# LETTERS & COMMENTS


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JUNE 2013

*Reader Culy raises a question of age discrimination.*

A reader looks back on 50 years of change. Another encourages readers not to take for granted that what they read is always right. A third questions models of climate change.

## EMBRACING PLENTY OF CHANGE

**To the Editor:** Have just finished leafing through the June issue of *ME* mag, and found it very stimulating. Including your editorial.

I received a little over a year ago my 50-Year Life Service Award from the ASME; so that tells you how much change I have seen. That service included being an ASME Section Chairman.

I embraced most of five decades of change, but some of it embraced me. I especially liked: Fortran programming; the HP45 calculator (I loved my slide rule, but instantly dropped it for my HP45); the IBM PC; MS Office; relaxed dress codes (as a test engineer on piston engines for my first job, I had to wear a white shirt and tie into greasy test cells); 3-D analysis/visualization/simulation/fabrication, etc., because it more easily lets us see and fit things into place.


I was an aircraft engine development engineer, still follow that field as best as I can from retirement, and can't help but note that unforeseen/inadequately analyzed problems still have major impact on product development in most fields, even with enhanced help from computers. I loved that career, and fortuitously found it when my planned career with the car companies in Detroit did not happen. I was a Western U.S. graduate, and the car companies did not interview in the West the last two years I was in school—but the aircraft companies did.

I sense along with reader Simmons that *ME* articles are not as in-depth as they used to be, and thus more like *Popular Science* or *Popular Mechanics* than the old *ME* mag. I trust that you felt guided in that direction by reader comments that long articles took too much attention.

The **Tech Buzz//Vault June 1983** article got my attention, as I published a paper on Monte Carlo simulation

## COMMENT

# PIPELINE EXPLOSIONS: A NEW THEORY

Perhaps the most publicized industrial accidents of recent times occurred at the nuclear reactors at Chernobyl, Three Mile Island, and Fukushima Daiichi, and at the Macondo well in the Gulf of Mexico. They and numerous other, less noted accidents share a common theme. They involve accidental explosions in industrial piping systems.

Numerous industrial explosions share several common factors: fluid transients were known to occur; trapped flammable gases were known to collect in the piping; fluid transients sometimes caused pressures exceeding 1,000 psi which meet the required pressures for autoignition of gases; and explosions in piping occurred with causes that are not yet well understood.

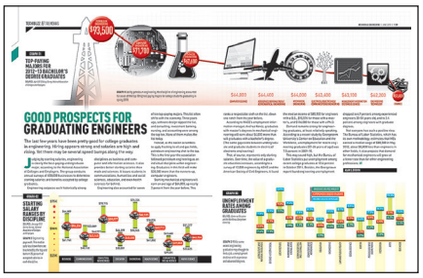
I developed a theory that may explain these events. The theory states that if piping contains a flammable gas and there is an inrush of fluid (or fluid transient) into the piping, the gas can adiabatically compress to its autoignition point (similar to a diesel engine), and then the gas, given sufficient quantity and pressure, can ignite and explode. Although further research is required, the safety and environmental implications of this theory are significant.

Accident summaries for Chernobyl, Three Mile Island, and Fukushima Daiichi cite the presence of fluid transients plus flammable hydrogen and oxygen in piping systems. Each of these accidents was caused by events other than explosions, but explosions were reported following accident onsets.

At Fukushima Daiichi, loss of reactor coolant followed flooding due to an earthquake-induced tsunami. According to this theory, hydrogen and oxygen were generated in the piping through the radioactive decomposition of coolant water. A subsequent inrush of sea water used to cool the reactors could have provided conditions required to cause explosions.

How might the accident at the Macondo Well be related to explosions in nuclear reactor piping? An explosion at an oil rig was accompanied by shearing of the piping near the sea floor. This new theory may provide a relationship between these seemingly

of the engine development process that year, as a way to anticipate the possible bad outcomes. Project engineering in my company did NOT like those possible bad outcomes being highlighted, since they were then and now still are dedicated optimists.




The **"Good Prospects for Graduating Engineers"** article gave me warm feelings, because in 1993, my long-time employer laid me off, along with a lot of other older guys, and I then found age discrimination in hiring to be rampant even against an engineer with advanced degrees. If *ME* mag has not investigated age discrimination in engineering employment, then it should.

Doug Culy, *Tempe, Ariz.*

## READERS PAYING ATTENTION

**To the Editor:** It was great to read the two letters in the May issue, one concerning conservation of energy and the second on energy conversion.

It has been a while since readers have challenged the technical content presented in *ME*. I am glad that there are still readers who pay attention to details and bring up points that do not make technical sense.

As a professor of mathematics to aspiring engineers and scientists, I always point out to my students that they should make a habit of looking at their answers to whatever application problems they are working to make sure they make sense, mathematically, technically, or practically.

Edward Esparza, P.E., *San Antonio, Texas*

## MODELING CLIMATE

**To the Editor:** The February article, "CFD and Safety Factors," made some excellent points regarding the necessity of verifying computer models with "old-fashioned experiments."

They show how significant errors will result from failing to verify and validate the computer models of complex systems. This is the sort of diligent and scientifically correct work that the Department of Energy needs to fulfill its missions.

How unfortunate that the many studies performed for the Department of Energy to show the effects of $CO_2$ on climate do not seem concerned that their inability to validate their models makes their modeling results virtually meaningless. And certainly the Earth's climate system is much more complex than the relatively simple pumping system discussed in the article.

Peter Staats, *Loveland, Ohio*

## FEEDBACK

Send us your letters and comments via hard copy or e-mail memag@asme.org (use subject line "Letters and Comments"). Please include full name, address and phone number. We reserve the right to edit for clarity, style, and length. We regret that unpublished letters cannot be acknowledged or returned.

disparate explosions.

Flammable gases are known contributors to fires and explosions in oil pipelines. "Swish, run, boom" is a common refrain reported by operators describing fires and explosions on offshore oil rigs. If upward-traveling gas collects between two separate slugs of liquid during the transfer of oil up through a pipeline, conditions may exist to ignite the gas.

One slug of liquid can lose momentum and slow down if a large gas pocket is present. The other slug of liquid may accelerate and compress the trapped gas. Depending on the volume of gas and flow rates of the two liquid slugs, autoignition conditions may exist.

"Swish" would be the sound that would be heard if gas in the pipeline explodes and accelerates one of the oil slugs in the pipeline up toward the drilling rig. One would have time to "run" before the "boom" occurs, which may damage undersea piping as well as the oil rig. That is, the conditions to initiate observed explosions and fires were potentially present during past explosions in pipelines.

*A pipeline explosion was one of the events in March 2011 at the Fukushima Daiichi reactor.*
*Photo: TEPCO*

Overall, I see too many similarities between these different explosions to be coincidence. This new theory is based on the fundamental physics of fluid and gas dynamics and is consistent with explosions.

This theory is further detailed in an ASME *Journal of Pressure Vessel Technology* publication, "A Hydrogen Ignition Mechanism for Explosions in Nuclear Facility Piping Systems," by R. A. Leishear (due to be published in October).

**ROBERT A. LEISHEAR** is a fellow engineer at Savannah River National Laboratory, and a member of the ASME B31.3 Process Piping Design Committee. His book, *Fluid Mechanics, Water Hammer, Dynamic Stresses, and Piping Design*, was published this year by ASME Press.