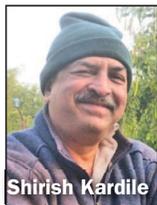


From the Board

For Want of a Nail, Poor Water Quality Plagued a Small City



Shirish Kardile

Around April 2006, Baramati, India, residents complained about their tap water's fishy smell and pale yellow color. So, operators at the local water treatment plant began prechlorination, using bleaching powder (calcium hypochlorite). Yet, the problem got worse. Colored source water was reported, with some residual white deposits.

At the time, the 4.5-mld-capacity water treatment plant's source was the Ujani Dam backwaters. The plant, put into operation in January 2006, is on a hillock 5 km away from the lake. Raw water is pumped to the plant, and, after treatment, is conveyed to the town via a 10-km-long gravity main. The plant consists of a standard Maharashtra Jeevan Pradhikaran (MJP) configuration: cascade aerator, mixing weir, two mechanical flocculation tanks, two tube settling tanks, two rapid sand gravity filters, a chemical house with alum dosing tanks, and a prechlorination and post-chlorination arrangement for dosing bleaching powder.

When visiting the plant, I discovered the raw water at the cascade aerator had a putrid odor and a greenish-black color, whereas a visit to the dam intake revealed the surface water was relatively clean. Prechlorination at the plant was causing dark brown and black

stains to appear on the channels' side walls and bottom. Alum was dosed after prechlorination, and the chemical report confirmed the following values: chemical oxygen demand 25–30 ppm, turbidity 10 ntu, pH 8.2–8.5, iron 0.2–0.3 mg/L, and dissolved oxygen above 6 mg/L. An orthotoluidine test confirmed a 2–3 mg/L chlorine level after prechlorination (in the flocculator) and nil at the filter outlet. Filtered water turbidity was 0.7–0.8 ntu, and the water was colorless. Postchlorination was repeated with the same bleaching powder (1.5–2 mg/L), resulting in a color change in the pure water sump. Free residual chlorine (FRC) at the city's distribution reservoir was reported to be 0.2–0.3 mg/L, with the water a pale- to dark-yellow color. The sludge from the tube settler hoppers was greenish black and had good consistency.

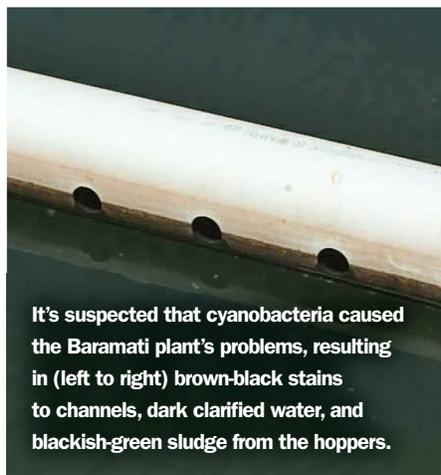
Investigations first focused on the MJP intake well, which had three ports at different levels. The lake is fairly shallow at the intake well, about 15–20 ft, and the bottom and mid-level ports were under water. It was obvious that water at the lake bottom had poor quality, containing algae and decayed vegetation. Finally, the likely problem was discovered: the well ports lacked isolation gates. Divers plugged the bottom port with cement bags. Within 3–4 hr, the MJP plant started receiving relatively good-quality raw water.

Simultaneous investigation revealed the bleaching powder the plant used had exceeded its expiration date and had little available chlorine. Operators had been injecting more and more bleaching powder to maintain the desirable FRC (1–2 mg/L for prechlorination). This increased the raw water pH above 10–11, and the organic iron (associated with cyanobacteria) had started precipitating. The FRC at the filtered water outlet was nil, indicating organic matter and iron was consuming all the available chlorine.

Fresh bleaching powder with an available chlorine content of about 20 percent was procured at the plant. Because the raw water quality had improved considerably then, only a 0.5 mg/L powder dose was given for prechlorination. The pH of the raw water remained about the same.

Plant performance changed drastically in 12 hr. The filtered water showed no more color. The local authority had to flush the pure water gravity main, as it contained lime deposits resulting from the old bleaching powder. Within a week of the initial investigation, Baramati's residents started receiving colorless, odorless water at their taps. And to think, all of this could have been avoided if someone would have just nailed a gate to the intake port!

—Shirish Kardile,
AWWAIndia Strategic Board Chair



It's suspected that cyanobacteria caused the Baramati plant's problems, resulting in (left to right) brown-black stains to channels, dark clarified water, and blackish-green sludge from the hoppers.

