Wet socks? Get a SPUR

By Clay Francis
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Those familiar with the Oklahoma State University campus know what spring can bring: lots of rain and debris that can make streets on campus ankle-deep with water that can carry pollutants into streams and rivers. That could all change thanks to three biosystems and agricultural engineering students.

The Solution for Pollution from Urban Runoff, or SPUR, was designed and assembled by Jeff Adams, Jay Jantzen and Diana Loudenslager in a departmental capstone class. The students are specializing in environment and natural resources and named themselves Engineers Using Reliable Erosion Control Alternatives, or EURECA.

Unlike most capstone courses, the biosystems and agricultural engineering course spans two semesters. In the first semester, students were given several possible projects.

EURECA chose urban run-off as its project. Urban run-off pollution consists of soil sediment, floating organic matter, floating man-made debris, chemicals and other residues carried by water.

"We spent most of the first semester brainstorming the possibilities," Adams said.

After the students chose urban run-off as their project, they met with their adopted client Gary Shockley, storm water quality manager for Oklahoma City. Shockley brought the team up to speed on the issue of urban run-off and what was being done to resolve the problem.

"After Shockley informed us of the issues at hand, we believed we could design an apparatus that would have the potential to be a positive attribute to society," Adams said.

The team knew the purpose of a storm water system is to remove run-off from the interior of a city as efficiently and effectively as possible, Adams said. They also knew Stillwater's system consisted of area inlets, curb inlets, underground conduit and open channels.

However, the team realized the problem was too big to handle in the time they had to design an apparatus and complete their engineering curriculum. They decided to concentrate on designing an apparatus for curb inlets.

After choosing this issue, the team set its objectives.

"Our objectives included removal of soil sediment, floating debris and a limited amount of floating residue before they reached the sewer system," Adams said.

Once the problems were addressed and the objectives were set, the real work began. The students realized the device would have to be simple so it could be implemented.

Maintainability was another issue to be considered. Along with these issues, the design had to be compatible with those systems already in place.

"We wanted to design an apparatus that could be installed quickly and that was economically and aesthetically appealing," Jantzen said. "The final and foremost issue was a successful design."

When they met with Shockley, they discussed devices and practices currently in use. A patent search was necessary to avoid designing anything that had already been done.

Team EURECA discovered temporary devices used for construction sites had been somewhat successful, but the devices were not feasible for urban settings.

With the standards set and the previous designs identified, they worked to achieve the best design possible.

The team faced two barriers in creating their design: the size of grate openings in curb inlets and the depth variations in sewer systems.

After reviewing the previous designs and barriers, the team set out to design SPUR. They came up with a series of prototypes. The parameters led to a rectangular device, which serves multiple purposes, including removing pollutants, lengthening the flow path, reducing re-suspension of material already trapped and allowing an overflow path for high-flow conditions.

After the team tested the SPUR design and made adjustments, they constructed a two-piece structure with a bottom portion that could vary in depth to control pollutants from entering the water system.

In May 2000, the team entered the design in the annual American Society of Agricultural Engineers design competition held in Milwaukee. The SPUR placed second at the competition sponsored by AGCO Corp.

"The experience with teamwork I gained from the competition and the class was invaluable," Adams said.

The SPUR design patent has been filed with OSU's Office of Intellectual Property and Technology Transfer.

The team said the project could never have been attained without support from the biosystems and agricultural engineering department, especially from capstone course instructor, Ronald Elliott. The team also received assistance from Kerry Robinson, research hydraulics engineer for the U.S. Department of Agriculture hydraulics lab in Stillwater.

"The SPUR is truly an outstanding invention with an exciting future ahead of it," Elliott said.

So on the next rainy day in your community, when the streets are draining freely during a heavy downpour, you can thank three OSU students for keeping your socks dry and your streams clean. CJ