**SWD INTERNAL PERMITTING MEMORANDUM**
**AND TECHNICAL EVALUATION**

TO: Kelley M. Boatwright
District Air Program Administrator

THRU: Nancy Knight
Air Permitting Engineer III

FROM: Richard Spaulding, PE
Air Permitting Engineer

DATE: August 2, 2013

SUBJECT: Draft Construction and Operation Permit Revision and Renewal Nos: 1030216-008-AC and 1030216-009-AO
Dynamet, Incorporated

Application Receipt Date: June 14, 2013 *(Time In-House Day 90 is 09/12/13)*

EU ID Nos. To Be Linked To This Project When Issued: All active EUs, 001 & 002

The primary purpose of these permits is to renew existing Permit No. 1030216-006-AO and continue operations at the plant. There is no new equipment, emission or increase in actual production.

A pre-draft version of these permits was emailed to Gary Robbins, Pinellas County on July 19, 2013. B.F. Riffee at Carpenter Technology and Ken Given at Air Testing were copied on the draft to allow their review and comment of the language changes in the permit. A response from Gary Robbins on July 24, 2013, pointed out three minor typographical errors which have been corrected. No other responses were received as of close of business July 26, 2013.

Technical Evaluation:

A potential source of confusion between these permits and previous combined 1030216-006-AO and 1030216-007-AC is that the current permit requests an *increase* in Hydrofluoric Acid (HF) to 8.82 tons/yr, when the previous permit stated a limit of 9.3 ton/year. This is the result of two minor oversights in the previous permit.

The first oversight is that it was not expressly stated in the previous combined 1030216-006-AO and 1030216-007-AC permit or the application whether the 9.3 tons/year limit of HF usage referred to the industrial grade solution of 49% by weight HF or to pure HF. This issue is not as obvious for the $H_2SO_4$ as the make-up solution of $H_2SO_4$ is 93%, so only a 7% error is introduced.

The second issue involves the method of acid usage calculation used. The 1030216-006-AO and 1030216-007-AC permit application used a weighted average to determine the density of the two acid dip solutions, i.e.

% HF X density of HF + % $H_2SO_4$ X density $H_2SO_4$ + % water X density of water = density of acid dip

Where % of each component by weight is multiplied by the density of the pure substance and the products then added together. Unfortunately, in the 1030216-006-AO and 1030216-007-AC permit application the densities for HF and $H_2SO_4$ used in the calculation of the acid dip solution density were based on the already diluted solutions, so that the calculations submitted were:

For acid dip # 1

% HF X density of HF + % $H_2SO_4$ X density $H_2SO_4$ + % water X density of water = density of acid dip
0.05 X 8.51 lb/gal + 0.10 X 8.89 lb/gal + 0.85 X 8.34 lb/gal = 8.403 lb/gal

And for acid dip #2:

% HF X density of HF + % $H_2SO_4$ X density $H_2SO_4$ + % water X density of water = density of acid dip
0.10 X 8.67 lb/gal + 0.15 X 9.19 lb/gal + 0.75 X 8.34 lb/gal = 8.5 lb/gal

The calculation should have used the densities of the pure substances, i.e.

For acid dip # 1

% HF X density of HF + % $H_2SO_4$ X density $H_2SO_4$ + % water X density of water = density of acid dip
0.05 X 11.319 lb/gal + 0.10 X 15.873 lb/gal + 0.85 X 8.34 lb/gal = 9.24 lb/gal

And for acid dip #2:

% HF X density of HF + % $H_2SO_4$ X density $H_2SO_4$ + % water X density of water = density of acid dip
0.10 X 11.319 lb/gal + 0.15 X 15.873 lb/gal + 0.75 X 8.34 lb/gal = 9.77 lb/gal

Note that due to miscibility issues and temperature differences, the actual operating densities will vary slightly and tend to be slightly lower.

The current application uses a more direct method to calculate the projected HF usage. This method is based on the actual production rates over the last 12 months, with production logs submitted to support the limits. The actual HF usage for the past 12 months is divided by the total mass of titanium processed, and this number multiplied by the requested production limit. The result is then given a small engineering safety factor buffer.

$$\frac{\text{12 month HF in lbs} \quad \text{X} \quad \text{titanium process rate requested}}{\text{Mass of titanium processed in 12 months in lbs X 2000 lb/ton}}$$

Or:

(12996 lb/yr HF X 2500 ton/yr Ti) / 3775509 lb/yr Ti X 2000 lb/ton) = 8.61 ton/year HF

Add a 2.5 % safety factor: 8.61 * 1.025 = 8.82 (within process round-off)

This calculation is based on actual usage and is not affected by temperature or miscibility of the components and therefore will improve reporting. The new limit also clarifies that it is based on the weight percent of the feed stock. As stated above the previous usage limits did not specify whether the allowed rate applied to pure acid or industrial strength acid stock. The 18 tons/year of HF requested in the current application is for 49% (by weight) HF stock. This is equivalent to 8.82 tons/year of pure HF (18 * 0.49 = 8.82).

The statement that this is an *increase* of HF usage is based on this 18 ton/year limit compared to the less specific 9.3 ton/year limit of the previous permit. This administrative clarification will not affect the production or emissions of the facility.