

Final Determination

SCM Corporation  
Organic Chemicals Division  
Duval County

Construction Permit  
Application Number:

AC 16-34907

Florida Department of Environmental Regulation

Bureau of Air Quality Management

Central Air Permitting

December 5, 1980

SCM CORPORATION, ORGANIC CHEMICALS DIVISION

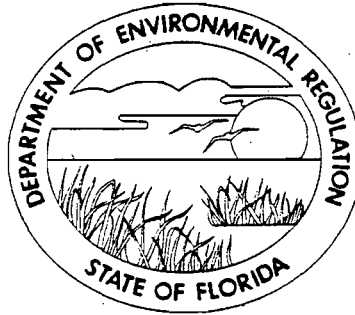
TERPENE REACTOR 171-1

DUVAL COUNTY

The construction application has been reviewed by the Department. Public notice of the Department's intent to issue was published in the Florida Times-Union on November 3, 1980. The preliminary determination and technical evaluation were available for public inspection at the Bio-Environmental Services, the DER St. Johns River Subdistrict and Bureau of Air Quality Management.

Comments were received from Duval County Bio-Environmental Services in regard to the VOC emission level permitted. Reconsidering the efficiency of the control device the emission level was adjusted since the amount remains de minimus.

It is recommended that the construction permit be issued with the above mentioned change.



STATE OF FLORIDA  
DEPARTMENT OF  
ENVIRONMENTAL REGULATION

CONSTRUCTION  
PERMIT

NO. AC 16-34907

SCM CORPORATION  
ORGANIC CHEMICALS DIVISION  
TERPENE REACTOR 171-1  
DUVAL COUNTY

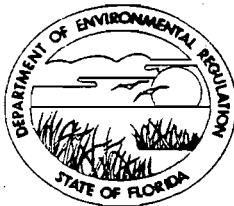
DATE OF ISSUANCE

5<sup>TH</sup> DECEMBER 1980

DATE OF EXPIRATION

SEPTEMBER 30, 1981

Jacob D. Varn  
JACOB D. VARN  
SECRETARY



STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

APPLICANT: SCM Corporation  
Organic Chemicals Division  
Box 389  
Jacksonville, Florida 32201

PERMIT/CERTIFICATION  
NO. AC 16-34907

COUNTY: Duval

PROJECT: Process Reactor  
171-1

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Chapter 17-1 & 17-2, Florida Administrative Code. The above named applicant, hereinafter called Permittee, is hereby authorized to perform the work or operate the facility shown on the approved drawing(s), plans, documents, and specifications attached hereto and made a part hereof and specifically described as follows:

For the installation of a sealed process reactor in Building 171. Volatile organic chemical (VOC) emissions are to be controlled by a Duall FW 300 scrubber. The plant is located at the foot of West 61st Street in Jacksonville, Florida. The universal transverse mercator and latitude, longitude coordinates are: UTM Zone 17, 435.600E, 3360.750N and 32° 72' 45" N by 81° 39' 50" W, respectively.

Attachments:

1. "Application to Construct Air Pollution Sources", DER form 17-1.122(16).
2. Letter of Incompleteness from DER to applicant.
3. Reply to letter of Incompleteness from applicant.

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations, and restrictions set forth herein are "Permit Conditions", and as such are binding upon the permittee and enforceable pursuant to the authority of Section 403.161(1), Florida Statutes. Permittee is hereby placed

PERMIT NO.:

APPLICANT:

on notice that the department will review this permit periodically and may initiate court action for any violation of the "Permit Conditions" by the permittee, its agents, employees, servants or representatives.

2. This permit is valid only for the specific processes and operations indicated in the attached drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit shall constitute grounds for revocation and enforcement action by the department.

3. If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately notify and provide the department with the following information: (a) a description of and cause of non-compliance; and (b) the period of non-compliance, including exact dates and times; or, if not corrected, the anticipated time the non-compliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the non-compliance. The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the department for penalties or revocation of this permit.

4. As provided in subsection 403.087(6), Florida Statutes, the issuance of this permit does not convey any vested rights or any exclusive privileges. Nor does it authorize any injury to public or private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.

5. This permit is required to be posted in a conspicuous location at the work site or source during the entire period of construction or operation.

6. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source, which are submitted to the department, may be used by the department as evidence in any enforcement case arising under the Florida Statutes or department rules, except where such use is proscribed by Section 403.111, F.S.

7. In the case of an operation permit, permittee agrees to comply with changes in department rules and Florida Statutes after a reasonable time for compliance, provided, however, the permittee does not waive any other rights granted by Florida Statutes or department rules.

8. This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, plant, or aquatic life or property and penalties therefore caused by the construction or operation of this permitted source, nor does it allow the permittee to cause pollution in contravention of Florida Statutes and department rules, except where specifically authorized by an order from the department granting a variance or exception from department rules or state statutes.

9. This permit is not transferable. Upon sale or legal transfer of the property or facility covered by this permit, the permittee shall notify the department within thirty (30) days. The new owner must apply for a permit transfer within thirty (30) days. The permittee shall be liable for any non-compliance of the permitted source until the transferee applies for and receives a transfer of permit.

10. The permittee, by acceptance of this permit, specifically agrees to allow access to permitted source at reasonable times by department personnel presenting credentials for the purposes of inspection and testing to determine compliance with this permit and department rules.

11. This permit does not indicate a waiver of or approval of any other department permit that may be required for other aspects of the total project.

12. This permit conveys no title to land or water, nor constitutes state recognition or acknowledgement of title, and does not constitute authority for the reclamation of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the state. Only the Trustees of the Internal Improvement Trust Fund may express state opinion as to title.

13. This permit also constitutes:

- ☐ Determination of Best Available Control Technology (BACT)
- ☐ Determination of Prevention of Significant Deterioration (PSD)
- ☐ Certification of Compliance with State Water Quality Standards (Section 401, PL 92-500)

SPECIFIC CONDITIONS:

PERMIT NO.: AC 16-34907  
APPLICANT: SCM Corporation

SPECIFIC CONDITIONS

1. The maximum allowable VOC emissions from Reactor 171-1 shall be:  
0.73 lbs./hr.            3.2 tons/year
2. The maximum solvent input shall be 102 pounds per hour (447 TPY) and 187 pounds per hour other reactants (819 TPY).
3. The maximum operating schedule will be 8,760 hour per year.
4. The effectiveness of the absorbent in the control device shall be checked by gas chromatograph analysis prior to each batch charged.
5. Following approval of test results and prior to 90 days before expiration a complete application for an Operation Permit shall be submitted to the DER, St. Johns River Suvdistrict office or its designee. Full operation of the source may then be conducted in compliance with the terms of this permit until expiration or receipt of an Operation Permit.

Jacob D. Varn  
Jacob D. Varn  
Secretary

Expiration Date: September 30, 1981

Issued this 5<sup>TH</sup> day of DECEMBER, 19 80.

STATE OF FLORIDA  
DEPARTMENT OF ENVIRONMENTAL REGULATION

Check Sheet

Company Name: SCM Corporation  
Permit Number: AC 10-034907  
PSD Number: \_\_\_\_\_  
Permit Engineer: \_\_\_\_\_

**Application:**

- |                                                         |                          |
|---------------------------------------------------------|--------------------------|
| <input checked="" type="checkbox"/> Initial Application | Cross References:        |
| <input type="checkbox"/> Incompleteness Letters         | <input type="checkbox"/> |
| <input type="checkbox"/> Responses                      | <input type="checkbox"/> |
| <input type="checkbox"/> Waiver of Department Action    | <input type="checkbox"/> |
| <input type="checkbox"/> Department Response            |                          |
| <input type="checkbox"/> Other                          |                          |

**Intent:**

- ☐ Intent to Issue
  - ☐ Notice of Intent to Issue
  - ☒ Technical Evaluation
  - ☐ BACT or LAER Determination
  - ☐ Unsigned Permit
- Correspondence with:
- ☐ EPA
  - ☐ Park Services
  - ☐ Other
- ☒ Proof of Publication
    - ☐ Petitions - (Related to extensions, hearings, etc.)
    - ☐ Waiver of Department Action
    - ☐ Other

**Final**

**Determination:**

- ☒ Final Determination
- ☒ Signed Permit
- ☐ BACT or LAER Determination
- ☐ Other

**Post Permit Correspondence:**

- ☒ Extensions/Amendments/Modifications
- ☒ Other

In the folder labeled as follows there are documents, listed below, which were not reproduced in this electronic file. That folder can be found in one of the file drawers labeled Supplementary Documents Drawer. Folders in that drawer are arranged alphabetically, then by permit number.

**Folder Name:** SCM Corporation

**Permit(s) Numbered:**

AC	16	-	034907
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Period during  
which document  
was received:

Detailed Description

APPLICATION 16 SEP 1980	1.	13"×28" BLUEPRINT: GLIDDEN-DURKEE ORGANIC CHEMICALS JACKSONVILLE PLANT LOCATION OF REACTORS & JET SYSTEMS AND BULK TANKS (DRAWING NUMBER: 5000-2) DRAWN 9/29/70, REV #7
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State of Florida

DEPARTMENT OF ENVIRONMENTAL REGULATION

INTEROFFICE MEMORANDUM

For Routing To District Offices  
And/Or To Other Than The Addressee

To: _____	Locn.: _____
To: _____	Locn.: _____
To: _____	Locn.: _____
From: _____	Date: _____

TO: Files

FROM: Teresa M. Heron

DATE: June 19, 1981

SUBJ: ASTM - Standard Specification for Isopropyl Alcohol

## Methods.

- Standard Precipitation for Isopropyl Alcohol.
- Volatile alcohols in water by direct aqueous-injection gas chromatography.
- Specific gravity of industrial aromatic hydrocarbons and related materials.
- Calculation of volume and weight of industrial chemical liquids.
- Photovolt's Aquatest.
- Water in volatile solvents.
- Gas chromatography method for Determining Purity of Ethanol.

Designation: D 770 - 70 (Reapproved 1975)<sup>1</sup>

## Standard Specification for ISOPROPYL ALCOHOL<sup>1,2</sup>

This Standard is issued under the fixed designation D 770; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval.

<sup>1</sup>NOTE—Editorial changes were made in the title and Sections 1 and 2 in August 1975.

### 1. Scope

1.1 This specification covers isopropyl alcohol (99 percent grade).

### 2. Properties

2.1 Isopropyl alcohol shall conform to the following requirements:

Specific gravity, 20/20 C	0.785 to 0.787
25/25 C	0.782 to 0.784
Color	not more than No. 10 on the platinum-cobalt scale
Distillation range	shall distill entirely within a 1.5 C range which shall include 82.3 C
Nonvolatile matter	not more than 0.005 g/100 ml
Odor	Characteristic, nonresidual
Water	not more than 0.2 weight percent. This quantitative water limit ensures that the material is miscible without turbidity with 19 volumes of 99 percent heptane at 20 C
Acidity (free acid as acetic acid)	not more than 0.002 weight percent, equivalent to 0.019 mg KOH per gram of sample
Water miscibility	miscible without turbidity when diluted to 10 volumes with distilled water at 25 C

### 3. Sampling

3.1 The material shall be sampled in accordance with ASTM Methods D 268, Sampling and Testing Volatile Solvents for Use in Paint, Varnish, Lacquer, and Related Products.<sup>3</sup>

### 4. Test Methods

4.1 The properties enumerated in this specification shall be determined in accordance with the following ASTM methods:

4.1.1 *Specific Gravity*—Determine the specific gravity by any convenient method that is accurate to the third decimal place, the temperature of both sample and water being 20 C. See Methods D 268.

4.1.2 *Color*—Method D 1209, Test for Color of Clear Liquids (Platinum Cobalt Scale).<sup>3</sup>

4.1.3 *Distillation Range*—Method D 1078, Test for Distillation Range of Volatile Organic Liquids,<sup>3</sup> an ASTM Solvents Distillation Thermometer 40C having a range from 72 to 126 C and conforming to the requirements in ASTM Specifications E 1, for ASTM Thermometers.<sup>4</sup>

4.1.4 *Nonvolatile Matter*—Method D 1353, Test for Nonvolatile Matter in Volatile Solvents for Use in Paint, Varnish, Lacquer, and Related Products.<sup>3</sup>

4.1.5 *Odor*—Method D 1296, Test for Odor of Volatile Solvents and Diluents.<sup>3</sup>

4.1.6 *Water*—Method D 1364, Test for Water in Volatile Solvents (Fischer Reagent Titration Method)<sup>3</sup> and Method D 1476, Test for Heptane Miscibility of Lacquer Solvents.<sup>3</sup>

4.1.7 *Acidity*—Method D 1613, Test for Acidity in Volatile Solvents and Chemical

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee D-1 on Paint and Related Coatings and Materials.

Current edition accepted Dec. 24, 1970. Originally issued 1944. Replaces D 770 - 64.

<sup>2</sup> This compound is also known under the name propanol 2 and isopropanol.

<sup>3</sup> Annual Book of ASTM Standards, Part 29.

<sup>4</sup> Annual Book of ASTM Standards, Parts 25 and 44.





- D 1364 Test for Water in Volatile Solvents (Fischer Reagent Titration Method)<sup>2</sup>
- D 1476 Test for Heptane Miscibility of Lacquer Solvents<sup>2</sup>
- D 1555 Calculation of Volume and Weight of Industrial Aromatic Hydrocarbons<sup>2, 3</sup>
- D 1613 Test for Acidity in Volatile Solvents and Chemical Intermediates Used in Paint, Varnish, Lacquer, and Related Products<sup>2</sup>
- D 1614 Test for Alkalinity in Acetone<sup>2</sup>
- D 1616 Test for Copper Corrosion by Mineral Spirits (Copper Strip Test)<sup>2</sup>
- D 1617 Test for Ester Value of Lacquer Solvents and Thinners<sup>2</sup>
- D 1720 Test for Dilution Ratio in Cellulose Nitrate Solutions for Active Solvents, Hydrocarbon Diluents, and Cellulose Nitrates<sup>2</sup>
- D 1722 Test for Water Miscibility of Water-Soluble Solvents<sup>2</sup>
- D 2360 Test for Nonaromatic Hydrocarbons in Monocyclic Aromatic Hydrocarbons by Gas Chromatography<sup>2</sup>
- D 2804 Test for Purity of Methyl Ethyl Ketone Gas Chromatography<sup>2</sup>
- D 3257 Test for Aromatics in Mineral Spirits by Gas Chromatography<sup>2</sup>
- D 3278 Tests for Flash Point of Liquids by Setflash Closed Tester<sup>2</sup>
- D 3329 Test for Methyl Isobutyl Ketone Analysis by Gas Chromatography<sup>2</sup>
- E 12 Definitions of Terms Relating to Density and Specific Gravity of Solids, Liquids, and Gases<sup>4</sup>
- E 201 Calculation of Volume and Weight of Industrial Chemical Liquids<sup>5</sup>
- E 202 Analysis of Ethylene Glycols and Propylene Glycols<sup>2, 5</sup>
- E 203 Test for Water Using Karl Fischer Reagent<sup>5</sup>
- E 300 Recommended Practice for Sampling Industrial Chemicals<sup>2, 5</sup>
- E 346 Analysis of Methanol<sup>2, 5</sup>

### 3. Sampling

3.1 Representative samples are a prerequisite for the evaluation of any product. The directions for obtaining representative samples cannot be made explicit to cover all cases and must be supplemented by judgment, skill, and

sampling experience. It is recommended that Recommended Practice E 300, be employed in sampling liquid solvents.

### 4. Specific Gravity

4.1 Specific gravity of liquids is defined in Definitions E 12, as "the ratio of the mass of a unit volume of a material to the mass of the same volume of gas-free distilled water at a stated temperature." When the stated temperature of the water is taken at 4.0°C, specific gravity and density are numerically equal.

4.2 The apparent specific gravity of a liquid is defined in Definitions E 12 as "the ratio of the weight in air of a unit volume of material at a stated temperature to the weight in air of equal density of an equal volume of gas-free, distilled water at a stated temperature."

NOTE 1—Specific gravity or density is an intrinsic property of all substances and can to a degree be used to identify them. When such substances are of high purity, specific gravity may be used in support of other properties to define their degree of purity. The use of specific gravity for such purposes, however, is valid only when all components and their relative effects upon the specific gravity of the system are known.

4.3 The choice of method for determining specific gravity is largely dependent on the degree of accuracy required. In general, when the product specification requires an accuracy to the third decimal place, the hydrometer or specific gravity balance method may be employed. When the product specification requires an accuracy to the fourth decimal place, a pycnometer method should be employed. Methods D 891, give procedures using all three techniques.

4.4 Apparent specific gravity measurements also provide a convenient means for determining the weight of a measured volume of a liquid and are used for this purpose in computing the weight of solvents that are bought and sold on a weight basis. A detailed description of the methods for converting specific gravity data to weight and volume data at various temperatures is given in Method E 201, for oxygenated and chlorinated compounds; similar data for aromatic hydrocarbons are given in Method D 1555.

<sup>2</sup> Annual Book of ASTM Standards, Parts 14 and 41.

<sup>5</sup> Annual Book of ASTM Standards, Part 30.





## Standard Test Method for VOLATILE ALCOHOLS IN WATER BY DIRECT AQUEOUS-INJECTION GAS CHROMATOGRAPHY<sup>1</sup>

This standard is issued under the fixed designation D 3695; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval.

### 1. Scope

1.1 This method covers a wide range of alcohols with various structures and boiling points that can be separated and detected quantitatively in water and wastewater at a minimum detection limit of approximately 1 mg/litre by aqueous-injection gas-liquid chromatography.<sup>2</sup> This method can also be used to detect other volatile organic compounds qualitatively. Organic acids, amines, and high-boiling, highly polar compounds are not readily detectable under this set of conditions. For analysis of organics with similar functionalities, refer to other methods in Part 31.

1.2 This method utilizes the procedures and precautions as described in Practice D 2908. Utilize the procedures and precautions as described therein.

### 2. Applicable Documents

- 2.1 *ASTM Standards:*  
D 1129 Definitions of Terms Relating to Water<sup>3</sup>  
D 1192 Specification for Equipment for Sampling Water and Steam<sup>3</sup>  
D 1193 Specification for Reagent Water<sup>2</sup>  
D 2908 Practice for Measuring Volatile Organic Matter in Water by Aqueous-Injection Gas Chromatography<sup>2</sup>  
E 260 Recommended Practice for General Gas Chromatography Procedures<sup>4</sup>  
E 355 Recommended Practice for Gas Chromatography Terms and Relationships<sup>4</sup>

### 3. Summary of Method

3.1 An aliquot of an aqueous sample is

directly injected into a gas chromatography by means of a microlitre syringe. The organic compounds in the sample are separated and eluted from a chromatographic column into a flame ionization detector. The compounds are identified by relative retention time or Kováts Index and measured by direct comparison with corresponding standard responses.

### 4. Significance

4.1 The major organic constituents in industrial wastewater need to be identified for support of effective in-plant or pollution control programs. Currently the most practical means for tentatively identifying and measuring a range of volatile organic compounds is gas-liquid chromatography.

### 5. Definitions

5.1 For definitions of terms used in this method, refer to Definitions D 1129, and Recommended Practice E 355.

### 6. Interferences

6.1 Since the specified column and conditions are applicable to numerous organics, the possibility of one or more components having identical retention times is always present.

<sup>1</sup> This method is under the jurisdiction of ASTM Committee D-19 on Water and is the direct responsibility for Subcommittee D 19.06 on Methods for Analysis for Organic Substances in Water.

Current edition approved Aug. 18, 1978. Published October 1978.

<sup>2</sup> Sugar, J. W., and Conway, R. A., "Gas-Liquid Chromatographic Techniques for Petrochemical Waste Water Analysis," *Journal of the Water Pollution Control Federation*, JWPCA, Vol. 40, 1968, pp 1622-1631.

<sup>3</sup> Annual Book of ASTM Standards, Part 31.

<sup>4</sup> Annual Book of ASTM Standards, Part 42.

# Best Available Copy



D 3695

Therefore, the analyst must determine the qualitative identity of the components of each peak by spectrometric techniques or a multi-column approach, or both, so that proper quantitation for those compounds of interest may be made.

## 7. Apparatus

7.1 *Gas Chromatograph and Accessory Equipment*, described in D 2908, Sections 6.1 through 6.6, is used for this analysis.

7.2 *Column: Carbowax 20 M<sup>5</sup> (5 %) on 80/100 Acid-Washed Chromosorb W,<sup>6</sup> 6.1-mm (20-ft), 3.2-mm (1/8-in.) outside diameter, 0.508-mm wall thickness, stainless steel.*

## 8. Reagents

8.1 *Purity of Reagents*—Reagent grade chemicals shall be used. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available.<sup>7</sup> Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

8.2 *Purity of Water*—Unless otherwise indicated, references to water shall be understood to mean reagent water conforming to Specification D 1192, Type I.

8.3 *Calibration and Standardization*—Prepare a stock solution of the materials of interest by weighing a known amount of each, 1.00 g or less, diluting with water to 1 litre, and mixing. Subsequent dilutions should be prepared as deemed necessary.

## 9. Sampling

9.1 Collect the samples in accordance with the procedures outlined in Method D 2908.

## 10. Procedure

10.1 Utilize the procedures as described in Recommended Practice D 2908.

## 11. Typical Chromatogram

### 11.1 Instrument Parameters:

Column	Carbowax 20 mm (5%) 80/100 AW Chromosorb W., (6.1-mm) 20-ft, 3.2-mm (1/8-in.) outside diameter, S.S.
Detector	flame ionization
Temperatures	injected, 165 to 260°C detector, 250°C column, 50 to 250°C at 8°C/min carrier, He about 45 millilitres/min
Gases	
Sample size	10 µlitre
Recorder	chart speed, 1.3 cm/min (0.5 in/min); full scale response, 1 mV (23.3 cm).

11.2 See Fig. 1.

## 12. Precision and Accuracy\*

12.1 Six laboratories determined the precision and accuracy of the procedure performing triplicate analyses at three levels in both natural and distilled water (see Table 2).

12.2 Express the respective precisions as shown in Table 3.

12.3 The precision and accuracy data presented in 12.1 and 12.2 were based on an interlaboratory collaborative study with samples containing alcohols only. The precision and accuracy of this procedure for the other compounds covered by the procedure may vary from this data.

<sup>5</sup> Carbowax is a trademark of Glyco Products Co.

<sup>6</sup> Chromosorb W is a trademark of Johns-Manville Products Co.

<sup>7</sup> "Reagent Chemicals, American Chemical Society Specifications," Am. Chemical Soc., Washington, D.C. For suggestions on the testing of reagents not listed by the American Chemical Society, see "Reagent Chemicals and Standards," by Joseph Rosin, D. Van Nostrand Co., Inc., New York, N. Y., and the "United States Pharmacopeia."

\* Supporting data giving results of cooperating testing have been filed at ASTM Headquarters as RR:D 19-1045.





## Standard Test Methods for SPECIFIC GRAVITY OF INDUSTRIAL AROMATIC HYDROCARBONS AND RELATED MATERIALS<sup>1</sup>

This Standard is issued under the fixed designation D 891; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval.

These methods have been approved for use by agencies of the Department of Defense to replace Method 4183 of Federal Test Method Standard No. 141A and for listing in the DoD Index of Specifications and Standards.

\* Note—Editorial changes were made throughout in October 1976.

### 1. Scope

1.1 These methods<sup>2</sup> cover the determination of the specific gravity (Note 1) of industrial aromatic hydrocarbons and related materials. They define suitable apparatus and procedures and furnish details underlying the interpretation of test data and the selection of numerical limits for agreement among interested persons and agencies.

NOTE—As defined in 2.1.

1.2 Four methods are covered as follows:

1.2.1 *Method A*, specific gravity by means of a specific gravity balance.

1.2.2 *Method B*, specific gravity by means of a hydrometer.

1.2.3 *Method C*, specific gravity by means of a pycnometer.

1.2.4 *Method D*, specific gravity by means of a vacuum pycnometer.

NOTE 3—In referee problems, the pycnometer method (Method C) shall be used.

### 2. Definitions<sup>3</sup>

2.1 *specific gravity*—the ratio of the weight in air of a given volume of the material at a stated temperature to the weight in air of an equal volume of distilled water at a stated temperature. It shall be stated as follows:

2.1.1 When the temperatures of the material and of the water are the same:

Specific gravity,  $x/x$  C

where  $x$  is the temperature of the material

and the water.

2.1.2 When the temperature of the material and of the water are *not the same*:

Specific gravity,  $x/y$  C

where  $x$  is the temperature of the material and  $y$  is the temperature of the water.

2.2 *absolute specific gravity*—the ratio of the weight referred to vacuum of a given volume of the material at a stated temperature to the weight referred to vacuum of an equal volume of gas-free distilled water (Note

<sup>1</sup>These methods are under the jurisdiction of ASTM Committee D-16 on Aromatic Hydrocarbons and Related Chemicals and are the direct responsibility of Subcommittee D16.0A on BTX, Cyclohexene, and Their Derivatives.

Current edition accepted Sept. 10, 1959. Originally issued 1946. Replaces D 891 - 51.

<sup>2</sup>For information concerning the development of these methods, see the following references:

ASTM Definitions D 16, Terms Relating to Paint, Varnish, Lacquer, and Related Products, which appears in the *Annual Book of ASTM Standards*, Part 29; ASTM Method D 287, Test for API Gravity of Crude Petroleum and Petroleum Products (Hydrometer Method), see *Annual Book of ASTM Standards*, Part 23; ASTM Definitions E 12, Terms Relating to Density and Specific Gravity of Solids, Liquids, and Gases, see *Annual Book of ASTM Standards*, Parts 14 and 41.

"Testing of Hydrometers," *Circular No. 16*, Nat. Bureau Standards; "Standard Density and Volumetric Tables," *Circular No. 19*, NBSA, Nat. Bureau Standards.

"Methods of the Chemists of the U.S. Steel Corp. for the Sampling and Analysis of Coal, Coke, and By-Products," Carnegie Steel Co., Bureau of Technical Instruction, Pittsburgh, Pa., 1929.

Griffin, R. C., *Technical Methods of Analysis*, McGraw-Hill Book Co., Inc., New York, N. Y., 1921.

<sup>3</sup>These definitions are in compliance with Definitions E 12.

4) at a stated temperature. It shall be stated as follows:

2.2.1 When the temperatures of the material and of the water are the *same*:

Absolute specific gravity,  $x/\Delta$  C

where  $x$  is the temperature of the material and the water.

2.2.2 When the temperatures of the material and of the water are *not the same*:

Absolute specific gravity,  $x/y$  C

where  $x$  is the temperature of the material and  $y$  is the temperature of the water.

NOTE 4—Gas-free distilled water is distilled water which has been boiled to eliminate dissolved gases.

### 3. Test Temperatures

3.1 Material specifications often specify different temperatures at which specific gravity shall be measured (Note 5), for example:

Specific gravity at 15.56/15.56 C,  
Specific gravity at 20/20 C,  
Specific gravity at 25/25 C, or  
Specific gravity at 60/60 F

Where precision is desired, it is necessary to determine the specific gravity at the temperature prescribed in the specifications for the material to be tested and to use instruments that have been calibrated and standardized at the specified temperature.

NOTE 5—For the significance and interpretation of expressions such as "specific gravity at 25/15.56 C" see 14.2.

3.2 For some of the liquids, an agreement may be reached as to the coefficient of expansion of the product. In such cases the specific gravity may be changed from one temperature basis to another as described in 14.3.

### METHOD A—SPECIFIC GRAVITY BY MEANS OF A SPECIFIC GRAVITY BALANCE

#### 4. Apparatus

4.1 *Balance*—Westphal or equivalent balance, capable of determining specific gravity to the fourth decimal place, and equipped with a plummet for use at 15.56 C.

4.2 *Cylinder*—The cylinder may be of metal or of clear glass, with a lip on the rim

for convenience in pouring. A convenient size of cylinder is approximately 1½ in. (38.1 mm) in diameter and 5 in. (127 mm) in height.

4.3 *Thermometer*—An ASTM Gravity Thermometer having a range from 20 to +102 C and conforming to the requirements for Thermometer, 12C as prescribed in ASTM Specifications E 1, for ASTM Thermometers.<sup>4, 5</sup>

4.4 *Water Bath*—A water bath capable of maintaining a temperature of 15.56 ± 0.05 C during the test.

#### 5. Procedure

5.1 Cool the sample in the original closed container to the temperature specified for the test. The thermometer, plummet, and cylinder should be at about the same temperature. Take care to prevent the temperature of the sample from changing appreciably during the time necessary to complete the test. This may be done by placing the test cylinder in the water bath maintained at the necessary temperature during the time of the test. Sufficient time shall be allowed to permit the plummet, cylinder, and thermometer to reach the specified temperature. In cases of dispute it is recommended that the temperature of the sample be determined both before and after the reading is taken.

5.2 Suspend the plummet from the arm of the balance and adjust the balance to equilibrium in air so that the reading is zero. Pour freshly boiled and cooled distilled water into the cylinder. Place the cylinder in the water bath and arrange so that the plummet is immersed in the distilled water. Be sure that the plummet is free of air bubbles, is completely submerged, and does not touch the sides or bottom of the cylinder containing the sample. Stir the contents of the cylinder and, when the temperature is 15.56 ± 0.05 C, take the balance reading. Wash the plummet and cylinder with alcohol and ether to clean and dry. Pour enough of the previously cooled sample into the cylinder to cause the suspension wire to be immersed to the same point as before and repeat the above procedure to ob-

<sup>4</sup> Annual Book of ASTM Standards, Part 25.

<sup>5</sup> Annual Book of ASTM Standards, Part 44.



tain the reading when the plummet is immersed in the sample at  $15.56^\circ\text{C}$ .

## 6. Calculation

6.1 Calculate the specific gravity as follows:

$$\text{Specific gravity at } 15.56/15.56^\circ\text{C} = A/B$$

where:

A = reading obtained with sample, and

B = reading obtained with water.

## METHOD B—SPECIFIC GRAVITY BY MEANS OF A HYDROMETER

### 7. Apparatus

7.1 *Hydrometer*—The hydrometers to be used shall be those specified in ASTM Specification F 100, for ASTM Hydrometers,<sup>1</sup> as follows:

Nominal Specific Gravity Range	Hydrometer
0.850 to 0.900	86H
0.900 to 0.950	87H
0.950 to 1.000	88H

NOTE 6—Corresponding hydrometers calibrated with the API scale may be used and the API reading converted to specific gravity with Table 3 of D 1250, Petroleum Measurement Tables. In case of dispute the 86H, 87H, and 88H hydrometers shall be controlling.

7.2 *Hydrometer Cylinder*—The vessel in which the sample for the gravity test is confined shall be made of clear glass and shall be cylindrical in shape. For convenience in pouring, it may have a lip on the rim. The inside diameter shall be at least 25.4 mm (1.0 in.) greater than the outside diameter of the hydrometer used in it. The height of the cylinder shall be such that after equilibrium has been reached, the lowest point on the hydrometer will be at least 25 mm (1 in.) off the bottom of the cylinder.

7.3 *Thermometer*—See 4.3.

7.4 *Water Bath*—See 4.4.

### 8. Procedure

8.1 Cool the sample in the original container to about  $14^\circ\text{C}$ . Rinse each piece of equipment with a portion of the sample and discard the rinse liquid. Pour the sample into the clean hydrometer cylinder without splashing, so as to avoid formation of air bubbles. Remove any air bubbles adhering to the surface by touching them with a piece of clean

filter paper. Select a location that is free from air currents. Place the cylinder vertically in the water bath and let the temperature of the sample reach  $15.56 \pm 0.05^\circ\text{C}$  as follows: Stir the contents of the cylinder, being careful to avoid formation of air bubbles. When the temperature of the sample is  $15.3^\circ\text{C}$ , slowly and carefully lower the hydrometer into the sample to a level two smallest scale divisions below that at which it will float and then release the hydrometer. After it has come to rest and floats freely away from the walls of the cylinder, read the gravity as the point at which the surface of the sample apparently cuts the hydrometer scale. When the temperature is  $15.56^\circ\text{C}$ , make this observation by placing the eye slightly below the level of the liquid and slowly raise the eye until the surface of the sample first seen as a distorted ellipse seems to become a straight line cutting the hydrometer scale. Determine the temperature of the sample just before and also, for referee tests, just after reading the hydrometer.

## METHOD C—SPECIFIC GRAVITY BY MEANS OF A PYCNOMETER\*

### 9. Apparatus

9.1 *Pycnometer*—A pycnometer of 25-ml capacity with a ground-glass stopper having a capillary opening, a chamber to provide for expansion up to room temperature, and a cap to prevent evaporation.

9.2 *Water Bath*—A water bath capable of maintaining a temperature of  $15.56 \pm 0.05^\circ\text{C}$ , or other required temperature, during the test.

9.3 *Thermometer*—An ASTM Low Softening Point Thermometer having a range from  $-2$  to  $+80^\circ\text{C}$  and conforming to the requirements for Thermometer 15C as prescribed in Specifications E 1.

9.4 *Analytical Balance*—A balance having a sensitivity of between 2 and 3 scale divisions displacement effected by an excess weight of 1 mg when carrying a load of between 15 and 50 g in each pan.

\*For a high degree of accuracy, the following paper discusses an apparatus and method of much merit.

Lipkin and Associates, "Pycnometer for Volatile Liquids," *Industrial and Engineering Chemistry, Analytical Edition*, Vol. 36, Jan. 15, 1944, pp. 55-58.

The Bingham and other pycnometers employing capillary tubing use the same principle as described in the paper.



9.5 *Analytical Weights*—Class S weights, as certified by the National Bureau of Standards, or equivalent weights.

#### 10. Procedure

10.1 Clean the pycnometer by filling it with a saturated solution of chromic acid in sulfuric acid ( $H_2SO_4$ , sp gr 1.84), allowing it to stand for a few hours, emptying, and rinsing well with distilled water. Fill the pycnometer with freshly boiled distilled water which has been cooled to 12 to 14 C. Place it in the water bath maintained at  $15.56 \pm 0.05$  C until the pycnometer and its contents are at a constant volume at 15.56 C. After immersion in the bath for at least 30 min, adjust the level of liquid to the proper point on the pycnometer, put the stopper in place, remove from the bath, wipe dry, and weigh. Empty the pycnometer, rinse successively with alcohol and ether, remove the ether vapor, immerse in the bath, and bring to 15.56 C as was done before. After immersion at 15.56 C for at least 30 min, put the stopper in place, remove from the bath, wipe dry, and weigh. Subtract the weight of the empty pycnometer from the weight when filled with water in order to get the weight of the contained water at 15.56 C in air. Call this difference  $W$ . Cool the sample to 12 to 14 C, fill the pycnometer with it, immerse in the bath and bring to 15.56 C as was done before. After immersion at 15.56 C for at least 30 min, adjust the liquid level, put the stopper in place, remove from the bath, wipe dry, and weigh. Subtract the weight of the empty pycnometer from the weight when filled with sample in order to obtain the weight of the contained sample at 15.56 C. Call this difference  $S$ .

#### 11. Calculation

11.1 Calculate the specific gravity at 15.56/15.56 C (in air) as follows:

$$\text{Specific gravity at 15.56/15.56 C} = S/W$$

#### METHOD D—SPECIFIC GRAVITY BY MEANS OF A VACUUM PYCNOMETER

NOTE 7—This method is suitable for use where an agreement has been reached concerning the magnitude of the coefficient of cubical expansion of the material at different temperatures.

#### 12. Apparatus

12.1 *Pycnometer*—A vacuum-wall pycnom-

eter, 25 ml in capacity.

12.2 *Thermometer*—See 9.3.

12.3 *Analytical Balance*—See 9.4.

12.4 *Analytical Weights*—See 9.5.

#### 13. Procedure

13.1 Using the procedure described in 13.2, determine at two different temperatures (for example, 15 and 30 C) the weights of water required to fill the pycnometer at these temperatures. Retain the data for use in calculating the weight of water required to fill the pycnometer at any particular temperature at which it is subsequently employed, as outlined in 13.2. Call this calculated weight  $W'$ . Dry the pycnometer and keep it ready for use.

13.2 Transfer about 200 ml of the sample at room temperature to a clean, dry 300-ml beaker. Rinse the pycnometer with some of the sample, immerse it in the beaker, and allow it to fill. Insert the thermometer in the beaker. Let the apparatus stand several minutes to permit the sample and the instruments to reach the same temperature. Empty the pycnometer and immerse it again until it is filled with the sample. Record the temperature in degrees Celsius ( $x$ ). Remove the pycnometer, insert the capillary tube stopper, and quickly wipe dry, taking care to see that the ground-glass cap joint is dried and that none of the liquid is removed from the capillary. Put the glass cap in place and weigh at once. Clean and dry the pycnometer and obtain its weight when empty. Record the weight  $W'$  of the sample required to fill the pycnometer at  $x$  degrees Celsius.

#### 14. Calculation

14.1 Calculate the specific gravity as follows:

$$S_x = W'/W$$

$$S_o = S_x[1 + k(x - 15.56)](d_x/d_{15.56})$$

where:

$S_x$  = specific gravity at  $x/x$  C,

$S_o$  = specific gravity at 15.56/15.56 C,

$W$  and  $W'$  have the values stated in 13.1 and 13.2 respectively,

$x$  = temperature at which test was made,

$k$  = coefficient of cubical expansion (0.00124 for industrial pure benzene and 0.00110 for industrial pure toluene).

$d_1$  = absolute density of water at  $x$  degrees Celsius, and

$d_{15.56}$  = absolute density of water at 15.56 C (taken as 0.99901).

14.2 The expression "specific gravity at 25.0/15.56 C," for example, means the ratio of the weight in air of a given volume of material at 25.0 C to the weight in air of an equal volume of pure water at 15.56 C. This cannot be determined directly due to the fact that the volume of the pycnometer is not the same at 25 C as at 15.56 C. A simple and accurate procedure for obtaining the specific gravity of a sample at  $x/15.56$  C consists in determining the weight in air of that amount of sample which fills the pycnometer at temperature  $x$  C, dividing this by  $W$  (the water weight in air at the same temperature  $x$  C) and correcting for the change in the water weight between  $x$  C and 15.56 C. The water weight in the pycnometer at  $x$  C is derived as follows from the data obtained in 14.1: Divide the observed water weights (in air) at each of two temperatures by the corresponding absolute densities of water and interpolate linearly between these values to find an "apparent volume" of the pycnometer at  $x$  C. This "apparent volume" multiplied by the absolute density of water at  $x$  C gives the value of  $W$ . The specific gravities at  $x/x$  C and at  $x/15.56$  C are inversely proportional to the absolute densities of water at  $x$  C and 15.56 C. Absolute densities of water at different temperatures are tabulated in various handbooks.

14.3 If the coefficient of cubical expansion of the sample is known, its specific gravity,  $S_2$ , at  $x_2/y$  C may be calculated from the

specific gravity,  $S_1$ , at  $x_1/y$  C by using the following equation:

$$S_2 = S_1[1 + k(x_1 - x_2)]$$

where  $k$  is the coefficient of cubical expansion over the proper temperature range. This relationship holds provided that the values of  $S_1$  and  $S_2$  are based upon water of the same reference temperature  $y$  C. By differentiation of this equation, it becomes evident that an error of 0.1 C in measuring the temperature of the sample will cause an error in the specific gravity figure approximately equal to the numerical value of the expression,  $0.1 k S_1$ .

14.4 Optionally, one may calibrate the pycnometer directly at the same temperature at which it is used.

## 15. Precision

15.1 When Method A, C, or D is employed, different laboratories using different instruments should be able to obtain results that differ from the mean by not more than 0.0002.

15.2 The limits of precision and accuracy of any method for determining specific gravity depend upon the attention which is given to details of calibration and technique. Consideration, in general, must be given to the problems of keeping a large volume of liquid (sometimes unstirred) at a constant temperature, providing for the effects of humidity or static electricity during weighing of pycnometers, and weighing relatively large loads. When extreme accuracy is desired, instruments certified by the National Bureau of Standards shall be used and the necessary corrections applied.

*The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, is entirely their own responsibility.*

*This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, Pa. 19103, which will schedule a further hearing regarding your comments. Failing satisfaction there, you may appeal to the ASTM Board of Directors.*



## Standard Method for CALCULATION OF VOLUME AND WEIGHT OF INDUSTRIAL CHEMICAL LIQUIDS<sup>1</sup>

This Standard is issued under the fixed designation E 201; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval.

### 1. Scope

1.1 Tables and equations presented in this method are for use in calculating the volume and weight of the following industrial chemical liquids:

#### 1.1.1 Alcohols and Polyols:

	Tables
Glycerin, high-gravity	1
Hexylene glycol	2
Isobutyl alcohol	3
Isopropyl alcohol, anhydrous	4
Isopropyl alcohol, 95 volume percent	5
Isopropyl alcohol, 91 volume percent	6

#### 1.1.2 Chlorinated Compounds:

Epichlorohydrin	7
Ethylene dichloride	8
Perchloroethylene	9

#### 1.1.3 Esters:

Ethyl acetate, 85-88 weight percent	10
Secondary butyl acetate, 85-88 weight percent	11

#### 1.1.4 Glycol Ethers:

Ethylene glycol monomethyl ether	12
----------------------------------	----

#### 1.1.5 Ketones:

Acetone	13
Methyl ethyl ketone	14
Methyl isobutyl ketone	15

1.2 A method is given for calculating the volume at 60°F from a volume observed at another temperature, 1°F.

NOTE 1: Tables at 20°C can be calculated from the data and information provided.

1.3 A method is given for determining the weight in pounds per U. S. gallon (in air) at 60°F from an observed specific gravity, and to compute therefrom the weight in pounds of a given volume of the liquid in U. S. gallons at 60°F.

### 2. Definitions

2.1 The relationships involved in this method are defined to conform to the current revision of ASTM Definitions E 12, Term Relating to Density and Specific Gravity of Solids, Liquids, and Gases,<sup>2</sup> as follows:

2.1.1 *density*—the mass of a unit volume of a material at a specified temperature. The units shall be stated, such as grams per milliliter, grams per cubic centimeter, pounds per cubic foot, or other. The form of the expression shall be

Density at  $x$ ...

where  $x$  is the temperature of the material.

2.1.2 *density, apparent*—the weight in air of a unit volume of a material at a specified temperature. The units shall be stated. The form of expression shall be

Apparent density at  $x$ ...

where  $x$  is the temperature of the material.

2.1.3 *specific gravity*—the ratio of the mass of a unit volume of a material at a stated temperature to the mass of the same volume of gas-free distilled water at a stated temperature. The form of expression shall be

Specific gravity  $x/y$  C...

where:

$x$  = temperature of the material, and

$y$  = temperature of the water.

2.1.4 *specific gravity, apparent*—the ratio

<sup>1</sup> This method is under the jurisdiction of ASTM Committee E-15 on Analysis and Testing of Industrial Chemicals.

Current edition effective Dec. 24, 1970. Originally issued 1962. Replaces E 201 - 67.

<sup>2</sup> Annual Book of ASTM Standards, Parts 14 and 41.



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E 201

of the weight in air of a unit volume of a material at a stated temperature to the weight in air of equal density of an equal volume of gas-free distilled water at a stated temperature. The form of expression shall be

Apparent specific gravity  $x/y$  C...

where:

$x$  = temperature of the material, and

$y$  = temperature of the water.

### 3. Use of Tables to Compute Volume at 60 F of Any Volume of Liquid Measured at an Observed Temperature, $t$ F

3.1 Measure the volume of liquid by suitable methods as given in ASTM Method D 1085, Gaging Petroleum and Petroleum Products.<sup>3</sup> Report to the nearest U. S. gallon.

3.2 Measure the temperature of the liquid at enough points to establish the average temperature with an accuracy of  $\pm 1$  F by suitable methods as given in ASTM Method D 1086, Measuring the Temperature of Petroleum and Petroleum Products.<sup>4</sup> Report to the nearest degree Fahrenheit.

3.3 Using the appropriate temperature correction table, convert the measured volume (3.1) to the corresponding volume at 60 F by multiplying the measured volume by the factor under the heading "volume corrected to 60 F" opposite the line corresponding to the average temperature determined in 3.2.

*Example* What is the volume at 60 F of a tank car of acetone whose volume was found by measurement to be 10,240 U. S. gal at an average temperature of 38.2 F?

*Step 1* In the temperature correction table for acetone, select a temperature of 38 F and note under the column entitled "volume corrected to 60 F" the multiplying factor 1.0172.

*Step 2* Multiplying,  $10,240 \times 1.0172 = 10,416$  U. S. gal, the volume of the contents of the tank car at 60 F.

### 4. Use of Tables to Compute Weight (Pounds in Standard Air) of a Measured Volume of Liquid

4.1 Determine the volume in U. S. gallons at 60 F in the manner described in Section 3 for the quantity of liquid under consideration.

4.2 Take a representative sample of the liquid by suitable methods as given in ASTM Method D 270, Sampling Petroleum and Pe-

troleum Products.<sup>4</sup>

4.3 Determine the specific gravity of the representative sample by suitable methods as given in ASTM Methods D 891, Test for Specific Gravity of Industrial Aromatic Hydrocarbons and Related Materials.<sup>5</sup>

4.3.1 If a hydrometer is used, report the specific gravity at 60/60 F.

4.3.2 If pycnometers are used, report the apparent specific gravity at 20/20 C.

4.4 Using the appropriate bulk weight table, select the specific gravity nearest the value determined in 4.3. Opposite this value obtained the corresponding value for pounds (air) per U. S. gallon of 60 F.

4.5 Multiply the weight in pounds per U. S. gallon (4.4) by the volume in U. S. gallons (determined in 3.3) to get the weight (in air) in pounds of the bulk of liquid under consideration.

*Example* What is the weight in pounds (in air) of a tank car of acetone whose volume at 60 F was found to be 10,416 U. S. gal and whose contents were found to have a specific gravity at 20/20 C of 0.7928?

*Step 1* In the bulk weight table for acetone, opposite a specific gravity at 20/20 C of 0.7928 read the apparent density of 6.636 lb/U. S. gal at 60 F.

*Step 2* Multiplying:  $10,416 \times 6.636 = 69,121$  lb, the net weight of our carload of acetone.

*NOTE 2* It is recognized that the use of a fixed value of 0.0012 g/ml for air buoyancy introduces a theoretical possibility for error in the calculation of the weight of material. However, for all practical purposes, variations of air density from the chosen standard may safely be ignored.

### 5. Precision and Accuracy

5.1 Calculations are derived from density data furnished by the various laboratories contributing to this program; hence, the precision and accuracy of the equations will not necessarily be identical for all of the compounds reported.

*NOTE 3* The purchaser and the supplier are expected to agree upon a reasonable policy in regard to rounding of final numbers in all computations. Rounding the final weight or volume to not more than five significant digits is, in most cases, consistent with the experimental reliability of the data.

<sup>3</sup> Available as a separate reprint.

<sup>4</sup> Annual Book of ASTM Standards, Part 23.

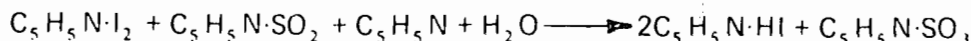
<sup>5</sup> Annual Book of ASTM Standards, Part 29.

## 8. THE METHOD

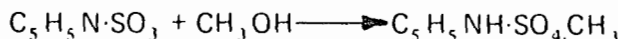
### Aquatest

#### 9.1 Historical

The determination of water is one of the most important and most widely practiced analyses in industry. The field of application is so large that it is the subject of a 3-volume monograph *Aquametry*.<sup>1</sup> Of all the techniques the Karl Fischer titration<sup>2</sup> is the most useful and generally applied. It relies on the specificity to water of the reagent devised by Fischer. The latter contains pyridine, sulfur dioxide, and iodine in an organic solvent. It reacts with water quantitatively:



There is a secondary reaction with the methanol (solvent):



It is noted that although this reaction is specific and quantitative, some difficulty may be caused by any admixed impurities which can react with the solvent to form water, interfere by redox reaction, or which bind iodine or react chemically with the other constituents. Usually these side reactions are much slower than the reaction with water, and although they might be distinguished, such reactions cannot be eliminated. Altogether, the Karl Fischer titration technique is successful in most problems and its use has shown a steady growth over the past 40 years.

Various improvements of the original technique are also of long standing. Karl Fischer himself suggested that an electrometric endpoint detection could be used instead of the visual observation of the disappearance of the dark color of iodine. Almy and Griffin<sup>3</sup> used a potentiometric endpoint successfully. However, an even sharper endpoint detection was introduced by Wernimont and Hopkinson<sup>4</sup> who employed the "dead-stop" method of polarized sensing electrodes.<sup>5</sup> The various commercial instruments are all based on this method, by now considered classic.

However, in 1959, Meyer and Boyd demonstrated the possibility of coulometrically generating iodine in Karl Fischer titrations.<sup>6</sup> This was a novel concept with great potential advantages. If the reagent mix contains iodide together with pyridine, sulfur dioxide and a solvent, the necessary iodine to complete the Karl Fischer reaction can be generated by passing electric current through the titration chamber. When the geometry of the cell and other conditions are properly chosen, 100% current efficiency can be maintained. When this is the case, according to the basic laws of coulometry  $96,500 \text{ coulombs} = 1 \text{ chemical equivalent}$  (Faraday number). A Karl Fischer coulometer is then an *absolute* instrument, and the analysis requires no calibration or standardization. The coulometer can be governed by the classic dead-stop electrode. As the latter governs the reaction back to the original set-point, sample after sample can be titrated in the same solution. This system then can be essentially all-electronic, obviating the need for handling liquids, burettes, etc.; this is of particular advantage in this case because the Karl Fischer reagent is noxious and somewhat toxic. Additionally, an electronic system lends itself to automation.

#### 9.2 Photovolt's AQUATEST

These advantages were recognized and a number of coulometric Karl Fischer titrators were employed in research.<sup>7</sup> The first demonstration of such a system in routine analysis was by Shaw and Goode.<sup>8</sup> Encouraged by this background information the first commercial instrument, the AQUATEST,<sup>9</sup> was produced by Photovolt. It had a typical accuracy of 1% and a sensitivity of about 20 micrograms of water. What made it particularly attractive as an industrial quality control instrument was that it read directly in micrograms of water and that the only control was a "Start" switch to initiate the titration.

One vexing problem was keeping the reagent free from deterioration by ambient humidity; thus this model was designed with a completely closed titration vessel. However, whenever positive or negative pressure developed, the liquid was pumped from the cathode to the anode, or vice versa. It was then found that the vessel solution, which lacks iodine, is not nearly as hygroscopic as the usual Karl Fischer reagent.

Consequently, a new version, the AQUATEST II, was built with a pressure-equalizing vent. The cathode chamber and configuration was also improved and the instrument exhibited superior performance.<sup>10</sup> The AQUATEST II enjoys widespread use, and a number of papers have been published on its performance in the field.<sup>11</sup> It is also accepted in an official test method.<sup>12</sup>

The AQUATEST IV is a newer version of these instruments. It is the result of a further study<sup>13</sup> in which the limiting factors were scrutinized. Changes include an asymmetric sensing electrode, a cover fastened by a clamp which reduces still further the seepage of ambient humidity, and a stepping motor that provides more reliable performance. Together, these changes tend to reduce electrical noise.

The AQUATEST IV incorporates a microprocessor which offers the advantages pointed out above. The most important is, perhaps, that it serves to distinguish between the titration of water in the sample and water which is slowly generated by parasitic reactions, ambient humidity which seeps in, or any other effects which are oxidizing (or reducing) in character. All these effects, conveniently called "drift", are determined subsequent to the titration proper, and the result of the titration is automatically corrected. The microprocessor also performs the arithmetic operations. There are no controls other than the keyboard, which incorporates all the functions as described in Section 3 above.

The operation is based on the principles of all AQUATESTs. When the instrument is started and a sample is added to the vessel solution, a voltage arises across the polarized sensing electrode which indicates a "wet" condition. This triggers the coulometer and a constant current flow from the anode through the frit, which separates the vessel solution (anolyte) from the generator solution (catholyte), to the cathode. In consequence, iodine is developed at the anode by oxidation of iodide. The iodine completes the Karl Fischer reagent and is mixed by stirring throughout the vessel. When all the water has reacted, the voltage at the sensing electrode drops. This signals the coulometer to stop, and the electrical charge integrated during the titration process is stored in memory. During the subsequent time period of approximately one minute data are taken to establish current requirement, both positive and negative, to maintain the solution at equivalence. These data are then used to correct the initial titration value to reflect the net value due only to the water content of the sample without the background "drift".

The circuit of the AQUATEST IV is shown in Section 10.

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## Standard Test Method for WATER IN VOLATILE SOLVENTS (FISCHER REAGENT TITRATION METHOD)<sup>1</sup>

This Standard is issued under the fixed designation D 1364; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval.

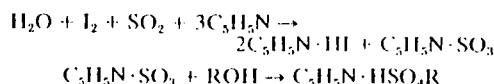
*This method has been approved for use by agencies of the Department of Defense to replace Method 4082.1 of Federal Test Method Standard No. 141A and for listing in the DoD Index of Specifications and Standards.*

### 1. Scope

1.1 This method covers the determination of water in any proportion in volatile solvents and chemical intermediates used in paint, varnish, lacquer, and related products. This method is not applicable in the presence of mercaptans, peroxides, or appreciable quantities of aldehydes or amines.

### 2. Principle of Method

2.1 This method is based essentially upon the reduction of iodine by sulfur dioxide in the presence of water. This reaction can be used quantitatively only when pyridine and an alcohol are present to react with the sulfur trioxide and hydriodic acid produced according to the following reactions:



2.2 To determine water, Fischer reagent (a solution of iodine, pyridine, and sulfur dioxide, in the molal ratio of 1+10+3) dissolved in anhydrous 2-methoxyethanol is added to a solution of the sample in anhydrous pyridine-ethylene glycol (1+4) until all water present has been consumed. This is evidenced by the persistence of the orange-red end-point color; or alternatively by an indication on a galvanometer or similar current-indicating device which records the depolarization of a pair of noble-metal electrodes. The reagent is standardized by titration of water.

### 3. Description of Terms

3.1 *Instrumental End Point*, for the purpose of this test, is that point in the titration when two small platinum electrodes, upon which a potential of 20 to 50 mV has been impressed, are depolarized by the addition of 0.05 ml of Fischer reagent (6 mg of H<sub>2</sub>O per ml), causing a change of current flow of 10 to 20  $\mu$ A which persists for at least 30 s.

NOTE 1—This end point is sometimes incorrectly called the "dead stop" which is the reverse of the above.

3.2 *Color End Point*—During the titration, the solution first turns yellow, then later deepens towards the end of the titration; the end point is indicated by the change from yellow to orange-red which is quite sharp and easily repeated. The orange-red color must persist for at least 30 s in order to indicate an end point.

NOTE 2—View the color by transmitted daylight or by transmitted light from an artificial daylight lamp, such as the one which complies with the specifications given in ASTM Method D 1500, Test for ASTM Color of Petroleum Products (ASTM Color Scale).<sup>2</sup>

### 4. Apparatus

#### 4.1 Titration Vessel—For color end point

<sup>1</sup> This method is under the jurisdiction of ASTM Committee D-1 on Paint and Related Coatings and Materials and is the direct responsibility of Subcommittee D01.35 on Solvents, Plasticizers, and Chemical Intermediates.

Current edition approved Sept. 29, 1978. Published January 1979. Originally published as D 1364 - 55 T. Last previous edition D 1364 - 64 (1976).

<sup>2</sup> *Annual Book of ASTM Standards*, Parts 23 and 40.



titrations, use a 100 or 250-ml volumetric flask which need not be calibrated; a 250-ml flask fitted with interchangeable electrodes (Fig. 1)<sup>3</sup> may also be used for instrument end point and is particularly suitable for titrations at ice temperatures. For permanently mounted assemblies, the vessel should have a capacity about equal to that of a 300-ml tall-form beaker; provided with a tight-fitting closure to protect the sample and reagent from atmospheric moisture, a stirrer, and a means of adding sample and reagents and removing spent reaction mixture. It is desirable to have a means for cooling the titration vessel to ice temperature.

**4.2 Instrument Electrodes**—Platinum with a surface equivalent to two No. 26 wires 5 mm long. The wires should be 3 to 8 mm apart and so inserted in the vessel that 25 ml of liquid will cover them.

**4.3 Instrument Depolarization Indicator**, having an internal resistance of less than 5000  $\Omega$  and consisting of a means of impressing and showing a voltage of 20 to 50 mV across the electrodes and capable of indicating a current flow of 10 to 20  $\mu$ A by means of a galvanometer or radiotuning eye circuit.<sup>4</sup>

**4.4 Buret Assembly** for Fischer reagent, consisting of a 25 or 50-ml buret connected by means of glass (not rubber) connectors to a source of reagent; several types of automatic dispensing burets<sup>5</sup> may be used. Since the reagent loses strength when exposed to moist air, all vents must be protected against atmospheric moisture by adequate drying tubes containing indicating calcium sulfate drying agent. All stopcocks and joints should be lubricated with a lubricant not particularly reactive<sup>6</sup> with the reagent.

**4.5 Weighing Bottle** of the Lunge or Grethen Type, or equivalent.

## 5. Reagents

**5.1 Purity of Reagents**—Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available.<sup>7</sup> Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

**5.1.1 Fischer Reagent (equivalent to 6 mg of  $H_2O$  per ml)**—For each liter of solution, dissolve  $133 \pm 1$  g of  $I_2$  in  $425 \pm 2$  ml of anhydrous (less than 0.1 percent  $H_2O$ ) pyridine in a dry glass-stoppered bottle. Add  $425 \pm 2$  ml of anhydrous (less than 0.1 percent  $H_2O$ ) 2-methoxyethanol. Cool to below 4°C in an ice bath and add gaseous  $SO_2$ , dried by bubbling through concentrated  $H_2SO_4$  (sp gr 1.84); determine the amount of  $SO_2$  added by measuring the change in weight of the  $SO_2$  cylinder ( $102 \pm 1$  g) or the increase in volume ( $70 \pm 1$  ml) of the reagent mixture. Alternatively, add 70 ml of freshly drawn liquid  $SO_2$  in small increments.

**5.1.2 Sample Solvent**—Mix 1 volume of anhydrous (less than 0.1 percent  $H_2O$ ) pyridine with 4 volumes of anhydrous (less than 0.1 percent  $H_2O$ ) ethylene glycol.

**NOTE 3**—Pyridine, ethylene glycol, and 2-methoxyethanol each containing less than 0.1 percent water, are available and should be used.

**NOTE 4**—If adequately dry reagents cannot be procured, they can each be dried by distillation through a multiple-plate column, discarding the first 5 percent of material distilling overhead and using the 95 percent remaining. Drying may also be accomplished by the addition of 1 volume of benzene to 19 volumes of the pyridine-glycol, or of the pyridine ethylene glycol monomethyl ether mixture, followed by distillation; the first 5 percent distilled is discarded and the residual 95 percent is used.

## 6. Standardization of Reagent

**6.1 Standardize the Fischer reagent** each day used by either the color or instrument end point (Section 3) method using the same procedure as used for titrating the sample.

**6.1.1** Add to each flask 25 ml of ethylene glycol-pyridine mixture, and titrate this as described in Section 8. Add to the solvent thus titrated, in place of the sample, 0.15 to

<sup>3</sup> Such flasks are made by Rankin Glass Blowing Co., 3920 Franklin Canyon Road, Martinez, Calif.

<sup>4</sup> A type similar to the Precision Scientific Co. "Aquatrator," or Fisher Scientific Co. "Fisher Titrimeter," is suitable for the measurement of the instrument end point.

<sup>5</sup> A type similar to Catalog No. J-821 of Scientific Glass Apparatus Co., Bloomfield, N. J., or Catalog No. 750 or Eck and Krebs, New York, N. Y., has been specifically designed for this purpose and presents the minimum contact of reagent with stopcock lubricant.

<sup>6</sup> Suitable lubricants are Apiezon N (James G. Biddle and Co., Philadelphia, Pa.); High Vacuum Silicone Grease (Dow Corning Co., Midland, Mich.); Sisco 300 (Swedish Iron and Steel Co., New York, N. Y.).

<sup>7</sup> "Reagent Chemicals, American Chemical Society Specifications," Am. Chem. Soc., Washington, D. C. For suggestions on the testing of reagents not listed by the American Chemical Society, see "Reagent Chemicals and Standards," by Joseph Rosin, D. Van Nostrand Co., Inc., New York, N. Y., and the "United States Pharmacopeia."

# Best Available Copy



D 1364

0.18 g of water from a weighing pipet. Complete the titration with Fischer reagent as described in Section 8.

6.1.2 Calculate the equivalency factor of the reagent in terms of water content per millilitre by means of the following equation:

Equivalency factor,  $W$ , mg of water per ml =  $A/B$

where:

$A$  = weight of water, milligrams, used in the standardization, and

$B$  = volume of Fischer reagent, millilitres, required.

## 7. Safety Precautions

7.1 **Caution**—Karl Fischer Reagent contains four hazardous compounds: iodine, pyridine, sulfur dioxide, and 2-methoxyethanol. The sample solvent contains pyridine. Take adequate safety precautions when handling the compounds separately or the reagent or sample solvent themselves. Dispense the liquids in a well-ventilated area, and exercise care to avoid unnecessary inhalation of the chemicals or direct contact of them with the skin. Following accidental spillage, wash with large quantities of water. Do all transfers and handling in a location free from sources of ignition.

7.2 Most organic solvents will burn. Provide adequate ventilation to maintain solvent vapor concentrations below the explosive limit during transfer and handling, and below the threshold limit value in the general work area.

## 8. Sample

8.1 **Lacquer Solvents**—It is essential to avoid changes in the water content of the material during sampling operations. Errors from this source are particularly significant in the analysis of materials having low water content. When analyzing materials which absorb water readily (for example, absolute alcohols), limit all possible contact of the sample with air in transferring the sample into the titration vessel. Avoid intermediate sample containers, if possible.

## 9. Procedure

9.1 Introduce 10 to 25 ml of the anhydrous specimen solvent (pyridine-glycol, 1+4) into the titration vessel, making sure, if an instrument end point apparatus is used, that the

electrodes are covered by this amount of solvent. If the color end point is to be determined, make up a second flask as well.

9.2 Adjust the stirrer, if any, to provide adequate mixing without splashing. Titrate the mixture to the instrument end point (see 3.1), or the color end point (see 3.2), with Fischer reagent. If the color end point is to be observed, titrate one flask to the orange-red end point and the second to match the first. Set aside the first flask as a comparison standard for titrating the specimen.

9.3 To the titration mixture thus prepared, add an amount of specimen as indicated in Table 1. Exercise care when the specimen is transferred so that water is not absorbed from the air, particularly under conditions of high humidity. Again, titrate the mixture with Fischer reagent to the same instrument or color end point previously employed. Record the amount of reagent used to titrate the water in the specimen.

NOTE 5(a) **Ketones**—In titrating ketones, when greatest precision is required, cool the reaction mixture in ice water during the addition of Fischer reagent.

(b) **Organic Acids**—Cool the reaction mixture in ice water prior to the addition of Fischer reagent.

NOTE 6—When using the volumetric flask type titration vessel in humid climates, place a piece of thin sheet rubber over the mouth of the vessel; provide a small hole for introducing the buret tip. In less humid climates it is sufficient to lower the tip of the buret deeply into the long neck of the titration flask.

NOTE 7—In titrating with the volumetric flask type titration vessel, avoid wetting the stopper and upper end of the flask with either the reagent or the sample solvent. Each time the titration is interrupted, touch the buret tip to the neck of the flask to remove droplets which, if not removed, would absorb moisture from the atmosphere. When the flask is removed from under the buret tip, wipe the tip with a clean dry cloth in a downward motion.

## 10. Calculation

10.1 Calculate the water content of the specimen as follows:

$$\text{Water, percent} = (V \times W) / (10 \times S)$$

where:

$V$  = volume of Fischer reagent required by the specimen, in millilitres,

$W$  = equivalency factor for Fischer reagent, in milligrams of water per millilitre of reagent, and

$S$  = weight of specimen, in grams.

## 11. Repeatability

11.1 For water content, percent, within 0.1 percent, for average.

## 12. Precision

12.1 For judgment of samples, see Table 1.

12.1.1 the mean

Table 1  
Water Content, percent  
2.5 to 10

0.2 to 2.5

Below 0.5

The American  
connection  
validity of a

This standard  
years and  
for addition  
at a meeting  
a fair hearing  
1910, when  
ASTM was

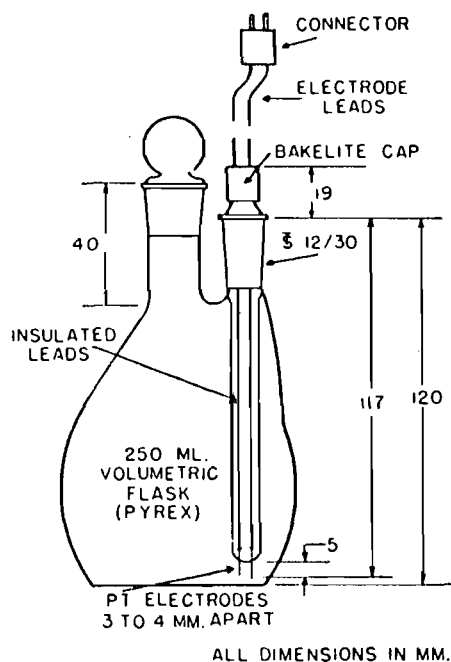
## 12. Precision

12.4.1 *Repeatability*—Two results, each the mean of duplicate determinations, ob-

12.1.2 *Reproducibility*—Two results, each the mean of duplicate determinations, obtained by analysts in different laboratories should be considered suspect if they differ by more than 0.027 percent absolute.

Note 8:—The preceding report and precision statements are based upon an interlaboratory study on samples of acetone containing 0.118 and 0.406 percent water and on samples of methyl ethyl ketone containing 0.050 and 0.176 percent water. Duplicate determinations were made on each sample by one analyst on two different days in each of eight different laboratories.

Water Content, percent	Specimen Size	Manner Specimen Taken
2.5 to 10	weight containing 0.15 to 0.18 g of H <sub>2</sub> O	weighing pipet
0.2 to 2.5	10 ml	calibrated volumetric pipet
Below 0.5	25 ml	



**FIG. 1 Titration Flask Assembly**

*The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, is entirely their own responsibility.*

*This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, Pa. 19103, which will schedule a further hearing regarding your comments. Failing satisfaction there, you may appeal to the ASTM Board of Directors.*

# Gas Chromatography Method For Determining Purity of Ethanol

## Scope

1. This method describes a procedure for the determination of purity in both denatured and undenatured ethanol by Gas Chromatography. The denatured alcohol is CDA-20. This method is the basic outline which can be adapted to your specific needs.

## Apparatus

2. (a) Gas Chromatograph equipped with a flame ionization detector.
- (b) Column, 6 ft. x 2 mm, 1D glass containing 0.1% SP-1000 on 80/100 carbopack C, (available from Supelica).

## Reagents

3. (a) Ethanol, 99% minimum purity.
- (b) Denaturants of interest.
- (c) CDA-20

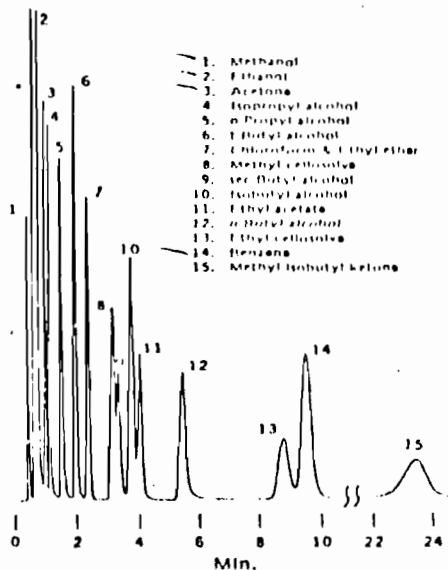
## GLC Operating Conditions

4. (a) Temperature
  - (1) Column: 80°C. Isothermal
  - (2) Injector: 140°C.
  - (3) Detector: 140°C.
- (b) Carrier Gas: Nitrogen at 20 ml/min. flow rate.
- (c) Sample Size: 0.1 microliter

## Analysis and Calculation

5. (a) The retention time of ethanol and/or denaturants in question must be determined before the sample is run. In addition, relative response factors should be applied to the denaturant peaks for the most accurate quantitation.
- (b) Inject the sample and allow to run for 30 minutes. This should be adequate for the elution of the most common denaturants.
- (c) The adjusted areas of denaturant peaks (if present) will be subtracted from the total peak area count to give % of ethanol by weight.
- (d) Since the flame ionization detector does not detect water present in the alcohol, a Karl Fischer water determination must be subtracted from the % ethanol by weight (by GC) to give % purity by weight.
- (e) This procedure will detect methanol.

## Denaturants in Alcohol





**INTEROFFICE MEMORANDUM**

For Routing To District Offices And/Or To Other Than The Addressee		
To: _____	Locn.: _____	
To: _____	Locn.: _____	
To: _____	Locn.: _____	
From: _____	Date: _____	
Reply Optional [ ]	Reply Required [ ]	Info. Only [ ]
Date Due: _____	Date Due: _____	

TO: Clair Fancy  
FROM: Teresa M. Heron *TH*  
THRU: Bill Thomas  
THRU: Willard Hanks  
DATE: June 16, 1981  
SUBJ: SCM Organic Chemicals AC 16-34907

In response to your note concerning the above subject, I have reviewed SCM Corporation's files and evaluated Mr. James O. Swell proposals for monitoring scrubber water.

I consider SCM request to be reasonable from an economic point of view if the company does not possess a chromatographic analyzer in its chemical lab.

As Mr. Swell noted, the isopropyl alcohol dissolves in water forming a homogenous mixture. Since there is no change in temperature during this process (ambient temperature), the specific gravity method is a practical way to monitor the alcohol concentration. Specific gravity measurements with a hydrometer can be subject to error if other elements are in the mixture. The hydrometer method to measure alcohol content may be equivalent to the gas chromatograph method for measuring volatile alcohol in water but is not accurate enough for SCM situation.

Mr. Swell's request to use specific gravity to comply with condition No. 4 could be as he proposed for daily in house records measurements. For periodic test reports submitted to the Department, the scrubber water should be analyzed by a commercial chemical lab using the gas chromatograph method, if it is uneconomical for the company to purchase a gas chromatograph analyzer at this time.

TH:caa

DEPARTMENT OF ENVIRONMENTAL REGULATION

**ROUTING AND TRANSMITTAL SLIP**

BAQM - Central Air Permitting

ACTION NO.

ACTION DUE DATE

1 TO (NAME OFFICE LOCATION)

INITIAL

DATE

AMODIO

BOCK

GEORGE

HANKS

2

INITIAL

DATE

HERON

HODGES

HOLLADAY

KING

3

INITIAL

DATE

PALAGYI

POWELL

ROGERS

SVEC

4

INITIAL

DATE

THOMAS

VEGA

FILE

ALL

REMARKS

INFORMATION

REVIEW & RETURN

REVIEW & FILE

INITIAL & FORWARD

DISPOSITION

REVIEW & RESPOND

PREPARE RESPONSE

FOR MY SIGNATURE

FOR YOUR SIGNATURE

LET'S DISCUSS

SET UP MEETING

INVESTIGATE & RESP

INITIAL & FORWARD

DISTRIBUTE

CONCURRENCE

FOR PROCESSING

INITIAL & RETURN

*Bill*

*File*

*This is my  
memo in  
response of Clair  
Fancy's assignment*

*Clair —  
looks unanimous — Too much  
error in hydrometer for  
valid compliance —  
BT*

*3/31/82*

FROM

*Tessa*

DATE

*6-14-81*

PHONE

DEPARTMENT OF HEALTH, WELFARE  
& BIO-ENVIRONMENTAL SERVICES  
Bio-Environmental Services Division  
Air and Water Pollution Control



May 18, 1981



Mr. James O. Sewell, P. E.  
Senior Project Engineer  
SCM Organic Chemicals  
P. O. Box 389  
Jacksonville, Florida 32201

RE: Terpene Reactor 171 - 1  
AC16-34907

Dear Mr. Sewell:

By copy of this letter I am recommending to the Department of Environmental Regulation that the captioned permit be extended to expire on March 31, 1982 as per your April 16, 1981 letter of request.

This agency cannot recommend that Specific Condition number 4 of the permit be changed. The proposed alternate analysis method is subject to error and is not accurate enough for the purpose of ascertaining compliance. The only other methods of assuring compliance that would be acceptable to this agency, besides the use of a gas chromatograph, would be to sample the stack gasses using a Total Organic Carbon analyzer or to vent the gas to a boiler for hydrocarbon destruction.

Please document how SCM plans to perform compliance testing on this unit, also indicate how you will determine the maximum alcohol content of the recirculated scrubber water during the emissions test.

Very truly yours,

E. P. Balducci  
Assistant Air Engineer

EPB/sg

cc: G. Doug Dutton, DER  
Steve Smallwood, BAQM



DEPARTMENT OF ENVIRONMENTAL REGULATION

ROUTING AND TRANSMITTAL SLIP

ACTION NO.

73897-9A

ACTION DUE DATE

1. TO: (NAME, OFFICE, LOCATION)

Bill

INITIAL

DATE

2.

INITIAL

DATE

3.

INITIAL

DATE

4.

INITIAL

DATE

REMARKS:

please have Teresa look into to # 2 & 3 on SCM letter as to whether or not it is an "equivalent" method. When I get her ideas, I will answer SCM.

INFORMATION

REVIEW & RETURN

REVIEW & FILE

INITIAL & FORWARD

DISPOSITION

REVIEW & RESPOND

PREPARE RESPONSE

FOR MY SIGNATURE

FOR YOUR SIGNATURE

LET'S DISCUSS

SET UP MEETING

INVESTIGATE & REPT

INITIAL & FORWARD

DISTRIBUTE

CONCURRENCE

FOR PROCESSING

INITIAL & RETURN

FROM:

Chin

DATE

5/28

PHONE



DEPARTMENT OF ENVIRONMENTAL REGULATION

ROUTING AND TRANSMITTAL SLIP

ACTION NO.

ACTION DUE DATE

1. TO: (NAME, OFFICE, LOCATION)

INITIAL

DATE

2.

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INITIAL

DATE

REMARKS:

INFORMATION

REVIEW & RETURN

REVIEW & FILE

INITIAL & FORWARD

DISPOSITION

REVIEW & RESPOND

PREPARE RESPONSE

FOR MY SIGNATURE

FOR YOUR SIGNATURE

LET'S DISCUSS

SET UP MEETING

INVESTIGATE & REPT

INITIAL & FORWARD

DISTRIBUTE

CONCURRENCE

FOR PROCESSING

INITIAL & RETURN

B, 11 -

Can we extend permit. Potentially I  
don't see any reason why not.

What action  
is required?

Ed.

Date extension is no problem  
What are your thoughts on the  
testing request?

BT

(over)

FROM:

STEVE SMALLWOOD

DATE

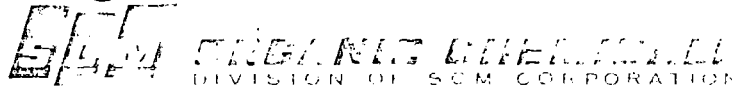
5-19-81

PHONE

I see no reason why not to extent permit, guess they realize what I said all along, the process is no good- don't believe the shipping of equipment problem.

I really don't know why they want the test method changed- they have a control lab with 10-15 VPC machines just for plant testing. I think they may ~~have~~ have a problem with the union as who will take the sample to the lab. The distance is only about 50 yards from bldg to lab. What he says is true but a new VPC would not be necessary, Jim is playing with words. I donot recommend the condition be changed.

Ed



P. O. BOX 389, JACKSONVILLE, FLA. 32201 (904) 743-1711

April 16, 1981

Mr. Steven R. Pace, P. E.  
Air Pollution Engineer  
Air & Water Pollution Control  
515 West Sixth Street  
Jacksonville, Florida 32206

Re: Construction Permit #AC16-34907

Dear Mr. Pace:

*OK - see*  
I am requesting a six (6) month extension for the date of expiration for this permit. Slow deliveries of equipment have made the construction schedule change.

*could this be checked to see if it is true?*  
#2  
I am also requesting a change in the SPECIFIC CONDITIONS, Item #4. The use of a gas chromatograph to check the effectiveness of the absorbent (water) to dissolve isopropanol is a very expensive method when compared to checking by specific gravity. The gas chromatograph, which would have to be dedicated to this use alone, costs about \$8000 and must be operated by a technician. A hydrometer and cylinder costs about \$15 and can be used in the operating area by the chemical operator to get immediate results. It would be a simple lab job to make a graph showing specific gravity vs % alcohol in water for use by the chemical operator to read.

*#3*  
In addition the number of tests on the absorbant is excessive. Iso propyl alcohol is infinitely soluble in water. The flow sheet shows a continuous supply of fresh water purging the scrubber absorbant of alcohol and water. The expected rate of absorbtion should produce a water/alcohol solution of no more than 25% alcohol under the worst conditions. This concentration would not reduce the efficiency of the scrubber.


I am requesting that Item #4 in the SPECIFIC CONDITIONS be changed to read as follows:

Continued

Mr. Steven R. Pace, P. E.  
April 16, 1981  
Page -2-

The effectiveness of the absorbent in the control device shall be checked by specific gravity daily prior to the first batch started after 7:00 a.m.

Yours very truly,



James O. Sewell, P.E.  
Senior Project Engineer

JOS/mwf

cc: R. W. Harrell

TWIN TOWERS OFFICE BUILDING  
2600 BLAIR STONE ROAD  
TALLAHASSEE, FLORIDA 32301



*File copy*

BOB GRAHAM  
GOVERNOR  
JACOB D. VARN  
SECRETARY

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

FL Times Union  
1 Riverside Drive  
Jacksonville, FL 32202

10-27-80

Dear Sir:

We are forwarding to you a legal ~~advertisement~~ advertisement to be published:

Nov 3, 1980  
ONE TIME ONLY  
Subject: Construction Permit

To ensure prompt payment, please send an invoice and proof of publication for legal ads to the address below:

Department of Environmental Regulation  
PURCHASING OFFICE  
2600 Blair Stone Road  
Tallahassee, FL 32301

If you have any questions, please contact us at 904/488/0870.

Sincerely,

*W H Wallace*  
William H. Wallace  
Purchasing Office



Enclosure: (1)

The Florida Department of Environmental Regulation (DER) has received an Application from and intends to issue a Construction Permit to SCM Corporation, Organic Chemicals Division for the installation of a Process Reactor to be located at the Foot of West 61st., Jacksonville, in Duval County. A Determination of Best Available Control Technology was not required. Copies of the Application, Technical Evaluation, and DER Intent are available for inspection at the following offices: DER, St. Johns River Subsdistrict, 3426 Bills Rd., Jacksonville; Bureau of Air Quality Management, 2600 Blair Stone Road, Tallahassee, Florida 32301; Duval County Department of Health, Welfare, and Bio-Environmental Services, Division Of Bio-Environmental Services, 515 West 6th Street, Jacksonville. Comments on this action shall be submitted in writing to John Svec of the Tallahassee Office, within 30 days of the notice.



# FLORIDA PUBLISHING COMPANY

Publishers

JACKSONVILLE, DUVAL COUNTY, FLORIDA

STATE OF FLORIDA }  
COUNTY OF DUVAL }

Before the undersigned authority personally appeared .....

Ronald W. Keeler ....., who on oath says that he is

Advertising Manager ..... of The Florida Times-Union, and

Jacksonville Journal, daily newspapers published at Jacksonville in Duval County,

Florida; that the attached copy of advertisement, being a .....

## Legal Notice

in the matter of ..... Installation of a Process Reactor .....

in the ..... Court,

was published in ..... The Florida Times Union .....

in the issues of ..... November 3, 1980 .....

Affiant further says that the said The Florida Times-Union and Jacksonville Journal are each newspapers published at Jacksonville, in said Duval County, Florida, and that the said newspapers have each heretofore been continuously published in said Duval County, Florida, The Florida Times-Union each day, and Jacksonville Journal each day except Sundays, and each has been entered as second class mail matter at the postoffice in Jacksonville, in said Duval County, Florida, for a period of one year next preceding the first publication of the attached copy of advertisement; and affiant further says that he has neither paid nor promised any person, firm or corporation any discount, rebate, commission or refund for the purpose of securing this advertisement for publication in said newspaper.

Sworn to and subscribed before me

this ..... 3rd ..... day of

November A.D. 19 80

*Notary Public*  
Notary Public,  
State of Florida at Large.

My Commission Expires

Notary Public, State of Florida at Large

My Commission Expires

Bonded By American

DA 444

The Florida Department of Environmental Regulation (DER) has received an Application from and intends to issue a Construction Permit to SCM Corporation, Organic Chemicals Division for the installation of a Process Reactor to be located at the Foot of West 61st, Jacksonville, in Duval County. A Determination of Best Available Control Technology was not required. Copies of the Application, Technical Evaluation, and DER Intent are available for inspection at the following offices: DER, St. Johns River Subdistrict, 3426 Bills Rd., Jacksonville; Bureau of Air Quality Management, 2600 Blair Stone Road, Tallahassee, Florida 32301; Duval County Department of Health, Welfare, and Bio-Environmental Services, Division of Bio-Environmental Services, 515 West 6th Street, Jacksonville. Comments on this action shall be submitted in writing to John Svec of the Tallahassee Office, within 30 days of the notice.

*Ronald W. Keeler*

*John Svec*





TWIN TOWERS OFFICE BUILDING  
2600 BLAIR STONE ROAD  
TALLAHASSEE, FLORIDA 32301



BOB GRAHAM  
GOVERNOR

JACOB D. VARN  
SECRETARY

STATE OF FLORIDA

**DEPARTMENT OF ENVIRONMENTAL REGULATION**

MEMORANDUM

CERTIFIED MAIL

TO: SCM Corporation, Organics Chemical Div. Jacksonville,  
Florida  
G. Doug Dutton, Manager, St. Johns River Subdistrict, FDER  
Jacksonville Bio-Environmental Services

FROM: Steve Smallwood, Chief, Bureau of Air Quality Management

DATE: October 22, 1980

SUBJ: Proposed Department Action on SCM Corporation Application  
to Construct One Process Reactor at Their Plant at the  
Foot of W. 61 Street in Jacksonville, Duval County, Florida.

Attached is one copy of the proposed Construction Permit  
and Technical Evaluation for SCM Corporation, Organic Chemicals  
Division, Jacksonville, Florida.

Pursuant to 17-2.091 and 40 CFR 51.18 this information is  
to be maintained on file for public review for 30 days.

Comments are to be submitted to the Bureau of Air Quality  
Management.

SS:caa

Attachments

Technical Evaluation  
and  
Preliminary Determination

SCM Corporation  
Organic Chemicals Division  
Jacksonville, Florida

Construction Permit  
Application Number:  
AC 16-34907

Florida Department of Environmental Regulation  
Bureau of Air Quality Management  
Central Air Permitting  
October 22, 1980

## I. PROPOSED DEPARTMENT ACTION

The Department intends to issue the requested construction permit to SCM Corporation, Organic Chemicals Division to install a process reactor at the plant located at the foot of West 61 Street, Jacksonville, Florida, subject to public comment received as a result of this notice.

Any person wishing to file comments on this proposed action, may do so by submitting such comments in writing to:

Mr. John Svec  
Florida Department of Environmental  
Regulation  
Twin Towers Office Building  
2600 Blair Stone Road  
Tallahassee, Florida 32301

Any comments received within thirty days after publication of this notice will be considered and noted in the Department's final determination.

Any person whose substantial interests would be affected by the issuance or denial of this permit may request an administrative hearing by filing a petition for hearing as set forth in Section 28-5.15 (copy attached). Such petition must be filed within 14 days of the date of this notice. Such petition is to be filed with:

Mary Clark  
Office of General Counsel  
Florida Department of Environmental  
Regulation  
Twin Towers Office Building  
2600 Blair Stone Road  
Tallahassee, Florida 32301

## II. SUMMARY OF EMISSION AND AIR QUALITY ANALYSIS:

a. The proposed installation is located within that portion of Duval County classified as "nonattainment" for the criteria pollutants particulate matter and ozone. The proposed construction will only be a source of volatile organic compounds (VOC) which could react photochemically in the atmosphere to produce ozone.

b. The significant VOC source will emit a water soluble solvent at the rate of 0.73 lb/hr., controlled. This is the only source covered under this permit.

### III. SYNOPSIS OF APPLICATION:

#### a. Name and address of applicant:

SCM Corporation  
Organic Chemicals Division  
P. O. Box 289  
Jacksonville, Florida

#### b. Description of Project and Controls:

The project is the installation of a sealed chemical process reactor in Building 171 at the existing plant in Jacksonville, Florida. This is to be a batch crystallization process. The reactor is vented during charging, crystallization and water wash steps. Emissions will be controlled with a Duall Industries, Inc., FW-300 fan scrubber. The control process is absorption using water at ambient temperature. The efficiency of the scrubber is 96% to be monitored by gas chromatograph analysis.

c. Edible solids, terpene blend, solvent and emulsifier (total charge 278 lbs./hr.) are combined in the reactor. After crystallization is complete, the solvent is removed and the product washed with water. 18.31 lbs./hr of solvent (VOC) is vented to the scrubber resulting in 0.73 lb/hr. emissions or 3.2 TPY.

### IV. RULE APPLICABILITY:

The proposed project is located in the Duval County ozone nonattainment area. The actual emission being less than 50 tons/year and not more than 100 lbs/hr. exempt the project from the nonattainment rules (FAC 17-2.17(3)(a)1.a.(ii)).

The proposed project is located in that portion of Duval county classified "nonattainment" for particulate matter. Since particulate matter is not emitted in this process, the project is exempt from the nonattainment rules.

### V. FINDINGS:

1. The solvent used has a vapor pressure of 0.7 PSIA (AP-42-4.3-7) and is considered a volatile organic compound (VOC) (FAC 17-2.02(136)).

2. The source is potentially a major emitting facility FAC 17-2.02(70). Due to the low value of allowable emissions after application of the proposed technology, the emissions are considered de minimus.

3. The allowable VOC emissions are projected to be:  
0.73 lb/hr. (3.2 TPY).

4. The solvent is soluble in water. The use of an absorption pollution control device using water as the absorbent, is a suitable pollution control installation for the proposed facility.

5. The control device has an absorbent recirculation system. To prevent saturation with consequent decrease in efficiency, the absorbent shall be analyzed by gas chromatography prior to the start of each batch.

6. The maximum solvent input shall be 102 lbs./hr. (447 TPY) and 187 lbs./hr. (819 TPY) other reactants.

7. The maximum operating schedule will be 8,760 hours per year.

VI. PROPOSED ALLOWABLE EMISSIONS AND PERMIT CONDITIONS:

See Draft Permit

Attachment: Rule 28-5

RULES OF THE ADMINISTRATIVE COMMISSION  
MODEL RULES OF PROCEDURE  
CHAPTER 28-5  
DECISIONS DETERMINING SUBSTANTIAL INTERESTS

28-5.15 Requests for Formal and Informal Proceedings

- (1) Requests for proceedings shall be made by petition to the agency involved. Each petition shall be printed typewritten or otherwise duplicated in legible form on white paper of standard legal size. Unless printed, the impression shall be on one side of the paper only and lines shall be double spaced and indented.
- (2) All petitions filed under these rules should contain:
  - (a) The name and address of each agency affected and each agency's file or identification number, if known;
  - (b) The name and address of the petitioner or petitioners;
  - (c) All disputed issues of material fact. If there are none, the petition must so indicate;
  - (d) A concise statement of the ultimate facts alleged, and the rules, regulations and constitutional provisions which entitle the petitioner to relief;
  - (e) A statement summarizing any informal action taken to resolve the issues, and the results of that action;
  - (f) A demand for the relief to which the petitioner deems himself entitled; and
  - (g) Such other information which the petitioner contends is material.

DER PERMIT APPLICATION TRACKING SYSTEM MASTER RECORD  
 FILE#000000034907 COE# DER PROCESSOR:PALAGYI DER OFFICE:TLH  
 FILE NAME:SCM CORPORATION DATE FIRST REC: 09/16/80 APPLICATION TYPE:AC  
 APPL NAME:HARRELL, R.W. APPL PHONE:(904)764-1711 PROJECT COUNTY:16  
 ADDR:P.O. BOX 389 CITY:JACKSONVILLE ST:FLZIP:32204  
 AGNT NAME:SEWELL, J.O. AGNT PHONE:(904)764-1711  
 ADDR:P.O. BOX 389 CITY:JACKSONVILLE ST:FLZIP:32204

ADDITIONAL INFO REQ: / / / / / / / / / / / /  
 APPL COMPLETE DATE: / / COMMENTS NEC:Y DATE REQ: / / DATE REC: / /  
 LETTER OF INTENT NEC:Y DATE WHEN INTENT ISSUED: / / WAIVER DATE: / /

HEARING REQUEST DATES: / / / / / / / / / / / /  
 HEARING WITHDRAWN/DENIED/ORDER -- DATES: / / / / / / / / / / / /  
 HEARING ORDER OR FINAL ACTION DUE DATE: / / MANUAL TRACKING DESIRED:N

THIS RECORD HAS BEEN SUCCESSFULLY ADDED 09/22/80 15:52:47  
 FEE PD DATE#1:09/16/80 \$0020 RECEIPT#000033552 REFUND DATE: / / REFUND \$  
 FEE PD DATE#2: / / \$ RECEIPT# REFUND DATE: / / REFUND \$  
 APPL:ACTIVE/INACTIVE/DENIED/WITHDRAWN/TRANSFERRED/EXEMPT/ISSUED:AC DATE:09/16/80  
 REMARKS:CHEMICAL REACTOR #1, BLDG. 171. TERPENE CRYSTALLIZATION. LAT./ LON. =  
 NOT GIVEN. UTM = 7435.600E. / 3360.750N.

STATE OF FLORIDA  
 DEPARTMENT OF ENVIRONMENTAL REGULATION

No 33552

RECEIPT FOR APPLICATION FEES AND MISCELLANEOUS REVENUE

Received from SCM CORPORATION (CHEM. REACTOR #1) Date 16 JFF 80

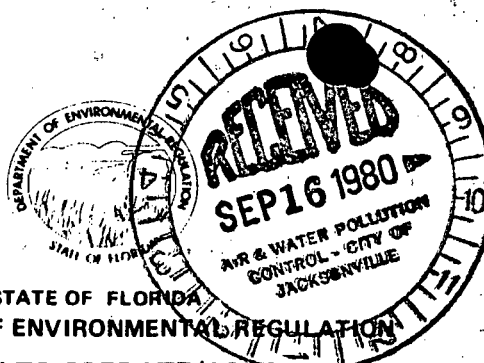
Address P.O. BOX 389, JACKSONVILLE Dollars \$ 200

Applicant Name & Address R.W. HARRELL, PEST ENG MGR

Source of Revenue \_\_\_\_\_

Revenue Code 0101 Application Number AC 16-34907

By M. G. THOMPSON



STATE OF FLORIDA  
DEPARTMENT OF ENVIRONMENTAL REGULATION  
APPLICATION TO OPERATE/CONSTRUCT  
AIR POLLUTION SOURCES

AC 16-34907

SOURCE TYPE: Chemical Reactor ☒ New<sup>1</sup> ☐ Existing<sup>1</sup>  
APPLICATION TYPE: ☒ Construction ☐ Operation ☐ Modification  
COMPANY NAME: SCM Corporation - Organic Chemicals Div. COUNTY: Duval  
Identify the specific emission point source(s) addressed in this application (i.e. Lime Kiln No. 4 with Venturi Scrubber; Peeking Unit No. 2, Gas Fired) Chemical Reactor - one - Building 171  
SOURCE LOCATION: Street Foot of West 61st Street City Jacksonville  
UTM: East 7435600 North 3360750  
Latitude        °        '        "N Longitude        °        '        "W  
APPLICANT NAME AND TITLE: Robert W. Harrell, Manager of Engineering  
APPLICANT ADDRESS: P. O. Box 389, Jacksonville, Florida 32201

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative\* of SCM Corporation, Organic Chemicals Div.

I certify that the statements made in this application for a Construction permit are true, correct and complete to the best of my knowledge and belief. Further, I agree to maintain and operate the pollution control source and pollution control facilities in such a manner as to comply with the provision of Chapter 403, Florida Statutes, and all the rules and regulations of the department and revisions thereof. I also understand that a permit, if granted by the department, will be non-transferable and I will promptly notify the department upon sale or legal transfer of the permitted establishment.

\*Attach letter of authorization

Signed: Robert W. Harrell  
Robert W. Harrell, Manager of Engineering  
Name and Title (Please Type)

Date: \_\_\_\_\_ Telephone No. (904)-764-1711-229 Ext. \_\_\_\_\_

B. PROFESSIONAL ENGINEER REGISTERED IN FLORIDA (where required by Chapter 471, F.S.)

This is to certify that the engineering features of this pollution control project have been designed/examined by me and found to be in conformity with modern engineering principles applicable to the treatment and disposal of pollutants characterized in the permit application. There is reasonable assurance, in my professional judgment, that the pollution control facilities, when properly maintained and operated, will discharge an effluent that complies with all applicable statutes of the State of Florida and the rules and regulations of the department. It is also agreed that the undersigned will furnish, if authorized by the owner, the applicant a set of instructions for the proper maintenance and operation of the pollution control facilities and, if applicable, pollution sources.

Signed: James O. Sewell  
James O. Sewell  
Name (Please Type)  
SCM Corporation Organic Chemicals Div.  
Company Name (Please Type)  
P. O. Box 389, Jacksonville, Florida 32201  
Mailing Address (Please Type)

Date: \_\_\_\_\_ Telephone No. (904)-764-1711-370 Ext. \_\_\_\_\_

<sup>1</sup>See Section 17-2.02(15) and (22), Florida Administrative Code, (F.A.C.)



## SECTION II: GENERAL PROJECT INFORMATION

- A. Describe the nature and extent of the project. Refer to pollution control equipment, and expected improvements in source performance as a result of installation. State whether the project will result in full compliance. Attach additional sheet if necessary.  
This is a sealed reactor for use in processing terpenes. The product is crystallized in the presence of solvent. The solvent is recovered. The vent from the reactor goes to a scrubber to remove solvent. This project will result in full compliance.
- B. Schedule of project covered in this application (Construction Permit Application Only)  
 Start of Construction October 1980 Completion of Construction March 1981
- C. Costs of pollution control system(s): (Note: Show breakdown of estimated costs only for individual components/units of the project serving pollution control purposes. Information on actual costs shall be furnished with the application for operation permit.)  
\$9100 - Dual Scrubber
- D. Indicate any previous DER permits, orders and notices associated with the emission point, including permit issuance and expiration dates.  
None
- E. Is this application associated with or part of a Development of Regional Impact (DRI) pursuant to Chapter 380, Florida Statutes, and Chapter 22F-2, Florida Administrative Code? Yes ☒ No
- F. Normal equipment operating time: hrs/day 24 ; days/wk 7 ; wks/yr 52 ; if power plant, hrs/yr \_\_\_\_\_ ; if seasonal, describe: \_\_\_\_\_
- G. If this is a new source or major modification, answer the following questions. (Yes or No)
- |                                                                                                                                       |     |
|---------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1. Is this source in a non-attainment area for a particular pollutant?                                                                | YES |
| a. If yes, has "offset" been applied?                                                                                                 | NO  |
| b. If yes, has "Lowest Achievable Emission Rate" been applied?                                                                        | NO  |
| c. If yes, list non-attainment pollutants.<br><u>Hydrocarbons</u>                                                                     |     |
| 2. Does best available control technology (BACT) apply to this source? If yes, see Section VI.                                        | NO  |
| 3. Does the State "Prevention of Significant Deterioration" (PSD) requirements apply to this source? If yes, see Sections VI and VII. | NO  |
| 4. Do "Standards of Performance for New Stationary Sources" (NSPS) apply to this source?                                              | NO  |
| 5. Do "National Emission Standards for Hazardous Air Pollutants" (NESHAP) apply to this source?                                       | NO  |
- Attach all supportive information related to any answer of "Yes". Attach any justification for any answer of "No" that might be considered questionable.

## SECTION II: GENERAL PROJECT INFORMATION

A. Describe the nature and extent of the project. Refer to pollution control equipment, and expected improvements in source performance as a result of installation. State whether the project will result in full compliance. Attach additional sheet if necessary.  
This is a sealed reactor for use in processing terpenes. The product is crystallized in the presence of solvent. The solvent is recovered. The vent from the reactor goes to a scrubber to remove solvent. This project will result in full compliance.

B. Schedule of project covered in this application (Construction Permit Application Only)

Start of Construction October 1980

Completion of Construction March 1981

C. Costs of pollution control system(s): (Note: Show breakdown of estimated costs only for individual components/units of the project serving pollution control purposes. Information on actual costs shall be furnished with the application for operation permit.)

\$9100 - Duall Scrubber

D. Indicate any previous DER permits, orders and notices associated with the emission point, including permit issuance and expiration dates.

None

E. Is this application associated with or part of a Development of Regional Impact (DRI) pursuant to Chapter 380, Florida Statutes, and Chapter 22F-2, Florida Administrative Code? Yes ☒ No

F. Normal equipment operating time: hrs/day 24 ; days/wk 7 ; wks/yr 52 ; if power plant, hrs/yr \_\_\_\_\_ ; if seasonal, describe: \_\_\_\_\_

G. If this is a new source or major modification, answer the following questions. (Yes or No)

1. Is this source in a non-attainment area for a particular pollutant?

YES

a. If yes, has "offset" been applied?

NO

b. If yes, has "Lowest Achievable Emission Rate" been applied?

NO

c. If yes, list non-attainment pollutants.

Hydrocarbons

2. Does best available control technology (BACT) apply to this source? If yes, see Section VI.

NO

3. Does the State "Prevention of Significant Deterioration" (PSD) requirements apply to this source? If yes, see Sections VI and VII.

NO

4. Do "Standards of Performance for New Stationary Sources" (NSPS) apply to this source?

NO

5. Do "National Emission Standards for Hazardous Air Pollutants" (NESHAP) apply to this source?

NO

Attach all supportive information related to any answer of "Yes". Attach any justification for any answer of "No" that might be considered questionable.

### SECTION III: AIR POLLUTION SOURCES & CONTROL DEVICES (Other than Incinerators)

**A. Raw Materials and Chemicals Used in your Process, if applicable:**

Description	Contaminants		Utilization Rate - lbs/hr	Relate to Flow Diagram
	Type	% Wt		
Terpene Oils	VOC	1	18.75 lb/hr.	A
Edible Solids	None	0	154.65 lb/hr.	B
Solvent	VOC	0.18	101.71 lb/hr.	C
Emulsifier	None	0	2.63 lb/hr.	D
H <sub>2</sub> O	None	0	11.25 lb/hr.	E

**B. Process Rate, if applicable: (See Section V, Item 1) - See Flow Diagram for weight balance**

1. Total Process Input Rate (lbs/hr): 288.99

2. Product Weight (lbs/hr): 267.72

**C. Airborne Contaminants Emitted:**

Name of Contaminant	Emission <sup>1</sup>		Allowed Emission <sup>2</sup> Rate per Ch. 17-2, F.A.C.	Allowable <sup>3</sup> Emission lbs/hr	Potential Emission <sup>4</sup>		Relate to Flow Diagram
	Maximum lbs/hr	Actual T/yr			lbs/hr	T/yr	
Hydrocarbons	0.95	4.15	100 lb/hr. 50 T/Yr.	N/A	18.75	82.13	F

**D. Control Devices: (See Section V, Item 4)**

Name and Type (Model & Serial No.)	Contaminant	Efficiency	Range of Particles <sup>5</sup> Size Collected (in microns)	Basis for Efficiency (Sec. V, It <sup>5</sup> )
Dual FW 300-4000	Hydrocarbons	95%	N/A	See Attached Mfg. Data

<sup>1</sup>See Section V, Item 2.

<sup>2</sup>Reference applicable emission standards and units (e.g., Section 17-2.05(6) Table II, E. (1), F.A.C. - 0.1 pounds per million BTU heat input)

<sup>3</sup>Calculated from operating rate and applicable standard

<sup>4</sup>Emission, if source operated without control (See Section V, Item 3)

<sup>5</sup>If Applicable

E. Fuels - NONE

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	

\*Units Natural Gas, MMCF/hr; Fuel Oils, barrels/hr; Coal, lbs/hr

Fuel Analysis:

Percent Sulfur: \_\_\_\_\_ Percent Ash: \_\_\_\_\_

Density: \_\_\_\_\_ lbs/gal Typical Percent Nitrogen: \_\_\_\_\_

Heat Capacity: \_\_\_\_\_ BTU/lb \_\_\_\_\_ BTU/gal

Other Fuel Contaminants (which may cause air pollution): \_\_\_\_\_

F. If applicable, indicate the percent of fuel used for space heating. Annual Average N/A Maximum \_\_\_\_\_

G. Indicate liquid or solid wastes generated and method of disposal.

Water from scrubber sent to plant waste water treatment section

H. Emission Stack Geometry and Flow Characteristics (Provide data for each stack): - NO STACK

Stack Height: \_\_\_\_\_ ft. Stack Diameter: \_\_\_\_\_ ft.

Gas Flow Rate: \_\_\_\_\_ ACFM Gas Exit Temperature: \_\_\_\_\_ °F.

Water Vapor Content: \_\_\_\_\_ % Velocity: \_\_\_\_\_ FPS

#### SECTION IV: INCINERATOR INFORMATION - N/A

Type of Waste	Type O (Plastics)	Type I (Rubbish)	Type II (Refuse)	Type III (Garbage)	Type IV (Pathological)	Type V (Liq & Gas By-prod.)	Type VI (Solid By-prod.)
Lbs/hr Incinerated							

Description of Waste \_\_\_\_\_

Total Weight Incinerated (lbs/hr) \_\_\_\_\_ Design Capacity (lbs/hr) \_\_\_\_\_

Approximate Number of Hours of Operation per day \_\_\_\_\_ days/week \_\_\_\_\_

Manufacturer \_\_\_\_\_

Date Constructed \_\_\_\_\_ Model No. \_\_\_\_\_

E. Fuels - NONE

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	

\*Units Natural Gas, MMCF/hr; Fuel Oils, barrels/hr; Coal, lbs/hr

Fuel Analysis:

Percent Sulfur: \_\_\_\_\_ Percent Ash: \_\_\_\_\_

Density \_\_\_\_\_ lbs/gal Typical Percent Nitrogen: \_\_\_\_\_

Heat Capacity: \_\_\_\_\_ BTU/lb \_\_\_\_\_ BTU/gal

Other Fuel Contaminants (which may cause air pollution): \_\_\_\_\_

F. If applicable, indicate the percent of fuel used for space heating. Annual Average N/A Maximum \_\_\_\_\_

G. Indicate liquid or solid wastes generated and method of disposal.

Water from scrubber sent to plant waste water treatment section

H. Emission Stack Geometry and Flow Characteristics (Provide data for each stack): - NO STACK -

Stack Height: \_\_\_\_\_ ft. Stack Diameter: \_\_\_\_\_ ft.

Gas Flow Rate: \_\_\_\_\_ ACFM Gas Exit Temperature: \_\_\_\_\_ °F.

Water Vapor Content: \_\_\_\_\_ % Velocity: \_\_\_\_\_ FPS

#### SECTION IV: INCINERATOR INFORMATION - N/A

Type of Waste	Type O (Plastics)	Type I (Rubbish)	Type II (Refuse)	Type III (Garbage)	Type IV (Pathological)	Type V (Liq & Gas By-prod.)	Type VI (Solid By-prod.)
Lbs/hr Incinerated							

Description of Waste \_\_\_\_\_

Total Weight Incinerated (lbs/hr) \_\_\_\_\_ Design Capacity (lbs/hr) \_\_\_\_\_

Approximate Number of Hours of Operation per day \_\_\_\_\_ days/week \_\_\_\_\_

Manufacturer \_\_\_\_\_

Date Constructed \_\_\_\_\_ Model No. \_\_\_\_\_

	Volume (ft) <sup>3</sup>	Heat Release (BTU/hr)	Fuel		Temperature (°F)
			Type	BTU/hr	
Primary Chamber					
Secondary Chamber					

Stack Height: \_\_\_\_\_ ft. Stack Diameter \_\_\_\_\_ Stack Temp. \_\_\_\_\_

Gas Flow Rate: \_\_\_\_\_ ACFM \_\_\_\_\_ DSCFM\* Velocity \_\_\_\_\_ FPS

\*If 50 or more tons per day design capacity, submit the emissions rate in grains per standard cubic foot dry gas corrected to 50% excess air.

Type of pollution control device: ☐ Cyclone ☐ Wet Scrubber ☐ Afterburner ☐ Other (specify) \_\_\_\_\_

Brief description of operating characteristics of control devices: \_\_\_\_\_

Ultimate disposal of any effluent other than that emitted from the stack (scrubber water, ash, etc.):

#### SECTION V: SUPPLEMENTAL REQUIREMENTS – SEE ATTACHED SHEET

Please provide the following supplements where required for this application.

1. Total process input rate and product weight — show derivation.
2. To a construction application, attach basis of emission estimate (e.g., design calculations, design drawings, pertinent manufacturer's test data, etc.) and attach proposed methods (e.g., FR Part 60 Methods 1, 2, 3, 4, 5) to show proof of compliance with applicable standards. To an operation application, attach test results or methods used to show proof of compliance. Information provided when applying for an operation permit from a construction permit shall be indicative of the time at which the test was made.
3. Attach basis of potential discharge (e.g., emission factor, that is, AP42 test).
4. With construction permit application, include design details for all air pollution control systems (e.g., for baghouse include cloth to air ratio; for scrubber include cross-section sketch, etc.).
5. With construction permit application, attach derivation of control device(s) efficiency. Include test or design data. Items 2, 3, and 5 should be consistent: actual emissions = potential (1-efficiency).
6. An 8½" x 11" flow diagram which will, without revealing trade secrets, identify the individual operations and/or processes. Indicate where raw materials enter, where solid and liquid waste exit, where gaseous emissions and/or airborne particles are evolved and where finished products are obtained.
7. An 8½" x 11" plot plan showing the location of the establishment, and points of airborne emissions, in relation to the surrounding area, residences and other permanent structures and roadways (Example: Copy of relevant portion of USGS topographic map).
8. An 8½" x 11" plot plan of facility showing the location of manufacturing processes and outlets for airborne emissions. Relate all flows to the flow diagram.



9. An application fee of \$20, unless exempted by Section 17-4.05(3), F.A.C. The check should be made payable to the Department of Environmental Regulation.
10. With an application for operation permit, attach a Certificate of Completion of Construction indicating that the source was constructed as shown in the construction permit.

### SECTION VI: BEST AVAILABLE CONTROL TECHNOLOGY - N/A

- A. Are standards of performance for new stationary sources pursuant to 40 C.F.R. Part 60 applicable to the source?

☐ Yes ☐ No

Contaminant	Rate or Concentration

- B. Has EPA declared the best available control technology for this class of sources (If yes, attach copy) ☐ Yes ☐ No

Contaminant	Rate or Concentration

- C. What emission levels do you propose as best available control technology?

Contaminant	Rate or Concentration

- D. Describe the existing control and treatment technology (if any).

1. Control Device/System:

2. Operating Principles:

3. Efficiency:\*

5. Useful Life:

7. Energy:

9. Emissions:

4. Capital Costs:

6. Operating Costs:

8. Maintenance Cost:

Contaminant	Rate or Concentration

\*Explain method of determining D 3 above.

9. An application fee of \$20, unless exempted by Section 17-4.05(3), F.A.C. The check should be made payable to the Department of Environmental Regulation.
10. With an application for operation permit, attach a Certificate of Completion of Construction indicating that the source was constructed as shown in the construction permit.

### SECTION VI: BEST AVAILABLE CONTROL TECHNOLOGY - N/A

- A. Are standards of performance for new stationary sources pursuant to 40 C.F.R. Part 60 applicable to the source?  
☐ Yes ☐ No

Contaminant	Rate or Concentration

- B. Has EPA declared the best available control technology for this class of sources (If yes, attach copy) ☐ Yes ☐ No

Contaminant	Rate or Concentration

- C. What emission levels do you propose as best available control technology?

Contaminant	Rate or Concentration

- D. Describe the existing control and treatment technology (if any).

1. Control Device/System:

2. Operating Principles:

3. Efficiency: \*

5. Useful Life:

7. Energy:

9. Emissions:

4. Capital Costs:

6. Operating Costs:

8. Maintenance Cost:

Contaminant	Rate or Concentration

\*Explain method of determining D 3 above.

## SECTION V

1. The process input rate as derived from the flow sheet is

$$757.74 - 468.75 = 288.99 \text{ lb/hr.}$$

The output rate as derived from the flow sheet is product plus solvent equals

$$176.57 + 91.15 = 267.42 \text{ lb/hr.}$$

The 21.27 lb difference is split as follows:

19.41 lbs/hr. to the scrubber

1.85 lbs/hr. out with cleaning water

2. Emission estimate made from weight balance shown on the flow sheet.
3. The potential discharge estimate was made from the weight balance shown on the flow sheet.
4. Design details on Duall unit attached
5. Control device efficiency furnished by manufacturer

**TBC**  
**Tom Barrow Company**

*Manufacturers' Representatives*

JACKSONVILLE OFFICE:  
BLDG. 16 - 4549 ST. AUGUSTINE ROAD  
P.O. BOX 10009  
JACKSONVILLE, FLORIDA 32207  
904/737-8788

ATLANTA OFFICE:  
708 ANTONE STREET, N.W.  
ATLANTA, GEORGIA 30313  
404/351-1010

September 4, 1980

SCM Organic Chemicals  
P. O. Box 389  
Jacksonville, FL 32201

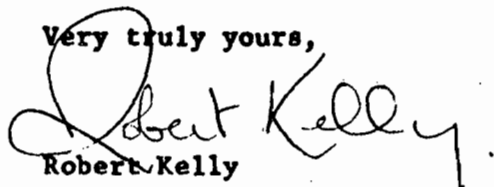
Attention: Mr. Ed DeWhitt  
Project Engineer

Subject: Isopropyl Alcohol Fume  
Duall FW300-4000 with special packing.

Dear Mr. DeWhitt:

The efficiency of the above Duall unit on 5% Isopropyl Alcohol can be expected to be as high as 96%-98%. You will certainly be safe in reporting an anticipated efficiency of 96%.

Very truly yours,



Robert Kelly  
Duall Industries  
c/o Tom Barrow Company  
Jacksonville, Florida

RK/tb

cc: Bill Cook  
Duall Industries - Owosso



# Tom Barrow Company

Manufacturers' Representatives

JACKSONVILLE OFFICE:  
BLDG. 16 - 4549 ST. AUGUSTINE ROAD  
P.O. BOX 10009  
JACKSONVILLE, FLORIDA 32207  
904/737-8788

ATLANTA OFFICE:  
708 ANTONE STREET, N.W.  
ATLANTA, GEORGIA 30313  
404/351-1010

August 25, 1980

SCM Organic Chemicals  
P. O. Box 389  
Jacksonville, FL 32201

Attention: Mr. Ed DeWhitt, Project Engineer

Subject: Fume Containing Isopropyl Alcohol  
Duall "Single" Packed Scrubber

Dear Mr. DeWhitt:

For your effluent containing 5% Isopropyl Alcohol we have again selected the Duall FW300 PVC Scrubber. This unit has been used successfully in Jacksonville by observing two design criteria:

- (1) Oversizing the scrubber.
- (2) Using packing specially designed for SCM.

This time we've chosen the FW300-4000 to handle 2040 CFM at ambient temperature.

The price is \$9105.00 FOB Forest City, NC. Shipping time 10-12 weeks. Terms 2% 10 days. Net 30 days.

The above price includes the following features:

- (1) 3 foot layer of "K" packing.
- (2) 6 layers of #1696.
- (3) Float box for liquid level control.
- (4) 5 HP fan drive motor 230/460-3-60.
- (5) 1 1/2 HP Pump motor 230/460-3-60.

*3 Exp Proof*

We look forward to working with you on this project.

Very truly yours,

Robert Kelly  
Duall Industries  
c/o Tom Barrow Company  
Jacksonville, Florida

RK/tb

enc: 2

cc: Mr. Bill Cook - Duall, Owosso.





P. O. BOX 389, JACKSONVILLE, FLA. 32201 (904) 764-1711

October 7, 1980



Department of Environmental Regulation  
Twin Towers Office Building  
2600 Blair Stone Road  
Tallahassee, Florida 32301

Attention: Mr. W. A. Thomas, Jr.

Re: Application to Construct (1) Sealed Reactor - Building 171

Dear Mr. Thomas,

The following letter is in answer to your letter dated October 2, 1980.

1. The latitude is 30° 22" 45". Longitude is 81° 39' 50"
2. The vent height will be 6.87 ft. above top of foundation which should be 12-15" above grade. The vent diameter will be 13.125 inches. The exhaust gas flow rate will be 2.15 ACFM at 77°F.
3. The name means reactor number one in Building 171; the plant number designation proposed is 171-1.
4. (a) The sealed Reactor is vented to the scrubber for the charging, crystallization, and water wash steps.  
  
(b) The proposed solvent is isopropanol and the solubility of isopropanol in water is infinite according to CRC 54th Ed. Page C453. Note the name of this solvent is to be considered as Confidential Process Information.  
  
(c) The displaced vapors will be vented through the scrubber.  
  
(d) The expected analysis of the vapors vented to the scrubber is:

Water - 2.4%  
Hydrocarbons - 97.6%

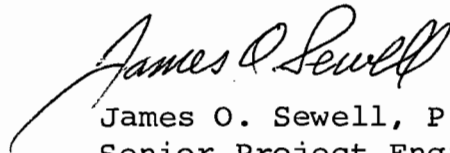
Continued

Mr. W. A. Thomas, Jr.  
Department of Environmental Regulation  
October 7, 1980  
Page -2-

5. The two attached prints are the only manufacturers drawings furnished.
  - (a) The scrubber will be monitored by gas chromatograph.
  - (b) The temperatures will be the ambient temperature. There is no need to control the temperature.
6. The solvent stream shown leaving the reactor is contaminated and contains 91% IPA.

If you have any further questions, please do not hesitate to contact me.

Yours very truly,



James O. Sewell, P. E.  
Senior Project Engineer

JOS/mwf

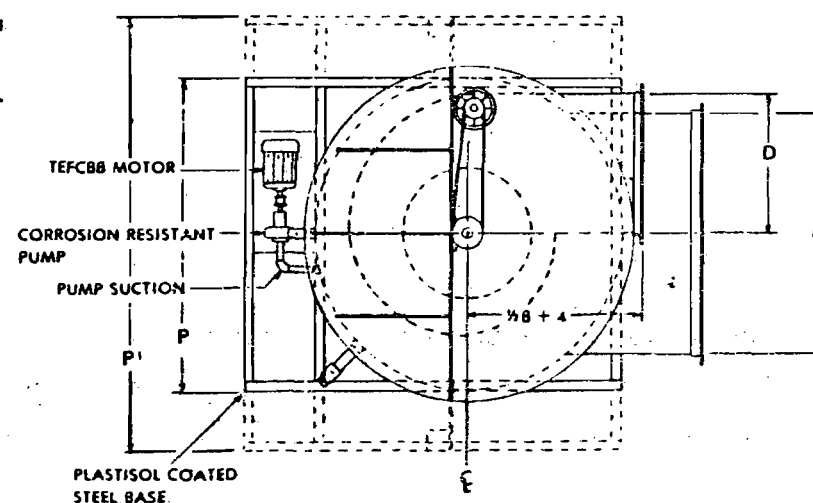
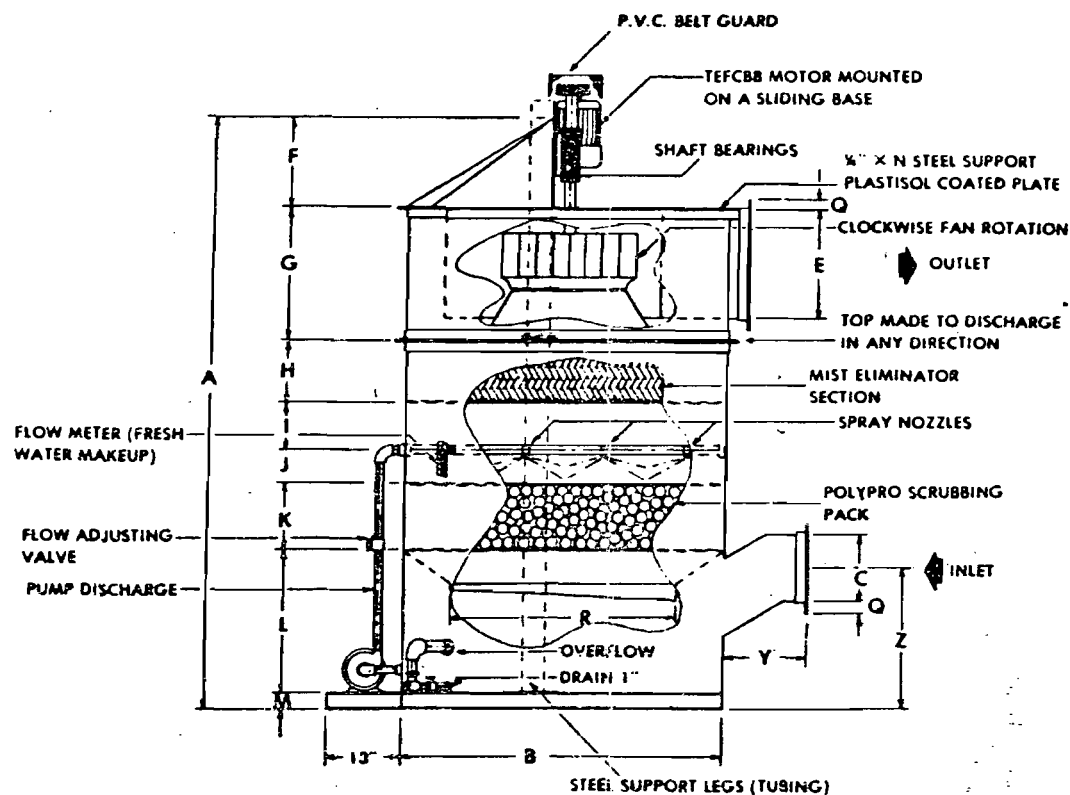
Attachments

cc: R. W. Harrell

CFM	FAN NO.	MOTOR	SP	A	B	O.D.	I.D.	I.D.	F	G	H	I	J	K	L	M	N	O.D.	P	Q	R	Y	Z	P'	OVER FLOW	PUMP SUCTION	PUMP DISCHARGE	NO. OF NOZZLES
500	6	1	4	90%	20	4	6%	4%	14	11%	11	10	6	12	24	2	24	8	20	1 1/2	10	9	18	28	1	1	1/2	1
1,000	8	1 1/2	4	95	26	6	9	5%	14	16	11	10	6	12	24	2	30	12	26	1 1/2	14	10	20	34	1	1	1/2	1
2,000	10	3	4	98%	32	8	12	7%	14	19%	11	10	6	12	24	2	36	16	32	1 1/2	20	10	20	40	1	1	1/2	1
3,000	30	5	4	105	34	10	15%	11%	16	24	11	10	6	12	24	2	38	20	34	1 1/2	24	10	21	42	1	1	1/2	2
4,000	33	5	4	105	40	10	17%	13%	16	24	11	10	6	12	24	2	44	26	40	1 1/2	28	10	21	48	1	1	1/2	2
5,000	36 1/2	7 1/2	4	105	45	11	19	14%	16	24	11	10	6	12	24	2	49	30	45	1 1/2	31	15	25	53	1 1/2	1	1/2	3
6,000	44 1/2	7 1/2	4	106	49	11	23%	17%	16	24	11	10	6	12	24	3	53	36	49	2	34	15	25	59	1 1/2	1 1/2	1	4
7,000	44 1/2	7 1/2	4	106	53	12	23%	17%	16	24	11	9	6	12	25	3	57	44	53	2	38	15	25	61	1 1/2	1 1/2	1	4
8,000	49	10	4	110	57	12	25%	19%	20	24	11	9	6	12	25	3	61	44	57	2	40	15	25	68	1 1/2	1 1/2	1	6
10,000	49	15	4	110	64	14	25%	19%	20	24	11	7	6	12	27	3	68	48	64	2	45	15	25	79	1 1/2	1 1/2	1 1/2	6
12,000	54	20	4	118%	70	16	28%	21%	22	27%	11	7	6	12	29	4	74	48	70	2	50	15	26	84	1 1/2	1 1/2	1 1/2	8

NOTE: 4"X4"X1/2" STEEL SUPPORT TUBING REQUIRED ON 10 AND 12 THOUSAND SCRUBBERS

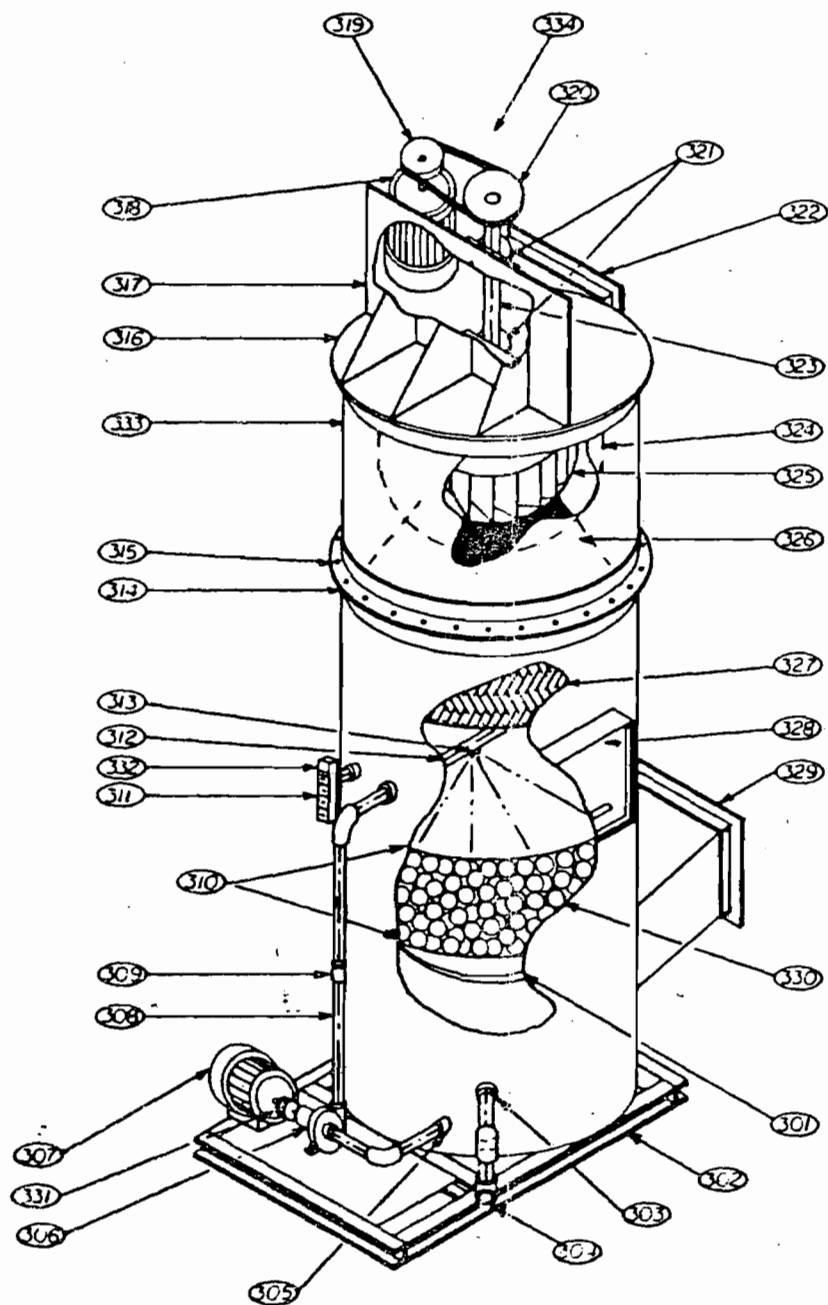
NOTE: 10,000 & 12,000 CFM units cannot be feasibly rotated and we should know rotation before start of fabrication.



### FW-300 FAN SCRUBBER WITH SELF CONTAINED RECIRCULATION

DUAL INDUSTRIES, Inc. Owosso, Mich.

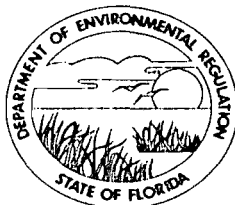
DRAWN	USER
DATE	PURCH.
JOB NO.	LOCA.
CFM	ARR. FAN
G.P.M. REQ.	WATER MAKEUP
V. PH. CY.	CLASS



SELF CONTAINED  
FW-300 FAN SCRUBBER  
PARTS LIST

NO.	PART
301	INLET CONE P.V.C.
302	PLASTISOL COATED STEEL BASE
303	OVERFLOW COUPLING P.V.C.
304	DRAIN AND OVERFLOW OUTLET
305	PUMP SUCTION COUPLING P.V.C.
306	CORROSION RESISTANT PUMP
307	TEFCBU MOTOR
308	PUMP DISCHARGE LINE
309	FLOW ADJUSTING VALVE
310	P.V.C. PERFORATED PACK RETAINER
311	FLOW METER FRESH WATER MAKEUP
312	SPRAY HEADER
313	SPRAY NOZZLE
314	P.V.C. FLANGES
315	STAINLESS STEEL NUTS AND BOLTS
316	ROUND STEEL SUPPORT
317	VERTICAL STEEL SUPPORT FOR MOUNTING THE MOTOR AND BEARINGS
318	TEFCBB MOTOR
319	MOTOR DRIVE
320	WHEEL DRIVE
321	BEARINGS
322	FAN HOUSING DISCHARGE
323	STAINLESS STEEL WHEEL SHAFT
324	FAN HOUSING
325	PLASTISOL COATED CENTRIFUGAL STEEL
326	FAN INLET CONE
327	MIST ELIMINATOR SECTION
328	PLEXIGLAS CLEAN OUT DOOR
329	SCRUBBER INLET
330	POLYPROPYLENE MASPACK
331	COUPLING COVER NOT SHOWN
332	CAUSTIC COUPLING NOT SHOWN
333	CLEAN OUT DOOR NOT SHOWN
334	P.V.C. BELT GUARD NOT SHOWN

TWIN TOWERS OFFICE BUILDING  
2600 BLAIR STONE ROAD  
TALLAHASSEE, FLORIDA 32301



BOB GRAHAM  
GOVERNOR

JACOB D. VARN  
SECRETARY

STATE OF FLORIDA

**DEPARTMENT OF ENVIRONMENTAL REGULATION**

October 2, 1980

Mr. Robert W. Harrell  
Manager of Engineering  
Organic Chemicals Division  
SCM Corporation  
P. O. Box 389  
Jacksonville, Florida 32201

Dear Mr. Harrell:

The Department of Environmental Regulation has received and reviewed for completeness your application for a permit to install one reactor in building 171. The application is incomplete requiring additional information and clarification of data given on the application.

Following is a list of the additional information required to complete this application.

1. The latitude and longitude of the source.
2. The Stack Height, which is the vertical distance between the point of emission (scrubber effluent) and ground level. The Stack Diameter, which is the inside diameter of a circular section at the point of emission. For a noncylindrical exit it is the cross sectional area in square feet. Temperature and flow rate of the exhaust gas volumm released. Reoprt using the following order of priority for selection; Actual, Design, or Maximum rates. (See Section III-H).
3. The specific emission point on the application cover page is described as; Reaction-one-Building 171. Is this to mean "Reactor number one in building 171" or Building 171 contains one reactor? Please advise an identifying characteristic to be included on the permit to pin point the emission point. (Vessel manufacture, model number or applicants plant number designation).
4. The process flow sheet addendum indicates five steps; charging, crystallization, Solvent removal, water wash, Product removal.
  - a. At which step(s) in the process is the sealed reactor vented to the scrubber?
  - b. If not proprietary information advise the common generic name of the solvent used or adivse the Reid vapor pressure



- according to the American Society for Testing and Materials, Part 17, D-323-72. Also the solubility of the emitted vapors in the absorbent at operating temperature(s). (FAC 17-2.02(101) and 17-2.02(136)).
- c. During a twenty four hour period 4629 pounds or approximately 701 gallons of solvent will be transferred to and from storage. Will the displaced vapors be vented through the proposed scrubber? If not, how will the vapors be controlled?
  - d. What is the expected analysis of the vapors vented to the scrubber?
  5. The August 25, 1980 letter from the Tom Barrow Company indicates the Duall FW 300 PVC scrubber will be oversized containing 3 foot layers of "K" packing and 6 layers of #1696. Please send a copy of the manufacturers drawing of the actual Duall scrubber to be installed.
    - a. Water flow rate to the Duall scrubber will be 2001.6 lb/hr. or 5,760 gallons per day, according to the addendum process flow sheet. Per the vendor data the scrubber will have a recirculation system on liquid level control. If the recirculation system is used, how will the scrubber be monitored to maintain the 95% efficiency.
    - b. What will be the temperature parameters of the absorbent at stated efficiency? How will these temperatures be maintained during the year.
  6. According to Section II-A the scrubber will control solvent vapors vented at some point in the process. The solvent weight balance (addendum Process flow sheet) indicates 10.56 lbs/hr. will be lost during processing. If vented through the scrubber at 95% efficiency will yield a 0.53 lb/hr emission rate or 2.3 TPY. Please explain the difference from the amount reported on Section III-C.

As soon as the missing information is received, the department will begin processing the application.

Sincerely,



Steve Smallwood, Chief  
Bureau of Air Quality Management

SS:dav

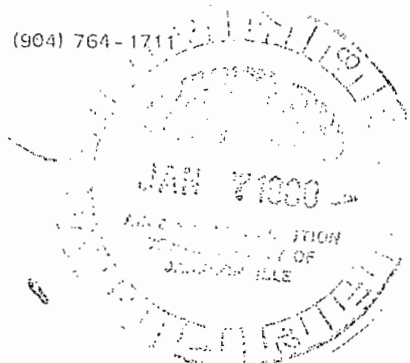
cc: Mr. E. P. Balducci  
Mr. Johnny Cole  
Mr. Robert Kappelman



ORGANIC CHEMICALS  
DIVISION OF SCM CORPORATION

P. O. BOX 389, JACKSONVILLE, FLA. 32201 (904) 764-1711

January 4, 1980



Mr. E. P. Balducci  
Assistant Air Pollution Control Engineer  
Bio-Environmental Services Division  
Air and Water Pollution Control  
515 West Sixth Street  
Jacksonville, Florida 32206

Re: 1. Permit Renewal Application  
for A016-2400, 38 Vacuum Jets  
2. AC16-6716, Two Reactors

Dear Mr. Balducci:

This letter is in answer to your request to submit data to account for the difference between the total process input rate and the product weight as shown in Item B of each of the above applications.

The data submitted on these forms was old data and should have been the same on each permit. The data below is based on the last 6 calendar months of 1979:

Item A - Raw Materials

Crude Sulfate Turpentine - 9378 lb/hr.

Item B - Process Rate

1. Total Process Input Rate - 9378 lb/hr.
2. Product Weight - 8444 lb/hr.

The difference between B-1 and B-2 (9378-8444) of 934 lbs/hr. includes the following:

- a. Emissions to air 385.4
- b. Dissolved oil in waste water
- c. Residual oil on catalyst returned to manufacturer

Continued

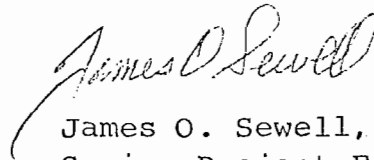
Mr. E. P. Bald  
Assistant Air Pollution Control Engineer  
January 4, 1980  
Page -2-

The data from which these numbers were obtained are production records and are our best estimates. (Active)

This plant processes fractions of crude sulfate turpentine into many products; production of each material varies from month to month depending on sales and available time in equipment. The process steps, which vary widely with each product, can total as many as twenty-five (25) individual processes that include reactions, distillations, neutralizations and water washes. Some reactions increase the weight of the chemical molecules and others decrease these weights.

If there are any questions regarding this information, please contact me by telephone or letter.

Yours very truly,



James O. Sewell, P.E.  
Senior Project Engineer

JOS/mwf

cc: Mr. R. W. Harrell  
Mr. K. R. Handley

BY J.O. Sewell

DATE 9-16-80

SUBJECT Reactor Permit

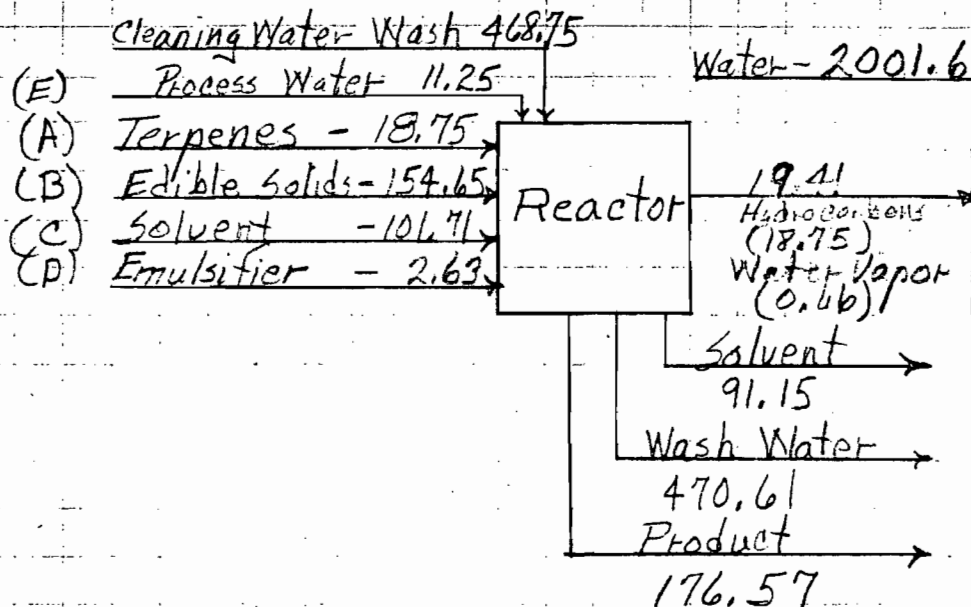
OUT

Product	176.57
Solvent	91.15
To Scrubber	19.41
Cleaning Water	470.61
	<u>757.74</u>

IN

Terpenes	18.75
Edible Solids	154.65
Solvent	101.71
Emulsifier	2.63
Process Water	11.25
Cleaning Water	468.75
	<u>757.74</u>

Reactor



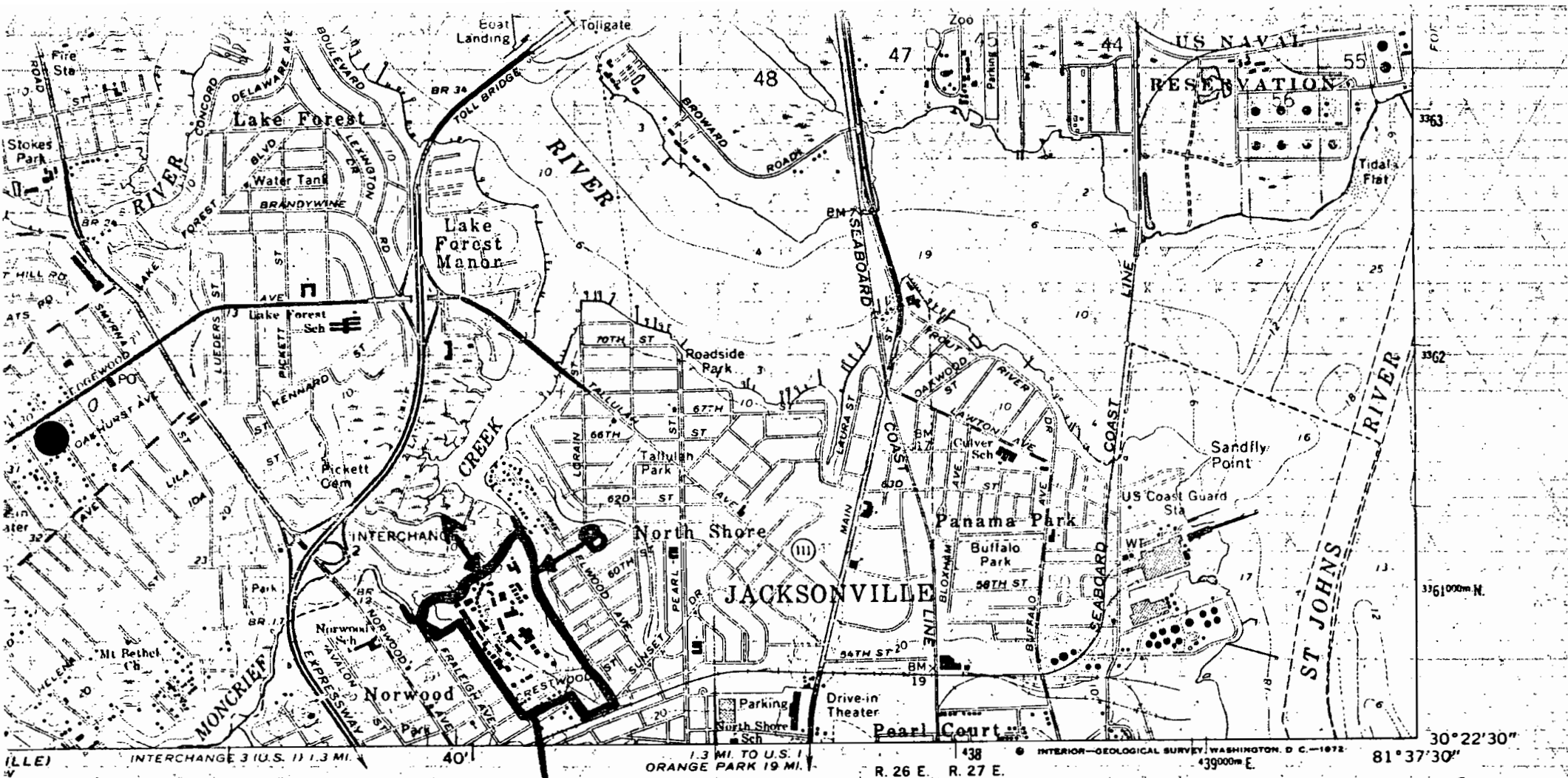
Scrubber

IN

From Reactor	19.41
Water	2001.6
	<u>2021.01</u>

OUT

Scrubber Water	1919.96
Vent - Water Vapor	100.1
Vent - Hydrocarbons	0.95
	<u>2021.01</u>



000  
4000 5000 6000 7000 FEET  
1 KILOMETER  
1:10 FEET  
SEA-LEVEL  
ST-DATUM IS MEAN LOW WATER  
CLIMATE LINE OF MEAN HIGH WATER  
APPROXIMATELY 1 FOOT

**A-D002  
B-D003**  
**SCM PLANT  
ENCLOSED AREA**



QUADRANGLE LOCATION  
SCM CORPORATION  
ORGANIC CHEMICALS DIVISION  
PLANT LOCATION  
DATE 12-21-78  
APPROVED *[Signature]*  
DWG. NO.  
S-5000-26

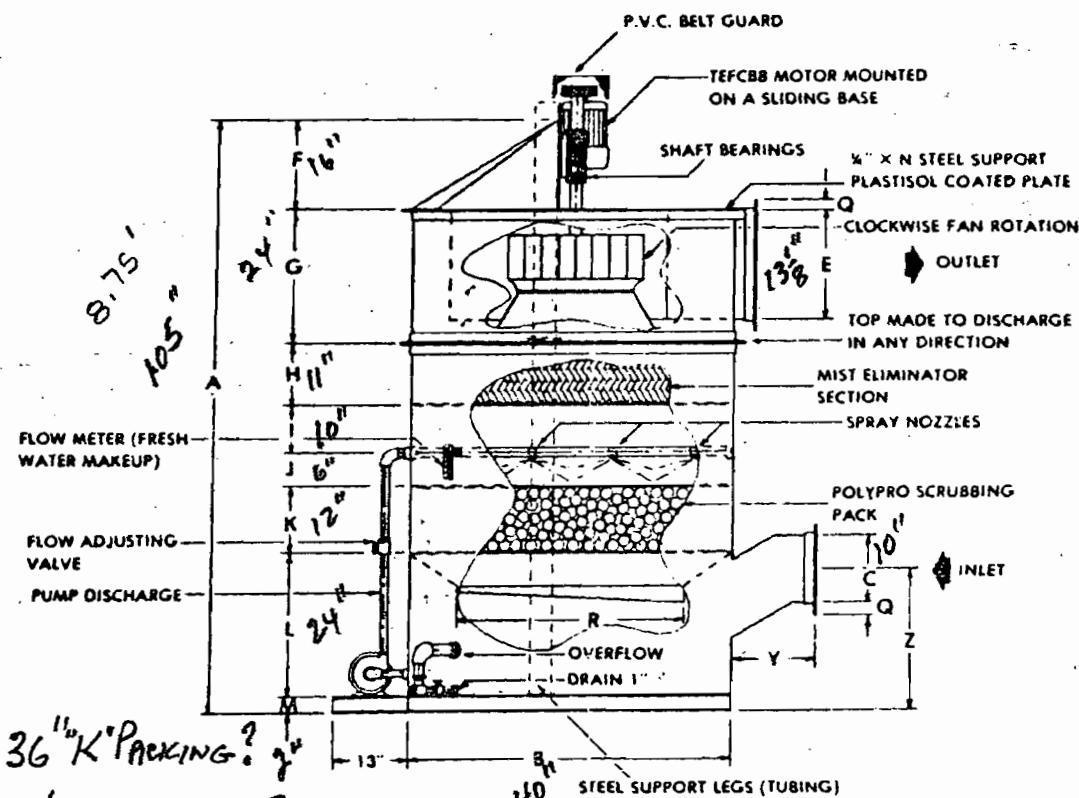
ROAD CLASSIFICATION  
Heavy-duty ——— Light-duty ———  
Medium-duty ——— Unimproved dirt - - - - -  
○ Interstate Route ○ U. S. Route ○ State Route

TROUT RIVER, FLA.

N3022.5—W8137.5/7.5

1964  
PHOTOREVISED 1970  
AMS 4644 : NW—SERIES V847

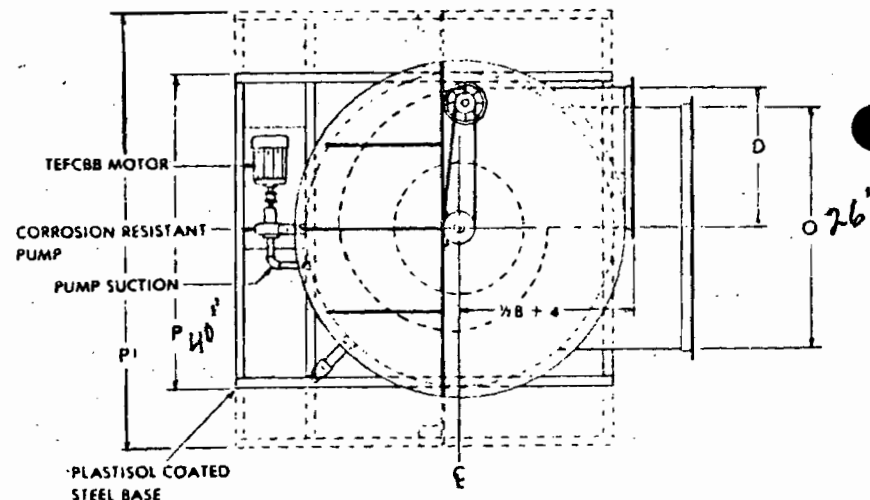
NOTE: 10,000 & 12,000 CFM units cannot be feasibly rotated and we should know rotation before start of fabrication.



36" K'PACKING? 2"  
6 LAYERS #1696?

**DUALL INDUSTRIES, Inc. Owosso, Mich.**

DRAWN	USER
DATE	PURCH.
JOB NO.	LOCA.
CFM	ARR. FAN
G.P.M. REQ.	WATER MAKEUP
V. PH. CY.	CLASS





SUBJECT

DATE

DATE

BY

CHECKED BY

1 OF 1  
Reactor Permit

9-16-80

J.O. Sewell

184.65  
 (E) Process Water 11.25  
 (A) Terpenes - 18.75  
 (B) Edible Solids - 154.65  
 (C) Solvent - 101.71  
 (D) Emulsifier - 2.63

18.75  
 0.1  
 18.85

Cleaning Water - Wash 468.75

757.74

Reactor

IN

Terpenes

18.75

Edible Solids

154.65

Solvent

101.71

Emulsifier

2.63

Process Water

11.25

Cleaning Water

468.75

757.74

OUT

Product

176.57

Solvent

91.15

To Scrubber

19.41

Cleaning Water

470.61

757.74

Reactor

19.41

Hydrocarbons

(18.75)

Water Vapor

(0.66)

Solvent

91.15

Wash Water

470.61

Product

176.57

91.15

267.72

Water - 2001.6

Recirculate

Scrubber

Vent - Hydrocarbons 0.95

Vent - Water Vapor 100.1

Water to Waste Water

Treatment 1919.96

5325 gal/day

Scrubber

IN

From Reactor

19.41

Water

2001.6

2021.01

OUT

Scrubber Water

1919.96

Vent - Water Vapor

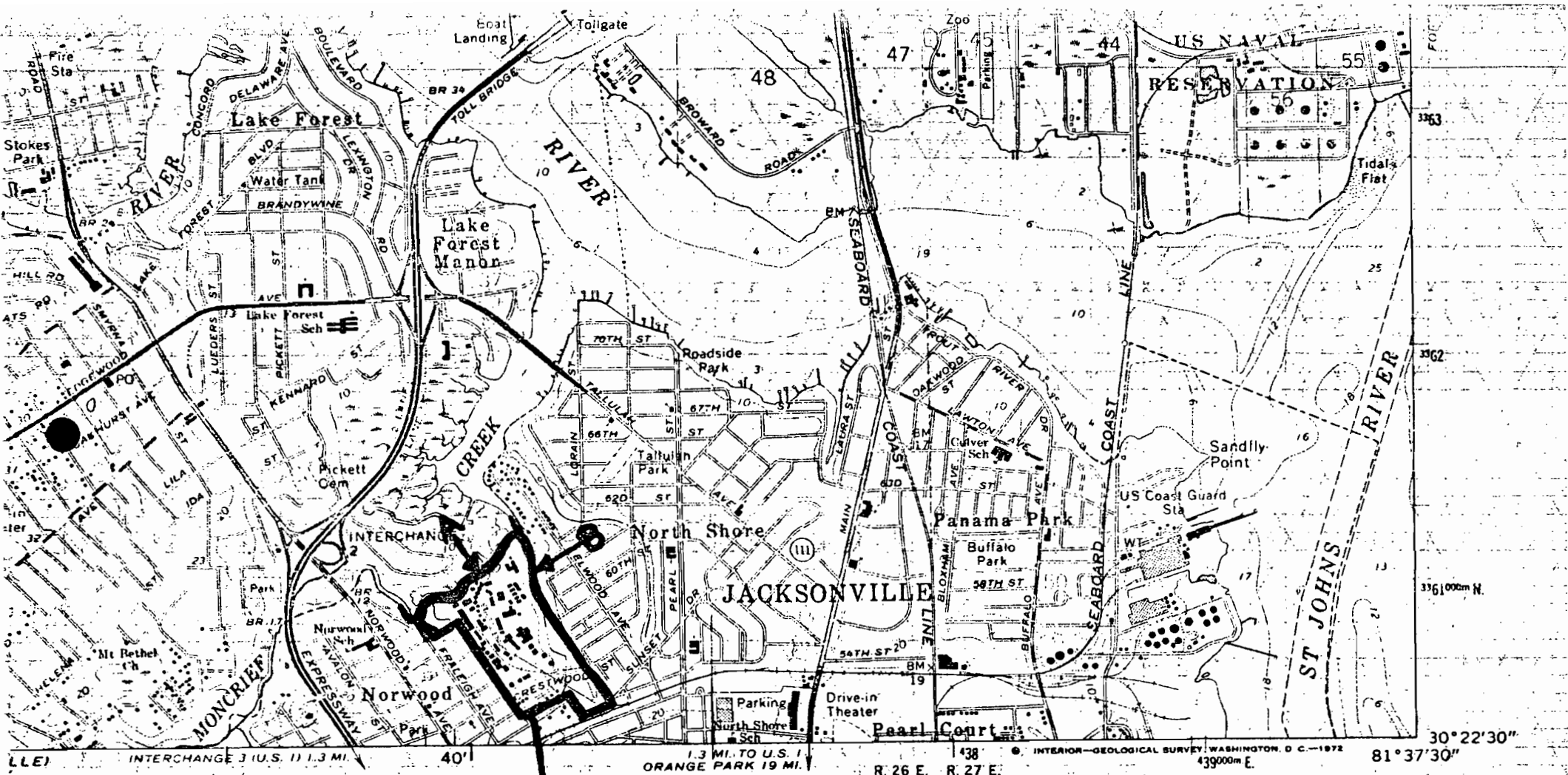
100.1

Vent - Hydrocarbons

0.95

2021.01

8760



000  
4000 5000 6000 7000 FEET  
1 KILOMETER  
L 10 FEET  
SEA-LEVEL  
T-DATUM IS MEAN LOW WATER  
IMATE LINE OF MEAN HIGH WATER  
PROXIMATELY 1 FOOT

A-D002  
B-D003  
SCM PLANT  
ENCLOSED AREA



QUADRANGLE LOCATION  
SCM CORPORATION  
ORGANIC CHEMICALS DIVISION  
PLANT LOCATION  
DATE 12-21-78  
APPROVED [Signature]  
DWG. NO.  
S-5000-26

ROAD CLASSIFICATION  
Heavy-duty ——— Light-duty ———  
Medium-duty ——— Unimproved dirt ———  
○ Interstate Route — ○ U. S. Route — ○ State Route

TROUT RIVER, FLA.

N3022.5—W8137.5/7.5

1964  
PHOTOREVISED 1970  
AMS 4644 ; NW—SERIES V847

MAP ACCURACY STANDARDS  
VEY WASHINGTON, D. C. 20242  
SYMBOLS IS AVAILABLE ON REQUEST