

**Table 10.2**  
**Causes, Observed Effects and Remedies of Activated Sludge Separation Problems**

PROBLEM	CAUSE	OBSERVED EFFECT(S)	POSSIBLE REMEDY
Dispersed growth	Microorganisms do not form floc and so are dispersed, forming only small clumps or single cells.	Turbid effluent. No zone settling of sludge.	<ol style="list-style-type: none"> <li>(1) Check for excessive turbulence or over-oxygenation in the aeration basin (floc shear). Reduce turbulence if excessive.</li> <li>(2) Look for evidence of a toxic influent and control if possible.</li> <li>(3) Re-seed the aeration basin with live microorganisms if necessary.</li> </ol>
Non-filamentous bulking or "Viscous Bulking"	Large amounts of exocellular slime are present in the floc. In severe cases, the slime imparts a jelly-like consistency to the activated sludge.	Reduced settling and compaction rates. Virtually no solids separation in severe cases resulting in overflow of sludge blanket from secondary clarifier. In less severe cases, viscous foam is present.	<p>Investigate nutrient imbalance, especially nitrogen and phosphorus. The ratio of influent nutrients should be around:</p> <p>1% phosphorus            5% nitrogen            94% carbon</p> <p>Supplement nutrients if needed.</p>
Pin floc or Pinpoint floc in supernatant	Small, compact, weak, roughly spherical floc are formed, the larger of which settle rapidly. Smaller aggregates settle slowly.	Low SVI (< 100) and a cloudy, turbid effluent.	Raise F:M by lowering MLSS concentration in a controlled manner.
Large, jagged "straggler floc" in supernatant	Incomplete bio-flocculation, which leaves some large particles in the supernatant.	Slow settling and compaction during first 30 minutes of the settleometer test, although the SVI is only slightly elevated. This is common during plant start-up, when the mixed liquor is building or in plants that are organically overloaded.	<ol style="list-style-type: none"> <li>(1) Lower F:M by building up mixed liquor.</li> <li>(2) Increase aeration basin volume.</li> </ol>
Bulking	Filamentous organisms cause an open floc structure or inter-floc bridging and interfere with compaction and settling of activated sludge.	High SVI (Typically > 150) - very clear supernatant. Decreasing RAS and WAS solids concentrations. In severe cases, solids washout occurs where the sludge blanket is lost from the secondary clarifier. Solids handling processes become hydraulically overloaded.	<ol style="list-style-type: none"> <li>(1) Lower RAS pumping rate to prevent solids washout.</li> <li>(2) Reduce MLSS concentration by 1/3. (Lean the system out).</li> <li>(3) Identify the causative filament(s) and correct conditions that allowed growth.</li> <li>(4) Chlorinate the RAS (last resort).</li> </ol>
Rising Sludge	Denitrification in the sludge blanket releases N <sub>2</sub> gas, which floats chunks of activated sludge to the surface of the secondary clarifier.	Large chunks of activated sludge found on the surface of a secondary clarifier. If allowed to accumulate, a thick layer of sludge will form on the clarifier surface.	<ol style="list-style-type: none"> <li>(1) Increase RAS pumping rate.</li> <li>(2) Lower MLSS concentration in a controlled manner.</li> </ol>
Foaming/Scum formation	Caused by the presence of grease and non-degradable surfactants. <i>Microthrix parvicella</i> and <i>Nocardia</i> sp. are the primary filamentous bacteria that cause the problem.	Foams float large amounts of activated sludge solids to surface of treatment units. <i>Nocardia</i> and <i>Microthrix</i> foams are persistent and difficult to breakup mechanically. Foams accumulate and can putrefy. Solids can overflow into secondary effluent or overflow tank walls onto walkways. Foam exiting in the effluent can be cited as a permit violation.	<ol style="list-style-type: none"> <li>(1) Stop grease from entering the sanitary sewer.</li> <li>(2) Improve plant pretreatment (tighter mesh barscreen).</li> <li>(3) Increase wasting to remove grease from the system, after the supply has been stopped.</li> <li>(4) Stop decanting from digester (this recycles grease in the system).</li> <li>(5) Install primary clarifier to remove grease before it enters the aeration basin.</li> </ol>