EDITORIAL

Well, but we can't do that because . . .

***Chris D. Powell**, Contributing Editor*

When a child does not receive the desired parental answer, most respond with *'but . . . .'* After proceeding toward adulthood, the *'but'* seems to be preceded with *'well.'* The next advancement is to extend the ubiquitous *'well, but'* by entering into explanation and justification with *'because.'* The phrase *"well, but we can't do that because . . ."* used to be a corporate rarity spewed forth by the unknowing who had not first engaged in proper thought process. Unfortunately, it seems to have advanced from rarity to now be the norm, not solely by the unthinking, but, well, by the norm, just because.

It is a sad day when a growing number of American businesses do not prudently address their problems, but instead feel compelled to offer rationalizations as to why they should not. Please realize that we cannot compete in a world market using a philosophy of denial and vacillation. Needless to say, this is driving me nuts! So, after an extended sabbatical sans editorial rant, here is some food for corporate thought.

Granted, my professional life has been problematic, so to speak. That is, I do not get called to visit happy machines. I only get to see the things that have gone wrong, do not work properly, shake too much, are too noisy, or have suffered the ultimate of mechanical ills – catastrophic failure. Usually the issue has climbed up the corporate ladder and is viewed at the highest level as now being a really big problem. Most probably because their customer is really, *really* upset.

My approach to problem resolution is to review the operational history so that a program can be designed that will lead to problem identification. One must then understand why the problem exists before recommending corrective action so that the problem at hand can be solved without creating a new one. It seems so logical. Bottom line to the client – here is your fix, and FYI, this was the problem. Lately, however, there seems to be a general lack of interest in problem definition and a growing number of *"well, but we can't do that"* responses to the fix. Not that the proposed fix is not viable, but that the fix is politically unappealing to the 'alpha' person for some generally undisclosed, illogical reason. Now I'm not saying that all companies are dealing with their problems this way but only pointing to an unacceptable, disturbing trend in that direction.

Vibration problems generally fall into one of two categories:

1. The forcing function is too large for the structure's strength.
2. The forcing frequency aligns with a structural natural frequency.

The solution for Case 1 is to either reduce the forcing amplitude or strengthen the structure. For Case 2, either change the forcing frequency or shift the natural frequency. (Don't tell anyone about this, because they all will start doing it this way!)

Now, to the thrust of my discontent. One of the most memorable occurrences of running full speed into the illogical, *"well, but"* stonewall involved a large centrifuge, a "brand new" design. Actually, it should be more properly termed a "scaled-up" version of an existing design, which is a dangerous approach. The machine is driven by a constant-speed motor acting through a fluid coupling. Unfortunately, the rotor never got up to full speed before the driveline ripped itself from the machine. The company deemed the driveline in need of more strength via cast steel bearing blocks rather than cast iron. New bearing blocks, next startup, same result, rendered into individual pieces parts, and a fluid coupling the size of half an office desk is trying to chase everyone around the factory floor.

The problem: critical speed of the overhung coupling matched the motor's speed. Matched, not close to, but matched exactly. Bullseye! Only the finest of analytical tools can be used to design this stuff to perfectly align. The solution: assemble the same components in a different sequence. Simple solution, clean, no cost impact. Then it happened, *"well, but we can't do that."* To which one must ask: why? The response was *"because it will look different."* Well, yes it will, and it also will not come apart! The illogical reason was that marketing had told the customer that the machine will "look like this," and according to some well-placed nitwit, this dictates that the appearance shall not change. Give me a break. *Because it will look different!* Now, I may be presumptuous, but what are the chances that marketing also intimated that the machine would not self-destruct during start-up. Second lesson: never, absolutely never, let marketing get control of the company tour bus!

Let me mention a dynamic strain gage test designed to show compliance with regulatory stress limits. It's simply a go/no-go test based on time history peak-to-peak amplitude. Unfortunately, the equipment tested had a stress amplitude above the allowable limit. This example clearly falls into Case 1. The forcing amplitude cannot be changed, or at least not practically, limiting corrective action to increasing the structure's strength. The needed strength can be simply gained by extending a fillet weld. Then it happened, *"well, but we can't do that."* Of course you can; just stop the weld here instead of here! Do you know that will add 50 cents to the manufacturing cost? Yes it will, and if you spend $150.50 instead of $150.00, it will pass the stress test. *"Well, but . . ."* Well, but it looks to me like we have some *Peter Principle* issues of the cheapest kind here.

A large rotating machine failed catastrophically. The cost to clean up the mess was $1 million. Shortly thereafter, the machine did it again, but the repair this time was a more economical $800,000. Those of political persuasion no doubt would claim that this is an overall savings of $200,000, but that is a different editorial. Cause of both accidents – fatigue failure of a $50 threaded insert. The insert carries jackscrew load used to center the rotor. Root cause: someone had the great idea to change the insert from being an interference fit to being a slip fit. Why? Because it is easier to refurbish the rotor if the insert can be "slipped out" rather than "driven out." Well, yes it is, but did anyone think about the change in load path? Obviously not. The person probably got a cash award from the suggestion box for this money/time savings brain cramp.

Think about it . . . the prior load path was an interference fit that forced load transfer by friction from the insert to its mate. The new path purposely eliminates the friction, causing the entire load to go directly into the insert's flange, which just happens to have a sharp notch that is the site of fatigue failure. Solution; go back to the original design. *"Well, but we can't do that, because it is too hard to drive out the insert."* Ok, then you will have to redesign the flange and do an ultrasonic inspection every X number of cycles. *"Well, but we can't do that either, because we would have to shut the machine down and it would be too expensive."* Ok, then put up yellow tape, keep everyone out, call it a cleanup area, and order $1 million in spare parts for the next failure. Did I mention this stuff is driving me crazy?

I got a call that a machine was *"really vibrating."* I went to see the thing and much to my surprise, the description was a considerable understatement. I have never seen anything shake like this and still be running. This thing looked like a big shake table doing a seismic qualification test. There was a handrail banging against a building column. After the machine was shut down, I went back to the handrail and found the gap to the column was a full two fingers wide. When was the last time you saw peak-to-peak vibration measuring four fingers? When was the last time you wanted to stand on such a gyrating body? When was the last time you met anyone who would think this was ok? The machine

has a high degree of inherent unbalance by the very nature of its operation, and the manufacturer recommends mounting the machine to a seismic block, which is then mounted to the shop floor. In this case, a seismic block was not used. In fact, neither was a floor, but why should that matter. Not one, but two of these variable speed beasts are mounted atop a "tinker toy" mezzanine. Why did they do that? Because they did not want to loose floor space. In that regard they succeeded. There are certain times when you would just like to grab someone by the collar, shake them around a bit, and ask if anybody's home? "Hello! Hello! Anybody in there? Look at it! Why would you think this would work? Really, how could anyone possibly think this would work?"

Let me conclude with what is in essence a very large, slowly rotating, chain driven barrel. Every so often, and recurring at regular intervals, the whole thing absolutely shudders. It jumps, it bangs, and the bearings are destroyed in short order. This is another case where vibration can be measured with a tape measure. One must ask if this machine has always been like this? No, only since the supplier stopped carrying the matching sprocket. What? Well, we used to get the chain and sprocket from the same supplier, but he no longer carries the matching sprocket. Are you saying the sprocket and chain do not have the same pitch? Yes. You realize this will not work? Yes. Well then, go buy the correct sprocket. "Well, but we can't do that." Well then, go buy the correct chain. *"Well, but we can't do that."* Why? Because the supplier does not carry a chain that matches the new sprocket. You have to realize how stupid this sounds! Ok. Then, find another supplier. *"Well, but we can't do that."* Why? Because we can't. Ok, enough circular discussion.

Here is the drill. Accept this as my expert opinion for which I shall send you a large bill. The machine is destroying itself because the chain and sprocket are mismatched. So, here are your choices, and pay attention because this is a multiple-choice test. You can: a) Buy a sprocket here and a chain there; or b) a chain here and a sprocket there; or c) you can buy a chain wherever and make a sprocket; or d) you can buy a sprocket wherever and make a chain; or e) none of the above, but the latter is not a valid choice. Pick one. *"Well, but we can't do that."* Ok. So you choose e)? Hello! Hello! One can only guess how long this guy has been traveling along the Mobius strip looking for resolution. And you wonder why some companies are in trouble? Go figure.

There is a growing trend in corporate philosophy. It bothers me greatly. The problem is not limited to industry, corporate size, product type, cost, geographic location, or climatic influence. It may have something to do with moon phases, but I have not yet received the expected federal grant to prove it. When you flip the switch and the light does not come on, you can continue flipping the switch, or you can screw in a new bulb. If the latter is too simple and you need absolute proof of system performance with a path forward, you can undertake a painfully thorough engineered approach and check every single component between the source of generation and the light bulb, including all pertinent ISO paperwork.

Now, no matter if you chose a simple or painful path, when the goal is to have light, and it is determined that you simply need a new light bulb, the options are limited. The corporate body has to recognize that *"well, but we can't do that"* is neither a solution nor will it lead to one. It is avoidance of the obvious and is nonproductive. Quite frankly, it is incompetence. You may discuss options such as wattage, color, efficiency, etc., but the bottom line is you need a new bulb if you want light. Corporate America has passed a critical point. The choices are to turn back and see the light or proceed further into darkness. I do not understand how the greatest and most productive country in the world got to this point, but here we are. The whole thing is absurd and it bothers me. S/V

Send your comments on this editorial to the author at: cpowell@structuraltechnology.com.