

Paul

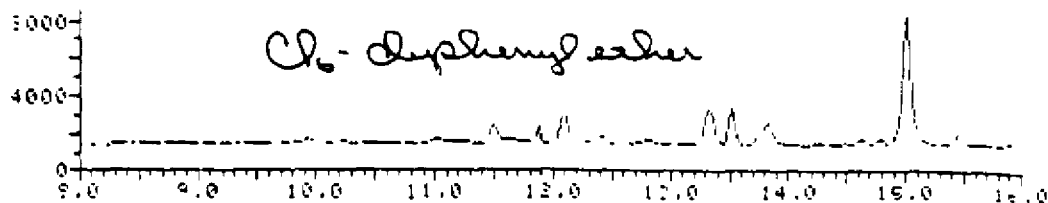
5/85

This is the SP-2330
data for the TCDF analyses
of Aroclor 1254. You can
compare our chromatograms
to those of Rappe's. We are
getting a little better resolut.
of the 2378 from the 2348-TCDF.

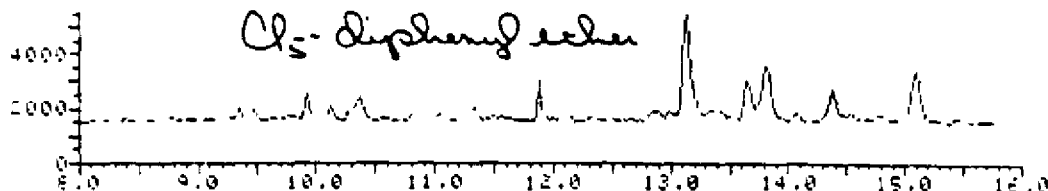
Fred

Anchor 1254

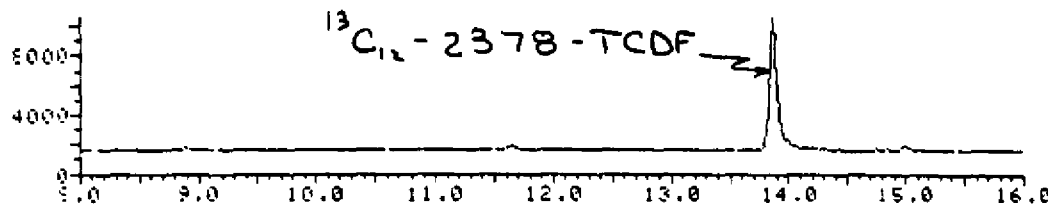
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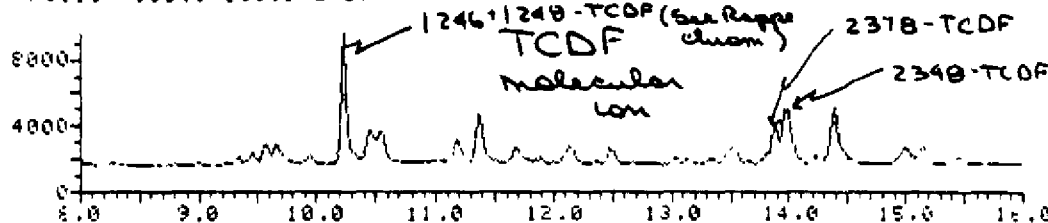
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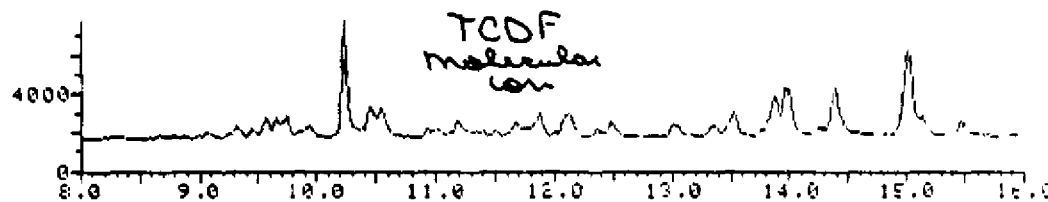
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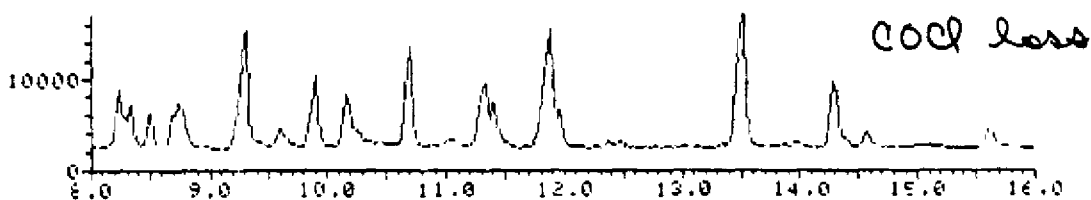
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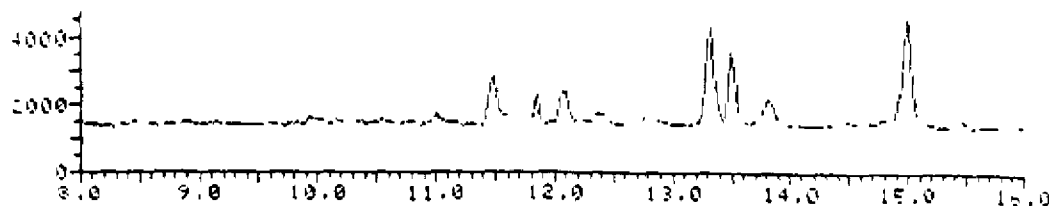
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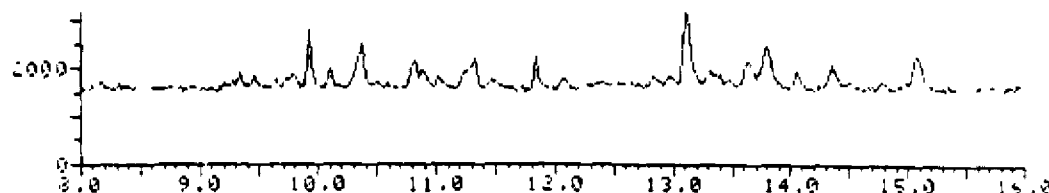
MONS 214352

Chocla 1254 (Rep)

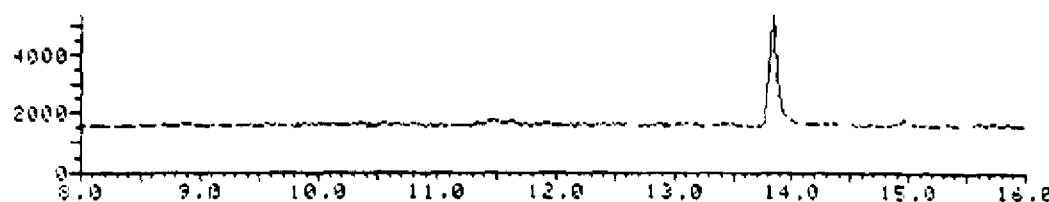
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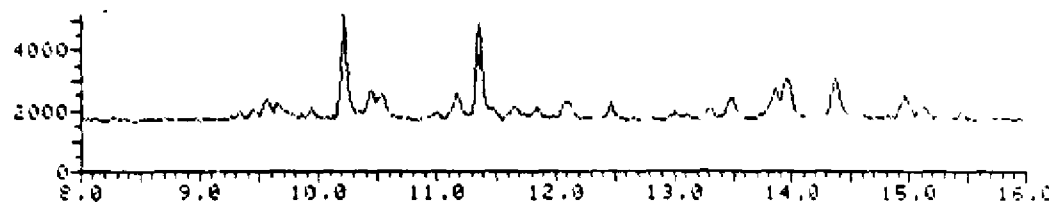
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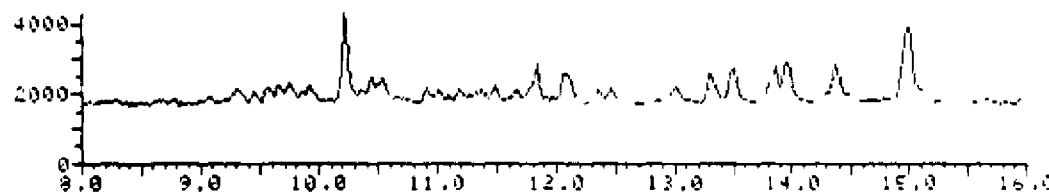
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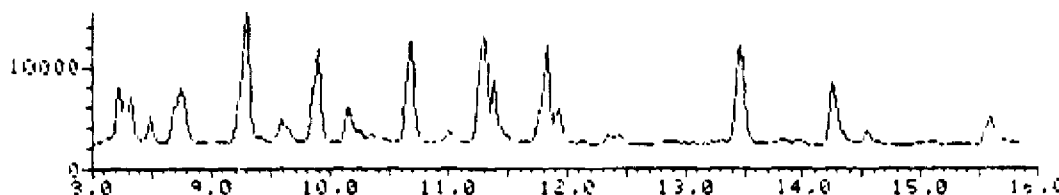
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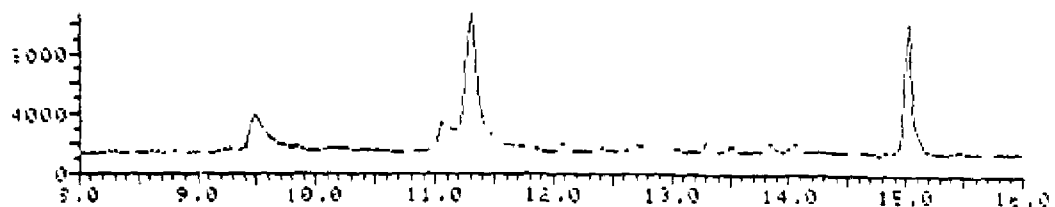


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MONS 214353

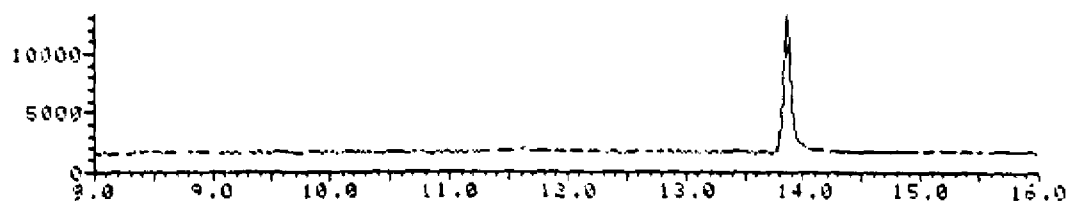
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Reaction 1254 (spike) - 461pp1



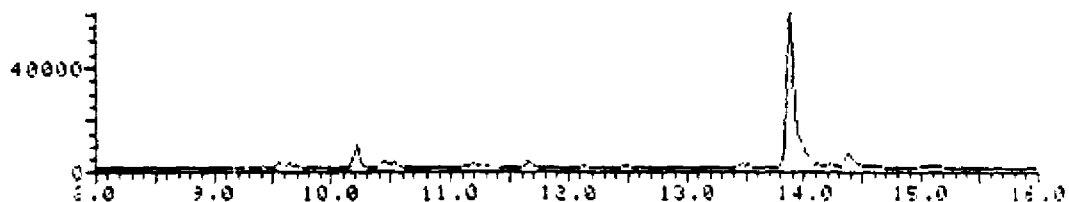
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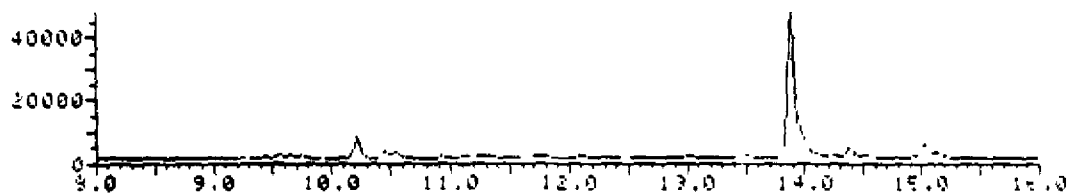
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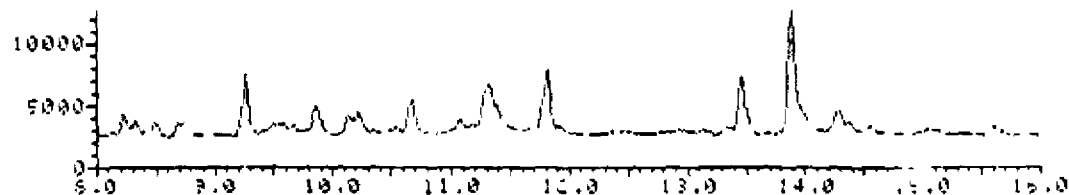
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File F0891 303.6-304.6 amu.2UL #1542 DB-S 200-1 10 275 FH ET



File F0891 240.7-241.7 amu.2UL #1542 DB-S 200-1 10 275 FH ET



MONS 214354

Paul

This is some data
Rappe has presented. Note
the TCDF difference between
1254 and Clophen A50.

End

MONS 214355

New clean-up method

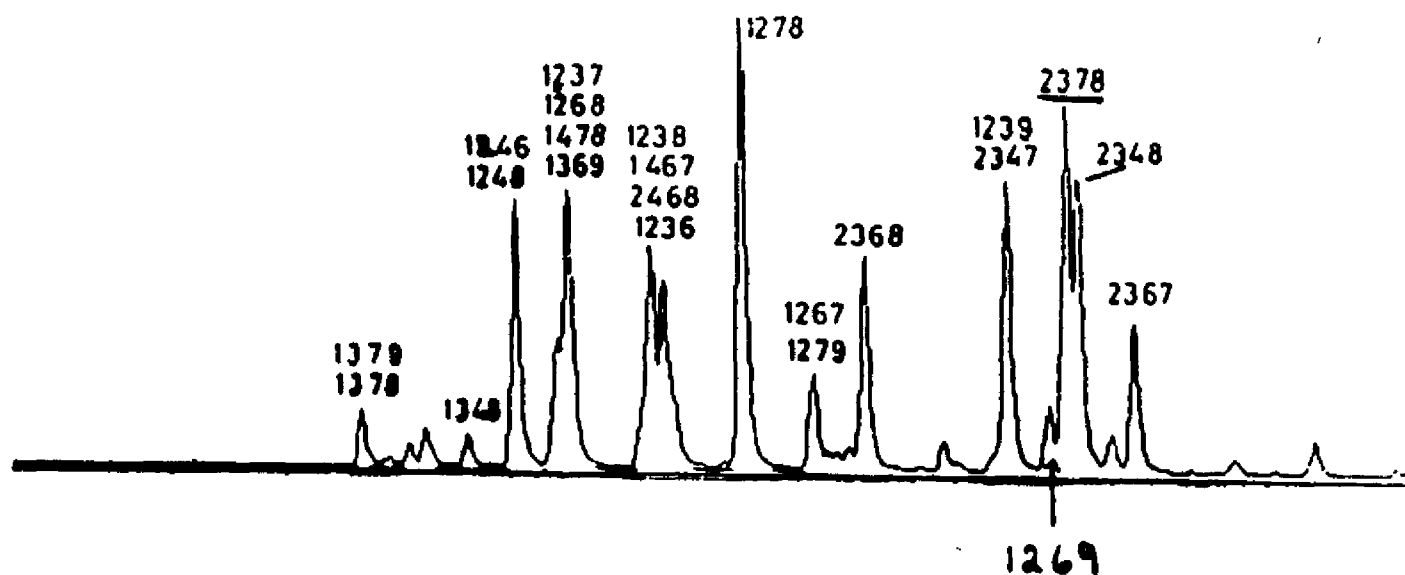
1. Dissolve PCB (0.05 - 0.1 g) in MC / ^{sup}m-Hexane
2. Spike ¹³C₁₂ - 2,3,7,8-tetra-CDF
3. column carbon on fibers (D. STALLING)
4. Reverse toluene, evaporate toluene
5. Dissolve MC / ^{sup}m-Hexane / MeOH
6. Fluorosil column - ^{sup}elute to 1% MC / ^{sup}Hexane
7. Reverse MC
8. HRGC / MS SIM
 NCI
9. Isomer identification Toxic 2,3,7,8-Substituted
10. Quantification
11. Recovery > 65%

Can also be used for wipes etc.
in PCB Fires.

CSH 16

French PCB

Phenochlor 30.10 = 10%



MONS 214357

CS+

MSD MASS CHROMATOGRAMS

DATA: MPR2685 01

SCANS 1600 TO 2500

03/23/04 7:36:00

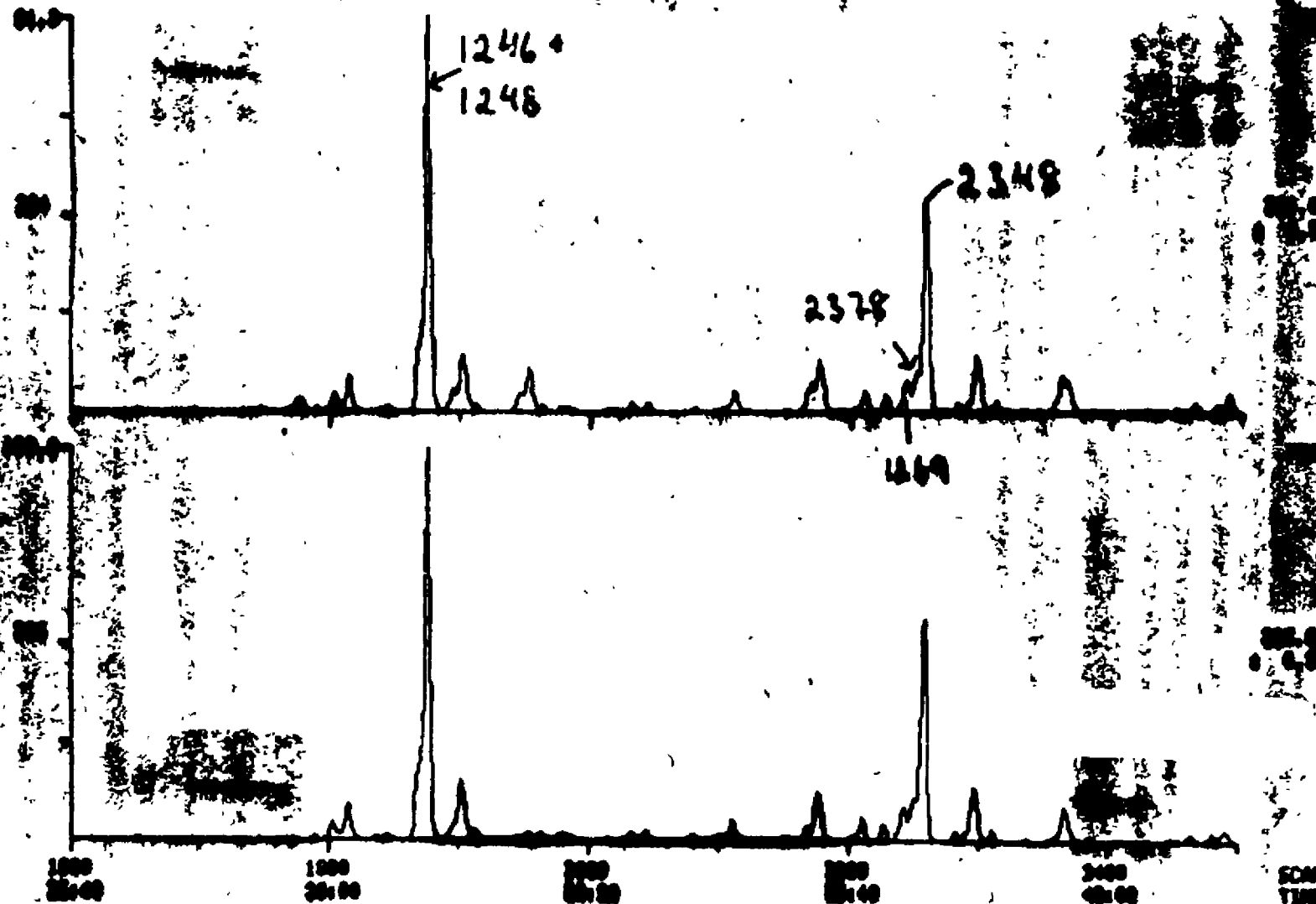
CALI: MCA18322 00

SAMPLE: MPR 268 5

COND.: SUPELCO 60N 100-100/20-250/3 40 PSI

RANGE: G 1, 1 LABEL: M 2, 4.0 QUAN: A, B, L, J, D BASE: U 20, 3

Aroclor 1254



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CSH 17

MID MASS CHROMATOGRAMS

03/23/04 0:51:00

SAMPLE: NFR 267 3

CONDS.: SUPELCO 60M 100-100/20-200/3 40 PSI

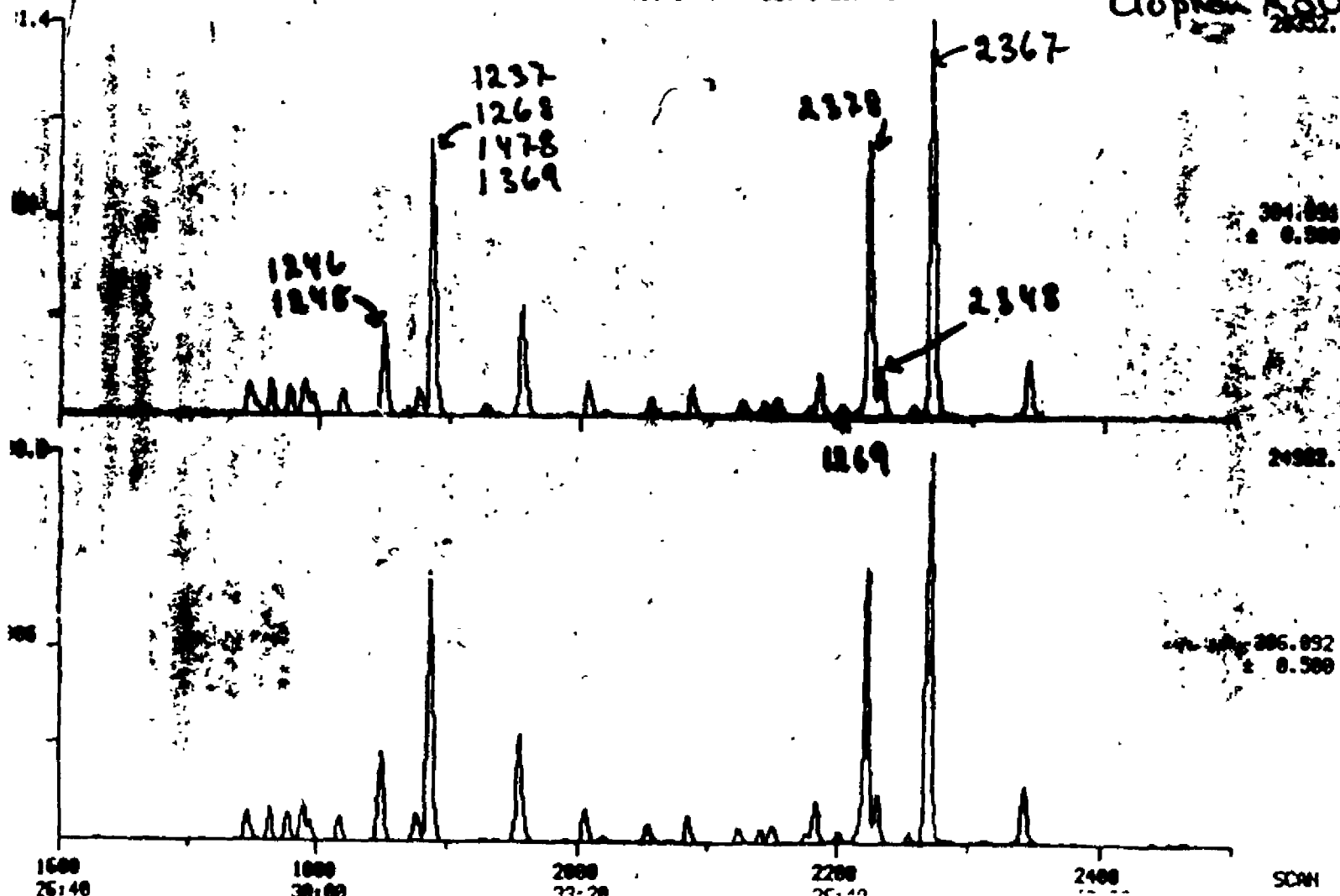
RANGE: G 1, 1 LABEL: M 2, 4.0 QUANT: A 0, 1.0 J 0 BASE: U 20, 3

DATA: NFR2673 01

CALI: NCAL0322 03

SCANS 1600 TO 2500

German
Clophen A50
20032



SCAN

MONS 214359

RED HESS CHROMATOGRAMS

09/23/04 7136100

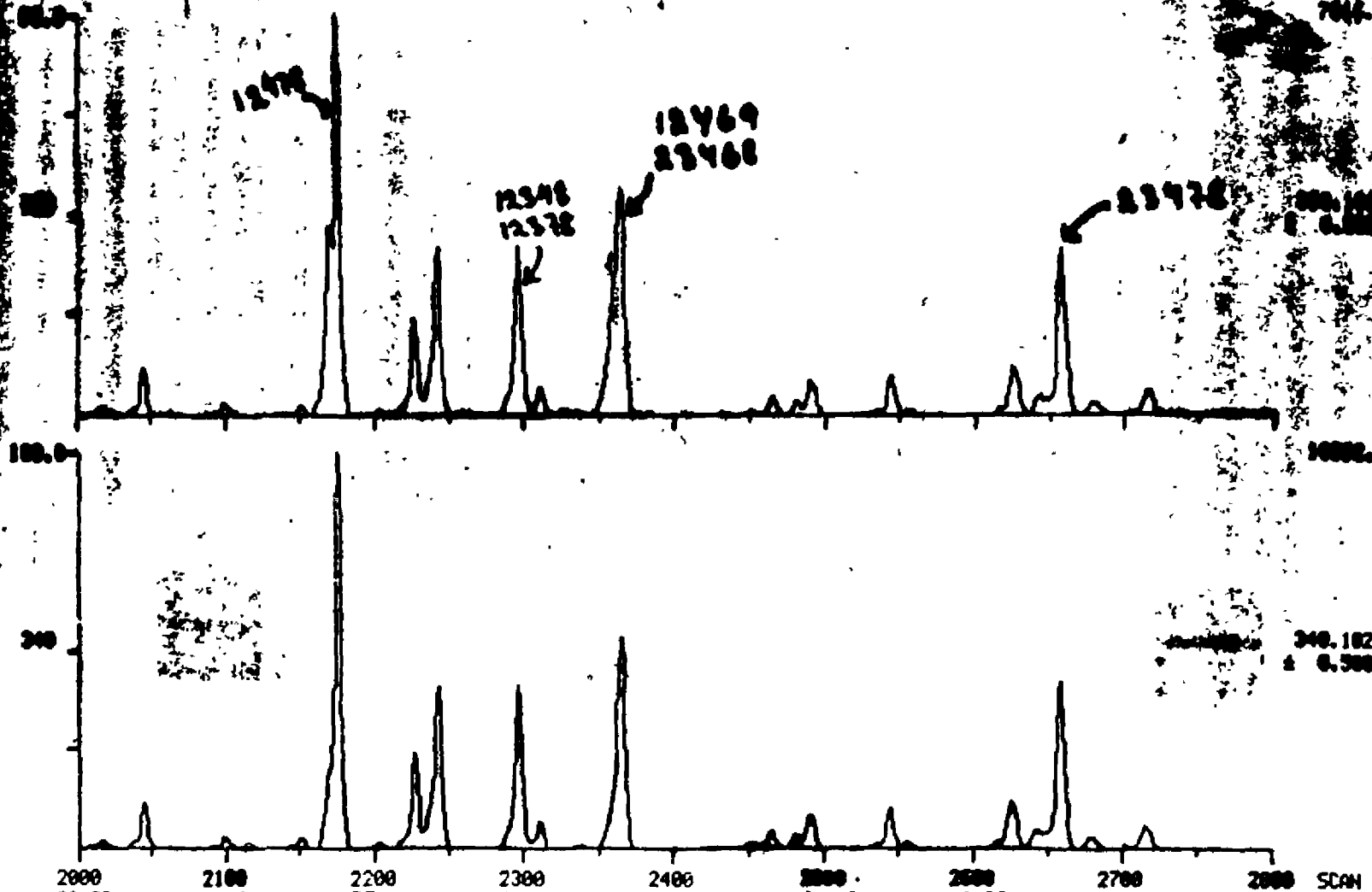
SAMPLE: NFR 200 5

COND.: SUPPLIED GUN 100-100/20-200/3 40 PSI

RANGE: 0 1. 1 LABEL: 0 2. 4.0 QUAN: A 0. 1.0 J 0 BASE: U 20. 3

DATA: NFR2000 01
CALI: H0AL0002 00

SCANS 2000 TO 2800



MONS 214360

MID MASS CHROMATOGRAMS

03/23/04 8:51:00

SAMPLE: MPR 267 3

COND.: SUPELCO 60M 100-100/20-250/3 40 PSI

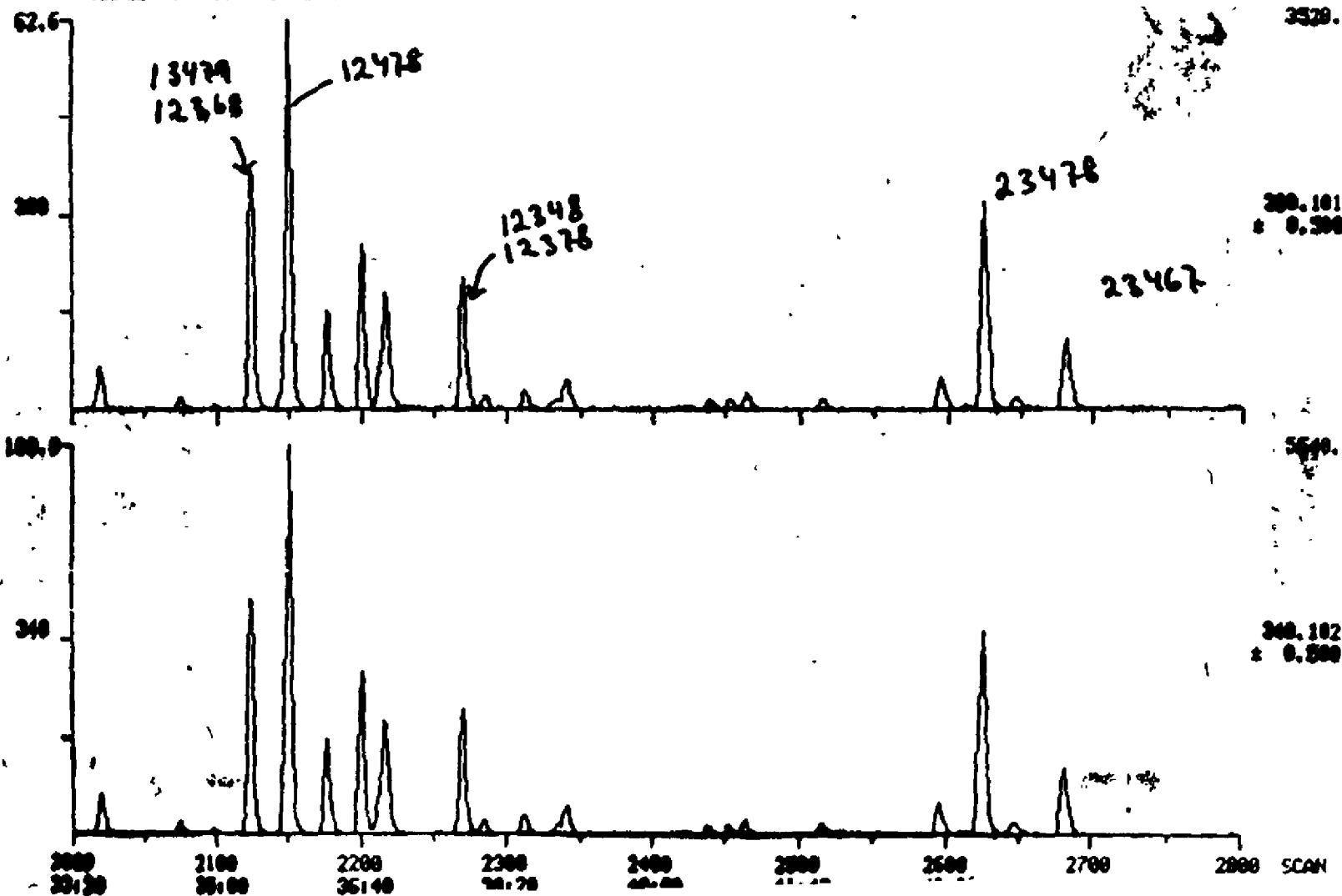
RANGE: C 1, 1 LABEL: H 2, 4.0 QUAN: A 0, 1.0 J 0 BASE: U 20, 3

DATA: MPR2673 01

CAL: NCAL0322 03

SCANS 2000 TO 2800

A50



MONS 214361

MID MASS CHROMATOGRAMS

83/23/84 7:36:00

SAMPLE: NPR 260 5

CONDS.: SUPELCO 60M 100-100/20-260/3 40 PSI

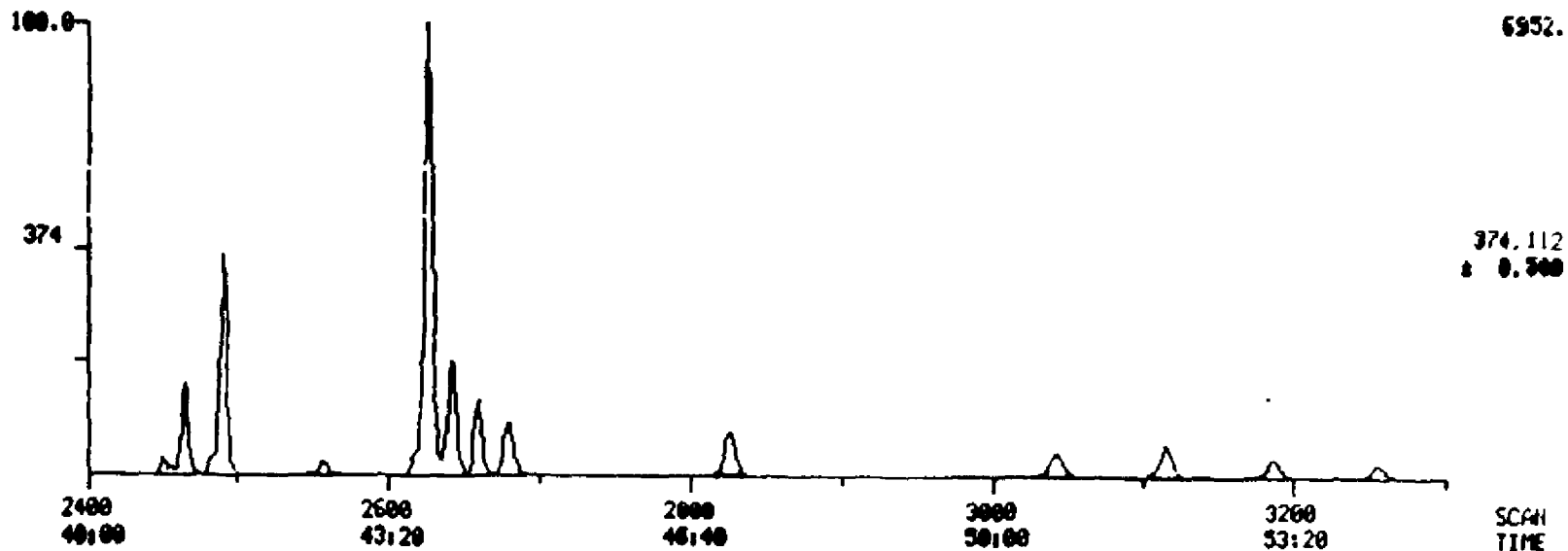
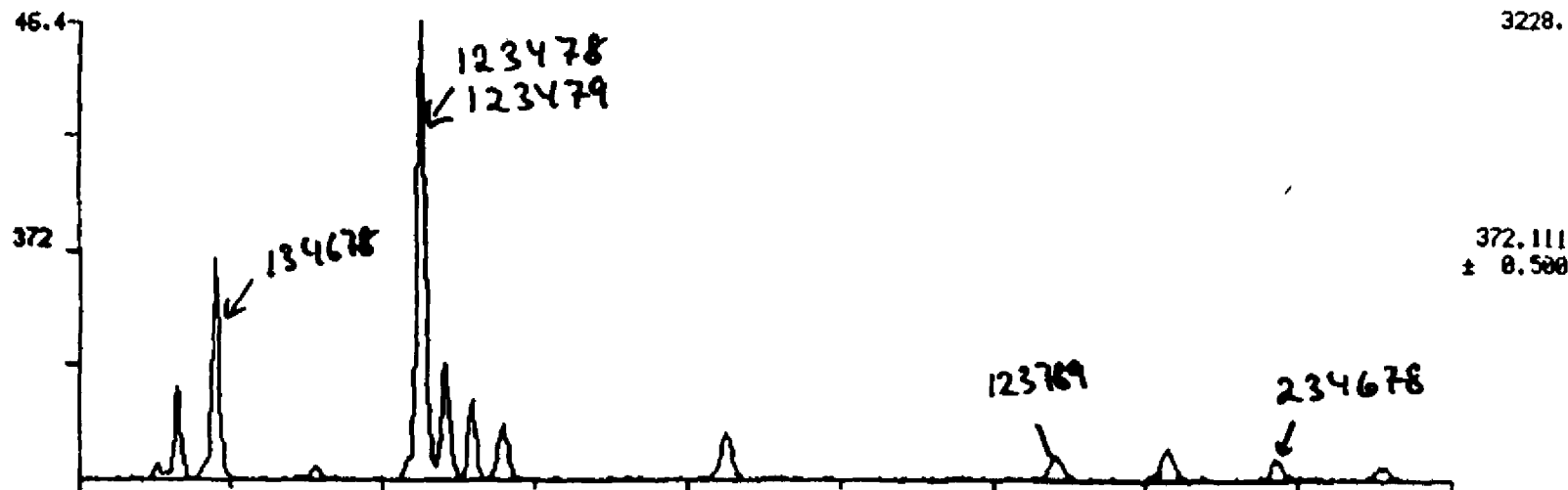
RANGE: G 1. 1 LABEL: N 2. 4.0 QUANT: A 0. 1.0 J 0 BASE: U 20. 3

DATA: NPR2605 #1

CAL: NCAL8322 #3

SCANS 2400 TO 3300

1254



MONS 214362

MID MASS CHROMATOGRAMS

03/23/84 8:51:00

SAMPLE: MPR 267 3

COND: 1 SUPELCO 60M 100-100/20-250/3 40 PSI

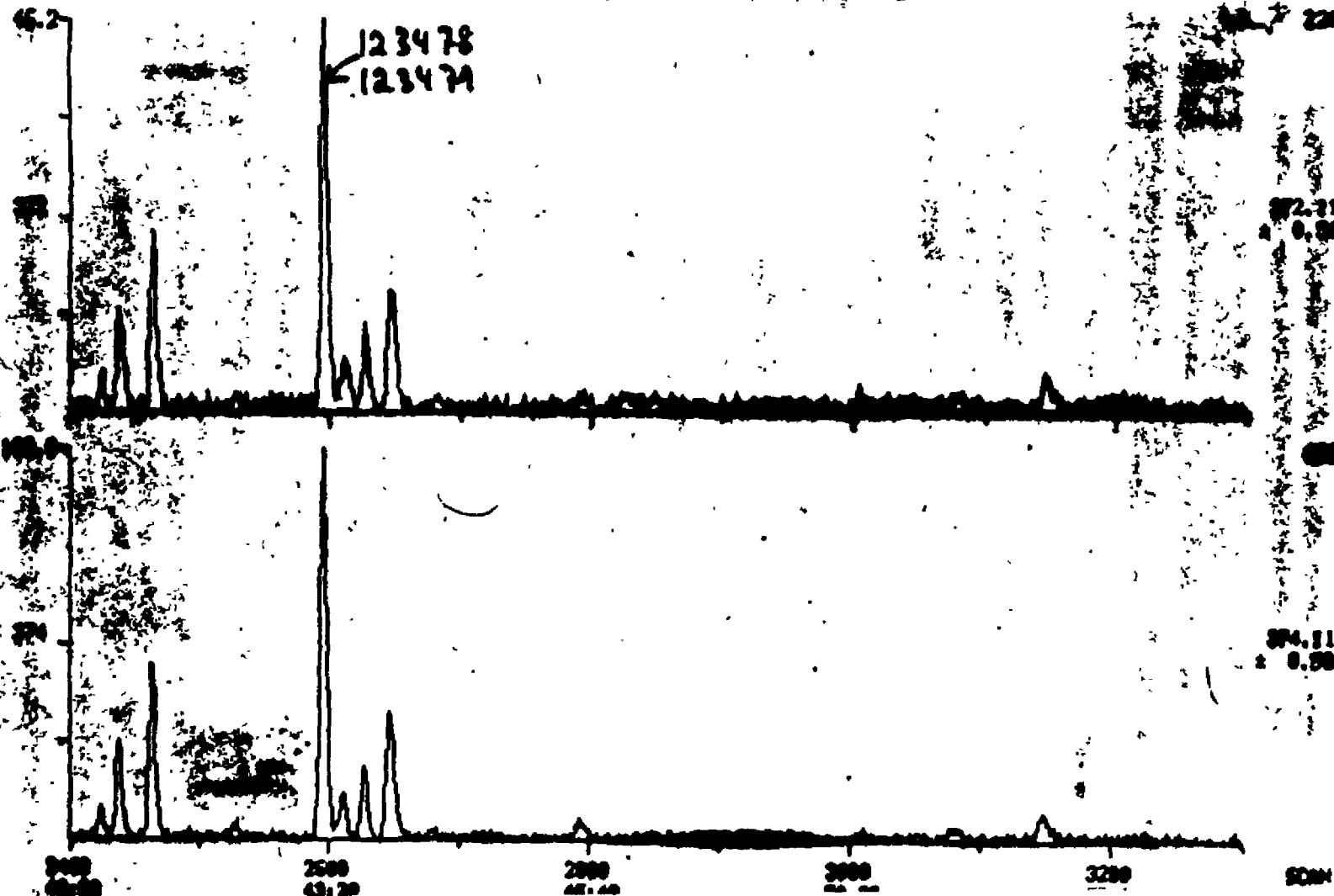
RANGE: G 1, 1 LABEL: M 2, 4.0 QUAN: A 0, 1.0 J 0 BASE: U 20, 3

DATA: MPR2673 01

CALI: NCAL0322 03

SCALE 2400 TO 3000

A 50



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Levels of PCDFs in PCB samples (ppm)

	3010	1254	1260	A40	A50
2,3,7,8-TCDF (C.001 ppm)	0.05	0.019	0.013	0.18	3.30
Σ TCDFs	0.63	1.40	0.110	2.60	20.0
1,2,3,7,8-PeCDF (C.002 ppm)	0.01	0.09	0.048	0.10	0.76
2,3,4,7,8- " " " "	tr	0.19 RRF	0.036	0.01	1.10
Σ PeCDFs	0.035	1.60	0.260	1.70	8.00
123478/9-HxCDF	< 0.01	2.50	0.50	0.08	0.70
123678- " " "	- " -	2.10	0.12	0.07	0.36
123789- " " "	- " -	0.19	0.19	< 0.01	0.02
234789- " " "	- " -	0.13	0.03	tr	0.90
Σ HxCDFs		10.00	1.50	0.31	3.00
Σ HpCDFs	< 0.01	0.96	1.30	< 0.01	0.08
OCDF	< 0.02	tr	tr	< 0.02	< 0.02
TOTAL PCDFs	<u>0.70 ppm</u>	<u>16.4 ppm</u>	<u>3.17 ppm</u>	<u>4.61 ppm</u>	<u>31.7 ppm</u>
Recovery (2,3,7,8-TCDF)	79.2%	2.1%	> 70%	> 70%	95%

SUSAN PHILLIPS READ
Counsel - Environmental Protection

National Electrical Manufacturers Association
2101 L Street, N.W., Suite 3
Washington, D.C. 20037 (202) 457-61

GENERAL ELECTRIC COMPANY
1 River Road
Corporate Operating Services Schenectady, N.Y. 12345

June 24, 1982

Document Control Officer (TS-793)
Office of Toxic Substances
Environmental Protection Agency
Room E-401
401 M Street, S.W.
Washington, D.C. 20460

Re: Docket Number OPTS-62015B;
Reply Comments on Notice of
Proposed Rulemaking Concerning
Polychlorinated Biphenyls (PCBs);
Use in Electrical Equipment,
47 Federal Register 17,246 (April 22, 1982)

Dear Sir/Madam:

These reply comments are submitted to the Environmental Protection Agency ("EPA") on behalf of the National Electrical Manufacturers Association ("NEMA"), the principal national trade association of the electrical manufacturing industry. NEMA's reply comments address the following topics considered at EPA's informal hearing on the above-proposed rule: (1) the assessment of "insignificant exposure"; (2) the likelihood of exposure to polychlorinated dibenzofurans ("PCDFs") as a result of the continued use of PCB-containing electrical equipment; (3) the electrical manufacturing industry's ability to replace all existing Large High and Large Low Voltage Capacitors containing PCB dielectric fluid ("Large PCB Capacitors") in ten years; (4) the 50 parts per million ("ppm") regulatory cutoff as it applies to the use of PCB-containing electrical equipment; and (5) various additional questions directed by the hearing panel to NEMA.

1. Insignificant Exposure

Section 6(e)(2)(A) of the Toxic Substances Control Act ("TSCA") prohibits PCB uses except in a "totally enclosed

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manner." Section 6(e)(2)(C) provides that "'totally enclosed manner' means any manner which will ensure that any exposure of human beings or the environment to a polychlorinated biphenyl will be insignificant as determined by the Administrator by rule." (Emphasis added.) In other words, "totally enclosed manner" must be defined in terms of "insignificant exposure" and it is the Administrator's duty to determine what constitutes an "insignificant exposure" to PCBs.

In both the proposed and final PCB Ban Rules, EPA defined "insignificant exposure" as no exposure, or exposure "not measurable or detectable by any scientifically acceptable analytical method." 40 CFR 761.3(h)(h). This stringent determination was based in large measure on EPA's findings that any PCB exposure may have adverse effects and poses a significant risk to the health of man. These findings, in turn, were fundamentally based on the toxicological and human health effects information developed in the mid-1970's during the rulemaking to establish toxic pollutant effluent standards for PCBs under Section 307(a) of the Federal Water Pollution Control Act. ✓

Since that time, however, much additional scientific information about the human health effects of PCBs has become available, including several reports of studies of heavily exposed (blood PCB levels ranging from 10 parts per billion to 3330 parts per billion) worker populations. Since some of the worker populations studied included employees at facilities owned and operated by NEMA members, NEMA has maintained a keen interest in understanding as much as possible about the human health effects of PCBs. As a party to Environmental Defense Fund, Inc. v. Environmental Protection Agency, 636 F.2d 1267 (D.C. Cir. 1980), NEMA also recognized EPA's obligation to assess the risk to human health of any PCB exposures that may result from the continued use of PCB-containing electrical equipment; i.e., to determine "insignificant exposure" in this rulemaking.

In order to draw EPA's attention to important recent scientific information concerning the human health effects of PCBs, NEMA, together with the Utility Solid Waste Activities Group ("USWAG") of the Edison Electric Institute ("EEI"), contracted with the firm of Drill, Friess, Hayes, Loomis and Shaffer, Inc. ("DFHLS") to conduct a study to examine the toxicological and epidemiological literature on PCBs ("DFHLS study"). Both NEMA and EEI/USWAG have submitted the DFHLS study to the docket.

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NEMA and EEI/USWAG also subsequently asked DFHLS to comment on EPA's memorandum dated April 12, 1982 from Dr. I. Baumel (TS-796) to Dr. M. Halper (B-798) entitled "Proposed Rule on Polychlorinated Biphenyls (PCBs) Use in Electrical Equipment." NEMA encloses a copy of DFHLS' comments, which have also been separately submitted to the docket.

Both the DFHLS study and the enclosed comments contain numerous citations to the original data and studies that were reviewed. (Likewise, NEMA's previous submissions to this docket and to Docket No. OPTS-62018 contain numerous citations to the original data and studies on which NEMA based its opinions regarding the human health effects of PCBs.) As stated at the informal hearing, NEMA urges EPA's review of both the DFHLS study and comments and the original scientific data.

Indeed, Section 6(e) requires EPA to review and weigh such scientific data and to make a determination of "insignificant exposure" based on it. NEMA respectfully submits that recitation of virtual truisms (i.e., "the risks posed from exposure to PCBs are reduced as exposure to PCBs is reduced") and broad-brush characterizations and dismissals of the scientific information (i.e., "the Agency does not agree that this information [e.g., the DFHLS study] proves that PCBs do not pose any serious risks to human health or the environment") do not constitute a determination of "insignificant exposure" (and/or "unreasonable risk" and/or de minimis risk) based on substantial evidence.

2. PCDFs

At the informal hearing, Dr. Ian Webber representing RTE Corporation asserted that concentrations of PCDFs in askarel transformers^{1/} increase with time in service. Ms. Juliann Sum representing Local 1245 of the International Brotherhood of Electrical Workers asserted that continued industrial use of PCB-containing electrical equipment may result in occupational exposures to higher concentrations of PCDFs than were present in the contaminated rice oil causing

^{1/} When used in these comments, the term "askarel transformer" refers to those transformers designed and manufactured to contain a fire resistant liquid insulating coolant (askarel) with between 60% (600,000 ppm) and 100% (1,000,000 ppm) of the commercial PCB products. The term "PCB Transformer" as defined at 40 CFR § 761.3(y) includes all askarel transformers (as defined above) plus transformers filled with mineral oil but contaminated with PCBs at concentrations of 500 ppm or greater.

Yusho disease. By contrast, NEMA has consistently maintained that (1) there is no evidence that the conversion of PCBs into PCDFs occurs in PCB-containing electrical equipment; and (2) the causative circumstances for the production of high levels of PCDFs in the Yusho incident do not exist in the United States today. As discussed below, available data support NEMA's position on both points.

Samples of unused Aroclor-trademarked commercial PCB products manufactured by Monsanto have been analyzed for PCDF concentration. The values usually reported have been between 0.1 to 2.0 ppm, although higher values (up to 5.6 ppm) have been reported as well.^{2/}

Samples of used askarel taken from United States and Canadian-manufactured transformers have also been analyzed for PCDF concentration. For instance, Moseley et al., from the National Institute for Occupational Safety and Health analyzed both bulk samples of used askarel and air in a transformer maintenance workplace, finding trace tetrachlorodibenzofuran ("TCDF") concentrations (0.013-0.116 ppm) in the fluids and no detectable concentration in the air.^{3/} Albro and Parker from the National Institute of Environmental Health Sciences have characterized two samples of used askarel.^{4/} Fluid A, obtained from a transformer of early manufacture but unknown extent of use,^{5/} contained 0.7 ppm PCDF. Fluid B, a bulk sample of used askarel obtained from a transformer maintenance operation,^{5/} contained 4.7 ppm PCDF.^{6/}

-
- 2/ Samples of unused commercial PCB products manufactured by foreign producers have also been analyzed and found to contain considerably higher PCDF concentrations. See Exhibit A. (All exhibits are attached at the end of these comments.)
 - 3/ Moseley, C.L., Geraci, C.L. and Burg, J. (1982) Polychlorinated Biphenyl Exposure in Transformer Maintenance Operations. J. Amer. Ind. Hyg. Assoc., 43, 170-174.
 - 4/ Albro, P.W. and Parker, C.E. (1980) General Approach to the Fractionation and Class Determination of Complex Mixtures of Chlorinated Aromatic Compounds. J. Chrom., 197, 155-169.
 - 5/ Private communication, P. W. Albro (1982).
 - 6/ The PCDFs found in Fluid B consisted principally of octachlorodibenzofuran (4.5 ppm), and no detectable TCDF.

At the informal hearing, Dr. Webber referred to the unpublished work of Chittim et al., who reported TCDF concentrations ranging from ca. 0.005 to 5.0 ppm in used askarel. Chittim et al., concluded that (1) TCDF concentration increases with time in service, although there is no linear relationship; and (2) electrical sparks and/or failure do not increase PCDF concentration, most likely because of the short duration of the sparks or events causing failure.^{7/}

Several points should be kept in mind when evaluating the work of Chittim et al.: (1) the TCDF concentrations in twenty-seven (27) of twenty-nine (29) samples of used askarel analyzed contained 1.1 ppm TCDF or less;^{8/} (2) the analytical work was performed in 1979 using gas chromatography with a packed column, a less sensitive analytical methodology than is generally used today; and (3) it does not appear that the values reported had been corrected to take into account possible interference by polychlorinated diphenyl ethers ("PCDPEs"), which co-elute with PCDFs.

NEMA also is aware of additional, more recent analyses of used askarel for PCDFs. Specifically, a year ago the General Electric Company ("GE") submitted a sample of used askarel obtained from the Canadian General Electric Company to both a university-affiliated and an industrial laboratory for PCDF analysis. Using "state of the art," high resolution gas chromatography/mass spectroscopy ("GC/MS"), the industrial laboratory found PCDFs on the order of 1.0 ppm or lower. The university-affiliated laboratory found no

^{7/} Chittim, B. G., Clegg, B. S., Safe S. N., and Hutzinger, O. (1979) Chlorinated Dibenzofurans and Dibenzo-P-Dioxins: Detection and Quantitation in Electrical Equipment and Their Formation During the Incineration of PCBs, Draft Report prepared by Wellington Science Associates, Inc. under Contract No. OSS78-00067, Environmental Protection Service, Department of Fisheries and Environment (Canada).

^{8/} See Exhibit P, captioned "Table 6: Transformer Data, Askarel Composition and TCDF Concentrations", and excerpted from the Draft Report of Chittim et al., ibid. Samples 4-1 and 4-2 from "very old" (Circa 1947) transformers contained 4.7 and 2.2 ppm TCDF respectively. Note that (1) Chittim et al., elsewhere acknowledged the lack of maintenance and operating records for the transformers sampled; and (2) even these "high" values are not appreciably higher than concentrations reported for some samples of unused Aroclors. (See Exhibit A.)

PCDFs at detection limits of 10.0 ppm for 4-Cl and 5-Cl, and 1.0 ppm for 6-Cl, 7-Cl, and 8-Cl isomers.

Subsequently, GE submitted four (4) additional samples of used askarel to the same industrial laboratory for PCDF analysis. These samples had been obtained from in-service distribution transformers at a GE transformer manufacturing facility in the United States during the course of normal maintenance activities.^{9/} The following table describes each sample and sets forth the PCDF concentrations found:

Concentration of PCDFs in Used Askarel Transformer Fluids

<u>Sample Number</u>	<u>Type of Transformer from Which Sample Obtained</u>	<u>Date Installed</u>	<u>PCDF (ppm) Total</u>	<u>% PCDF^{10/}</u>
#3	Single Phase - 100KVA 2300 vt -- 115/230 115 gallons fluid	1940	1.1	56.4
#23	3 phase - 1250KVA 1380 vt -- 480Y/277 490 gallons fluid	1947	0.62-0.82	66.2
#44	2 phase - 375KVA 2300 vt -- 550 31.5 gallons	1938	1.84-1.86	60.1
#45	Single phase -100KVA 2300 vt -- 120/240 42 gallons	1939	0.64-0.86	66.8
"Pure Aroclor 1254" (control)			0.62-0.82	

The industrial laboratory estimated accuracy at + 30%, but emphasized that PCDFE interference could be responsible for larger errors; therefore, these values should be regarded

^{9/} That is, sampling is routinely done on an annual basis as part of the normal maintenance program for in-plant transformers. Approximately one quart of fluid is removed and tested for a variety of properties such as dielectric strength, color, dissipation factor and chloride analysis.

^{10/} There is no record of retrofill for the four transformers sampled. This is consistent with the percentage of PCB (Aroclor 1260) in each of the four samples.

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as maximum concentrations.^{11/} Note that the values range from 0.62 to 1.86 ppm PCDF, indicating that PCDF concentrations in these forty-year old, used askarels are comparable to the PCDF concentrations reported for unused Aroclors. ✓

Nor should these analytical results be surprising, given the conditions of temperature and residence time reported in the literature as required for the conversion of PCBs into PCDFs. That is, Buser has reported that both Aroclors 1254 and 1260 heated for one minute in air to 550°-650°C yield about 1.0-3.0% PCDF; and heated for one minute to 700-850°C, PCBs were completely destroyed and no PCDFs were observed.^{12/} Morita has reported that Aroclor 1248 heated for one week at 300°C in the presence of oxygen yields about 0.2% PCDF; and heated for one week at 300°C in the presence of air yields about 0.05% PCDF. Morita also concluded that temperatures over 270°C are necessary to initiate the transformation, and that PCDFs decompose at temperatures over 330°C.^{13/} The instability of PCDFs at their formation temperatures is undoubtedly the reason that their highest yields are limited to a few percent. ✓

These conditions of temperature and time simply do not exist in in-service askarel transformers and capacitors. That is, transformers usually operate at temperatures of 100° - 130°C and transformer "hot spots" typically are no greater than 135°C. Occasionally, there are short circuits, with temperatures reaching 200° - 250°C for a few minutes. In the very rare case of an arc where a transformer is destroyed, maximum temperatures may reach 1000°C, but failure occurs within fractions of a second.

^{11/} That is, PCDFs present in a GC/MS analysis will appear as PCDFs since they decompose in the mass spectrometer to yield the same fragments. As a result, the ethers must be scrupulously separated from the furans before introduction into the mass spectrometer. This understanding of PCDF interference in PCDF analysis has developed only recently, principally as a result of the work of Albro and Parker.

^{12/} Buser, H.R., Bosshardt, B.P. and Rappe, C. (1978) Formation of Polychlorinated Dibenzofurans (PCDFs) From the Pyrolysis of PCBs. Chemosphere, 7, 109.

^{13/} Morita, M., Nakagawa, J., and Rappe, C. (1978) Polychlorinated Dibenzofuran (PCDF) Formation from PCB Mixture by Heat and Oxygen, Bull. Environm. Contam. Toxicol., 19, 665-670.

Capacitors typically operate below 100°C. In those capacitor failures resulting in rupture, heating and internal arcing may have occurred prior to rupture; however, it is questionable whether there is sufficient time at temperature or oxygen for PCDF formation.

New information has also added to our understanding of Yusho (Japan) disease, cited by Ms. Sum as a basis for grave concern regarding current United States occupational exposures to PCBs. This incident involved human ingestion of rice oil containing approximately 1000 ppm PCBs, 1000 ppm polychlorinated quaterphenyls ("PCQs") and 5 ppm PCDFs.

The rice oil contaminant has been identified as fluid that leaked from a heat exchanger originally filled with a Japanese commercial PCB product, Kanechlor 400. The quantities of actual PCBs ingested by Yusho victims (average intake of 466 mg) were much lower than PCB body burdens exhibited by asymptomatic, heavily exposed capacitor workers, but were accompanied by comparable quantities of PCQs, which are of unknown toxicological activity, and an average of 2.5 mg of PCDFs, which are more toxic than PCBs.^{14/} The PCQs and PCDFs are believed to have been formed from high temperature thermal oxidation and condensation of PCBs in the heat exchanger. Recent findings from animal tests and follow-up studies on Yusho patients have linked Yusho disease symptoms with exposure to unusually large amounts of PCDFs and, possibly, PCQs. See the DFHLS Study at 26, and references cited therein.

^{14/} Ms. Sum consistently equates the toxicity of 2,3,7,8-TCDF and 2,3,7,8-tetrachlorodibenzodioxin ("TCDD"), and further asserts that 2,3,7,8-TCDF is "about 1 million times more poisonous than PCB's in terms of laboratory experiments." T-618. In fact, on the basis of a species-by-species comparison of LD-50, 2,3,7,8-TCDF is approximately 1/10 to 1/700 as toxic as 2,3,7,8-TCDD. Moreover, 2,3,7,8-TCDF is only 40 to 150 times more toxic in the guinea pig (among the more susceptible species) than is 3,4,3',4'-tetrachlorobiphenyl (the correspondingly most toxic PCB isomer). (Ms. Sum appears to have compared the LD-50 for 2,3,7,8-TCDF in the guinea pig to the LD-50 for commercial PCB products in mice and rats. This is somewhat like comparing apples with oranges.) See Goldstein, J. A. (1980) Structure-Activity Relationships for the Biochemical Effects, Chapter 6, Halogenated Biphenyls, Terphenyls, Napthalenes, Dibenzodioxins and Related Products, R. D. Kimbrough, Ed., Elsevier Press, Amsterdam.

There are no reports of Yusho disease in the United States and there is virtually no possibility of such an event arising in the future. The Kanechlor 400 involved in the Yusho incident contained PCDF concentrations (based on PCBs) 250 times greater than the concentrations reported for unused Kanechlor 400 (20 ppm) and 2500 to 5000 times the usual concentrations (1-2 ppm) in unused Aroclors. (See Exhibit A.) Assuming a PCDF concentration in Aroclors of 2 ppm and a PCDF toxicity threshold dose of 0.5 mg, a minimum 250g of Aroclor would have to be absorbed - a highly unlikely event - before Yusho disease symptoms would appear. Moreover, as noted previously, conversion of PCBs to PCDFs and PCQs, requires heating to over 270°C in the presence of air.

There is no evidence that this conversion occurs in the use, maintenance or repair of PCB-containing electrical equipment. Since November 1, 1979, heat transfer systems employed in the manufacture or processing of food, drugs or cosmetics in the United States have not been authorized to contain heat transfer fluid with PCB concentrations over 50 ppm. 40 CFR 761.31(d)(3). Any industrial heat transfer system that ever contained PCBs has been drained and refilled at least three times since November 1, 1979 with fluids containing less than 50 ppm PCB. 40 CFR 761.31(d)(1) and (2).

3. Capacitor Phase-Out

Questions were raised at the informal hearing about the ability of the electrical equipment manufacturers to meet the increased demand that would result from EPA's proposed ten-year phase-out of Large PCB Capacitors. NEMA reiterates its position that (1) there should be no ban; (2) an absolute minimum of ten years is required for such a changeout; and (3) the success of any such changeout depends on a relatively steady rate of equipment replacement. NEMA can think of no "command and control" regulation that EPA might successfully impose to insure such a steady rate.

4. The 50 ppm Regulatory Cutoff

There is a need for a ppm regulatory cutoff insofar as the PCB Ban Rule is concerned unless (1) EPA determines - as NEMA believes it should - that the use of PCBs in electrical equipment is use in a "totally enclosed manner"; or (2) EPA deletes the assumption - as EEI/USWAG has urged - that all oil-filled transformers, voltage regulators, switches, electromagnets and cable are PCB-Contaminated Electrical Equipment unless tested or otherwise verified and found not

to contain between 50 and 500 ppm PCB. Moreover, EPA's retention of the cutoff is supported by substantial evidence.

Regulation under Section 6(e) of electrical equipment containing less than 50 ppm PCBs would yield but de minimis health or environmental benefits. First, it can not be overemphasized that 50 ppm represents almost a 20,000-fold decrease in PCB concentration below that of the commercial PCB products to which asymptomatic capacitor workers were exposed for many years. By any measure, this is a truly remarkable "margin of safety."

Second, indiscriminate disposal represents virtually the only conceivable means of widespread human or environmental exposure to electrical fluids containing less than 50 ppm PCBs. But disposal of such "waste oil" is regulated already pursuant to TSCA or the Resource Conservation and Recovery Act ("RCRA"), or soon will be regulated under RCRA. Since whatever unreasonable risk may be presented by electrical fluids containing PCBs in concentrations below 50 ppm is therefore amply regulated,^{15/} it is NEMA's view that duplicative regulation of such fluids pursuant to Section 6(e) would be confusing and unnecessarily burdensome to both the regulated community and EPA. Such regulation would afford no additional protection to human health or the environment, and would run counter to Section 9(b) of TSCA, which expresses Congress' intent that TSCA not be used when other statutes are sufficient to regulate a particular risk.

5. Question Raised by the Hearing Panel

Q: What inconsistency does NEMA see between EPA's conditions for the use authorizations and the definition of a leak as disposal?

A: The proposed conditions for the use authorizations for PCB Transformers, Large PCB Capacitors and PCB-Contaminated Electrical Equipment should define the equipment owner's total obligation. An owner who complies in good faith with these conditions should not also be subject to penalties for improper disposal in the event a leak nonetheless occurs. This is especially so in the case of any leaks from PCB-Contaminated Electrical Equipment, where inspections for leaks are not even required in

^{15/} So that there may be no misunderstanding, NEMA stresses again its belief that PCBs in concentrations below 50 ppm present no unreasonable risk of injury to health or the environment.

view of the equipment's miniscule PCB content. Yet such leaks as might occur constitute illegal disposal (or so NEMA reads the proposed rule).

Q: What are NEMA's recommendations?

A: NEMA recommends (1) revising the definition of "leak" or "leaking" to mean "any instance in which a PCB Article, PCB Container or PCB Equipment has any quantity of PCBs running off or about to run off any portion of its external surface;" and (2) making no change in the definition of "disposal" or the spills provision of the disposal requirements.

Q: Is there any correlation between capacitor size and location?

A: NO.

Q: Is there any correlation between capacitor cost and size?

A: Yes, the larger the capacitor the more costly.

Q: Is there any correlation between capacitor location and age?

A: NO.

Q: Is there any correlation between capacitor failure rate and location?

A: NO.

Q: How long does it take for a manufacturer to provide capacitors once an order has been placed?

A: The time will vary depending on the plant's workload. (No generalization may be made.)

Q: How many units are typically included in a single order?

A: This will vary anywhere from a single unit to more than one thousand units. (No generalization may be made.)

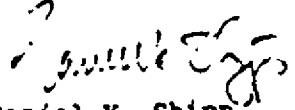
Q: What percentage of new orders are attributable to failure, obsolescence or new applications?

A: Statistics are unavailable.

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- Q: What data does NEMA have as to the fluids, effectiveness and costs of available capacitor protective devices?
- A: NEMA believes these kind(s) of questions can best be answered by the users of such devices.
- Q: Are capacitors shelf items or custom designed?
- A: Both, depending on customer requirements.
- Q: Does NEMA have engineering data to show failure, leakage and rupture rates for electrical equipment?
- A: - NO.
- Q: Do engineering specifications for transformers and capacitors vary greatly among manufacturers, by customer industry or by application (i.e. indoor/outdoor)?
- A: Engineering specifications depend on customer requirements.

Sincerely,


Daniel K. Shipp
Vice President,
Public Affairs

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Concentrations of Chlorinated Dibenzofurans
in Commercial PCB Products

PCB	4-Cl	5-Cl	6-Cl	Total
Aroclor 1016 (1977) ^a	ND	ND	ND	--
Aroclor 1016 ^b	ND	ND	ND	--
Aroclor 1242 ^b	0.07	0.03	.003	0.15
Aroclor 1242 ^f	2.3	2.2	ND	4.5
Aroclor 1254 (1969) ^a	0.1	0.2	1.4	1.7
Aroclor 1254 (1970) ^a	0.2	0.4	0.9	1.5
Aroclor 1254 ^c	0.02	0.2	0.4-0.6	0.8
Aroclor 1254 ^f	0.1	3.6	1.9	5.6
Aroclor 1260 (1969) ^a	0.1	0.4	0.5	1.0
Aroclor 1260 (lot AK3) ^a	0.2	0.3	0.3	0.8
Aroclor 1260 ^d	0.3	1.0	1.1	3.8 ^{*/}
Aroclor 1260 ^f	0.8	0.9	0.5	2.2
Clophen A60 ^a	1.4	5.0	2.2	8.4 ^{**/}
Clophen T64 ^d	0.3	1.73	2.5	5.4 ^{*/}
Phenoclor DF-6 ^a	0.7	10.0	2.9	13.6
Prodelec 3010 ^d	1.1	0.4	0.1	2.0 ^{*/}
Kanechlor 400 ^{e, f}				ca 20.0

^{*/} Totals include quantities of 3-Cl and 7-Cl isomers analyzed for and reported only in reference d.

^{**/} Total as reported in the original.

References to Table

- a. Bowes, G.W., Mulvihill, M.J., Simoneit, B.R.T., Burlingame, A.L. & Risebrough, R.W. (1975) Identification of chlorinated dibenzofurans in American polychlorinated biphenyls. Nature (Lond.), 256, 305-307.
- b. Albro, P.W. & Parker, C.E. (1979) Comparison of the Compositions of Aroclor 1242 and Aroclor 1016. J. Chrom., 169, 161-166.
- c. Bell, R.A. (1981) General Electric Company, unpublished results. These results represent maximum values because of possible chlorinated diphenyl ether interference.
- d. Rappe, C. & Buser, H.R. (1980) Chemical Properties and Analytical Methods, Chapter 2, Halogenated Biphenyls, Terphenyls, Napthalenes, Dibenzodioxins and Related Products, R.D. Kimbrough, Elsevier Press, Amsterdam.
- e. Nagayama, J., Kuratsune, M., and Masada, Y. (1976) Determination of chlorinated dibenzofurans in Kanechlors and 'Yusho Oil', Bull. Environ. Contamin. Toxicol. 15, 9-13.
- f. Morita, M., Nakagawa, J., Akiyama, K., Nimura, S. and Isono, N. (1977) Bull. Environ. Contamin. Toxicol. 18, 67-73.

Table 6

Table 6: Transformer Data, Aslarel Composition and TCDF Concentration

Sample	Installation	Manufacturer	Dielectric Strength (kv)	Power (kva)	Volume (litree)	kva/volume	1,3,5-Cl ₃ Bz	1,2,4-Cl ₃ Bz	1,2,3-Cl ₃ Bz	1,2,3,5- & 1,2,4,5-Cl ₄ Bz	1,2,3,4-Cl ₄ Bz	1,2,3,4,5-Cl ₅ Bz	PCBs/PCB ratio	Aroclor	TCDF
Group 1															
1-1	1957	FP	36	1500	1888	0.79	cr	26.4	6.8	1.0	14.4	2.4	51.0/49.0	1260	0.780
1-2	1961	FP	36	1500	2093	0.72	cr	28.4	6.6	cr	15.2	3.4	51.6/46.4	1260	1.110
1-3	1963	FP	36	1500	1251	1.19	cr	27.8	6.2	cr	14.0	2.6	50.6/49.4	1260	1.020
1-4	1963	FP	36	1500	1251	1.19	cr	28.8	6.4	cr	14.4	2.8	52.4/47.6	1260	0.790
1-5	1963	FP	36	1500	1274	1.17	cr	28.4	8.0	cr	2.2	cr	38.6/61.4	1260	0.350
1-6	1965	FP	29	1500	1151	1.30	cr	28.0	7.6	cr	1.6	ND	37.2/62.8	1260	0.290
1-7	1970	FP	30	1500	1765	0.85	cr	22.6	7.0	cr	cr	ND	29.6/70.4	1254	0.550
1-8	1970	FP	22	1500	1490	1.01	cr	21.2	6.8	cr	cr	ND	28.0/72.0	1254	0.470
1-9	1971	FP	28	1500	1490	1.01	cr	21.2	7.8	cr	cr	ND	29.0/71.0	1254	0.290
1-10	1974	FP	28	1500	1490	1.01	ND	21.6	6.8	ND	ND	ND	28.4/71.6	1254	0.051
1-11	NEW	FP	-	1500	-	-	cr	20.8	9.8	cr	cr	ND	30.6/69.4	1254	0.041
Group 2															
2-1	1967	CCE	33	500	725	0.69	ND	21.4	5.6	cr	14.8	3.4	45.2/54.8	1260	0.030
2-2	1967	CCE	31	1000	938	1.07	cr	26.2	7.2	cr	14.8	3.2	44.3/55.7	1260	0.004
2-3	1967	CCE	36	1000	770	1.30	cr	26.0	7.0	cr	14.4	3.2	50.6/49.4	1260	0.007
2-4	1967	CCE	35	866	1268	1.47	cr	26.4	6.4	cr	13.4	2.8	49.0/51.0	1260	0.010
2-5	1965	FP	36	700	660	1.06	cr	27.6	7.8	cr	cr	cr	35.4/64.6	1260	0.176
2-6	1965	FP	36	1500	1251	1.20	cr	27.0	5.8	cr	13.6	2.6	49.0/51.0	1260	0.435
2-7	1965	FP	36	2500	2084	1.20	cr	27.8	6.6	cr	1.0	cr	35.4/64.6	1260	0.110
2-8	1965	FP	36	2500	1092	2.29	cr	28.4	8.2	cr	cr	cr	36.6/63.4	1260	0.141
Group 3															
3-1	1967	CCE	33	500	725	0.69	ND	21.4	5.6	cr	14.8	3.4	45.2/54.8	1260	0.419
3-2	1967	CCE	41	1000	770	1.30	cr	26.0	7.0	cr	14.4	3.2	50.6/49.4	1260	0.341
3-3	1967	W	41	750	883	0.85	cr	28.2	8.0	cr	cr	cr	36.2/63.8	1260	0.444
3-4	1967	W	41	1200	1087	1.10	cr	27.4	7.8	cr	cr	cr	35.2/64.8	1260	0.426

cont...

Table 6 (continued)

Sample	Installation	Manufacturer	Dielectric Strength (kv)	Power (kva)	Volume (litres)	kva/volume	1,3,5-Cl ₃ B ₂	1,2,4-Cl ₃ B ₂	1,2,3-Cl ₃ B ₂	1,2,3,5- & 1,2,4,5-Cl ₄ 2	1,2,3,4-Cl ₄ B ₂	1,2,3,4,5-Cl ₅ B ₂	PCB ₂ /PCB ratio	Aroclor	TCDF
3-5	1967	FP	31	750	829	0.90	tr	28.0	7.8	tr	tr	tr	32.8/67.2	1260	0.168
3-6	1967	FP	36	1000	838	1.19	tr	25.0	7.8	tr	tr	tr	32.8/67.2	1260	0.179
Group 4															
4-1	1947	OGE	-	56	660	0.08	ND	24.8	7.2	tr	14.2	3.0	49.2/50.8	1260	4.730
4-2	1947	OGE	-	10,000	6,900	1.45	ND	25.2	6.6	tr	14.0	2.6	48.4/51.6	1260	2.201
4-3	1965	AD	-	-	-	-	ND	27.0	5.2	tr	14.4	3.6	50.2/49.8	1260	0.455
4-4	1973	MA	-	-	-	-	ND	27.4	5.2	tr	14.8	4.0	51.4/48.6	1260	0.403
4-5	'new'	OGE	-	-	-	-	tr	35.4	13.4	tr	10.0	ND	58.8/41.2	1254	< 0.001
4-6	'new'	W	-	-	-	-	ND	20.2	10.0	tr	ND	ND	30.2/69.8	1254	0.014
4-7	'new'	FP	-	-	-	-	tr	20.8	9.8	tr	tr	ND	30.6/69.4	1254	0.041

Table 6 : Legend

Table 6 : Legend

- Samples:
 - Group 1 (1-1, 1-2, etc.) - variable time-in-service.
 - Group 2 - 2-1 to 2-4 - CGE Transformers; variable kva/volume ratio
 - 2-5 to 2-6 - FP Transformers; variable kva/volume ratio
 - Group 3 - variable fluid type - 3-1 and 3-2 Pyranol
 - 3-3 and 3-4 Chlorextol
 - 3-5 and 3-6 Inerteen
 - Group 4 - 4-1 and 4-2 - 'very old' transformers; large variation in kva relative to fluid volume.
 - 4-3 and 4-4 - transformers which had failed in service
 - AD - Adelaide Street (Toronto Hydro)
 - WA - Walkerton, Ont. (Canada Packers)
 - 4-5, 4-6 and 4-7 - new Pyranol, Inerteen and Chlorextol.

- Manufacturer:

(fluid type)	CGE - Canadian General Electric FP - Ferranti-Packard W - Westinghouse AD - Brown Boveri WA - Foster Electric	(Pyranol) (Chlorextol) (Inerteen) (Pyroclor) (Inerteen)
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- 1,3,5-Cl₃Bz - 1,3,5-trichlorobenzene content ($\pm$ 0.05% w/w)
- 1,2,4-Cl₃Bz - 1,2,4-trichlorobenzene content ($\pm$ 0.05% w/w)
- 1,2,3-Cl₃Bz - 1,2,3-trichlorobenzene content ($\pm$ 0.05% w/w)
- 1,2,3,5- & 1,2,4,5-Cl₄Bz - 1,2,3,5- & 1,2,4,5-tetrachlorobenzene content ($\pm$ 0.05% w/w)
- 1,2,3,4-Cl₄Bz - 1,2,3,4-tetrachlorobenzene content ($\pm$ 0.05% w/w)
- 1,2,3,4,5-Cl₅Bz - 1,2,3,4,5-pentachlorobenzene content ($\pm$ 0.05% w/w)
- TCDF (ppm) - concentration of 2,3,7,8-tetrachlorodibenzofuran in askarel (ppm)