TREATMENT DIVISION
SUPPLEMENTAL CARBON PRODUCT EVALUATION POLICY

SUBJECT: Evaluation and Use of Alternative Supplemental Carbon Products

DATE: December 1, 2011, *revised October 23, 2019*

OBJECTIVE

The objective of this policy is to establish procedures for the evaluation and procurement of Supplemental Carbon products for the treatment plants.

This policy provides an organized approach for competitive evaluation and purchase of those carbon sources which, based on price, are determined to be most cost effective for denitrification by:

1. Defining the responsibilities of Treatment Process Engineer and Suppliers.

2. Defining the terms used in this policy.

3. Outlining the evaluation guidelines for supplemental carbon products.

4. Summarizing pricing policies and criteria for selection.

TREATMENT PROCESS ENGINEER RESPONSIBILITY

The Treatment Process Engineer (TPE) has the flexibility and responsibility to investigate new supplemental carbon sources or re-evaluate existing products routinely. In evaluating and making purchases of supplemental carbon, the TPE is acting as an extension of HRSD's Chief of Procurement. The TPE has a responsibility to:

1. Evaluate the performance of supplemental carbon products in current use and contact the Suppliers when deterioration in performance is noted.

2. Contact other Suppliers, if the current Supplier is unable to satisfactorily improve process performance.

3. Consider new supplemental carbon sources.

4. Ensure that evaluations are non-biased.

5. Ensure documentation and procurement procedures are in accordance with this policy.

6. Ensure evaluation and purchases are conducted in accordance with this policy.

7. Ensure the confidentiality of the challenging Supplier's written pricing.

8. Ensure testing is conducted within the agreed upon testing schedule.

9. Provide the Supplier with the most recent version of the Supplemental Carbon Product Evaluation Policy.

SUPPLIER RESPONSIBILITY

Suppliers, whose products are being used, have a continuing responsibility to maintain their competitiveness by:

1. Ensuring that HRSD facilities are utilizing their most cost-effective product for any particular application.

2. Reviewing and adjusting product prices on a routine basis to maintain competiveness. Suppliers may lower their price at any time regardless of the contract period.

3. Evaluating the use of other supplemental carbon alternatives manufactured by their company, for improved process performance or cost- effectiveness.

4. Evaluating whether their products are being properly used and making recommendations concerning supplemental carbon use.

5. Ensuring their product is compatible with HRSD equipment and environment.

6. Ensuring the product delivered to HRSD is the same composition as that evaluated by HRSD. HRSD should be notified of changes in quality or chemical composition of the product.

7. Providing a Certificate of Analysis applicable for type of product and provide a copy with each shipment of a supplemental carbon source. The Certificate of Analysis shall provide a content breakdown of the following information, where applicable:

    Chemical content
    Viscosity, density (g/mL)
    COD content (g COD/L)
    Percent (%) methanol content

    The Supplier must also provide the expected COD/NO3-N ratio on that carbon source and the basis for this ratio. Supplier must indicate if the applicable COD: NO3-N ratio is unknown. HRSD has the right to check and test the ratio provided by the Supplier.

    HRSD may request additional analysis certification for metals or other organic or inorganic compounds.

DEFINITION OF TERMS

BENCH SCALE TESTING – Screening tests that provide indication of the potential supplemental carbon sources effectiveness with the biological nutrient removal process being used at the facility. These tests may include, but are not limited to:

Sequential Batch Reactor tests for denitrification, COD verification, etc.

CHALLENGING SUPPLIER – Supplier, whose product is not being used for a specific plant unit process application.

COD – Chemical Oxygen Demand

COD:NO_3-N RATIO – This is the ratio of the COD mass required to remove and equivalent mass of Nitrate. It can be expressed in terms of grams COD to grams nitrate (NO_3-N).

COST/LB NO_3 DENITRIFIED – This is the cost in dollars to remove one (1) pound mass of nitrate (NO_3-N).

EXISTING SUPPLIER – Supplier whose product is currently used for a specific plant unit process application.

NEW UNIT PROCESS – Any new unit process that has been added to the facility. Any existing unit process that has been modified from its original intended purpose and function can also be considered a new unit process.

NO_3-N – Nitrate Nitrogen

PURCHASE OF SUPPLEMENTAL CARBON PRODUCTS

Initiation of Supplemental Carbon Product Evaluation:

1. Existing Suppliers may propose different products from their company at any time mutually convenient to the Supplier and the plant.

2. Challenging Suppliers may request an evaluation of their supplemental carbon products by submitting a request through the HRSD Procurement Office. The letter must be submitted on company letterhead and signed by an authorized company representative. The letter must include the following information:

    - Supplemental carbon source product name and number
    - HRSD plant name
    - Minimum order requirements
    - Delivery lead time
    - Standard Packaging
    - MSDS sheet
    - Specifications
    - Certificate of Analysis
    - Certificate of Insurance
    - Chemical Formula/Content
    - Product Density (g/mL)
    - Product viscosity over the range from -10 to 40 °C
    - Product freezing point and boiling point
    - Product flash point
    - Product cost ($/gal)

- Product COD (g COD/L)
- Expected COD:NO_3-N (g COD required/g NO_3-N denitrified)

3. Treatment Process Engineer may initiate an evaluation of supplemental carbon sources at any time there is:

   - A sustained deterioration in nitrate (NO3-N) removal performance in the denitrification process.
   - A deterioration in product consistency or quality
   - A plant process upset where the carbon source is a suspected cause.

   Note: If a TPE notes deterioration in the existing Supplier's product performance, the existing Supplier should be contacted and given the opportunity to correct the problem, prior to contacting a challenging Supplier. The Procurement Division should be contacted if there are significant problems.

4. For "new unit process" installations, the TPE may either:

   - Initially utilize a carbon product currently in current use by HRSD, or a product which has been successfully used by HRSD or the wastewater industry and which is considered the best alternative for start up of a particular process. The TPE will document the reasons for selecting the particular product.

   - Initiate a request to supplemental carbon Suppliers for evaluation of their products that are deemed by HRSD to be compatible to the plant unit process application startup.

   - If not in current use by HRSD, the HRSD Procurement Division will be requested to obtain competitive pricing on the selected product.

   - Once startup of the plant unit process is stabilized alternative product challenges will be accepted.

Evaluation and Testing of Supplemental Carbon Products Testing:

1. Suppliers shall provide technical data and product specification documents for their product(s). The TPE should review the product documentation, and if a product appears competitive a sample of the product may be requested from the Supplier for HRSD laboratory analysis or testing as necessary.

2. Testing is not required for all supplemental carbon products. Products used successfully by HRSD or by the wastewater industry may not require testing and may be evaluated based on the criteria outlined in in this policy.

3. HRSD reserves the right to test any products at any time- either during or after the procurement process.

4. Bench scale or other product testing may be conducted at HRSD's option to evaluate denitrification kinetics, stoichiometry (COD: NO3-N ratio), and acclimation requirements, as well as potential operating problems (settling, inhibition, etc) prior to full-scale application.

5. As needed, carbon source products may be analyzed to determine specific chemical content to verify the Supplier Certificate of Analysis.

6. Suppliers will supply product volumes necessary for conducting extended laboratory testing at no cost to HRSD.

7. Additional requirements and testing may be imposed on a supplemental carbon product where full-scale testing is deemed impractical or costly, where demonstrated problems with a particular type of supplemental carbon product have occurred within HRSD, or where insufficient information or experience exists with a new and untried carbon source. The need for this testing will be determined by the TPE in consultation with a Treatment Chief with notification to the Procurement Division. HRSD would purchase sufficient product volumes at the quoted price to conduct any full scale testing.

8. All testing will be documented, and copies forwarded to the appropriate Treatment Chief and the Procurement Division. Suppliers may request copies of test results.

9. If the test results indicate product competitiveness in accordance with the criteria for changing products, the TPE will send a memo to Procurement requesting that a contract with the Supplier be established with a cost evaluation and justification.

Evaluation:

The TPE will perform an evaluation to compare the cost and performance of the existing carbon product to the challenging Supplier's supplemental carbon source. The TPE shall prepare a final evaluation with a recommendation concerning product use. The memo will summarize test data, the cost evaluation, and the impact of other factors impacting the overall recommendation. This memo shall be submitted through the appropriate Chief of Treatment to the Procurement Division. An example evaluation is attached at the end of this document.

1. The cost evaluations will consider the price submitted for the challenging product and the price of the existing supplemental carbon product in use by the plant in effect 30 days prior to the end of the existing Supplier's contract period.

   Note: the existing Supplier can reduce their price at any time.

2. Cost evaluations will compare the existing Supplier's product in use at the time of the request as compared to the challenging Supplier's product.

3. When products from an existing Supplier are compared, the cost criterion does not apply. An existing Supplier's product that meets the desired performance criteria and provides any cost savings as determined by the TPE is justification for changing products.

4. The evaluation will be based several factors as outlined below:

   - The total operating and capital cost of product use

   - The cost/lb NO_3-N removed The COD:NO_3-N ratio used for the evaluation will be determined from HRSD testing or other established data with appropriate documentation of the basis for selection of the ratio.

   - Other factors affecting both cost and plant operations including special safety equipment, labor requirements necessary to support the use of an alternative product, impacts on mixed liquor settling, product stability and shelf-life, and additional solids generated by differing biomass yield values. Additional factors, such as availability of supply will also be evaluated.

   - Cost evaluations should also include capital costs of any equipment that must be purchased to accommodate the proposed product. New equipment capital costs are annualized over a 3-year life, at an interest rate established by the Finance Manager and at current projected usage. The Supplier may supply tanks and equipment free of charge, with the understanding that challenging products may use this equipment for testing of their supplemental carbon product. Supplier furnished equipment must provide reliable operation. Excessive maintenance on Supplier furnished equipment is cause for termination of the test and/or contract with the Supplier.

Capital Cost of Equipment ($/MG) = $Annual\ CostTotal\ Million\ Gallons/3\ yr$

5. In order to change supplemental carbon products, the cost evaluation must show that:

   - Non-flammable challenge to an existing non-flammable product. The non-flammable challenging product must provide a total overall costs savings that is at least 10% of the existing product.

   - Flammable challenge to a flammable product: Flammable challenging product's total overall cost will require at minimum a 10% cost savings as compared to the cost/lb NO_3-N denitrified using 100% pure methanol or the current flammable carbon product in use. This bullet applies to pure flammable challenge and not pure product.

   - Glycerol cannot be utilized at the treatment plants that remove Phosphorus biologically which feed the product to the 1st or 2nd Anoxic zone.

PRICE POLICY

1. Suppliers will provide product pricing as $/gallon of product for the three scenarios noted below. HRSD will evaluate the performance of the product based on $/ (lbs. NO_3-N) removed. The Supplier will provide to HRSD the COD content, the yield and the C/N ratio for each product. These values will be utilized in the calculation to

convert to from $/gallon to $/lbs. of NO_3-N removed.

- Fixed unit cost for a 180 day contract period.
- Fixed unit cost for a 365 day contract.
- A floating cost determined by a +/- fixed percentage of current methanol cost (100%) as indicated by the Methanol Index or other relevant product price index. Evaluation will be based on contracted cost for pure Methanol.

2. Cost evaluation for the challenging and existing Supplier supplemental carbon products will be based on the price in effect 30 days prior to the end of the current contract with the existing Supplier.

3. Prices may not be increased during the contract period if a fixed price contract is awarded. Pricing may be reduced at any time to maintain the competitiveness of the product due to market trends and pricing. Once a challenging product has submitted an evaluation request, the existing Supplier's price cannot be lowered until the evaluation has been completed.

4. Prices submitted for any particular product will apply to all HRSD facilities using the product.

5. HRSD will maintain the confidentiality of written prices submitted for testing by the Challenging product to HRSD's Procurement Office. However, HRSD cannot maintain the confidentiality of prices verbally quoted to plant personnel. Suppliers are encouraged to reveal exact pricing only in their written submittal to the HRSD Procurement Office.

EXAMPLE SUPPLEMENTAL CARBON PRODUCT EVALUATION

CURRENT METHANOL DATA

Plant Flow Rate ……. .....15 MGD
Equivalent Nitrate concentration to be denitrified.....……..12 mg/L NO_3-N
Nitrate mass to be denitrified……. ..... 1,501 lbs/day NO_3-N
Methanol COD/NO_3-N Ratio (from table) ……4.8 lbs. COD:lb NO_3-N
COD Required…….……..... 7,206 lbs/day COD
Methanol Unit Cost..... $1.539/gal
Methanol Cost (from table) ……..……$0.74/lb. NO_3-N denitrified
Methanol Cost per day…… $1,111/day

CURRENT COSTS:

1. Methanol Cost/180 days = $1,111 x 180 = $199,980
2. Supplemental Costs = $ 6,058
   Off loading labor = $1,482
   Respirator Cartridges = $ 4,576
3. Total cost = 199,980 + 6,058 = $ 206,038

CHALLENGING SUPPLIER – Glycerol Blend Product

Plant Flow Rate ……. .....15 MGD
Equivalent Nitrate concentration to be denitrified...……...12 mg/L NO_3-N
Nitrate mass to be denitrified……... ..... 1,501 lbs/day NO_3-N
Glycerol product COD/NO_3-N Ratio (from table) …. ……5.7 lbs. COD:lb NO_3-N
COD Required……..……..... 8,556 lbs/day COD
Glycerol product Unit Cost $1.310/gal
Glycerol product Cost (from table) ……$0.89/lb. NO_3-N denitrified
Glycerol product Cost per day…… $1,336/day

CHALLENGING PRODUCT COSTS:

1. Glycerin Cost/180 days = 1,336 x 180 = $240,480
2. Supplemental Costs= $ 0 (Note: Non-flammable product)
3. Total cost = 240,480 + 0 = $ 240,480

COST DIFFERENCE:

Challenging Supplier =		$240,480
Current Supplier	=	$206,038
Difference	=	$ 34,442

CONCLUSION:

Since the cost/Lb NO_3-N denitrified is 17% higher than that of methanol and $34,442 is 17% higher in total cost on a 180 day contract basis, the glycerin product and pricing does not meet the criteria for changing products at this time.

Note: HRSD does reserve the right to test or switch to any new or hybrid products that become available at their discretion.

Product Comparison Table

Use table below to calculate the cost/lb NO_3-N denitrified. Enter values into the yellow cells under challenger. Do not enter any values into the blue shaded cells or the column labeled standard. Once the values are entered, you must change the security settings to enable macros prior to clicking the button below the table to update the cell calculations. The information used in the table below for the current standard and challenger are for example only and is not indicative of current pricing. Examples have been provided for pure and blended products and reflect the minimum data requirements.

	Existing Product	Challenger
Product Description	**100% Methanol (pure chemical)**	**Glycerin (blended product)**
Chemical Formula	**CH_4O**	**chemical analysis should be provided**
Product Density (g/mL)	**.7915**	**1.21**
Product Cost ($/gal)	**1.539**	**1.310**
Product COD (g COD/L)	**1,188**	**1,000**
COD:NO_3-N (g COD/g NO_3-N) Denitrified	**4.8**	**5.7**
Cost/Lb COD	**$ 0.155**	**$ 0.157**
Cost/Lb NO_3-N Denitrified	**$ 0.74**	**$ 0.89**
% +/- Premium		**17%**

Push to Update Table