

Cool Gears

Gear Technology's bimonthly aberration — gear trivia, humor, weirdness and oddments for the edification and amusement of our readers. Contributions are welcome.



It's nice to have a claim to fame. "We're probably the world's foremost authorities on making gears out of ice," says Jeff Root of Virtual Engineering, Plymouth, MI.

Root's firm built what is believed to be the first working clock ever to be made out of ice for the 17th Annual Plymouth International Ice Festival, held January 14–18, in Plymouth, Michigan.

"We wanted to get into the *Guinness Book of World Records*," Root says, "and none of us thought we could sit on a flagpole for two years, so this is what we came up with."

The 6 x 12-foot clock included 11 working gears, all made from ice, the largest of which was four feet across and weighed 77 pounds. The ice gears were designed using Pro/E gear models that the company keeps available for free download at their Web site (www.veng.com).

The models were converted into G-Code and transferred to a homemade CNC router. The router was used to make plywood templates of each gear. The ice clock gears were manufactured from the templates on-site using a custom-made, three-axis router arm that was made out of garage door hinges and plywood.

The Virtual Engineering team wanted a nice line of gears that accomplished a

3600:1 ratio. "We had to use a lot of extremely nonstandard DPs to get everything to line up right," Root says. "Careful examination of the picture will reveal that we also used some dramatically different tooth profiles to get the job done."

Unfortunately, warm weather prevented the team from running their clock for very long. The temperature had risen to about 43°F the day they were supposed to run the clock, so they disassembled it and put all the pieces under snow-covered tarps. The next morning, at about 4 a.m., they ran the clock for about 15–20 seconds just to prove that it worked, Root says. However, though they had designed the clock to work via ice weights without external power, the team planned to use an electric motor to power the clock for continuous operation.

Even though the clock only ran for a few seconds, the Virtual Engineering team considers their effort a success. The company used the project mainly to demonstrate their capabilities and to recruit potential new engineers, Root says. Plans are already underway to build an even better ice clock for the next festival.

"We're the first to admit that there's absolutely no possibility for commercial applications made out of ice," Root says. ☉



Top: The ice clock used a straight line of gears to achieve a 3600:1 ratio.
Middle and Bottom: The homemade CNC router used to make gear templates.

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