Technology works to lower noise of car gears

By Sharon Crow
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Improved aerodynamic design has made today's cars quieter, but noisy gears continue to be a problem. OSU's gear research laboratory researches ways to quiet them.

Gears produce high-frequency sound waves and the United States needs to do research to decrease noise, said Donald R. Houser, professor of mechanical engineering and director of OSU's Gear Dynamics and Gear Noise Research Laboratory.

The United States is far behind other countries in gear research and needs to realize its competition is with countries across the oceans, not the company down the street, Houser said.

He said no one wants to hear the sound of their car's gears over the sound of the stereo or the car running.

"The gear industry is a hard-core industry, not high-tech," Houser said.

He said for many years the United States stopped researching gears. Now American companies are quickly realizing they cannot do everything on their own and need to work together.

For example, in West Germany there are 25 universities researching gears, said Dale Breen, director of the American Society of Mechanical Engineers' Gear Research Institute in Chicago. He said national gear research consortiums are common in Japan and Germany, where all researchers gather to share developments.

Ohio State is the only U.S. university that has continuing gear research, he said.

Ohio State's gear research lab is funded by 21 industry sponsors, which pay $7,000 a year to receive details of experiments, Houser said.

"It's fun working with industry because they're using the developments we've researched," Houser said.

Houser said the OSU lab does not work as a consultant for sponsors, but they may use the developments from OSU's research.

Research at the lab focuses on two areas — the noise and dynamics of gears, he said.

As gears turn and mesh their teeth together, noise occurs when the teeth do not mesh together perfectly, such as one tooth overlapping another at an odd angle. This is called deflection.

Houser said no gear is perfect and some deflection is expected.

Researchers are experimenting with the number and the size of the teeth to decrease noise when they make contact, Houser said.

The whining sound an automobile makes when in reverse is an example of gear noise, Houser said. Researchers concentrate on quieting the forward gears because reverse gears are rarely used, he said.

Distribution load is a term used for how well the gear teeth fit together and the amount of deflection that occurs as they mesh, Houser said.

Through the use of computer programs, the distribution load over the gears can be predicted, Houser said. He said knowing the distribution load helps researchers to change the size of a transmission based on the amount of power needed.

The transmission size must be changed each time an engine is redesigned. Research is then needed to decrease gear noise in the new transmission, he said.

Research in dynamics deals with the amplification of noise as the gear speed increases, Houser said. He said researchers can predict noise and such knowledge helps the gear designers when making new gears.

Breen said his organization researches gears and supports research done by Ohio State. But his organization emphasizes research that can be used in industry, whereas Ohio State focuses on educating students.

Houser said the lab benefits students by giving them an opportunity to work with industry in solving problems.

"Students get a better look at engineering," he said.