PROCESS REVIEW SUMMARY

<table>
<thead>
<tr>
<th>Facility:</th>
<th>Thermal Dynamics - Wastewater Evaporator</th>
<th>Engineer:</th>
<th>Tara E. Olson</th>
</tr>
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<tbody>
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<td>Location:</td>
<td>Thermal Dynamics Corporation</td>
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<td>Phone #:</td>
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<td>Industrial Park #2</td>
<td></td>
<td>(603) 298-5711</td>
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<td>West Lebanon, NH 03784-2006</td>
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<td>Date:</td>
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<td>AFS #:</td>
<td>3300990199</td>
<td>Application #:</td>
<td>FY05-0162</td>
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<td>Date:</td>
<td>10/17/05</td>
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<td>Page 1 of 7</td>
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CORRESPONDENCE

<table>
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<tr>
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<th>Description</th>
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<tr>
<td>9/2/05</td>
<td>DES-ARD received a request from Dan O’Neil, MFG Engineer, via email to review emissions from wastewater evaporator. Thermal Dynamics is applying for a Limited Permit from the Hazardous Waste Division and has been asked to review potential air permitting requirements associated with the evaporator.</td>
</tr>
<tr>
<td>10/10/05</td>
<td>Transmittal of various MSDSs by email of products used in the process potentially ending up in the evaporator.</td>
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PROJECT DESCRIPTION

Thermal Dynamics is reviewing requirements for a Limited Permit for their wastewater treatment evaporator in accordance with NH’s Hazardous Waste rules and has been requested from hazardous waste to evaluate whether an air permit is required for the evaporator. Dan O’Neil, MFG Engineer, has supplied wastewater analyses and specification on the evaporator. Mr. O’Neil also supplied various Material Safety Data Sheets (MSDSs) for other products (cleaners, fluxes, etc.) that may end up in the evaporator. ARD will use the wastewater data and information from the MSDSs to evaluate potential emissions in accordance with permitting requirements specified in NH’s Rule Governing the Control of Air Pollution.

PROCESS/DEVICE DESCRIPTION

Thermal Dynamics, located in West Lebanon, manufactures plasma arc cutting equipment. Operations performed at the facility include metal cutting and forming, powder coating, printed circuit board assembly, soldering and coating, transformer winding and coating, soldering, brazing and product testing and demonstration. Thermal Dynamics has a State Permit to Operate (PO-BP-2793) for the powder coating process which expires July 31, 2007

Thermal Dynamics maintains a 117 gallon evaporator which treats wastewater collected from various waste sources. The wastewater evaporator can potentially process 8 gallons/hr of wastewater. The wastewater is heated in the tank to boiling (212°F) by a heat exchanger. Air is drawn across the surface of the heated liquid, sweeping away water vapor as it breaks the surface. The moisture laden air is exhausted to the atmosphere via a 530 CFM blower. Any oil or sludge settle to the bottom and are sent off-site for further disposal.

See Process Diagrams below.
Wastewater collected in the 1,100-gallon holding tank comes from the following sources:
1) wastewater from brazing parts cleaning area;
2) wastewater from parts washers (3);
3) wastewater from powder coat wash;
4) oily water from compressor; and
5) wastewater from washing the shop floors.

A sample of wastewater was collected on 8/2/05 from the 1,100-gallon wastewater holding tank. The analyses are
included in the following table.

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Result (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>10.5 (Standard Units)</td>
</tr>
<tr>
<td>arsenic</td>
<td>0.009</td>
</tr>
<tr>
<td>barium</td>
<td>0.67</td>
</tr>
<tr>
<td>cadmium</td>
<td>0.045</td>
</tr>
<tr>
<td>chromium</td>
<td>0.019</td>
</tr>
<tr>
<td>lead</td>
<td>15</td>
</tr>
<tr>
<td>mercury</td>
<td>0.046</td>
</tr>
<tr>
<td>selenium</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>silver</td>
<td>0.012</td>
</tr>
<tr>
<td>propylene glycol</td>
<td>&lt;15 ppm (V/V)</td>
</tr>
<tr>
<td>% Halogens (as CL-)</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

Since VOCs were not analyzed in this waste sample and would be the contaminants of concern in a wastewater evaporator with respect to air emissions, DES additionally reviewed MSDSs of products that could potentially enter the wastewater stream and thus the evaporator. Based on a discussion with Dan O’Neil on 10/10/05, potential VOCs may enter the wastewater from the parts washer tanks (there are 3), from waste generated from washing the floors, and on occasion (one time per year) from the powder coat wash system.

1) MSDSs for the TEC Flux and Handy Flux were reviewed. The flux is brazed onto the part then is dipped into an acid wash followed by a final water rinse. Based on this rinse cycle, most of the flux not bound to the part would be found in the acid tank which does not discharge to the evaporator. Any residual flux found in the rinse tank which discharges to the evaporator could contain the following RTAPs:

- Ammonium chloride (CAS # 12125-02-9) 3-6%
- Hydrochloric acid (CAS #7647-01-0) 1-3%
- Lithium chloride (7447-41-8) <4%
- Zinc Chloride (7646-85-7) 40-50%
- Boric acid (CAS #10043-35-3) 15-30%
- Potassium Fluoride (CAS# 7789-23-3) 15-30%
- Potassium tetraborate tetrahydrate (CAS#12045-78-2) 15-30%

These RTAPs are not volatile and would not be expected to be emitted to the air. Residual concentration of flux products found in the wastewater would likely precipitate out as salts and be contained in the waste sludge.

2) A MSDS for the copper inhibitor was also reviewed for potential emissions via the evaporator. Approximately, 0.06 gallons (8 ounces) of the inhibitor is added to a 30–gallon rinse tank. The tank is discharged to the 1100-gallon holding tank approximately once a month. The rust inhibitor contains propylene glycol (CAS# 57-55-6) in 50-60% by weight. Propylene glycol is not an RTAP, nor a HAP but is considered a VOC and must be considered in potential emissions from the evaporator.

3) A MSDS for Cleanal E88 used in the parts cleaners was also reviewed. There are 3 separate cleaning stations each containing a 65-gallon tank. Approximately 0.19 gallons (24 ounces) of the Cleanal E88 is added to each 65-gallon parts cleaner tank. The 65-gallon tank(s) are discharged to the 1,100-gallon holding tank every week. The Cleanal contains the following RTAPs:
Ethanol, 2,2’,2”-Nitrilotris- (CAS #102-71-6, also known as triethanolamine) 15-20%
1-Propanol (CAS #34590-94-8, also known as dipropylene glycol methyl ether) 5-10%

4) A MSDS for Simple Green used as the floor cleaner was also reviewed. Approximately 0.008 gallons (1 ounce) of Simple Green is added to 3 gallons of water each time the floor is washed. The floor is washed every day and the wash water is changed out 4 times for each cleaning. The wastewater from the floor washing is discharged to the 1,100-gallon holding tank daily. Simple Green contains:

Butyl Cellosolve (CAS# 111-76-2) 6%

5) Metal parts that will be powder coated are washed in a 3-stage wash system prior to being powder coated. The metal part is first washed in an 1,100-gallon tank that contains tap water and acid cleaner (Sealtex 1571DS). The pH is maintained in this tank by adding CB-409 which is basically sodium hydroxide. The metal part is then rinsed in a 500-gallon tank that contains tap water only. The metal part gets a final rinse in the 3rd tank (500-gallons) which contains another cleaner (Sealtex 1523NCS). For the most part, waste from these tanks are treated off-site. On occasion, once/year, wastewater from these tanks could be treated in the evaporator.

The products added to the 3-stage wash system, include the following ingredients:

Ammonium Bifluoride (CAS#1341-49-7) 1-5% - Not an RTAP
Gluconic Acid (CAS#526-95-4) 1-5% - Not an RTAP
Sodium Hydroxide (CAS#1310-73-2) 30-60%
Phosphoric Acid (CAS#7664-38-2) 1-5%

These RTAPs completely dissolve in the water and are not volatile and would therefore not be emitted. Upon evaporation of the water, these RTAPs would precipitate out as salts and be found in the sludge.

It should be noted that oil from the oily/water mix from the compressors, is skimmed off the top of the liquid either before or after evaporation and does not get emitted and is, therefore, not considered in this evaluation.

**POLLUTION CONTROL EQUIPMENT**

None. Evaporator discharges water vapor to the atmosphere.

**EMISSION CALCULATIONS**

**Actual Emissions**

Emission calculations could be based on the data reported in the wastewater sample collected on 8/2/05, however, the analyses did not include VOCs and was not complete for emission purposes. For the most part, metals were detected in this sample. Since either dissolved or suspended metals in the wastewater will partition out as the water boils in the evaporator, the metals will settle out in the sludge and not be emitted to the atmosphere. For this reason, metals are not a significant concern with respect to emissions from the evaporator.

Similarly, residual chemicals found in the flux products (describe in 1) above) are not volatile and would precipitate out as salts as the water is heated in the evaporator. For this reason, these chemicals are not a significant concern with respect to emissions from the evaporator.
Since VOCs were not analyzed in the wastewater sample and are potentially present in the wastewater, an attempt was made to characterize the VOC content of the wastewater. This review included a mass balance evaluation based on information reported in the MSDSs of products potentially entering the waste stream and product use information.

Of consideration are:

- Propylene glycol emissions from the copper inhibitor rinse tank;
- Triethanolamine and dipropylene glycol methyl ether from the parts washing tanks (3); and
- Butyl cellosolve from the floor washing detergent.

**Propylene Glycol**
Found in Copper inhibitor
30-gallon tank emptied 1/month to the evaporator
Density = 8.92 lb/gal
0.06 gallons used each 30 gallon tank
0.06 gallons * 8.92 lbs/gal = 0.57 lbs copper inhibitor used each tank
0.57 lbs * 60% propylene glycol content = 0.33 lbs propylene glycol in each tank
assume all the propylene glycol found in the waste is emitted to the atmosphere, then
0.33 lbs * 12 times/year = 4.0 lbs/year propylene glycol emitted from the copper inhibitor rinse process

**Triethanolamine and dipropylene glycol methyl ether**
Found in Cleanal E88
0.19 gallons added to 65-gallon tank
Three 65-gallon tanks emptied weekly to the evaporator
Density of Cleanal = 9.0 lb/gal
0.19 gallons * 9.0 lb/gal = 1.71 lb Cleanal
1.71 lb * 20% (triethanolamine content) = 0.34 lbs triethanolamine in each tank
0.34 lb * 3 tanks * 52 weeks/year (emptied each week) = 53 lbs/year triethanolamine emitted from the Cleanal E88

53 lbs/year / 286 days/year = 0.18 lbs/day triethanolamine emitted from the Cleanal E88
1.71 lb * 10% (dipropylene glycol methyl ether content) = 0.17 lbs dipropylene glycol methyl ether in each tank
0.17 lb * 3 tanks * 52 weeks/year (emptied each week) = 26.5 lbs/year dipropylene glycol methyl ether emitted from the Cleanal E88

26.5 lbs/year / 286 days/year = 0.09 lb/day dipropylene glycol methyl ether emitted from the Cleanal E88

**Butyl Cellosolve**
Found in Simple Green Floor Cleaner
0.008 gallons added to 3-gallon bucket 4X daily emptied daily to evaporator
Density of Simple Green = 8.6 lb/gal
0.008 gallons * 8.6 lb/gal = 0.07 lbs * 4 = 0.27 lbs of Simple Green used daily
0.27 lbs * 6% (butyl cellosolve content) = 0.016 lbs/day butyl cellosolve emitted from the Simple Green cleaner
0.016 lbs/day * 260 days/year = 4.29 lbs/year butyl cellosolve emitted from the Simple Green cleaner

Based on this analysis, total VOC emissions are approximately 85 lbs/year well below the 10 tpy threshold requiring a permit. Similarly, RTAP emissions are below respective daily and annual deminimus values as seen below.

(Based on Actual Emissions)
**PROCESS REVIEW SUMMARY**

**Facility:** Thermal Dynamics - Wastewater Evaporator  
Engineer: Tara E. Olson

**Location:** Thermal Dynamics Corporation  
Industrial Park #2  
West Lebanon, NH 03784-2006  
Phone #: (603) 298-5711

**AFS #:** 3300990199  
**Application #:** FY05-0162  
**Date:** 10/17/05

<table>
<thead>
<tr>
<th>RTAP</th>
<th>CAS #</th>
<th>Daily emission (lb/day)</th>
<th>24-hr Deminimus (lb/day)</th>
<th>Annual Emission (lb/yr)</th>
<th>Annual Deminimus (lb/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propylene glycol</td>
<td>57-55-6</td>
<td>Not an RTAP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>triethanolamine</td>
<td>102-71-6</td>
<td>0.18</td>
<td>0.20</td>
<td>53</td>
<td>72</td>
</tr>
<tr>
<td>Dipropylene glycol</td>
<td>34590-94-8</td>
<td>0.09</td>
<td>24</td>
<td>26.5</td>
<td>8750</td>
</tr>
<tr>
<td>methyl ether</td>
<td></td>
<td>0.016</td>
<td>102</td>
<td>4.29</td>
<td>37318</td>
</tr>
</tbody>
</table>

**Potential Emissions**

Potential emissions are calculated as follows:

Thermal Dynamics processes approximately 880 gal/wk (or approximately 46,000 gallons/year) of wastewaster through the evaporator. The evaporator could potentially process 70,080 gal/year (8gal/hr * 24 hr/day * 365 day/yr). If 85 lbs/year of VOCs are emitted from a throughput of 46,000 gallons, then approximately 130 lbs/year of VOC emissions could be expected from a throughput of 70,080 given a similar process mix.

If individual RTAPs were evaluated for potential emissions using this same method, dipropylene glycol methyl ether and butyl cellosolve would still pass deminimus values, however, triethanolamine would need to be evaluated using in-stack method as shown below.

<table>
<thead>
<tr>
<th>RTAP</th>
<th>CAS #</th>
<th>Maximum Emissions (lbs/day)</th>
<th>Maximum Emissions (g/sec)</th>
<th>Maximum Emissions (ug/sec)</th>
<th>Stack Flowrate (acfm)</th>
<th>Stack Flowrate (m3/sec)</th>
<th>Facility In-Stack Conc* (ug/m3)</th>
<th>Adjusted In-Stack Conc** (ug/m3)</th>
<th>24-hr AAL (ug/m3)</th>
<th>Annual AAL (ug/m3)</th>
<th>Exceeds AAL?*** (Y/N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>triethanolamine</td>
<td>102-71-6</td>
<td>0.270</td>
<td>0.0014</td>
<td>1.417</td>
<td>530</td>
<td>0.250</td>
<td>5,666.62</td>
<td>14.17</td>
<td>25.00</td>
<td>17.00</td>
<td>N</td>
</tr>
</tbody>
</table>

Based on these assumptions, potential emissions from RTAPs found in the wastewater pass daily and annual AALs. Thermal Dynamics should maintain records documenting product use and process operations relative to the evaporator (similar to what is discussed in this process review summary) on an annual basis to evaluate compliance with NH’s air toxic rule.

**STACK INFORMATION**

Not known at this time. Calculations assume the exhaust stack is vertical and unobstructed.

**MODELING**

Not required at this point.

**EMISSION TESTING**

N/A

**SITE VISITS/INSPECTIONS AND/OR FUTURE ACTIVITY**

Not necessary

**REVIEW OF REGULATIONS**
**PROCES REVIEW SUMMARY**

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**State Regulations**

Env-A 600 – Permitting (effective 7/28/04)
- 607 – NO – PTE < regulatory thresholds. No permit required.
- 616 – NO – PTE < regulatory thresholds. No permit required.

Env-A 700 – Permit Fee System – NO – not applicable to source.

Env-A 900 - Recordkeeping and Reporting Obligations
- 907 - General Reporting Requirements – NO

Env-A 1400 – Regulated Toxic Air Pollutants (effective 2/05)
- 1402.01 – NO – RTAP emissions do not exceed deminimus levels.

**Federal Regulations**

- The source does not have the potential to emit VOCs greater than applicable thresholds.

**SUMMARY AND CONCLUSIONS**

Based on information supplied by Thermal Dynamics, a permit is not required for the wastewater evaporator. This evaluation assumes that the exhaust stack is not obstructed or directed downward. Additional review is necessary if any significant changes in waste composition or concentration or the detection of new constituents occur.