



Canadian Environmental Technology Verification (ETV) Information Bulletin

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Subject: Rationale and Procedure for D5 Correction Factor applied to Oil-Grit Separator Scour Test Data

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Overview

The capacity for Oil Grit Separators (OGS) to retain deposited sediments over the full range of flow rates to which they are subjected during storm events is an important performance parameter. The ability of OGS to retain sediments is evaluated in the CETV *Procedure for Laboratory Testing of Oil Grit Separators* by means of a 'sediment scour and resuspension test'. This test involves pre-loading fresh test sediment into devices and running clean water through the unit to determine how much of the pre-loaded sediment is scoured and discharged from the unit at high flow rates. Since the pre-loaded sediment contains very fine particles that may not be captured during normal operation, the *Procedure* allows fine particles to be mathematically removed from scour test effluent concentrations based on known particle size distributions (PSD) of retained and discharged sediment. Specifically, particles that are finer than those removed by the device during the lowest sediment capture test flow rate (40 L/min/m²) specified in the *Procedure* may be mathematically removed.

Since only a small proportion of very fine particles are typically found in the retained sediment, a threshold particle size needs to be determined to guide the process of mathematical removal. This is necessary because of relative differences in the amount of very fine particles available for scour during the sediment capture and scour tests. During the 40 L/min/m² sediment capture test, a quantity of test sediment is injected into the influent flow stream. Very fine particles with low settling velocities may be captured under this condition through processes of particle flocculation and/or incidental contact with the sediment bed (and 'armouring' by coarser particles), which would render the fine particles less susceptible to resuspension. Unlike the sediment capture test, the scour

test involves preloading of test sediment into the sedimentation chamber of the device. The test sediment contains 35% of particles less than or equal to 20 microns, which is a much larger proportion than would be normally captured during the 40 L/min/m² test. Under the preloaded condition, not only are there more fine particles available for scour, but the preloaded sediment particles will have had less opportunity than the injected sediment to interact and flocculate, potentially making them more available for scour. For this reason, CETV is allowing the smallest 5% of sediment (the D5) removed during the 40 L/min/m² capture test to be subtracted from the sediment scour effluent results, up to a maximum D5 particle size of 15 microns.

The procedure for the D5 correction is as follows:

First, the D5 of the PSD for the retained sediment in the 40 L/min/m² test is determined. For example:

Table 1: PSD data for sediment retained in 40 L/min/m² run

Table 1. Particle size distribution of retained sediment at surface loading rate of 40 L/min/m ²		
Particle size of retained sediment (µm)		Cumulative percent less than (%)
	1000	100
	500	85
	250	72
	150	35
	50	26
	20	20
	10	13
	8	9
	7	8
	5	6
	4	2.6
	3.5	2.3
	3.1	2
	2.9	1.5
	2.7	1.4
	2.5	1.2
	1.5	1
	1	0

Here the D5 is found by interpolation to be 4.7 microns

The next step is to look at the PSD for the effluent from each of the scour test flow rates and determine what percentage of the effluent sediment is smaller than the D5, 4.7 microns in this example. Table 2 shows sample scour effluent PSD data at 200 L/min/m².

Table 2. Scour test effluent sample PSD from the 200 L/min/m² run

Particle size of scoured sediment (µm)	Cumulative percent less than (%)
704	100
7.778	99.99
7.133	99.8
6.541	99.87
5.998	99.52
5.5	99.48
5.044	99.3
4.625	99.2
4.241	99.1
3.889	98.9
3.566	98.7
3.27	98.6
2.99	98.5
2.75	98.4
2.522	97.449
2.312	93.885
2.121	89.716
1.945	84.865
1.783	79.288
1.635	72.897
1.499	65.648
1.375	57.761
1.261	49.434
1.156	41.228
1.06	33.693
0.972	27.093
0.892	21.692
0.818	17.336
0.75	13.882
0.688	11.11
0.63	8.822
0.578	6.919
0.53	5.302
0.486	3.938
0.446	2.805
0.409	1.87
0.375	1.122
0.344	0.572
0.315	0.198
0.289	0

99.2% of the particles in the effluent sample are smaller than 4.7 microns. The formula for the D5 correction is as follows:

$$\text{Effluent sample concentration} * ((100 - \text{D5 percentile})/100)$$

Once the D5 correction is applied, the background concentration is subtracted and the final result is the effluent concentration to be reported. Table 3 shows an example of the table that would be included in a final technical evaluation or verification report.

Table 3: D5 corrected and background adjusted scoured sediment concentration

Flow rate	Background sample concentration	Effluent sample concentration	Adjusted concentrations after correction for D5 and background concentration (mg/L)
200	2	50	0
800	etc...	etc...	etc...
1400			
2000			
2600			