industrial operations, and mathematical modelling of service systems. He has a Ph D in Operations Research and Industrial Engineering from North Carolina State University, a MS in Industrial Engineering from Kansas State University, and a BS in Mechanical Engineering from Alexandria University in Egypt. Prior to joining KISR, Dr. Elimam worked on management science applications in manufacturing, distribution and maintenance for Union Carbide Corporation. He is a member of IEEE, ASQC, TIMS, ORSA, IIE, and the Egyptian Society for Mechanical Engineers, and of the honorary societies Alpha Pi Mu, and Omega Ro, and an associate member of Sigma Xi.

M. M. Sartawi; Applied Systems Dept.; Kuwait Institute for Scientific Research; P.O.Box 24885; 13109 Safat; KUWAIT.

M. M. Sartawi (S'77, M'78) is a research scientist in the Applied Systems Department of Kuwait Institute for Scientific Research (KISR) where he is working on power systems planning, operations and control problems. He got his Ph D in Electrical Engineering from McGill University, Quebec in 1978, MS degree from Sheffield University, Sheffield in 1974 and a BS in Electrical Engineering from Mosul University, Mosul in 1972. Prior to joining KISR, he was involved in various power system research projects with abovementioned universities. He is a member of IEEE and its Power Engineering Society.

Manuscript TR85-060 received 1985 July 1; revised 1986 May 22.

★ ★ ★

BOOK REVIEW BOOK REVIEW BOOK REVIEW BOOK REVIEW BOOK REVIEW BOOK REVIEW BOOK REVIEW BOOK REVIEW

Failure Analysis: The British Engine Technical Reports

F. R. Hutchings and Paul M. Unterweiser
1981, 496 pages, ca \$70
American Society for Metals;
Metals Park, Ohio 44073 USA.
LCCC 81-68626; ISBN 0-87170-116-2

Table of Contents

<i>Chapter</i>	<i>Title</i>	<i>pages</i>
1.	Environment-Related Failures Corrosion fatigue, Intergranular corrosion, Caustic cracking, Other causes.	98
2.	Design/Processing-Related Failures Fatigue, Corrosion, Stress corrosion, Welding-related failures, Misuse of welding, Brazing & soldering, Lamellar tearing, Other causes.	149
3.	Materials-Related Failures Brittle failure, Strain-age embrittlement, Corrosion, Other causes.	58
4.	Service-Related Failures Fatigue, Brittle failure, Thermal damage, Intergranular penetration, Failure of roller bearings, Other causes.	178
	Index	11

This is a very good book, not only for metallurgists but for reliability engineers, managers, teachers, and theorists. It is a collection of actual case histories. Most of them comment on how designers and fabricators can benefit from the unfortunate experience of others.

Not only is this a good book in its own right, but it shows that there is more to reliability than is usually taught in short and long courses. There is not a smidgeon of statistics in this entire book, nor is it needed therein. The book should be required reading for every theorist who writes an article on reliability optimization.

In large part the authors make the point that the preventive measures for these failures were "well known" at the time of design, manufacture, or REPAIR. It might be the *most unkindest cut of all* for theorists, but repair does not always restore an item to like-new nor is it necessarily benign to the rest of the system.

The book also shows that the reliability discipline did not begin ca 1950 but was going strong ca 1900. The reports on which this book is based began in 1879.

— Ralph A. Evans, *PhD, PE*
Product Assurance Consultant