ENVIRONMENTAL EXPRESS[®] **Total Dissolved Solids:** Going From Tedious to TDS

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Total Dissolved Solids (TDS)

- What is it and why does it matter?
- How is it currently being tested?
- Why is TDS so tedious?
- New products that alleviate these frustrations.

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 TDS, or Total Dissolved Solids, refers to the amount of organic and inorganic dissolved substances that may be found in your water.

AL FXP

- Minerals
- Metals
- Salts
- Pesticides

- Principal application of TDS is in the study of water quality for streams, rivers, and lakes.
- Not generally considered a primary pollutant.
- Used as an indication of aesthetic characteristic of drinking water.
- Aggregate indicator of the presence of a broad array of chemical contaminants.

AL FXP

- Practical implications of TDS:
 - Hard water
 - Magnesium, calcium, and variety of other metals

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- Scale buildup in pipes, valves, and filters
- Reduces effectiveness of soap
- Dry, itchy skin
- Soap scum



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- Practical implications of TDS:
 - Water aesthetics
 - Odor
 - Taste
 - Color
 - Turbidity









- Practical implications of TDS:
 - Life
 - Aquatic and terrestrial organisms







How is it currently being tested?

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- Three approved methods:
 - SM2540C 1997
 - ASTM D5907-03
 - USGS I-1750-85

TDS range of various water sources.

- Ocean water 30,000-40,000 mg/L TDS
- Fresh Water 100-500 mg/L TDS
- Drinking Water <300 mg/L TDS
- Laboratory grade water <10 mg/L TDS

How is it currently being tested?

TDS meter

- Digital or analog meters that measure the electrical conductivity or water.
- Estimate what the true
 TDS levels might be.
- Use conversion factors to account for different quantities of dissolved substances.



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How is it currently being tested?

- Sample is filtered through a 1.5µm, washed and dried, glass fiber filter.
- Filtrate transferred into an evaporating dish.
- Liquid evaporated to dryness.
- Dish and residue heated to 180°C for one hour.
- Dish and residue cooled to room temperature and weighed on balance.
 - Repeat cycle of 180°C heating, cooling, and weighing until two consecutive ± 0.0005 g results.



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- Weight comparison sample vs. apparatus
 - Method approved sample yield 2.5-200 mg.
 - Currently approved TDS apparatuses set forth in SM 2540B. 2*a. 1-3.*
 - 1) Porcelain most common, least expensive
 - 2) Platinum lightest but most expensive
 - 3) High-silica glass
 - Porcelain weighs 80 grams on average
 - 400x 32,000x difference between sample

AI FXPI

 Weight comparison – sample vs. apparatus – 400x



Weight comparison – sample vs. apparatus
 – 32,000x



- Weight comparison weight stability vs. apparatus
 - Porcelain is a porous material and gains weight
 - ±0.0005 g relative to 80 g porcelain crucible

160,000X difference

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 Weight comparison – weight stability vs. apparatus
 – 160,000x



Time to cool crucible to room temperature

 Takes about 1 hr. to cool to balance temperature
 The best way to achieve consistent results is to allow the same cooling/desiccating time each time the sample is weighed

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- Washing and preparing crucibles for use
 - heat clean dish to 180 ± 2°C for 1 h in an oven.

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- Store in desiccator until needed.
- Weigh immediately before use.



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- Made from a patented proprietary material that is functional up to 200°C
- Preconditioned and preweighed.
- Holds about 300 mL of sample













- Vessels weigh around 3.8 grams
 About 20x less than a crucible
- Weight stable to ±0.0005 g
 - Less reweighing
- Cools to balance temperature in 15 minutes.

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- Ready to use out of box
- Disposable

	Lot	Printed Weight	First Weight	1st - Printed	Wght. Diff (in mg)	% Recovery	Second Weight	2nd - Printed	Wght. Diff (in mg)	% Recovery	2nd - 1st Weight (g)	Wght. Diff (in mg)
5 mg	189	3.8886	3.8936	0.005	5	100	3.8937	0.0051	5.1	102	1E-04	0.1
	197	3.8194	3.8244	0.005	5	100	3.8248	0.0054	5.4	108	0.0004	0.4
	207	4.0106	4.0162	0.0056	5.6	112	4.0162	0.0056	5.6	112	0	0
	198	3.909	3.9144	0.0054	5.4	108	3.9142	0.0052	5.2	104	-0.0002	-0.2
10 mg	203	3.824	3.8353	0.0113	11.3	113	3.8348	0.0108	10.8	108	-0.0005	-0.5
	209	3.9574	3.9679	0.0105	10.5	105	3.9676	0.0102	10.2	102	-0.0003	-0.3
	219	3.9624	3.9736	0.0112	11.2	112	3.9735	0.0111	11.1	111	-1E-04	-0.1
	195	3.7807	3.7911	0.0104	10.4	104	3.791	0.0103	10.3	103	-0.0001	-0.1
50 mg	199	3.889	3.9395	0.0505	50.5	101	3.9395	0.0505	50.5	101	0	0
	217	3.9285	3.98	0.0515	51.5	103	3.9797	0.0512	51.2	102.4	-0.0003	-0.3
	220	3.8972	3.9484	0.0512	51.2	102.4	3.9482	0.051	51	102	-0.0002	-0.2
	190	3.7883	3.8396	0.0513	51.3	102.6	3.8391	0.0508	50.8	101.6	-0.0005	-0.5
100 mg	204	3.8761	3.9786	0.1025	102.5	102.5	3.9786	0.1025	102.5	102.5	0	0
	230	3.9385	4.0412	0.1027	102.7	102.7	4.0409	0.1024	102.4	102.4	-0.0003	-0.3
	255	3.9911	4.0942	0.1031	103.1	103.1	4.0935	0.1024	102.4	102.4	-0.0007	-0.7
	254	3.6881	3.7916	0.1035	103.5	103.5	3.7912	0.1031	103.1	103.1	-0.0004	-0.4
200 mg	229	3.7694	3.972	0.2026	202.6	101.3	3.972	0.2026	202.6	101.3	0	0
	256	3.7293	3.9336	0.2043	204.3	102.15	3.9335	0.2042	204.2	102.1	-0.0001	-0.1
	252	3.7869	3.9917	0.2048	204.8	102.4	3.9913	0.2044	204.4	102.2	-0.0004	-0.4
	228	3.7959	4.001	0.2051	205.1	102.55	4.0002	0.2043	204.3	102.15	-0.0008	-0.8

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...what about method compliance?

Update to SM 2540B:

2*a.*4 Other material shown to be resistant to the sample matrix and weight stable at the required evaporation and drying temperatures.* Aluminum is **not** appropriate for this purpose.

*Environmental Express StableWeigh or other products giving demonstrably equivalent results to the proscribed crucibles.

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ASTM D5907-03:

11.2 Preparation of the Evaporating Dish:

11.2.1 If filterable matter (TDS) is to be determined, heat a clean dish to 178 to 182°C in an oven for 1 h. After removing from the oven, cool in desiccator and weigh to the nearest 0.1 mg and record weight.

NOTE 5—The dish should be as small as practical to contain the volume of the sample plus the rinses. The relative mass of the dish needs to be kept at a minimum in order to be able to measure small mass differences with any accuracy. This is because of the inherent difficulties of trying to control temperature and moisture on a large mass within the requirements of the test. For larger volumes, it may be more practical to evaporate smaller increments, refilling the dish when dry until all the sample is transferred.

NOTE 6—The dish should be made of a material that is inert to the sample. Materials such as aluminum will oxidize when heated with many liquids, increasing the mass of the pan. Glass or light weight ceramic material is generally preferred.

Launching April 15th!

Thank you for your time!

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Questions???

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