Because its three million Btu per hour woodchip-fired biomass heating plant was the first demonstration project installed through the federal Fuels For Schools and Beyond Program in Big Sky country, the system that heats the Darby, Montana schools has become a model for others—and a learning experience.

The Darby school district’s biomass boiler was commissioned in late 2003. Since then, its biggest lesson learned hasn’t been about the boiler, but about the fuel.

“The most important thing to pass on to people who are putting [biomass systems] in is, ‘Pay attention to fuel quality,’” advises Tom Coston, Fuels For Schools coordinator at the nonprofit Bitter Root Resource Conservation and Development program, a Darby project partner in Hamilton, Montana.

“There are 14 systems operating now in the five-state [Montana, North Dakota, Idaho, Nevada, and Utah] Fuels For Schools area. Ninety-five percent of the operational problems they’ve had have been because of poor-quality fuels.

“The systems are designed to work perfectly with certain fuel specifications—and as long as you do that, they will,” he explains. “But if you buy dirty fuel or oversized fuel, that becomes a headache.”

‘A Win-Win Situation’

The US Forest Service (USFS) created Fuels For Schools after a very severe forest wildfire season hit the Bitterroot Valley of Montana in 2000. When logging is carried out to reduce wildfire hazard by thinning the forest, biomass system users can purchase and burn the otherwise noncommercial wood that those operations harvest. This new market boosts the region’s struggling wood-products industry, and it can sharply reduce fuel costs for schools.

For all these reasons, “using hazardous fuels for heating public facilities like schools was a win-win situation,” said a 2007 report on the Darby Project by Fuels For Schools.

“The Forest Service estimates that 70 million acres of federal land need immediate hazardous fuel reduction, and 140 million acres nationwide will soon need treatment,” said the report. “Developing ways of using forest residues from these treatments is vital for rural communities.”

Darby is one such community. With a population of less than 1,000, the town has three school buildings and 365 students. Each school previously had its own oil-fired steam-heating plant. In 2002, oil use averaged 47,600 gallons and cost $44,000 for all three schools combined.

“The three Darby schools are fairly typical for western Montana in age and condition,” said Fuels For Schools. “Insulation levels are far below those of new school construction.”

One of the schools’ three oil boilers was 40 years old; the other two were installed in 1990 and 1992.

The partners who put the biomass project together included the Bitterroot National Forest, the Bitter Root RC&D, and the USFS. The USFS’s Technology Marketing Unit recruited the nonprofit Biomass Energy Resource Center of Vermont to conduct feasibility studies for several school districts in the Bitterroot Valley—and BERC identified Darby as the best location for a biomass demonstration project. The USFS funded all of the $885,000 capital costs for the Darby project. Subsequent projects through Fuels For Schools have competed for up to 50 percent federal funding.
Saving Almost 80 Percent on Fuel Costs

Even though the Darby schools retained two backup oil boilers, the new biomass system met all the schools’ heating needs, even on the coldest days, through the 2003-04 and 2004-05 heating systems, said the 2007 Fuels For Schools report.

The system continues to work that well, says Rick Scheele, who is facilities manager for the Darby schools and also the town mayor. The cost savings, he adds, are dramatic.

“Last year, we burned right at 1,000 tons,” Scheele says. “We spent $40 per ton—right around $40,000,” to heat all three schools for the full year. Had Darby kept its oil-fired system, “We’d have spent right around $245,000” on fuel, Scheele estimates.

The Darby system was built with a projected payback time of 18.5 years, based on oil prices at 2003-04 levels. At today’s oil prices, “it’d take less than 10 years” for payback, Scheele figures. Darby’s system reduced its fuel costs by half in the first season, 75 percent in the second—and, according to Scheele’s calculation, nearly 80 percent in 2008-09.

When representatives from other communities interested in biomass systems visit the Darby facility, they often ask about air quality. “As far as smoke or emissions, no—we haven’t had any,” Scheele reports.

As a small-scale system, Darby’s boiler has no emission controls. Yet from an emissions perspective, it “performs much better than many of the older generation of much larger industrial wood boilers,” said the Fuels For Schools study. Testing showed particulate-matter emissions of about 1.25 pounds per green ton of chips burned, 1.22 pounds of nitrogen oxides, and 1.67 pounds of carbon dioxide, all well within USEPA standards.

“Virtually no odor or visible smoke is produced by modern school wood heating systems,” the report affirms. “The ash, removed from the boiler on a regular basis, is nontoxic and can either be landfilled or used as a soil amendment on lawns or fields.”

‘Proper Fuel, No Problems’

Overall, fuel quality remains “the biggest problem we have” at operating biomass systems in Big Sky country, says Coston, looking back on the experience at Darby and other school systems since installed through Fuels For Schools. Hog fuel, an unscreened mix of coarse, ground-up wood bark from logging waste, works fine in a pulp and paper mill’s cogeneration facility near Darby. But in the smaller school biomass units, it doesn’t.

“Chips are chips—but hog fuel comes from a grinder and is subject to large pieces, and they can’t seem to avoid having some dirt in it,” Coston says.

Darby’s system uses chips from small-diameter trees, treetops and logging debris. It’s more expensive than hog fuel, but runs reliably in school systems.

“If you use the product of a chipper, not only is the stuff more uniform, but the guy who owns the chipper doesn’t want to run dirt or rocks through it—so you get a better product all around,” Coston concludes.

“Basically, if you use the proper fuel, you have no problems.”