

top performer: **PLANT**

# Coming Out On Top

DEDICATION AND INGENUITY HELP A SMALL PLANT  
IN NEW HAMPSHIRE ENHANCE PERFORMANCE  
AND EARN RECOGNITION FROM THE U.S. EPA

By Mike Grennier

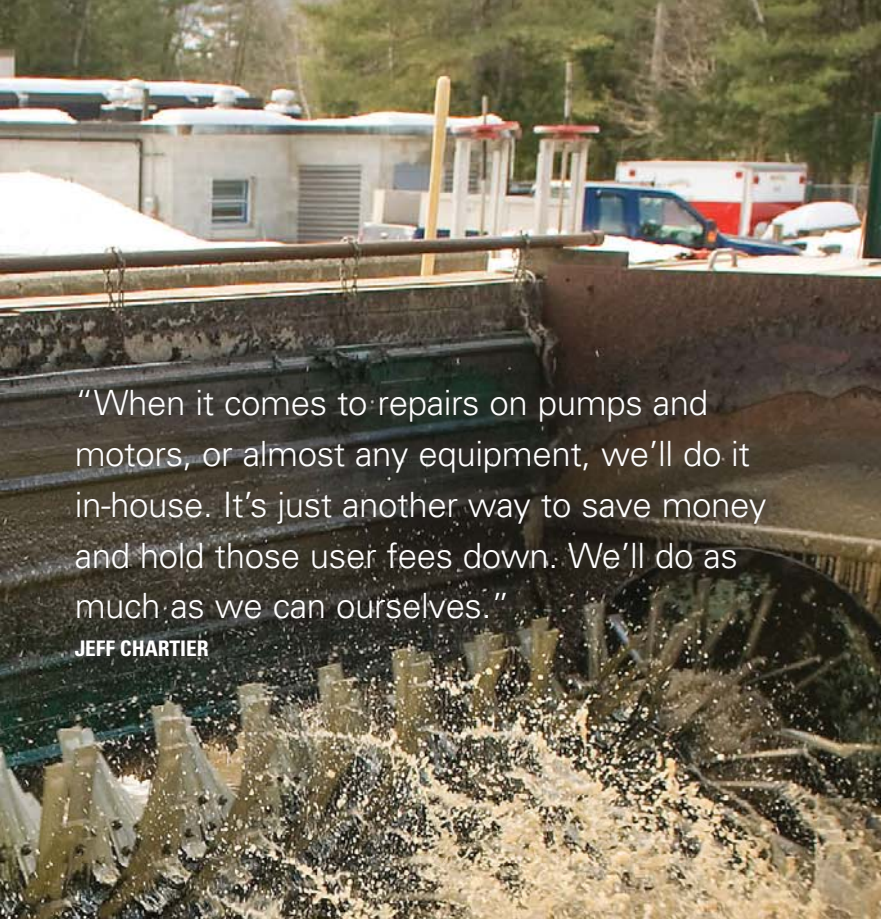
## profile

**Bristol Wastewater Treatment  
Plant, Town of Bristol, N.H.**



<b>BUILT:</b>	1969
<b>TREATMENT LEVEL:</b>	Secondary
<b>TREATMENT PROCESS:</b>	Extended aeration activated sludge
<b>FLOWS:</b>	0.5 mgd design, 0.19 mgd average, 0.509 mgd peak
<b>POPULATION SERVED:</b>	1,900
<b>RECEIVING WATER:</b>	Pemigewasset River
<b>PLANT MANAGER:</b>	Jeff Chartier, superintendent of sewer and water, grade II
<b>OPERATORS:</b>	Jesse Lamos, chief operator, grade II; Joseph Sarto, assistant chief operator, grade I; Joel Furmanick, operator-in-training

Aeration rotor and oxidation ditch retrofitted with a heated splash-guard at the Bristol, NH, Wastewater Treatment Plant. (Photography by Andy Duback)



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JEFF CHARTIER



Jeff Chartier,  
superintendent of  
the town's water and  
sewer department.

## THE TOWN OF BRISTOL WASTEWATER TREATMENT

Plant has often found itself between a rock and a hard spot, yet it has come out on top through hard work, old-fashioned ingenuity, and the help of experts when needed.

The strategy has paid off for the plant since it began operations in central New Hampshire in 1969. It has helped the plant earn first place for 2008 as Most Improved Plant, in the U.S. EPA Clean Water Act Recognition Awards.

Indeed, the plant has made significant progress in recent years to overcome challenges with discharge permit violations and various mechanical and process difficulties. “We’ve cleared a lot of hurdles,” says Town of Bristol sewer and water supervisor Jeff Chartier. “We’re also proud that the plant is now easier to operate and that we’ve freed up our operators to spend time on more essential matters. And most important, we’ve improved effluent quality.”

The job, he says, is never boring, especially when working on a limited budget. “You’re always met with a new challenge each day,” he says. “And we try to save money whenever possible by finding new ways to cut costs. It’s an ongoing goal.”

### SHARING THE LOAD

The Bristol plant is a small (0.5 mgd design flow) secondary treatment facility serving about 1,900 people. Chartier’s staff includes one dedicated operator, an operator-in-training and an office manager. Another operator focuses on the water operations and assists with wastewater treatment when needed. The plant’s struggles with effluent were largely the result of a mismatched plant design and harsh winter conditions.

The plant was originally designed to handle an average of 250,000 gpd. By 1990, however, it had neared capacity. That led to installation of a large clarifier to augment a smaller clarifier. The large clarifier, along with a number of other upgrades, effectively doubled capacity. All was set for handling peak flows. That drove the need to use the smaller clarifier only for backup, resulting in longer detention time in the large clarifier.

Problems then mounted. During the coldest winter nights, several inches of ice would form on the large clarifier. The plant also encountered ongoing icing issues in the main oxidation ditch. There, a rotating aerator splashed water onto a catwalk as it passed under it. During winter, the splashing created a virtual ice dam that prevented the aerator from moving past the catwalk and locked it in place. Process upsets and permit violations resulted. For years, de-icing became a dreaded winter chore.

“We’ve spent a lot of time chopping and chiseling ice,” says Chartier. “It’s obviously not something we liked to do, but it became necessary.” But whether it’s ice removal, or any other less desirable job, Chartier says everyone on the staff at the plant appreciates the concept of teamwork and the need to share the load.

“If it doesn’t involve specialty work like working on an electrical control panel, our operators handle it,” Chartier says. “They chip ice, mow grass, tear down pumps, rebuild motors. Anything that needs doing, my guys will dive in and get the job done.”

### DO-IT-YOURSELF

In addition to wearing more than one hat, Chartier looks to his operators to come up with solutions to problems that will not only work, but also save money. It’s an essential part of plant operations, since raising user rates isn’t always an option.

“I’d have to say funding is one of our biggest challenges,” says Chartier. Cost pressures force operators to think on their feet and hold down costs wherever possible.

“When it comes to repairs on pumps and motors, or almost any equipment, we’ll do it in-house,” Chartier says. “It’s just another way to save money and hold those user fees down. We’ll do as much as we can ourselves.”

The way the staff tackled its winter-related problems personifies the approach to treatment. For example, the staff realized both clarifiers needed to be covered. But when the estimates for permanent covers came in at more than \$200,000, the team developed a temporary solution

A shaftless screw conveyer (says it's a SPIRAC in sidebar?) loads a dumpster full of de-watered sludge at the Bristol, NH, Wastewater Treatment Plant.



## A HELPING HAND

To help address violations at Bristol Wastewater Treatment Plant, the team turned to the New Hampshire Department of Environmental Services technical assistance provider. With the adviser's guidance, the team has implemented a host of upgrades since 2002.

A process and influent evaluation revealed low food-to-microorganism ratio, filamentous bulking, and an old, over-oxidized sludge. That led to TSS violations and indicated that the mixed liquor solids inventory was too high for the applied BOD load. Additionally, the plant was not operating its belt press enough to ensure wasting room in the solids holding tank.

Under the guidance of the trainer, the plant reduced mixed liquor suspended solids (MLSS) in the oxidation ditch from 4,000 mg/l to 2,000 mg/l and provided better chlorination to reduce filament production. The operators also improved solids wasting rates by installing a sight-tube on the outside of the holding tank to facilitate monitoring of the solids level.

Additionally, the plant increased belt press operation to keep a lower solids inventory, thus improving settling and helping to control filament production. Biosolids are also hauled off site at a faster pace, thanks to an arrangement with a new hauler.

The plant's cold-weather improvements include clarifier covers and the oxidation ditch's heated splashguard, which consists of heat trace wire, chicken fencing, polystyrene foam insulation and tin roofing. The team also excavated and reset the plant's solids pipeline to keep it from freezing. As part of the project, a second pipeline for future use was added. Other improvements include:

- Use of Allen-Bradley (Rockwell Automation) variable-frequency-drive motors in the oxidation ditches and sludge holding tank for better control.
- Replacement of an old "lumber conveyor" in the dewatering operations with a more efficient and reliable SPIRAC screw conveyor.
- Construction of an expanded, climate-controlled lab with updated equipment.

for the large clarifier until it could figure out a better plan.

They built a lumber framework over the clarifier and had a local marina install boat shrink-wrap over it. That solved the problem temporarily at a cost of \$1,500. In fall 2008, the team solved the problem permanently by installing a tension-membrane structure (Rubb Building Systems) on each clarifier for a total cost of \$80,000.

The staff also took matters in hand when dealing with the oxidation



Above, Joe Sarto, assistant wastewater operator / water operator in training, weighs a sludge cake sample in an Ohaus Explorer balance. At left, A Hach turbidimeter tests the turbidity of the effluent.



ditch. After a number of experiments, the team created a heated splashguard to prevent the ice dam from forming. The homemade guard also prevents ice from falling onto the aerator's rotor blades and damaging them. The cost? \$500.

"Basically, chipping ice for hours on end is not something we wanted to do," Chartier says. "Plus, we weren't able to concentrate as much as we should on the process.

Eventually, we put our heads together and solved the problem. It's all part of the job."

## NOT LEARNED IN BOOKS

Common sense and creative problem-solving are strengths Chartier looks for in operators. Answers can't always be found in books. Instead, it's a matter of knowing the plant inside and out. "There's a lot of value in hands-on experience," Chartier says. "My two operators both started on the ground floor as shared laborers. That, combined with their certification, goes a long way toward ensuring our success."

At Bristol, the job of shared laborer means the person divides time between wastewater, water and highway work. A shared laborer who gets enough wastewater treatment experience can hire on full-time as an operator-in-training when a position opens up.

"It's how I started my career out of high school," says Chartier. "When I first came down to the plant, I thought water came in one end, chemicals were added to it, and then it went into the river. But when I joined the department in 1984, I found out there's a lot more to it."

Working in wastewater treatment, he says, isn't for everyone. "Once you get down here and you get involved with it, you realize you've got to get dirty," he says. "That's not a problem with my guys. They understand what's involved since they started on the ground floor."

Chief operator Jessie Lamos has been with the plant for nearly 10 years. He is quick to point out that the job isn't all about dirty work, or tackling projects that require a lot of physical labor. There's plenty of variety to make the job interesting.

(From left) Jeff Chartier, superintendent of the town's water and sewer department; Joel Furmanick, assistant wastewater operator in training; Joe Sarto, assistant wastewater operator / water operator in training; and Jesse Lamos, chief wastewater operator.



**BRISTOL WASTEWATER TREATMENT PLANT PERMIT REQUIREMENTS**

**CBOD** Monthly average: 25 mg/l  
Weekly average: 40 mg/l  
Daily maximum: 45 mg/l

**TSS** Monthly average: 30 mg/l  
Weekly average: 45 mg/l  
Daily maximum: 50 mg/l

**pH** 6.0 to 9.0

**Total residual chlorine** Monthly average: 1.0 mg/l  
Daily maximum: 1.0 mg/l

**E. coli** Monthly average: 126  
Daily maximum: 406

“We take our jobs very seriously, and the key thing is knowing that we’re in compliance and not polluting our waters. I’m really proud of the teamwork that got us to where we are today. I also take pride in knowing we’ve addressed major problems without adding significant costs to our users.”

**JEFF CHARTIER**

“There are so many things that make you stop and think,” he says. “It’s not strenuous work, but it’s more about spending your time wisely.” The most important aspect of managing the plant, he says, is to follow the schedule religiously and to avoid any tendency to become complacent.

“We tackle whatever is on the schedule and get it done before moving on in case something else comes up that isn’t on the schedule,” he says. “You’ve got to stay ahead of it. If you don’t, you’ll be sorry.”

**HELP AVAILABLE**

The Bristol staff rarely gets behind, no matter what problems come up, because help is always available. To that end, the operators carry cell phones. A rotation schedule ensures the plant is manned seven days per week to minimize the potential for small problems to turn into big ones. When the going gets tough, the team pulls together.

“Whether it’s the sewer or water department, we’re all cross-trained, and that means we can rely on each other for just about everything,” Chartier says. “I have faith in my operators, and I don’t have to look over their shoulders as I did when they started.”

“He definitely doesn’t sit in his office all day long. That’s something we all really appreciate.”

Lamos adds that the team can rely on Chartier, who does much more than simply preach a hands-on approach. “Jeff works right beside each of us,” he says. “He definitely doesn’t sit in his office all day long. That’s something we all really appreciate.”

They also appreciated outside expertise, particularly advice provided by the New Hampshire Department of Environmental Services (NHDES). Chartier and the operators

An operator tests a sample of effluent indicating chlorine residual.





Jesse Lamos, chief wastewater operator, incubates an effluent sample to test for *E. coli*.

tors worked closely with the department's technical assistance provider to pinpoint process control issues and implement a variety of changes to ensure compliance (see sidebar).

"Wes Ripple from the state will never hesitate to come here and help us troubleshoot a situation," Chartier says. "Wes has been a huge, huge help and I don't know what we would have done without him. The department should be proud to have a trainer and a process control guy like him."

## THE RIGHT THINGS

The Bristol team's dedication to getting the job done, combined with its knack for developing innovative solutions and its belief in working closely with NHDES, has proved beneficial on many levels. For Chartier, the most important benefit is the ability to process consistently high-quality effluent. In 2008, the plant reported one violation. That compares with 34 violations during a 16-month period in 2002-03.

"We take our jobs very seriously, and the key thing is knowing that we're

in compliance and not polluting our waters," he says. "I'm really proud of the teamwork that got us to where we are today. I also take pride in knowing we've addressed major problems without adding significant costs to our users."

Lamos says the entire Bristol team looks forward to moving forward. "Now we're paying more attention to the process of the plant instead of always doing things to keep it going," he says.

The bottom line, adds Chartier, is continuous improvement: "Our focus now is to fine-tune the operation and find ways to make it even better." ♦

## more info:

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