Signalysis News

July, 2016

This month is a very special edition of Signalysis News. We at Signalysis are fortunate for the opportunity to tap the expertise and experience of one of the industry's most-respected engineering minds: my father and lifelong mentor, Bob Coleman. Below you will read a little about the long road he has traveled and lessons learned along the way. I would also like to invite you to get a copy of his book: "Experimental Structural Dynamics: An Introductionto Experimental Methods of Characterizing Vibrating Structures". For more information on that see the article below or visit our web site. We look forward to hearing more from him from time to time throughout the months ahead.

On a personal note, I want to thank all of you who have taken me up on our offer to support your local charities. It has been my pleasure to spend some time with you while aiding such worthy causes. There's still time if you have an upcoming charity golf outing that we can help support. Give me a call or send me an e-mail and I'll check my availability.

As always we want to thank you for allowing us to serve your testing needs. At Signalysis we strive to *deliver the ultimate solution experience to our customers with unsurpassedintegrity*. I hope that you will agree that we are fulfilling this promise.

Sincerely,

Neil Coleman
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Visit our Website

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4 Questions 4: Bob Coleman

Sr. Applications Engineer, Bob Coleman brings a wealth of experience to Signalysis. Let's learn a little more about him with four quick questions.

Hi Bob. Can you tell is a little about yourself?

I grew up as one of 11 children in Globe, Arizona where my father was a piano tuner and my mother taught piano. After attending Arizona StateUniversity, I joined theU.S. Navy. Standingnight watches aboard the USS Coral Sea aircraft carrier, many late night conversations with an electronics engineering Officerand an electronics radar technician motivated me to study algebraand electronics. This led to enrollment in electronics engineering at TheUniversity of Oklahoma; which came with marriage to a very pretty Oklahoma girl. I chose an electronics major becauseI thought the electron was one of the most fundamental particles in nature and wanted to learn all about it. My advisor was flabbergasted, "You haveno idea what you are doing here. We have no interest in what theelectron is – we're just here to teach what you can do with it! You need to go to the physics department." After graduating in 1960 with a B.S. inphysics, I worked on a M.S. in physics at the University of Texas, and three years toward a PhD in physics back at Oklahoma. MyPhD dissertation failed to get off the launching pad when calculations showed thatthe gravitation antenna I had envisioned would be too large to be placed inorbit around the earth using the LTV Scout space vehicle.

What is your work experience?

My experience has mostly beenwith aerospace – usually associated with mechanical vibrations. Myfirst job was that of a test engineer on the submarine launchedNavy Polaris solid rocket motor. The internal pressure fluctuations andresulting burning rate fluctuations coupled with the rocket chamber acousticresonances led to catastrophic blowups on our test stands. We had theearliest Technical Products analog system for processing Power Spectral Densityfrom water cooled internal pressure transducers. Data was processed on an earlydiscrete transistor computer, the RCA 501. That began myexperience with mechanical vibrations. I later worked at White SandsMissile Range and then aNuclear Rocket Test Site. There were other stops along the way, including LTV Missiles and Space Division where, forthe first time, I worked with large electrodynamic vibration test systems.

An interesting experience developedat LTV, where I found myself applying our missile vibration technology to thedesign of pianos. The head of research for a piano manufacturer broughtfive pianos to my lab in Texas to see how our vibration technology couldbe applied. Coincidentally, the Defense Department had just retained Arthur C.Clarke, the famous writer of the science fiction *2001: A Space Odyssey,* to produce a film that would present to thepublic an account of the beneficial domestic fallout from Defense R&Dprograms. This led to a visit from Arthur Clarke to include our piano researchas an example of Defense Department technology applied to a purely domesticproduct. He and I had interesting conversations about his movie. On another occasion I found myselfat lunch with Edward Teller, "The Father of the H-Bomb." At that time, he wasconsumed with his *Star Wars* projectand the need for an aggressive approach to the Cold War with Russia. Hedescribed with passion his concern over Russian intentions.

Can you tell us a little more about your work at NASA?

I was at NASA from roughly1973 to 1994, working primarily with vibration testing and analysis. Following theChallenger catastrophe, the shuttle program was shut down for an extendedperiod of time. Eventually, after implementing design changes and changes inprotocol, the program resumed with the launch of Columbia.A new high speed, high resolution movie camera recorded the ascent of theshuttle. We received a callfrom Kennedy Space Center, from the movie operator reviewing theflight film. He reported that while focusing in on the O-Ring joint the Body Flap was in view as well. When viewedin slow motion, the Body Flap was seen to vibrate at around eight cycles per second withtrailing edge deflections swinging through a 4-inch total displacement. Thiswas entirely unexpected and raised concerns about eventual fatigue andstructural failure during a future fight. Following this revelation, the Subsystem Manager and the Project Manager were fullycommitted to an endeavor known as the SMIS Project (Shuttle Modal InspectionSystem), a project that included performance of experimental vibration modalanalysis for each of the space shuttles. A test would be performedbefore some flight and then again after three subsequent flights, allowing abefore-and-after comparison to identify any structural changes, as indicated byshifts in resonance frequencies and mode shapes. Together with the applicationof Finite Element Models (FEM), the modal test models obtained before and afterflights allowed the detection and also location of damage. Our softwarepresented on-screen displays of Orbiter sub-structure systems with coloredspots showing location and severity of damage. Modal analysis, along with FEM, allowed the estimate of available fatigue life. The analysis of theColumbia Body Flap data provided an estimate of structural failure after 20flights. The Shuttle is certified for 100 flights. The four actuators attachingthe Body Flap to the Orbiter Aft Fuselage were replaced. It was a lifetime and career honorwhen one of the Astronauts presented me with what they called *The Silver Snoopy Award* for contributionto the SMIS project.

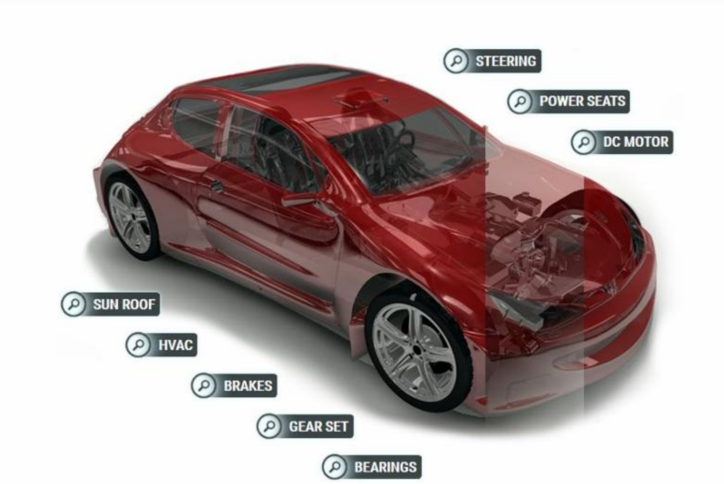
How is your expertise being leveraged by Signalysis?

In the early 1990s it became obvious that the NASA damage detection technology would have applicationon assembly lines of manufacturing plants. Whether automotive products,appliance industry products, or virtually any product, this technologycontinues to find new applications for detecting defects in any product thatcan be viewed as a mechanical system. A product coming down the assembly lineis typically nested in a fixture along with computer based measurement andanalysis systems. Some products, such as windshieldmotors or power seat motors, may operate during the test, producing structuralvibrations that can be analyzed for defects. Vibration may be induced in othernon-operating passive products using an electrodynamic shaker or an automatedimpact hammer. Data may be acquired from any of a number of measurement devices– force, acceleration, velocity, displacement, strain, temperature, or soundpressure. Data may be analyzed in many different forms, such as time series,frequency amplitude or power spectra, frequency response (ratio spectrum, suchas acceleration/force). The detection of a mechanical defectcould be so simple as measuring the shift in a vibrating resonance frequency.Or, it may require a more sophisticated detection involving identification of vibratingfrequency patterns expressed using eigenvector-eigenvalue analysis. The fullrange of advanced signal processing technology may be brought to bear on theproblem.Pass-fail decisions areautomatically performed in very short cycle times with automatic disposition, removing defective products from the assembly line.

Interested to learn more about Bob's work at NASA? Go here to read the white paper "Vibration Theory".

We provide manufacturers and suppliers around the world and acrossa variety of industries with quality inspection test systems! If you need it, we can deliver it!

Read more here.



Automotive Testing

From wiper motors,axles, power seats, door panels, sunroofs, window mechanisms, heating/cooling and many other internal components, we provide automotive sub-suppliers with a variety of production test systems.

Learn more here!

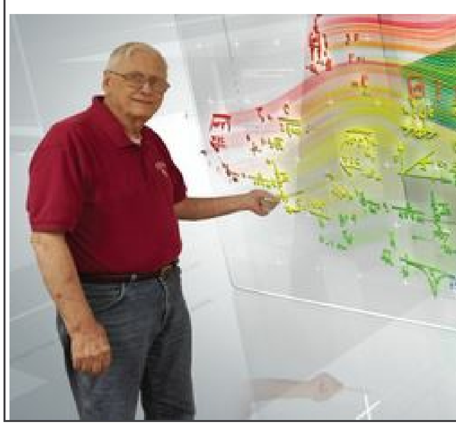
NVH in Desktop Engineering

Want to learn more about Noise, Vibration & Harshness (NVH) testing for the automotive industry?

Check out this article featuring Signalysis in the June issue of Desktop Engineering.

We've gotten great response to our charity golf offer and have been fortunate to support a number of worthy causes. And we're not finished yet... Signalysis President, Neil Coleman has a few open dates on his schedule for late summer and fall (and even later for warm weather sites). If you know of a charity who may be holding a golf outing in your area let us know. If we're available Signalysis will sponsor a team consisting of Neil "Pin Seeker" Coleman and three golfers of your choice.

Send Neil an e-mailto let him know about an upcoming golf charity event!



Learn from the Expert

Bob Coleman has authored a book *"Experimental Structural Dynamics: An Introductionto Experimental Methods of Characterizing Vibrating Structures".* Signalysis is making copies of the book available to you while they last.

Go here to get a copy.

Tips & Techniques

SigQC version 14.3.2.1 and greatersupports a "Post Process Template Design-Time Mode" feature designed to aid developmentof post process templates by allowing intermediate results to be viewed interactively.In addition to all of the existing post process calculation steps, data graph stepshave been added to allow display of data from the output of any calculationstep.

Interested? Read more here.

Visit our Website

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Delivering the Sound of Silence

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