

Gear Research Institute: A Big Part of Small World of U.S. Gear Research

Jack McGuinn, Senior Editor

The essence of designing gears is often by necessity risk-averse, given that many of them are used in applications where loss of life is a distinct possibility.

The Gear Research Institute (GRI) at The Pennsylvania State University conducts “risk reduction testing” with the same goal in mind—whether it be gears in fighter jets, Ferris wheels, tanks, or countless other gear-reliant vehicles and machinery.

The institute, founded in 1982, exists to “provide and supplement gear and related technological needs by conducting research and development, consulting, analysis and testing.” GRI has long prided itself on being “a leading proponent of cooperative pre-competitive research,” but is also quite active in working with individual companies in their R&D projects. *(Ed’s Note: An interesting historical fact regarding the GRI is that it was in fact founded in Illinois, in a Chicago suburb, by a group of gear engineers from International Harvester and a*

few other companies. GRI maintains its registration there to this day.)

GRI also shares DNA with several other Penn State centers of research. Suren Rao, senior scientist and longtime managing director at GRI, explains.

“ARL was started in 1945 and is an inter-disciplinary research institute of Penn State, sponsored by the Navy. The Drivetrain Technology Center (DTC) was started in 1992 as a division of ARL with support from the Navy ManTech program. GRI, started in 1982, became a long-term sponsor of the DTC in 1996 because of the synergy between the activities of DTC and GRI.”

GRI also boasts close ties with the American Gear Manufacturing Association (AGMA) and the American Society of Mechanical Engineers (ASME). How close? Six of the 10 members comprising GRI’s board of trustees are nominated by ASME and AGMA.

As for trying to single out a particular area of expertise relative to GRI, you might say consider them something akin to generalists in the gear world.

Or as Rao puts it: “The common theme is to improve the performance of geared systems. Performance can be many things like durability/life/power density/noise, etc.”

For non-profit entities such as GRI, it’s all about developing—and maintaining—close corporate relationships. Without them, the institute could not exist. And that existence is based in part on the required \$600 annual membership fee. Some of those dollars are used to support post- and undergraduate programs for Penn State students with engineering careers in mind.

“Undergraduates will work on any research activity that needs support. A graduate program will focus on a more formal defined topic that would constitute their thesis,” says Rao.

Great idea! Right?



Some of the machinery used in GRI’s research and testing efforts (photos courtesy GRI).

Unfortunately—if not surprisingly—the level of participation thus far has been rather dismal.

“To date, we have had only one company, John Deere, sponsor and recruit an undergraduate through GRI’s program,” Rao says. “We have had a few other enquires, but no other ‘bites’ so far.”

Not to point fingers, but this is the reality despite the continual hand-wringing and lamentations we read and hear about on the part of corporations/manufacturers bemoaning the dearth of talented young people pursuing engineering and manufacturing careers. Why this disconnect? Could it be that published reports and opinion pieces claiming that, despite American Business’s dire need for these new workers, they expect government to foot the entire bill? Just asking.

Returning to the subject of cooperative pre-competitive research, we asked Rao for his own, non-Harvard Business School definition.

“The term ‘cooperative’ is derived from the fact that the cost of the research effort is shared among several companies. Since the research results are shared between several competitors, without any restraint, the effort is generally classified as pre-competitive.”

But eventually, real-world reality reigns and “cooperation” reverts to “competitive.”

“The individual sponsors generally stop the research effort once they realize that any further sharing would erode their competitive position,” Rao says.

And speaking of individual sponsor research, the funding behind it is oftentimes anything but “individual.”

“Sometimes the single-client effort is funded by the sponsor’s internal R&D funds,” Rao explains. “In many instances GRI supports a larger corporate program that is funded by the Federal Government (e.g., DoD, DoC, DoE), in which case GRI’s funding is termed a

‘federal flow-thru’ through the corporate sponsor.”

One might think another type of funding—from the Dept. of Defense, for example—might be drying up, given the “sequester.”

Surprisingly, however, “At the moment (early 2013), we have not seen the funding stream affected,” says Rao. “It is tight; but it has always been tight.”

Which leads us back again to GRI’s cooperative pre-competitive research business model. Things look pretty good in the aerospace sector for the institute, but in other areas—less so.

Rao explains that “At its heyday (1980s), GRI had three or four research groups conducting research in the category of ‘cooperative, pre-competitive research.’ Only two survived the relocation of GRI’s activities to central Pennsylvania. I would consider this reduction as a result of geographical obstacles. In the early 2000s the Vehicle Research Bloc (GM, Ford, New Venture



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Gear, etc.) went into a steep financial decline and decided not to continue to support GRI.”

That response prompted asking Rao to compare what GRI does with the work done at the Gear and Power Transmission Research Laboratory (GearLab). Coincidentally—and it is in fact only coincidence—both institutions began around the same time.

“Until about five years ago, GearLab at OSU focused its efforts on gear noise, and GRI focused (its) efforts on gear materials and fatigue evaluation,” he points out. “Apparently OSU’s GearLab

(For their \$600 gift) “the corporate sponsor (of Penn State graduates and undergraduates) gets the satisfaction that they are helping educating the next generation of gear engineers.”

Suren Rao

has expanded into fatigue testing in the recent past.”

In our March-April *Gear Technology* we asked GearLab director Ahmet Kahraman why there are so few institutions like his the U.S. And so we asked Rao the same question. In some ways his answer creates more questions than answers.

“To be honest, locating sufficient funding to keep GRI alive, *in spite of the minimal competition*, is a herculean task. Maybe I am a lousy salesman; but marketing research for a technology that most consider ancient, is difficult enough with just two or three players (i.e., GRI, OSU Gear Lab, NASA-Gear Research Center). If there were more, some of us would have to close.”


Rao’s candid response compels us to ask of him the same question we pose to virtually anyone with an enduring stake in the gear industry and—more importantly—the country’s future: Given the dwindling number of aspiring engineers and skilled workers, do you fear for the future of high-tech manufacturing in the U.S.?

“That is a real concern,” Rao allows. “However, I am an optimist. As a nation of immigrants, we will attract the best the world has to offer if we

can give them a better life than they have in their native land.”

Good answer. But then there’s this: during lunch recently with a young management person working for a major company in the power transmission component industry, he said that while he was in school (a well-known private university in Chicago), professors went out of their way to dissuade their students from pursuing a career in engineering/manufacturing.

Rao’s reaction:

“I am very saddened by this. No wonder everything we utilize in our daily lives comes from China or Taiwan. I am also of the opinion that manufacturing is a very significant component of the ‘wealth creation’ activity of any nation. We are all poorer as a result.” 

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