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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION III

6TH AND WALNUT STREETS

PHILADELPHIA, PENNSYLVANIA 19106

RECEIVED

AUG 27 1980

STATE OF DELAWARE
DIV. OF ENVIRONMENTAL CONTROL
WILMINGTON OFFICE

AUG 19 1980

Mr. Al Simpson
Dept. of Natural Resources and Environmental Control
Edward Tatnall Building
Dover, DE 19901

Dear Mr. Simpson:

Enclosed are copies of documents and analyses relating to the construction and operation application submitted by Getty Methanol Corporation. Please make the information available for public inspection during the public comment period as required by the PSD regulations (40 CFR, Part 52.21(r)(ii)).

Thank you for your cooperation and should you have any questions regarding this matter please notify me at (215)597-8181.

Sincerely,

Ben Mykijewycz
Project Officer

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
6TH AND WALNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

Prevention of Significant Air Quality Deterioration Permit

Approval to Construct and Operate

Permit No. 80DE01

In compliance with the Clean Air Act Amendments of 1977, and the regulations for the Prevention of Significant Air Quality Deterioration (PSD) (40 CFR, Part 52.21), as amended,

Getty Methanol Corporation
Delaware City, DE 19706

is authorized to construct and operate a

980 ton/day (100 x 10^6 gal/yr) methanol production plant

located at

the existing Getty Refinery in Delaware City,
New Castle County, Delaware.

in accordance with the specific conditions (emission limitations, monitoring & testing requirements) and the general conditions set forth in parts I, and II herein.

PRELIMINARY

PSD PERMIT NO. 80DE01

DATE: _____

PART I - SPECIFIC CONDITIONS

1. Emissions shall not exceed the limitations specified below:

Source	Nitrogen Oxides
Tubular Reformer	0.13 lbs./10^6Btu

2. Within the time limits specified in General Condition 4 of this permit, a stack emission test for nitrogen oxides shall be conducted at the Tubular Reformer Stack in accordance with approved EPA methods as described in 40 CFR Part 60, Section 60.46. The stack emission test shall be conducted with the Tubular Reformer operating at maximum capacity. The test shall be conducted while combusting fuels representative of that to be used during normal operation.

3. The company shall install, operate and maintain, within the manufacturers specifications, COEN LOW NO_x Burners on the tubular reformer.

PRELIMINARY

PSD PERMIT NO. 80DE01

DATE: _____

PRELIMINARY

PART II - General Conditions

1. Within 10 days after receiving this permit the permittee shall notify EPA in writing of the estimated start-up date of the permitted facility. This notification is for EPA administrative purposes only and need not be a firm date.

2. The permittee shall notify EPA of the actual date on which construction commenced within 30 days after such date.

3. The permittee shall notify EPA of the actual start-up date within 30 days after such date. This notice shall also include a tentative date for emission testing if such tests are required by specific terms of this permit.

4. Each emission point for which an emission test requirement is established in this permit shall be tested to determine compliance with the emission limits contained herein within 60 days after achieving the maximum production rate but in no event later than 180 days after start-up of the permitted facility. The permittee shall notify EPA in writing of the actual test date at least 20 days prior to such tests. Compliance test results shall be reported to EPA in writing within 45 days after test completion and shall conform to the test report format enclosed with this permit.

5. The permitted facility shall be designed and constructed so as to allow emissions testing using the methods prescribed herein upon reasonable notice at any time.

6. The permittee shall retain records of all emission data and operating parameters required to be monitored by the terms of this permit for a period of 2 years.

7. If, for any reason, the permittee does not comply or will not be able to comply with the emission limitations or other conditions specified in this permit, the permittee shall provide EPA with the following information as soon as possible but no later than five (5) days after such conditions become known to the permittee:

(a) description of non-compliance;

(b) cause of non-compliance;

(c) anticipated time the non-compliance is expected to continue or, if corrected, the actual duration of non-compliance;

(d) steps taken by the permittee to minimize or eliminate the non-compliance; and

(e) steps taken by the permittee to prevent recurrence of the non-compliance.

Submittal of this report does not constitute a waiver of the emission limitations or other conditions of this permit nor does it in any way restrict EPA's authority to enforce the permit conditions pursuant to Section 113 of the Clean Air Act.

8. The permitted facility is to be designed, constructed, and operated in strict accordance with specifications contained in the permit application. Any change in those conditions which may increase emissions or their air quality impact shall be reported to EPA within five (5) days after such change occurs.

9. This approval shall become invalid if construction of the proposed plant is not commenced within 18 months after receipt of this approval, is discontinued for a period of 18 months or more, or is not completed within a reasonable time.

10. In the event of any change in control of ownership of the permitted source, the permittee shall notify the succeeding owner of the existence of this permit by letter and send a copy of that letter to EPA.

11. All notifications and reports required by this permit shall be sumitted to:

Director, Enforcement Division
U.S. EPA Region III
6th & Walnut Streets
Philadelphia, PA 19106
Attention: 3EN10

12. The conditions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of that provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

PRELIMINARY

SOURCE TESTING REPORT FORMAT

PRELIMINARY

Cover

1. Plant name and location
2. Source sampled
3. Testing company or agency, name and address.

Certification

1. Certification by team leader
2. Certification by reviewer (e.g., P.E.).

Introduction

1. Test purpose
2. Test location, type of process
3. Test dates
4. Pollutants tested
5. Observers' names (industry and agency)
6. Any other important background information.

Summary of Results

1. Emission results
2. Process data, as related to determination of compliance
3. Allowable emissions
4. Description of collected samples
5. Visible emissions summary
6. Discussion of errors, both real and apparent.

Source Operation

1. Description of process and control devices
2. Process and control equipment flow diagram
3. Process data and results, with example calculations
4. Representativeness of raw materials and products
5. Any specially required operation demonstrated.

Sampling and Analysis Procedures

1. Sampling port location and dimensioned cross section
2. Sampling point description, including labeling system
3. Sampling train description
4. Brief description of sampling procedures, with discussion of deviations from standard methods
5. Brief description of analytical procedures, with discussion of deviations from standard methods.

Appendix

1. Complete results with example calculations
2. Raw field data (original, not computer printouts)
3. Laboratory report, with chain of custody
4. Raw production data, signed by plant official
5. Test log
6. Calibration procedures and results
7. Project participants and titles
8. Related correspondence
9. Standard procedures.

8-1-80

Preliminary PSD Determination Summary

I Applicant

A. Getty Methanol Corporation
Delaware City, Delaware 19706
New Castle County
75°38'30"E & 39°35'15"N

B. Co. contact - -
R.W. Ladd (professional specialist-Air & Water Conservation)
302-834-6162

C. State Contact Al Simpson
~~Rod Bartchy~~ (resources engineer)
~~302-678-4791~~ (302) 571-3223

D. Stone & Webster Engr. Corp. Contact
1. Richard D. Siegel, PhD (consultant) 8-617-973-7620
2. Keith H. Kennedy (engineer) 8-617-973-0443

II Project Description

This project involves the construction and operation of a methanol production plant, which will be built within the boundaries of the existing Getty Refinery at Delaware City, Delaware. The plant is designed to produce 980 short tons per day of Federal Grade AA methanol. The yearly production is approximately 100×10^6 gallons, based on an on-stream factor of 92.7 percent.

It is anticipated that the plant will operate for 338 days per year. Operation is based on a 24 hour, 7 day schedule. The remainder of the year is allocated to unscheduled stoppages and maintenance. The emissions submitted were based on a 365 day work schedule, since the plant can potentially operate year-round.

A complete explanation of the methanol production process is attached.

III Source Impact Analysis

The only pollutant generated in quantities requiring PSD review is nitrogen dioxide (NO_2). NO_2 emissions are approximately 260 tons per year. Sulfur dioxide, particulate matter, hydrocarbons and carbon monoxide are also emitted. Fugitive emissions of carbon monoxide and hydrocarbons are expected from seal leaks in the various piping, valves, etc.

The proposed plant location is within a PSD Class II area. This area is classified attainment for nitrogen dioxide.

The nearest Class I area, Brigantine Wilderness in New Jersey, is over 100km away and no significant impact is expected.

Five years of meteorological data was used in modeling the NO_2 emissions from the proposed plant. EPA approved models, Climatological Dispersion Model (CDM) and the Valley Model, were used. Good engineering practice (GEP) stack heights were used in the model input parameters. The maximum predicted impacts were less than the 1 ug/m^3 significance level. No monitoring is required for this project.

No air quality problems from NO_2 are anticipated from this proposed source. Also no adverse impact upon soils or vegetation is expected from the operation of this source.

IV Technology Determination

The company proposal of using low NO_x burners has been evaluated and determined to represent BACT. The NO_2 emissions are estimated to be 0.13 $\#NO_x/10^6$Btu, which is less than the 0.20 $\#NO_x/10^6$Btu NSPS limit for boilers this size.

V Conclusions

Since all the requirements of the PSD regulations have been fulfilled, this project is approvable. A preliminary determination and public notice will be prepared soon.

SIMPLIFIED DESCRIPTION OF PROCESS

The methanol production plant comprises five major systems:

1. Feedstock hydrogenation and sulfur removal,
2. Steam reforming,
3. Synthesis gas compression,
4. Methanol synthesis, and
5. Methanol purification.

Feedstock for the plant can be either raffinate or a mixture of raffinate and refinery gas. For either case, hydrogen rich purge gas generated within the plant is mixed with the feedstock.

The raffinate and refinery gas feedstock must be treated to hydrogenate olefins, convert organic sulfur compounds to hydrogen sulfide and remove hydrogen sulfide, since olefins and sulfur are harmful to the reforming and synthesis catalysts.

The treated feedstock is reacted with steam over nickel catalyst to produce a mixture of hydrogen, carbon monoxide, and carbon dioxide. The steam-hydrocarbon reaction is also known as steam reforming. The resulting gas, after cooling and condensation of water, can be used as synthesis gas for methanol production even though it contains excess hydrogen. In order to increase the efficiency of the plant, carbon dioxide from the refinery is added to the gas mixture. This results in a more optimum gas for the methanol synthesis reaction.

The synthesis gas is compressed from 203 psia (the gas pressure from the steam reforming system) to 1195 psia, which is the synthesis gas pressure entering the methanol synthesis system.

The compressed synthesis gas is preheated and reacts over a copper base catalyst to produce raw methanol. The raw methanol contains water and small quantities of other chemicals such as dimethyl ether and ethanol.

The raw methanol is purified by distillation in three columns.

MAJOR FEATURES

1. Feedstock Flexibility

Methanol, at design capacity, can be made from either raffinate or a mixture of raffinate and refinery gas. Synthesis purge gas is recycled as feedstock. Carbon dioxide addition can be varied, depending on the proportion of refinery gas and synthesis purge gas in the feedstock mixture.

2. Energy Recovery

The plant is designed for a high degree of energy recovery to minimize fuel and steam consumption. The plant is self-sufficient in steam and provides some export of medium pressure and low pressure steam to the refinery.

Some of the energy saving features of the plant are:

1. Two step reforming of raffinate, using the Lurgi Recatro process, to reduce the steam quantity required for reforming,

2. Recycle of synthesis purge gas as process feedstock,

3. Addition of refinery carbon dioxide to the hydrogen rich reformed gas,

4. Non-condensing steam turbine drives for the synthesis gas compressor,

5. Generation of high pressure and medium pressure steam by heat recovery from process gas, flue gas, and synthesis reaction heat,

6. Heat recovery from process gas to furnish part of the reboil heat for distillation,

7. Evaporation of methanol distillation waste water for recycle as process steam,

8. Treatment of process condensate and reuse as boiler feed water, and

9. Recovery of distillation off-gas and compressor leakage-gas for fuel in reform furnace.

Items 7 and 8 also reduce the quantity of liquid effluent that must be treated and discharged to the environment.

OVERALL PROCESS DESCRIPTION

Liquid raffinate is pumped to the required pressure, vaporized, and heated and mixed with heated refinery gas and heated purge gas feedstock. Refinery gas is compressed and preheated before mixing with raffinate and purge gas feed. The feed mixture is hydrogenated over nickel-molybdenum catalyst to saturate olefins and hydrogenate organic sulfur compounds. The hydrogenated feed mixture then passes through vessels packed with zinc oxide catalyst to remove hydrogen sulfide.

The treated feed mixture then mixes with superheated process steam and enters the rich gas reformer. In the rich gas reformer, the hydrocarbons and steam react adiabatically to form a methane rich gas.

The methane rich gas is mixed with additional superheated steam and then enters the tubular reformer. Here the steam and methane react in externally fired, catalyst packed tubes to form hydrogen, carbon monoxide, and carbon dioxide. The hot reformed gas is cooled by passage through a series of heat recovery exchangers. The cooled gas is mixed with carbon dioxide to furnish a synthesis gas with the proper ratio of hydrogen to carbon oxides.

The synthesis gas is compressed from 203 to 1128 psia, mixed with synthesis recycle gas, and further compressed to 1195 psia. The compressed feed gas is preheated and then enters the methanol synthesis reactor. The reactor has catalyst filled tubes, where methanol is produced from the reaction of hydrogen and carbon dioxide. The heat of reaction is removed by generating 577 psia steam in the shell side of the reactor.

The exit gases from the reactor are cooled to condense out crude methanol. Most of the unreacted gas is recycled and the remainder is purged to avoid a buildup of inert gases. The purge gas is recycled as reformer feed. When refinery gas is used as part of the feed, some purge gas is bled to fuel to avoid nitrogen buildup in the synthesis loop.

Crude methanol from synthesis is purified into chemical grade methanol by a three tower distillation system. The water removed from the crude methanol contains alcohol impurities. This water stream is evaporated at pressure in the reformer flue gas heat recovery section and recycled as process steam.

Non-condensing steam turbine drives are used for the synthesis gas and recycle compressor. This avoids rejection of steam heat to cooling water and allows export of 600 and 40 psig steam to the refinery.

SUPPORTING FACILITIES

Within the methanol plant the following support facilities are included in the project scope:

1. Boiler feedwater treatment, pumping, and distribution.
2. Process condensate treatment and recovery, and
3. Refinery gas feed compression.

Offsite support facilities include:

1. Carbon dioxide compression,
2. Expansion of water demineralizers,
3. Intermediate and product methanol storage, and
4. Product methanol loading for barge, rail, and truck shipment.

Existing facilities at the refinery will be used to provide:

1. Electricity,
2. River cooling water ,and
3. Flare stack for startup and emergency relief venting.