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Category: 1 – Surface Coating of Cans

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April 13, 1984

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Gentlemen:

The Can Manufacturers Institute (CMI) is the national trade association of manufacturers of metal and composite cans and suppliers to the industry. The 110 member companies of the CMI account for more than 85 percent of the metal cans manufacturered and distributed in the United States.

Subsequent to the issuance by the U.S. Environmental Protection Agency of the Control Technology Guidelines for Can Manufacturing, state and local agencies in non-attainment areas have adopted regulations for the several categories of can coating materials.

One of the categories is end sealing compound. In establishing the Volatile Organic Compound (VOC) content requirements for this category, the U.S. EPA utilized the "technology forcing" concept which was based upon queries of can manufacturers and their suppliers of forecasting research efforts to lower the VOC content of materials from the time of issuance of the Control Technology Guidelines (CTG) to the nominal compliance date of December, 1982. To minimize the complexity of subsequent regulation, the Agency combined all types of end sealing compound into one category with a stipulated VOC content value.

At that time it was recognized by the Agency, the can manufacturers, and its end sealing compound suppliers that it was entirely possible that not all types of compounds could meet the new VOC content requirement. However, the CTG did propose a plant wide emissions concept which could provide emission offsets as an alternative compliance concept.

In July, 1981, It became apparent to can manufacturers that the conversion to lower VOC content of all types of end sealing compound could not be achieved by the end of 1982. At that time, the CMI provided to the U.S. EPA the data and information supporting their concern. On March 10, 1982, the Agency published a Federal Register notice which stated that an extension to year end 1985 could be granted by state and local agencies for end sealing compound compliance.

In the implementation of compliant end sealing compounds it is important to recognize that there are numerous different requirements for these compounds dependent upon the type of products contained in metal cans and subsequent processing.

The classes of end sealing compounds are those used for the following products:

- Non-food products, such as aerosols, and household/industrial products

- Food products

  - Beer/beverage
  - Sanitary
  - Fatty foods
  - Dry foods

A more complete description of types of foods and conditions of use can be found in 21 CFR 175-300, tables 1 and 2 (copy attached).

The use of end sealing compound for some of these categories is progressing with a reasonable forecast of implementation by year end 1985. However, end sealing compounds for other categories, such as sanitary, fatty and dry foods, have undergone extensive research and evaluation by compound suppliers and manufacturers with the conclusion that it is unlikely that complying compounds for all of these foods will be commercialized in the foreseeable future.

CMI estimates that the VOC emissions from these types of compounds is one to two percent of the total emissions from can manufacturing operations. A recent CMI survey has shown that an estimated 18 to 20 can plants will not be able to implement compliant end sealing compounds in the foreseeable future. That number of plants excludes those facilities in the industry that can use RACT Equivalence Averaging for Compliance.

It is imperative that the CMI meet with you and other appropriate Agency staff to determine the most effective administrative mechanism to exclude these non-complying types of compounds from existing regulations. We appreciate your willingness to meet with industry representatives to discuss this important subject. This will confirm our meeting scheduled for 1:00 pm., April 25. at EPA's Washington headquarters.

At our meeting, we will intend to discuss the following:

- Survey of can plants using end sealing compound for food cans;
- Research and evaluation efforts on experimental end sealing compound for food cans; and
- Characterization of ineffectiveness of add-on control.

Sincerely,

George O. Payne
Chairman, CMI Environmental
Quality Committee

GOP/jlr
Attachment
CC/Attachment: John O'Connor

Conceptual Cost Estimate
For
Can End Sealing Compound
VOC Emission Control

Prepared For

Can Manufacturers Institute
1625 Massachusetts Avenue
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Project No. 40240T
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INTRODUCTION

The manufacture of can ends includes the application of a solvent based end sealing compound which results in fugitive Volatile Organic Compound (VOC) Emissions. The USEPA has put forth regulations which limit VOC content in end sealing compounds in order to control organic emissions. The current compliance date is December, 1985.

In response to these regulations, can manufacturers and compound suppliers have undertaken an extensive research and development program to reduce the VOC content of end sealing compounds. The development of low end sealing compounds for several product categories is progressing on schedule, however development of compliant compounds in the sanitary, fatty foods, and dry foods categories has not been successful to date. A recent survey by the Can Manufacturers Institute (CMI) shows approximately 20 can plants will not be able to implement compliant end sealing compounds in the near future.

Environmental Resources Management, North Central, Inc., was retained by the Can Manufacturers Institute to provide a conceptual cost estimate for installing emission control equipment at a typical can plant. Additionally, research and development costs for developing low VOC end sealing compounds were summarized.

VOC Emission Control Costs

Conceptual Design

Control of fugitive VOC emissions at a typical can plant would involve capturing emissions evolved during the curing cycle of the end sealing compounds. CMI estimates that approximately 70% of the carrier solvent loss (hexane) occurs during the curing cycle. For a typical can plant producing 5 millions ends per day, hexane emissions during the curing cycle would be approximately 51 pounds per hour.

The general control scheme would be to construct a ventilated room for can end storage during the curing cycle. Exhaust from the ventilation system would be routed to a control device (incinerator or carbon adsorption) for removal of hexane prior to atmospheric discharge. A sketch of the proposed curing room ventilation system is shown in Figure 1.

Curing room dimensions to provide storage for ten million can ends would be approximately 160' long x 6' wide x 15' high. A series of 12 overhead doors would allow access to the storage pallets without entering the curing room, thus minimizing worker exposure to hexane. Two ductwork headers would provide uniform ventilation throughout the curing room. Separate process fans would exhaust the two headers into a common duct feeding the emission control device.

The two control devices considered for analysis were catalytic incineration and carbon adsorption.

Catalytic incineration involves preheat of the vapor laden air stream to

approximately 650 degree F., then passing the stream through a catalytic bed to oxidize hydrocarbons. The catalyst must be periodically replaced due to the fouling effect of the organic vapors. Preheat is accomplished with a series of natural gas burners, and is aided by a heat recovery system.

In carbon adsorption treatment, the vapor laden air stream is driven through one or more thick-bed stages of activated carbon. When the carbon reaches a level of saturation, the stream is redirected to a fresh adsorber to enable regeneration of the saturated adsorber. The saturated carbon is regenerated by blowing low temperature steam through the bed, then condensing it to capture spent solvents.

Design Basis

Costs for the control system were estimated for two operating conditions.

Condition #1. Curing room hexane concentration of 1,000 ppm. Based on the handbook of Environmental Data on Organic Chemicals Ten Minute Safe Exposure Level (2,000 ppm) with a safety factor of two.

Condition #2. Curing room hexane concentration of 50 ppm. Based on NIOSH Threshold Limit Value (100 ppm) with a safety factor of two.

NOTE: Diagram of a curing room belongs on this page

The exhaust rates required to maintain these concentrations were determined as follows:

Saturated Concentration of Hexane in Air at 75 degrees F

Conc (sat) = 0.0424 (lbs/cu. ft.)
= 200,000 ppm by volume

Hexane Generation

Q = 51 (lbs/hr)

<u>Condition #1</u>

Hexane Concentration at 1,000 ppm

conc (1,000 ppm) = (1,000/200,000) x 0.0424
= 2.12×10^{-4} (lbs/cu. ft.)

Exhaust Rate Required to Maintain 1,000 ppm

exhaust (1,000 ppm) = Q/conc (1,000 ppm)
= 51 (lbs/hr)/2.12×10^{-4} (lbs/cu. ft.)
= 240,566 CFH
= 4,009 CFM

Condition #2

Hexane Concentration at 50 ppm

conc (50 ppm) = (50/200,00)x 0.0424
= 1.06×10^{-5} (lbs/cu. ft.)

Exhaust Rate Required to Maintain 50 ppm

exhaust (50 ppm) = Q/conc (50 ppm)
= 51 (lbs/hr)/1.06×10^{-5} (lbs/cu. ft.)
= 4,811,300 CFH
= 80,188 CFM

Cost Analysis

Costs of VOC Emissions Control were estimated for the following three cases:

Case I. Catalytic incineration at 4,000 CFM

Case 2. Catalytic incineration at 80,000 CFM

Case 3. Carbon adsorption at 80,000 CFM

Cost estimates for process equipment were obtained through conversations with appropriate vendors. Cost estimates for the curing room, ventilation system, and installation were provided by a certified cost consultant.

Three cost analyzes were calculated for each case.

- Present Value Cost - Total project cost in 1984 dollars using a discount rate of 15% and assuming a project life of 15 years.
- Equivalent Annual Cost - The equivalent cost of the project from years 1984-1998 (15 years project life) using a discount rate of 15%.
- Cost per ton of hexane generated - The equivalent annual cost divided by the annual generation of Hexane for a typical can plant (225 tons per year).

Cost Summaries for each case are shown on Table I.

TABLE I
VOC Emission Control Costs

CAPITAL COSTS	CATALYTIC INCINERATION (4800 CFM) [a]	CATALYTIC INCINERATION (80,00 CFM) [b]	CARBON ADSORPTION (90,000 CFM) [b]
Storage and Curing Room	50,000	50,000	50,000
Ductwork and Process Fans	20,000	95,000	90,000
Equipment - Incinerator or Carbon Absorption	100,000	750,000	1,200,000
Installation & Construction	92,000	360,000	340,000
Contingency	25,000	110,000	165,000
Total Capital	285,000	1,365,000	1,945,000
ANNUAL COSTS			
Utilities	50,000	1,160,000	80,000
Maintenance	15,000	60,000	90,000
Catalyst/Carbon Replacement or Regeneration	3,000	60,000	200,000
Total O & M	68,000	1,290,000	370,000
Present Value Cost (1984) 15 yr. Project Life @ 15%	685,000	8,850,000	410,000
Equivalent Annual Cost 15 yr. Project Life @ 15%	115,000	1,515,000	685,000
Cost Per Ton of Hexane Generated	510	6,730	3,050

[a] Based on Hexane concentration of 1000 ppm
[b] Based on Hexane concentration of 50 ppm

End Sealing Compound Research and Development Costs

Costs associated with the development of low VOC end sealing compounds were complied in a recent CMI survey of 11 Can Manufacturers and three compound suppliers involved in the research and development effort. Costs incurred by the Can Manufacturers included research and development, cost of plant trials, and product loss during plant trials.

Expenditures for years 1977 to present were tabulated for Can Manufacturers and compound suppliers. The present value cost (1984 dollars) was calculated from these yearly cash flows using a discount rate of 15%. The equivalent annual cost for years 1984 through 1998 (15 year project life) was calculated using a 15% discount rate. The cost per ton of Hexane generated was calculated by dividing the equivalent annual cost by 4,500 tons per year of Hexane generated (20 plants at 225/tons/plant/year).

The summary of end sealing compound research and development costs are given in Table II.

TABLE II

End Sealing Compound Research & Development Costs

YEAR	CAN MANUFACTURERS R & D + PLANT TRIALS + PRODUCT LOSS	COMPOUND SUPPLIERS R & D COSTS
1977	0	70,500
1978	123,000	297,400
1979	103,000	377,000
1980	125,000	519,800
1981	447,000	1,029,400
1982	1,227,000	630,800
1983	221,500	540,800
1984	295,100	0
SUBTOTALS	2,541,600	3,466,000
TOTAL	6,007,600	
PRESENT VALUE COST (1984) @ 15%	9,128,200	
EQUIVALENT ANNUAL COST 15 YR. PROJECT LIFE @ 15%	1,560,900	
COST PER TON OF HEXANE GENERATED (20 PLANTS @ 225 TONS/PLANT)	347	