

Fastener and Joining Institute a One-of-a-Kind; Aids Auto Industry, NASA

by Jim Stickford

To much of the public, the subject of fastening and joining no doubt sounds like a silly thing to study, but it's incredibly important to improving manufacturing techniques – and Oakland University (OU) is on the cutting edge of research in this field.

Dr. Sayed Nassar is director of the university's Fastening and Joining Research Institute (FAJRI), which got its start back in 2003. He said it was his idea, which was triggered by the fact that in the late 1980s and early 1990s, Congress was concerned about the quality of bolts in the U.S.

Apparently, Nassar said, the market was being flooded by cheap – both in quality and price – bolts from overseas manufacturers. The cheap bolts were affecting the quality of American defense vehicles. So Congress passed the Fastener Quality Act.

"I thought to myself that if Congress spent that much money on bolts to make sure they were up to quality standards, they should understand that it takes more than bolts to make a reliable joint," Nassar said.

He had a friend who said that Nassar had a point and should approach Congress for money to study the issue of better fasteners and improve quality.

"I didn't know you could do that," Nassar said. "But I was able

to work with the Michigan delegation in Congress.

"It was Senator Levin who sponsored us in terms of funding. He was chairman of the Senate Armed (Services) Committee at the time, and later became chairman again when Democrats took back the Senate.

"Anyway, he sponsored our application for funding and it was approved and is processed through TARDEC (the U.S. Army Tank Automotive Research, Development and Engineering Center). We established a research contract and set up FAJRI at Oakland."

Prior to coming to OU, Nassar was at Lawrence Tech University for 17 years. Originally from Egypt, he got his masters degree and PhD from the University of Cincinnati. He said FAJRI does fundamental and applied research into all four major areas of fastening and joining – bolting, adhesive bonding, welding and advanced riveting.

Something like improving adhesives can be very important to the defense industry, Nassar said. For example, by being able to adhere panes of glass together, it's possible to build better transparent armor.

"The applications of improving fastening and joining have tremendous military and civilian applications," Nassar said. "Right now, we have three professors besides myself teaching and 10

masters and PhD students studying here. They come from all over the world – Japan, China, India. Three of the students are from the United States."

While there are people who study fastening and joining in the private sector, FAJRI is the only academic institution that exists solely for this purpose, Nassar said. He believes it's important to slowly expand their areas of research.

They are currently getting into biomechanics, Nassar said. While that might seem like a strange thing for FAJRI to do, it makes sense once you think about it.

"We are working with a neurosurgeon, Dr. Jawad Shah, from Flint," Nassar said, "on improving spine screws."

Over time, screws can stop working the way they should, Nassar said. When that happens, the patient will have to be operated on again, which is not really something doctors or patients like.

By developing better screws and surgical techniques, the medical profession can improve treatment and save patients discomfort and additional surgeries.

Part of developing new techniques means doing things FAJRI normally doesn't do, Nassar said. Shah recently returned from China where he tested surgical screws on cadavers.

"It was easier to do this work in China than fill out all the paperwork here," Nassar said.



Dr. Sayed Nassar shows Sen. Carl Levin fastening technology.

FAJRI is currently working on a model to analyze the loosening of pre-loaded fasteners that are subjected to vibration, Nassar said. Over time, fasteners can be subjected to vibration-induced loosening. By analyzing how that happens, better ways can be devised to cut down on loosening, which can be a dangerous thing.

"We're operating in a niche

arena," Nassar said. "We are unique in the sense that we are dedicated to graduate-level research. We are not-for-profit and operate in an academic setting.

"We even helped NASA develop a new standard for threaded fasteners in the U.S. space program. These standards are now used in space flight hardware. That's exciting."

Cadillac Turbo Listed in Wards '10 Best'

The 2.0-liter turbo I-4 engine that powers the all-new Cadillac ATS has been named one of WardsAuto.com 2013 "10 Best Engines" for North America.

The 2.0-liter turbo's 272 hp is the highest specific output of any GM production engine, and at 136 hp per liter, is the most power-dense engine certified by the Society of Automotive Engineers.

"The 2.0-liter turbo 4-cylinder is a stout performer that impressed all the WardsAuto editors," said Tom Murphy, executive editor of WardsAuto.com. "It muscled its way back into the winners' circle with remarkable horsepower per liter, and the engineers deserve kudos for reducing engine friction some 16 percent, which means it runs smoother and more efficiently."

Murphy added, "This engine gets four mpg better on the highway than the earlier version did a year ago in the Buick Regal GS, a former Ward's 10 Best Engines honoree. That's impressive. If the ATS can nibble into the market share of well-established German

brands, the 2.0-liter turbo should get most of the credit."

The ATS's lightweight and aerodynamic design allows it to accelerate from 0-60 in 5.9 seconds when equipped with the 2.0-liter turbo engine, while delivering EPA-rated fuel economy of 21 city and 31 hwy mpg.

Ward's reviewed 40 engines from 16 automakers in this year's competition. Winners were chosen based on several factors, including power, fuel efficiency, new technology, refinement, and comparative data for similar engines.

The 2.0-liter turbo engine includes the latest in technology combinations.

"Benchmark efficiency and refinement were our top priorities when developing the all-new 2.0-liter turbo," said Mike Anderson, global chief engineer for Ecotec engines. "The team was focused on using technology to reduce friction and engine noise and also managed to take specific output to a new level."

Among the engine's highlights: a direct-injection twin-cam, four-

valve-per-cylinder engine with continuously variable valve timing; twin-scroll turbocharger with air-to-air intercooler; forged-steel crankshaft with modular balance shaft system; and a two-stage variable-displacement oil pump with jet-spray piston cooling.

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