

WATER TREATMENT ADDITIVES

The Application

The discharger completes an application for approval to use a water treatment additive. The application contains the following information:

1. Name of the additive.
2. Whether the additive is a new one or is it a replacement for an existing approved additive.
3. Which outfall(s) discharge the additive
4. The concentration of the additive used in the treatment system and in the final discharge.
5. The applicant must demonstrate how the final concentration is determined.
6. The chemical composition of the additive as shown on Material Safety Data Sheets (MSDS).
7. The average blowdown rate of the system using the additive and the average discharge flow rate of all waste streams being discharged through the affected outfall.
8. Temperature, pH and hardness of the treatment system if relevant.
9. The toxicity of the additive expressed as the Lethal concentration to kill 50% of the test organism population (LC50) for as many types of organisms as possible.
10. Any decay rates of the additive.
11. Any other information that the applicant may have that will affect the final effluent concentration of the additive.

Determining the limits to meet Indiana Water Quality Standards

The discharger has to list all LC50 data for the whole product. The calculation of the WQBEL requires acute toxicity data for at least one of the following three genera in the family Daphnidae: Ceriodaphnia sp., Daphnia sp., or Simocephalus sp.

Organism	Test Duration (HOURS)	LC50(mg/l)
<u>Daphnidae</u>	<u>48 hrs</u>	<u> </u>
<u>Rainbow Trout</u>	<u>96 hrs</u>	<u> </u>
<u>Bluegill or Channel Catfish</u>	<u>96 hrs</u>	<u> </u>
<u>Phylum Chordata (Fish or Amphibian) (i)</u>	<u>96 hrs</u>	<u> </u>
<u>Benthic Crustacean (ii)</u>	<u>48 to 96 hrs</u>	<u> </u>
<u>Insect (iii)</u>	<u>48 hrs</u>	<u> </u>
<u>Rotifer, Annelida, Mollusca (iv)</u>	<u>48 to 96 hrs</u>	<u> </u>
<u>Other (v)</u>	<u>48 to 96 hrs</u>	<u> </u>

Examples:

- | | | |
|-------------------------|--|---|
| (i) Phylum Chordata | | Lungfish, frog, salamander, toad, etc. |
| (ii) Benthic crustacean | Vargula hilgendorffii
Cymodoce coronata
Caprella californica
crayfish | Sea Firefly
Marine Pill Bug
Skeleton shrimp
Crawdada |
| (iii) Insect | Order ephemeroptera | mayfly, |

odonoata	dragonfly, damselfly,
plecoptera	stonefly,
trichoptera	caddisfly,
diptera	mosquito, midge

(iv) Rotifera	No examples
Annelida	Segmented Worms and Leeches
Mollusca	Snails, Slugs, and Bivalves

(v) Other is specified in 327 IAC 2-1.5-11 (d)(2)(A) as “a family in any order of insect or any phylum not already represented.”

Choose the lowest LC50 listed above:

A. Enter the LC₅₀: _____ mg/liter B. Enter the Chronic Value: _____ mg/liter

For Comparison of Water Quality Criteria with Discharge Concentration of Water Treatment Additive:

Determination of Secondary Acute Value (SAV):

1. ALL FACILITIES

If all eight (8) minimum data requirements for calculating an FAV using Tier I (see 327 IAC 2-1.5-11(d)(2)(A)) are not met, a secondary acute value (SAV) shall be calculated using the lowest LC₅₀ value available for at least one of the following: Ceriodaphnia sp., Daphnia sp., or Simocephalus sp. The lowest LC₅₀ is divided by an adjustment factor, which corresponds to the number of satisfied data requirements listed in 327 IAC 2-1.5-11(d)(2)(A).

$$SAV = \frac{\text{Lowest LC}_{50} \text{ Listed Above}}{\text{Adjustment Factor}} = \text{_____ mg/liter}$$

Number of Minimum Data Requirements Satisfied	Adjustment Factor
1	21.9
2	13.0
3	8.0
4	7.0
5	6.1
6	5.2
7	4.3

Determination of Secondary Chronic Value (SCV):

2. FACILITIES WHICH HAVE A DILUTION FLOW OF LESS THAN 400:1 (Q_{7,10}/Q_e)

If the chronic value is not available then,

$$\text{Secondary Chronic Value (SCV)} = \frac{SAV}{18} = \text{_____ mg/liter}$$

Choose the appropriate Water Quality Criterion and the Water Treatment Additive Concentration from calculations immediately above and place in this blank:

a. Apply Acute Criterion for all Dischargers

Enter the concentration of the product at the Outfall:

Discharge Concentration= _____ mg/liter

SAV(Secondary Acute Value)= _____ mg/liter

b. Apply Chronic Criterion for Dilution Flow <400:1

Enter the receiving water concentration:

Receiving Water Concentration= _____ mg/liter

SCV(Secondary Chronic Value)= _____ mg/liter

Analysis

1. If the Discharge Concentration is greater than the SAV(Secondary Acute Value), then this chemical treatment additive is unacceptable for use.
2. If the Receiving Water concentration is greater than the calculated Secondary Chronic Value (SCV), then this chemical treatment additive is unacceptable for use.

Conclusions

Water treatment additives are only approved when the applicant has demonstrated that the additive will be discharged at a level which will not cause any acute or chronic toxicity to aquatic life. The SAV and SCV are very conservative values that ensure the protection of the aquatic life in the receiving stream. Water treatment additives are necessary to operate a treatment system at maximum efficiency and they reduce the loading of other pollutants in the discharge. Therefore the benefits of an additive always outweigh the detriment of having the pollutant in the discharge. If the discharger uses a large number of water treatment additives or a number of additives that have high toxicity, IDEM will place whole effluent toxicity testing in the permit to ensure that the additives do not produce any cumulative toxic effects to aquatic life.

Water treatment additives that are approved meet the definition of a de minimis lowering of water quality