



Part 8 of a 12-part **exclusive series** on understanding storm water pollutants

What comes to mind when you think about the Oil and Grease analysis? Probably a couple things – first, it’s not a very scientific term, and second, Oil and Grease is a pretty broad category. Does it test for all oils and greases? Or just petroleum oils and greases? Why does my lab report call it HEM? These are all good questions, and in this month’s edition of **The Rain Events**, we’re going to try our best to answer them.

The first step in understanding the Oil and Grease analysis is understanding the analytical method. Table 2 in the Industrial General Permit specifies EPA Method 1664A for measuring oil and grease. If you look at the EPA’s analytical method reference, the actual name for this test is n-Hexane Extractable Material, or HEM for short. The analytical procedure uses a solvent called n-hexane to isolate hexane-soluble materials from your storm water sample.

Well, you might ask, what materials are hexane-soluble? To answer this, we’ll have to look at the chemistry concept of polarity. Without getting overly complicated, molecules can generally be divided into two groups – polar and nonpolar.

This is important when it comes to dissolving a substance into another substance. The solvent (say, H₂O, or water) must be the same polarity as the solute (say, NaCl, or table salt). In this case, both water and table salt are polar molecules, so the salt dissolves in water. Why doesn’t oil mix with water? You guessed it – oils are nonpolar molecules, which can’t dissolve in a polar solvent. The answer to the question of which materials are hexane-soluble is simple: Hexane is a nonpolar solvent, which means that it will dissolve nonpolar molecules.

If you’re paying close attention, you’re probably thinking “Wait. Oils and greases can’t be the only nonpolar molecules, so is this analytical procedure picking up other things too?” Good observation. Most organic (carbon-based) compounds are nonpolar – including hydrocarbons, polymers (plastics and rubbers), waxes, soaps, and fatty acids

O&G
Oil and Grease

NAIs = 15 mg/L Annual
25 mg/L Instantaneous

Typical Motor Oil Carbon Chain

CCCCCCCCCCCCCCCC

(like those found in animal and plant based oils). All of these substances can *potentially* be detected by the EPA 1664A test. So, it is possible that a high oil and grease result could be caused by something other than motor oil or hydraulic fluid.

That being said, the SMARTS data for the 2016-2017 storm water monitoring year seems to indicate two main sources of oil and grease – used petroleum oil and/or fuel, and animal-based fats. The top five sources of oil and grease in California are SIC codes **5093** (scrap and waste materials), **4212** (local trucking without storage), **5015** (used motor vehicle parts), **4953** (refuse systems), and **2013** (sausages and other

prepared meats).

So, if you’re struggling with your oil and grease numbers, what to do? Well as always, the best BMP strategy uses a combination of source control, good housekeeping, and treatment control. Keep oily parts and equipment stored under cover, and perform maintenance activities indoors if possible. Keep your yard swept and clean, and do your best to run a tight ship. In most cases, a combination of good source control and good housekeeping is all you’ll need to bring your oil and grease numbers under control. Remember, oil is nonpolar and water is polar – so grease isn’t going to want to slough off into your storm water. But what if you’ve done everything possible to control your oil and grease numbers, but your numbers are still high?

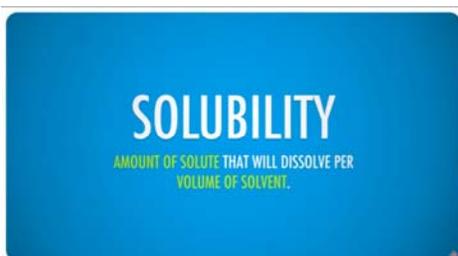
Well, do a thorough investigation to see if there are any unexpected oil sources on your site (don't forget to check those roof vents). If you can't find any sources of oil, check to see if there are other pollutants that are causing a "false positive" reading – other nonpolar compounds that are being extracted by the hexane test and being reported as oil and grease. Of special note is colloidal sulfur and thiosulfate – both of which are mentioned in the EPA 1664 method as known causes of false positive readings. ☁

Sources:

1. Method 1664, Revision B: n-Hexane Extractable Material (HEM; Oil and Grease) and Silica Gel Treated n-Hexane Extractable Material (SGT-HEM; Non-polar Material) by Extraction and Gravimetry, *United States Environmental Protection Agency*, https://www.epa.gov/sites/production/files/2015-08/documents/method_1664b_2010.pdf.
2. Michael K. Stenstrom, Gary Silverman and Taras A. Bursztynsky, *Oil and Grease in Stormwater Runoff* (Berkeley, CA: Association of Bay Area Governments, 1982). <http://www.seas.ucla.edu/stenstro/r/r8>
3. Wikipedia, s.v., "Hydrocarbon," *Wikipedia The Free Encyclopedia*, last modified January 12, 2018, <https://en.wikipedia.org/w/index.php?title=Hydrocarbon&oldid=819918264>

Want to hurt your brain?

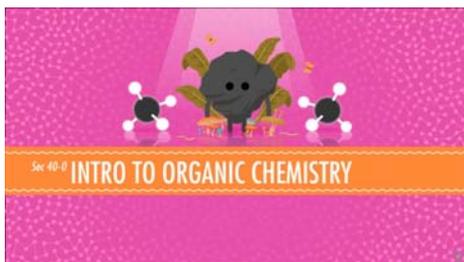
Check out these fast-paced (and weirdly entertaining) science videos to learn more about molecular polarity, solubility, organic chemistry, and hydrocarbons.



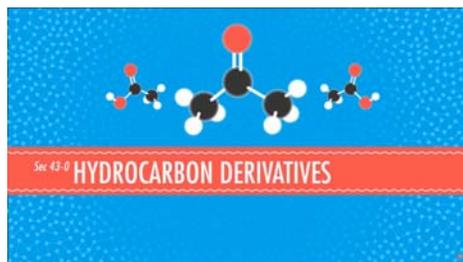
<https://www.youtube.com/watch?v=9h2f1Bjr0p4>



<https://www.youtube.com/watch?v=PVL24HAesnc>



<https://www.youtube.com/watch?v=Uolw7dhnIQ>



https://www.youtube.com/watch?v=hIXc_eEtBHA

finding the

sulfur 16 S 32.066	oxygen 8 O 15.999	uranium 92 Ur 238.029	cerium 58 Ce 140.116	sulfur 16 S 32.066
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So, what could be affecting oil and grease numbers at your facility? Here's a few common culprits:

- Motor oil, hydraulic fluid, power steering fluid, transmission fluid (petroleum oils)
- Heavier petroleum fuels (diesel, kerosene, fuel oil)
- Oil-based paints and coatings
- Animal-based fats (lard, tallow, etc.)
- Plant-based fats (vegetable oils, olive oil, etc.)
- Waxes (paraffin wax, beeswax, carnauba wax)

Have questions about the Industrial General Permit?

Give us a call at (209) 334-5363, ext. 114

"To Do List" for January:

- ☁ Perform the January monthly inspection
- ☁ If you're not finished already, get everything ready to collect the last two storm water samples for the 2017-2018 storm water year.
- ☁ Make sure all of your sample results for the first half of the 2017-2018 year have been uploaded to SMARTS. Remember, Ad Hoc reports must be submitted **within 30 days** of collecting a sample.

AMENDMENT:

Industrial General Permit

That's right – if you haven't heard, the State Water Board has released a list of amendments to the 2014-0057-DWQ Industrial General Permit. The comment period for the amendments ends on February 14th, 2018 – so if you haven't submitted comments yet, do so soon. But before you submit comments, you'll want to check out this podcast we recorded with Laurel Wardrip and Shuka Rastegarpour about the proposed amendments.

Part 1: TMDLs, TNALs, and NELs



<http://swpppradio.org/listen.php?ID=23>

Part 2: Attachment I, incentives, design storm standards.



<http://swpppradio.org/listen.php?ID=24>

Please contact us if you have any questions ...

The Rain Events

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Amendments to the California Industrial General Storm Water Permit on the Horizon

January 9, 2018

The California State Water Resources Control Board will be considering amendments to Industrial General Storm Water Permit at a workshop today, January 9, 2018 and can be watched on a webcast available here - <https://video.calepa.ca.gov/>.

On December 15th, the State Water Board staff proposed amendments to the Industrial General Storm Water Permit to incorporate proposed Total Maximum Daily Load (“TMDL”) implementation language, and to provide new potential compliance options.

The new amendments add new TMDL Numeric Action Levels (“TNALs”) and Numeric Effluent Limitations (“NELs”) not included in the previous permit that add more possibilities for permit violations and liability.

TNALs are pollutant concentration levels used to evaluate if Best Management Practices (“BMPs”) are effective and if additional measures are necessary to control pollutants to comply with applicable TMDLs.

All TNALs translated from a Waste Load Allocation are instantaneous maximums, and are set forth in the TMDL Compliance Table in new Attachment E.

Unlike NELs, TNALs are not effluent limits, and the exceedance of a TNAL is not a permit violation. However, as we know from the current permit, allegations of non-compliance will be made if discharges exceed the TNALs.

All TNALs are instantaneous maxima, not annual averages, and a TNAL exceedance occurs when two or more analytical results from samples taken for any parameter within a reporting year exceed the instantaneous maximum TNAL value in the TMDL Compliance Table in Attachment E.

NELs, set as both concentration and dry weight ($\mu\text{g}/\text{kg}$) limits, will constitute a violation of the permit if exceeded. It is unclear why NELs are being imposed when previous findings were that such limits were infeasible.

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The amendments proposed also provide new on-site and off-site compliance options in addition to traditional compliance. However, the emphasis is on storage and infiltration (which does not allow ground water impacts), or diversion to sanitary sewer (which may be prohibited in some areas of the state).

Although these are set forth as options, it may be that businesses have little choice since the number of lawsuits alleging non-compliance with the current permit have been more prevalent than expected.

Other changes blur the lines of where compliance must be demonstrated for receiving water limitation compliance.

Written comments are due at noon on February 14, 2018.

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Storm Water Contest...

Each month, we invite our readers to participate in a contest to test their knowledge of the Industrial General Permit and their storm water compliance program. We enter all submittals to our monthly newsletter question into a drawing, and one person is selected at random to receive a \$25 gift card. Last month's question was:

If storm water mixes with hydrochloric acid, will the resulting pH be higher or lower?

Congrats, **Sherri Santellan**, you're correct! Hydrochloric acid is a strong acid (low pH), and when mixed with water, the resulting solution will have a low pH. Sherri wins a \$25 gift card to Amazon.com!

This Month's Contest Question:

Why doesn't oil dissolve in water? (Hint: the answer is in the article)

By February 23, 2018, submit your response to the above question by sending an email to jteravskis@wgr-sw.com. All persons submitting the correct answer will be placed in a drawing. The winner will receive a \$25 gift card to Chili's.

