Fact or Fiction?

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Nitrates

Who's to blame for elevated concentrations of nitrates in stream water throughout the world? The quick answer is that human activities such as steel mills, explosives plants, mines, paper mills, livestock feeding, agricultural runoff, timber harvesting practices and domestic/industrial effluent discharges are the culprits.[1]

However, results from some recent research lay some of the blame on Mother Nature, which until now had been considered innocent. High levels of nitrates have been found in the ocean and in bedrock. First, some of the concerns with nitrates.

Nitrate Concerns

Regarding nitrates and nature, an established fact is that high levels of nitrates (and phosphates) in streams and lakes can cause eutrophication, which is a bloom of algae growth that leads to a deficiency of oxygen and destruction of marine fauna.[1]

Are nitrates a problem for humans? Jean-Louis L'hirondel reports: "Two major charges were leveled at nitrates some 30 years ago—infant methaemoglobinaemia or 'blue-baby syndrome', and a greater risk of cancer in adults. The many scientific studies carried out over the last few decades allow us to conclude that neither of those grievances were founded. Dietary nitrates pose no threat to human health."[2]

Bjorn Lomborg notes: "The latest meta-study points out that despite a clear connection between nitrate in water and nitrate in blood and saliva, and despite "extensive population exposure, there is little direct epidemiologic evidence of elevated risk among human populations exposed to nitrate in drinking water." The study concludes that "the epidemiologic data are not yet sufficient to draw a conclusion. No other effects from nitrate have been found. Moreover, the case for methaemoglobinemia and cancer is at best very weak."[3]

Regardless of all this, some folks will still be concerned about nitrates. As far as humans are concerned, most of the nitrates we receive come from vegetables. About 80 percent of the nitrates we receive come from food and 10 to 15 percent from drinking water.[2] Beets, celery, lettuce, and spinach provide us between 75 and 100 mg of nitrates a day, while vegetarians get more than 250 mg.[4] So, one way to minimize your nitrate consumption is to not be a vegetarian. Another is to stop eating vegetables altogether and this way you surely will get some bad disease.[5] As far as water is concerned, the maximum level of nitrates allowed in our drinking water is 10 ppm and this should allow plenty of safety.[6]

Nitrates are in Nature

Anyhow, as mentioned earlier many of mankind activities are associated with increasing amount of nitrates in our water. Recently, it's been shown that there is another culprit providing nitrates. It's Mother Nature. Chemical analysis of seawater provided the first direct evidence that the oceans may be a significant source of some nitrates (methyl and ethyl nitrate) that scientists had previously assumed to be produced primarily by industrial activity. These gases, members of a group called alkyl nitrates, are similar to the alkyl nitrates produced by forest fires and the burning of fossil fuels. These materials react with other atmospheric gases to create urban smog and also influence the amount of ozone in the lower atmosphere over remote ocean areas.[7]

Adele Chuck and her colleagues report, "Measurements of methyl and ethyl nitrate in seawater and air samples along two Atlantic Ocean transects provide the first direct evidence for an oceanic source of these compounds. Equatorial surface waters were highly supersaturated (up to 800 percent) in both species, with the waters in the temperate regions generally being closer to equilibrium."[8] The mechanism behind all this is unclear at present, however, as the journal *Environmental Science & Technology* reports: "Because such compounds were previously thought to be exclusively of anthropogenic origin, the findings raise questions about the formation of nitrogen compounds in remote marine environments and could have important implications for the formation and destruction of tropospheric ozone."[9]

There's more to the story. Another study has revealed "that bedrock containing appreciable concentrations of fixed nitrogen contribute appreciable concentrations of nitrate to surface waters in certain California watersheds, to an extent that even small areas of these rocks have a profound influence on water quality. As 75 percent of the rocks now exposed at the Earth's surface are sedimentary in origin, and as these rocks contain about 20 percent of the global nitrogen inventory, 'geological' nitrogen may be a large and hitherto unappreciated source of nitrate to surface waters."[10] The same geological formations where the nitrogen was found "extend for 300 km along the western flank of the Sierra Nevada, indicating the potential for nitrate contamination of much of California's surface water supply." As with nitrates in the ocean, here's another case where nitrogen as a non-point source of contamination needs to be reevaluated.

Some Observations

According to the Toxics Release inventory, nitrate and nitrite releases to water and land totaled over 112 million pounds from 1991 through 1993. The largest release of inorganic nitrates occurred in California (21 million pounds). Georgia (12 million

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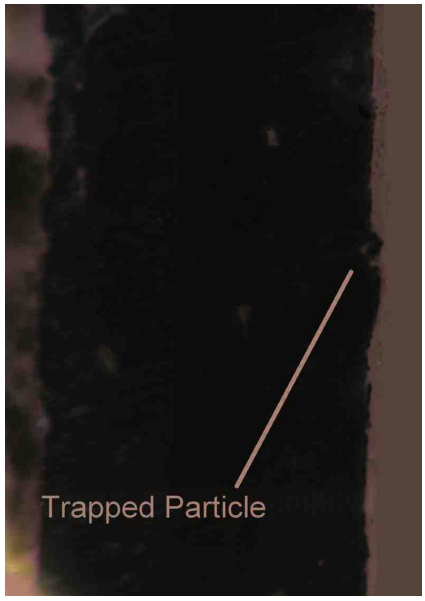

Photo 3—Cross section showing trapped particle.

exist. However, if continuous filtration is used at a relatively high flow rate, at about 4 to 5 turnovers per hour, and the filter is operated even during tank idle periods, a reliable particle removal rate will be successfully maintained. Typically, once four tank turnovers are employed, 97% of all filterable particulates are being removed (assuming ideal mixing of the process).

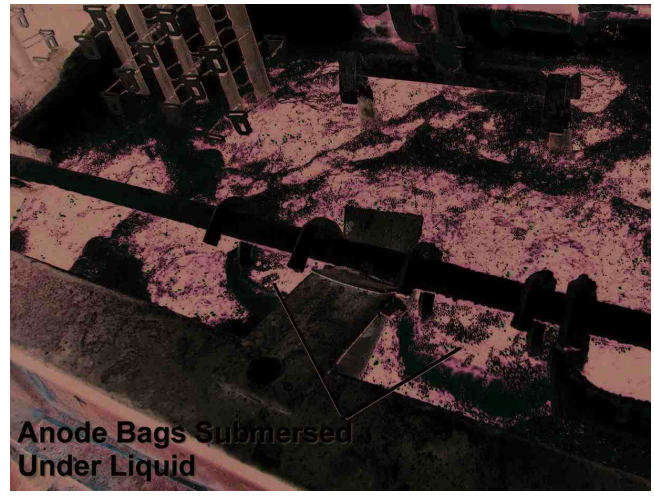

Photo 4—Submersed anode bags.

The higher the turnover rate, the longer the plating tank can be operated without producing a serious increase in defective product. As the filtering system continues to operate, the flow rate begins to fall and the pump pressure starts to rise since the filter begins to clog from build-up of particulate matter. When this occurs, servicing of the filter is required so that the expected flow rate is once again available. From an operational standpoint servicing of the filter should always occur before the pressure drop affects filtration quality. Frequent visual checks of the pressure in the filter, or a visibly lower flow from the filter should be performed. If the solution appears cloudy or significant amounts of particulate are found, batch servicing of the solution should be considered (affecting production), or the frequency of filter service should be increased. Ideally, if the lowest level of particulate is maintained in these solutions through proper procedures, then optimum filtration can be provided and, at the same time, the need for batch treatment to remove excessive contamination will be minimized.

Failure to maintain the filter may trigger the need for batch filtration of the process solution in order to insure complete removal of the particulate matter. This is accomplished by pumping the solution from one tank through a filter, and then back into the process tank. Batch filtration is also recommended after a major change in chemical make-up of the process. ***P&SF***

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pounds) and Alabama (6 million pounds) were next in line.[6] No debate that mankind activities were responsible for much of this, but in California perhaps Mother Nature provided some help with all the nitrogen in the mountains by the central valley.

Don Curlee, writing for a central valley newspaper says it rather bluntly: "Besides lifting the blame for high nitrate levels from agriculture the data clears timber harvesting, industrial discharges and atmospheric emissions. Now that the record has been set straight the pseudo-scientific environmentalists are learning that throwing rocks at self designated 'bad guys' is a futile effort, especially when the rocks themselves are the cause of the trouble."[11]

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