

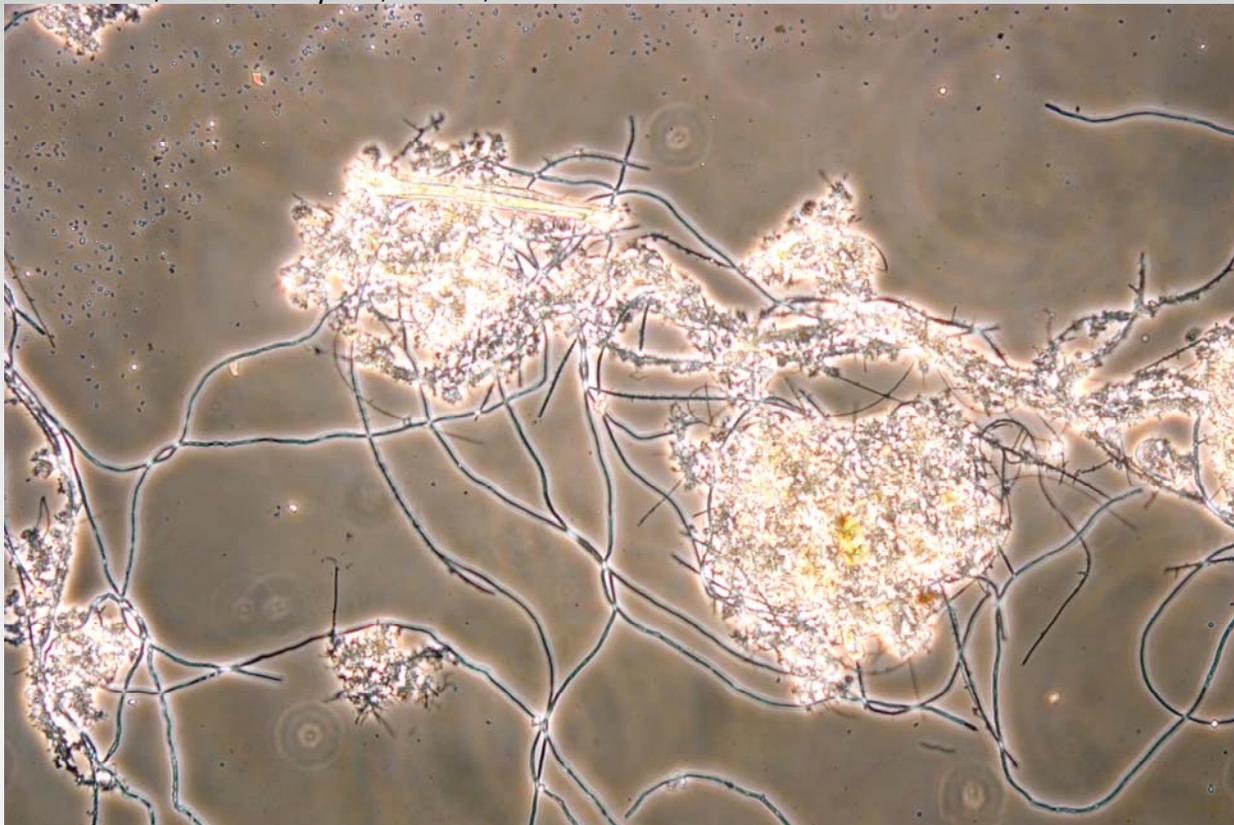
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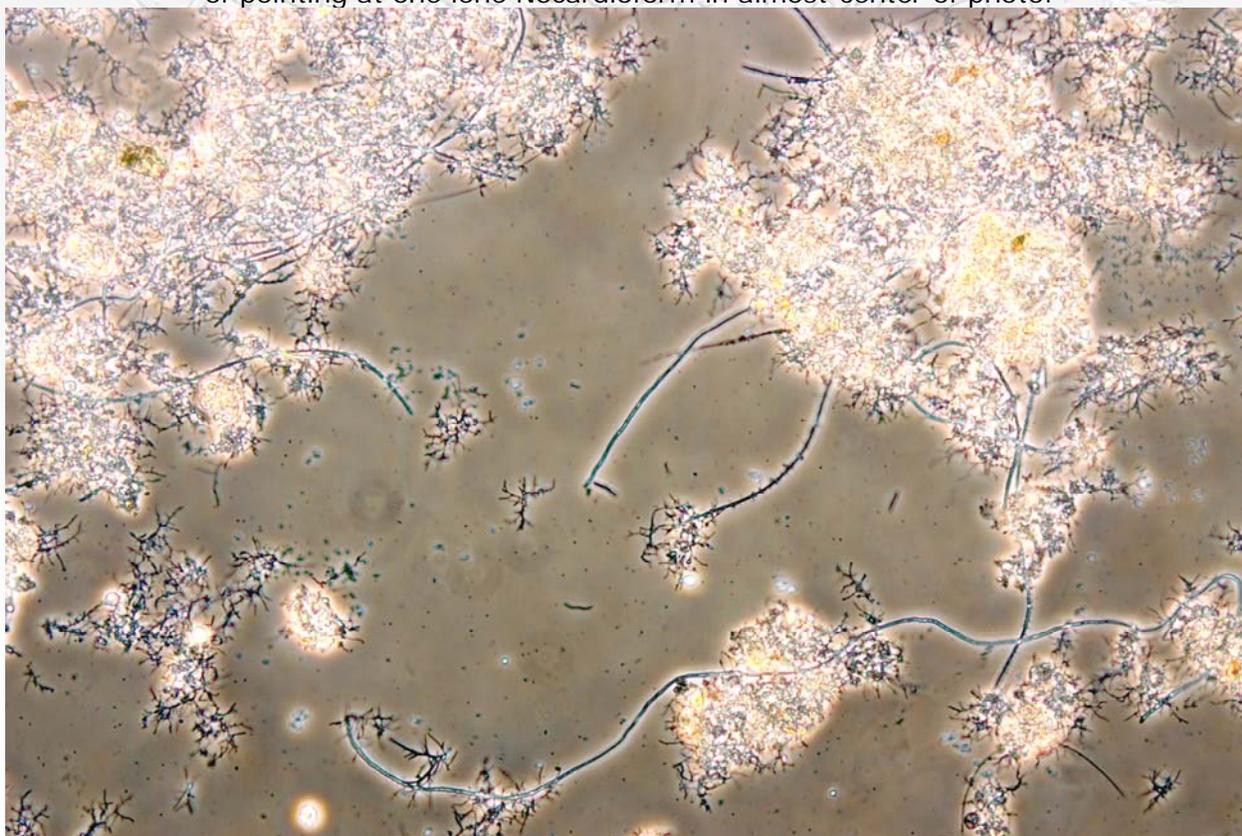
Ian:

Received one package on Friday 15 May 2020 via USPS with two samples. One sample was labeled as "mixed liquor" and second sample as "foam". Used a phase contrast microscope at 100x, 400x, and 1000x to identify any filamentous bacteria that might be causing bulking problems. Here is the summary: The filamentous bacteria that extends out of the floc is filament type 021N and Nocardioforms can be found in large concentrations in the foam sample. The following is a pictorial guide to both these organisms at various magnifications.

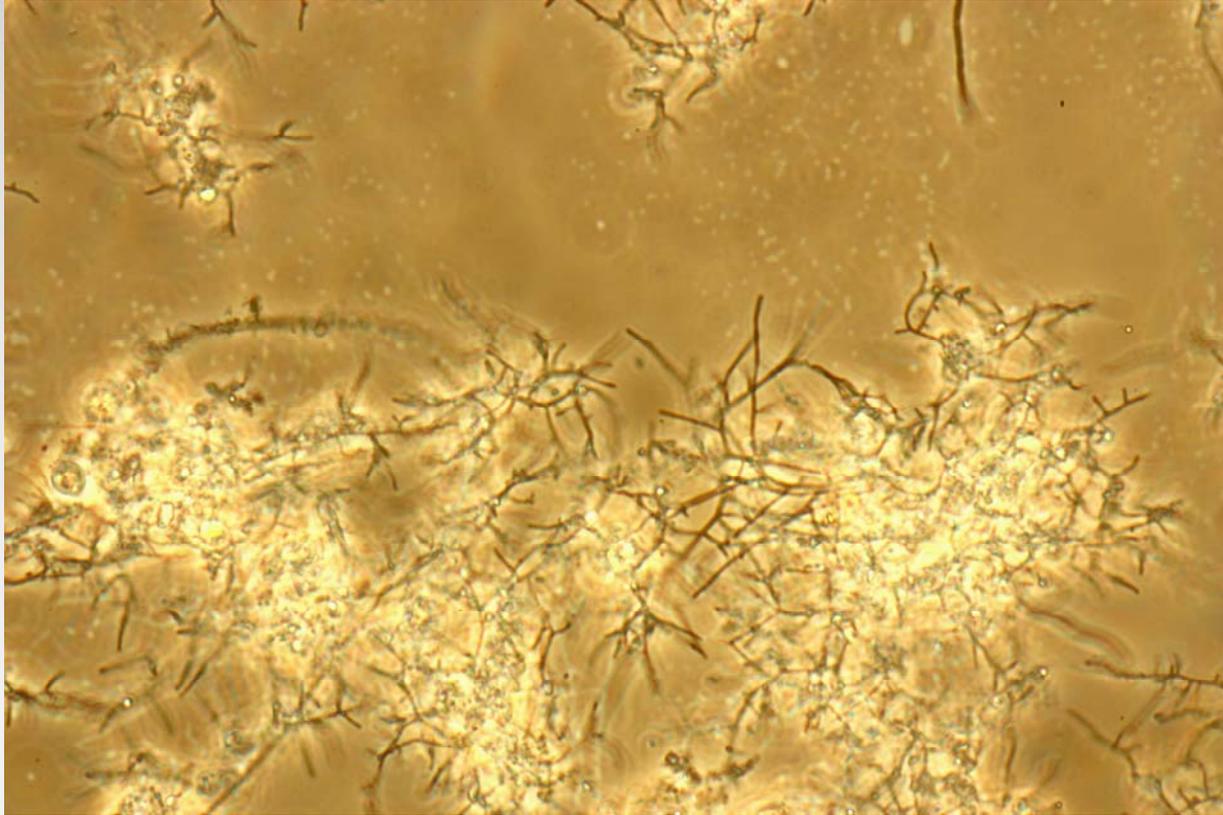
Wet Mount, Mixed Liquor, 100x, Phase Contrast:



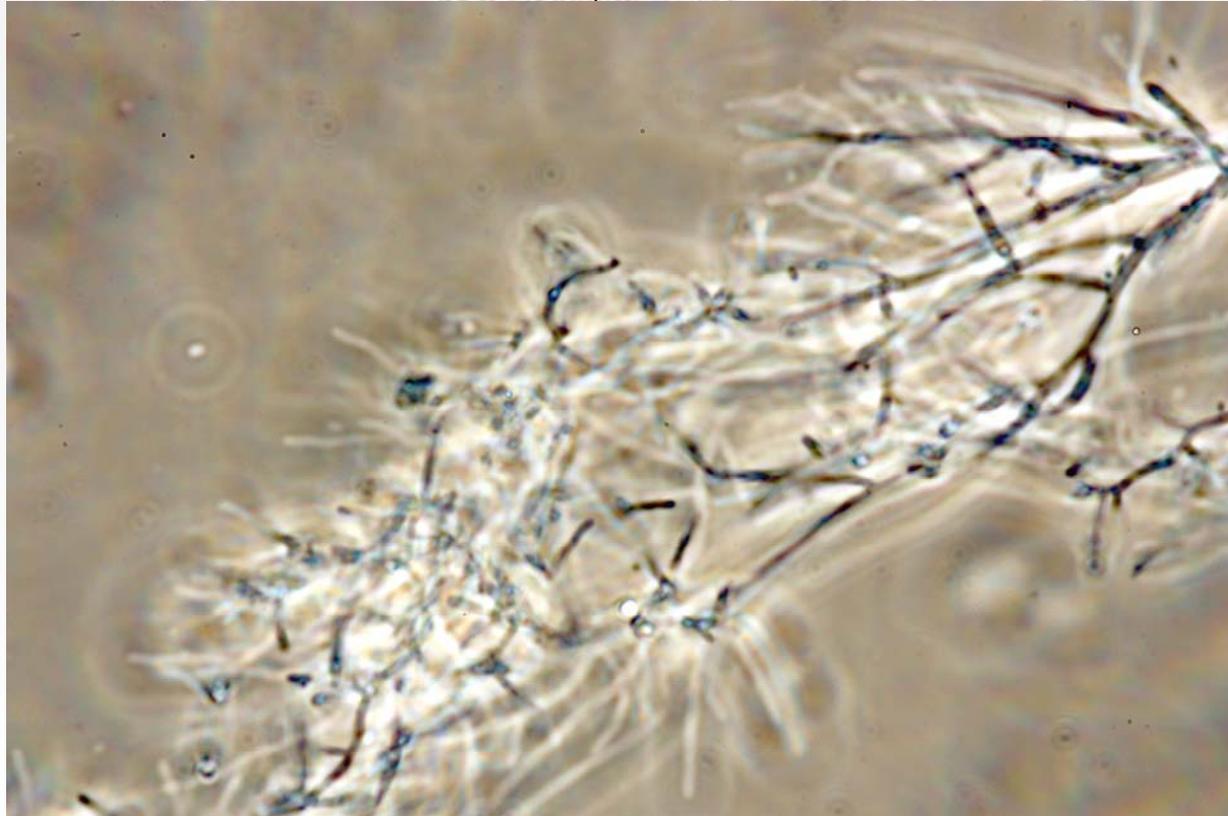
Both photos 100x. Top/Bottom photo show filament type 021N extending out of floc. Bottom photo displays branched, dispersed Nocardioforms found in bulk solution (one lone filament sort of pointing at one lone Nocardioform in almost-center of photo).



Wet Mount, Mixed Liquor, 400x and 1000x, Phase Contrast:



Nocardioforms. Top 400x, bottom 1000x.



Handwritten signature and date: [Signature] 10/10/13

Wet Mount, Mixed Liquor, 1000x, Phase Contrast:



Filament type 021N at 1000x. Distinctive beer barrel-shaped cells in filament.



Summary:

Sample has two distinct filamentous bacteria present that are contributing to bulking issues. Filament type 021N extends out of floc slowing down settling and subsequently compaction of solids. Dispersed Nocardioforms found in bulk solution are extremely small; very fine solids that can be trapped on air bubbles as they rise to the surface (similar to a dissolved air floatation-DAF) system and creating foaming issues.

Filament type 021N has been associated with presence of organic acids that can be introduced into a treatment process from septic dumpers, equalization basin with no mixing, primary fermenters (holding solids for too long in primaries), any place that holds solids for too long that goes anaerobic. Busted bubble diffusers/aerators that are not adequately mixing and allow solids to settle in aeration basins. Keep an eye out for areas in treatment process where anaerobic conditions might be allowing solids to ferment and produce volatile organic acids.

Dispersed Nocardioforms need to be physically and permanently removed from treatment process and not be reintroduced back into the system. Mix removed foam and primary grit and dump. Dispersed Nocardioforms can be coaxed back into the floc through the use of high charge density, cationic polymer such as Clarifoc LA 2691 (see "The Role of Nocardioform Filaments in Activated Sludge Foaming").

