

## Keeping Wind in Your Sail: Keeping Up with Tools, Techniques, and Technology

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While going through my “old files” I re-discovered a story about sailmakers. As I am an occasional sailor, it caught my attention. The story is about one sailmaking company that went out of business, while another sailmaker prospered. This story seems to have some parallel applications and guiding principles for us as failure analysts and investigators. The story goes:

Once upon a time there were two sailmakers, one in Rhode Island, the other in California. They both opened for business in the 1800s, and both companies prospered, making canvas sails for ships of all sizes. Even after steamships replaced tall ships, they survived because they were the low cost, high quality producers. In fact, both remained profitable in a much

smaller market well into the 20th century. Then nylon was invented.

Suddenly, they were both confronted with competitors, upstarts who sold lighter, stronger sails for less. Both sailmakers looked at their own operations and calculated how much it would cost to retool to make nylon sails.

The California Company said, “Retooling would be much too expensive and anyway nylon will never replace all canvas sails. We are still the biggest sailmaker in the country, and we cannot possibly lose all of our customers.” However, within a few years of the introduction of nylon sails, that company was out of business.

The Rhode Island manufacturer said, “Retooling would be much too expensive, on the other hand, we can clearly see that all sails will soon be made of nylon. Therefore we will find other stuff to make.” Today that company prospers making awnings and canvas bags [1].

Reading this story caused me to think about how we failure analysts and investigators handle change. The story reminded me of the importance of failure investigators and analysts keeping up with advances in analytical tools, new investigative approaches, and new developments in materials and technologies. Investigators must keep up with the times and advances in technology and analytical tools because good investigators provide the best services when they keep current. This story caused me to consider the following four thoughts on how to view change:

- Change and technological advances will happen; you can either resist the change or agree to the change.
- As the tools and techniques change, an investigative tool kit may need to be changed and updated.

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- Businesses and careers that stay abreast of change or change their services to meet current trends tend to prosper much more than those that do not.
- Failure analysis technical references need to change and remain current with technological advances.

First, change and technological advances will happen; you can either resist change or decide to adopt the changes. Change is inevitable; growth is optional. I remember, for example, working in the aerospace industry in the 1980s when the Apple computer came out with its window-graphical interface friendly approach. I also remember tediously counting the fatigue striations on fractures and having to learn a new method of sample preparation and interpreting scanning electron microscope (SEM) and transmission electron microscope (TEM) micrographs. I must admit, I initially had some resistance to learning new software programs and methods that required meticulous sample preparation and discernment with interpretation of microscopic fracture features. Yet, I soon realized that if I was going to prosper in my career and continue to provide the best services, I needed to accept those changes and embrace them as challenges.

Second, investigators and analysts have many tools in their investigative tool kit; but as tools and techniques change, those tool kits may need to be changed and updated. There are, of course, the traditional and reliable tools such as microscopes, measuring devices, and polishing equipment. If we merely rely on what has worked for years and these tools alone, we may become outdated in our approach. The ASM Failure Analysis committee has made intentional efforts to keep technical information current at symposiums and conferences. During the 2014 MS&T failure analysis sessions new tools, techniques, and technologies were discussed. Some of those presentations included advances in computed tomography (CT) imaging, rapid prototype technology, 3D laser scanning, and new finite element modeling (FEM) techniques. These are just a few examples of tools which may need to be added to an investigative tool box.

Another example of staying current with technology, at my own company, we had an outdated SEM that at one time used Polaroid film, and we also had a Unix-based operating system for our energy dispersive spectroscopy (EDS) system. To keep up with the times, we purchased a new digital image capture software program and upgraded to a Microsoft Windows-based platform which includes a new EDS detector that processes images and data at a much faster rate. Obviously, there was an initial added cost (or should I say investment) for these upgrades. The upgrades were a necessary expenditure in order for us to provide better services to our customers and to stay competitive. In addition to the added cost, we needed to learn how the new

equipment and technology operates and had to allow time for that.

Third, businesses and careers that stay abreast of change and/or change their services to meet current trends tend to prosper much more than those who do not. In the story, neither company embraced the new nylon material; one company died a slow death, while the other kept using canvas, but started making another product. Just like the canvas sailmakers, you can either change your product or service to meet the desires and needs of customers. What we failure investigators provide is a service to understand how something failed with the intention of preventing it in the future. Such a service was in the demand yesterday, is in demand today, and will be in demand in the future. Our product is often a written or verbal report that explains exactly that. Although the investigator service is needed, I have noticed that investigations and failure analyses now often require several disciplines to understand what happened and how something failed. For example, it is often not enough to simply state that a pipe or vessel had a brittle fracture. Customers now want to know the *root cause* for that brittle fracture. How will the process affect the material? What about other equipment; is it susceptible to brittle fracture, is it fit for service? More complex investigations and detailed questions may require a change in the service we provide and may involve other engineering disciplines as well.

Fourth, failure analysis technical references and many other references need to be changed and updated to ensure they are current with technological advances. This is important because these references help investigators know what is current. This includes updates to references such as the ASM Handbooks and references such as the primer, "Understanding How Components Fail,"<sup>[2]</sup> which was recently updated by Failure Analysis committee members. *The Failure Analysis and Prevention Journal* publish articles that discuss reliable and new tools, techniques, and technologies that you can consider in your investigations and use to solve the mystery of failure. Those new tools and techniques may not only help you solve the mystery of failure, but they may also help your career and/or your company prosper.

The moral is to keep up with the advances in analytical tools, technical approaches, and technological advances; while maintaining the fundamental skills of the best investigator. Hopefully, you will keep the wind in your sail!

## References

1. M.W. Hunt, *A Tale of Two Sails. Advanced Materials and Processes Magazine*, August 1996, p. 2
2. D.J. Wulpi, *Understanding How Components Fail*, 3rd edn, ed. by B. Miller, ASM International 2013