

**PCB de-chlorination work**  
**Pertaining to**  
**M/s KSEB, Kakkayam, Kerala**



**By**  
Dielectric Materials Division  
Central Power Research Institute  
Bengaluru -560080, India



**PCB de-chlorination work pertaining to M/s KSEB, Kakkayam, Kozhikode,  
Kerala-673615**

CPRI had submitted the PCB test report (no. DMD/LDL/PCB-1318-1325/KSEB, dt: 26.07.2016) to KHEP, Kakkayam. It was observed that the two transformers at KHEP were PCB contaminated.

A letter No. DB4/PH-GENL/2018-19/1693, dt: 28.01.2019 (**Annexure A**) has been received from the Executive Engineer, E.M sub Division, Kakkayam requesting guidelines for PCB de-chlorination, subsequently CPRI requested KSEB, Kakkayam to send the PCB contaminated oil to CPRI, Bangalore for PCB de-chlorination activity (Letter No: DMD/PCB/2019/KSEB, DT:13.02.2019, **Annexure B**).

KSEB made arrangements and sent around 1050Ltrs of oil to CPRI, Bangalore on 22.05.2019 for PCB de-chlorination activity (**Annexure C**). The details are given below in Table no.1.

**Table No.1: Details of PCB contaminated oil drums received at CPRI, Bangalore.**

Sl. No	Date	Qty of Barrels (No.)	Vehicle No.
1.	22.05.2019	5	KL738744

Upon receipt of oil Barrels, the PCB content of each Barrels were analyzed and the reports is given in Fig. No.1 to 5. It is observed that the PCB contamination is about 6 to 11 ppm.

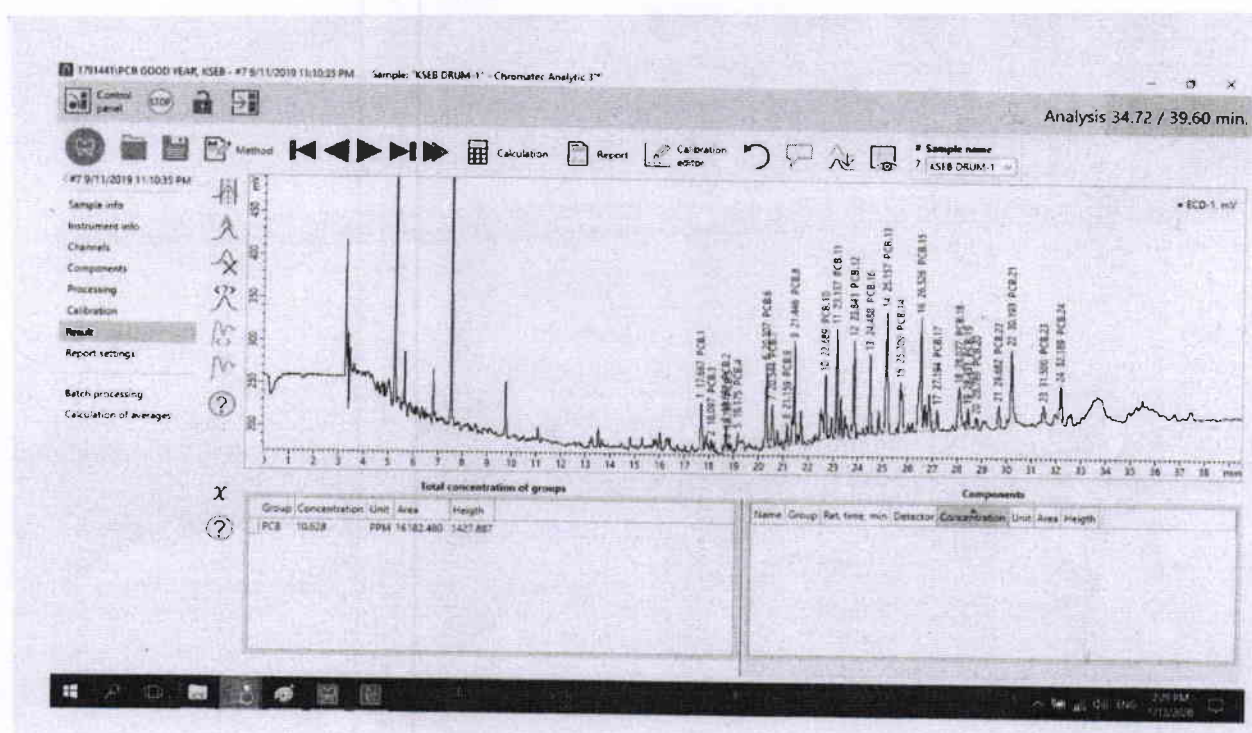


Fig.1: Drum No. 1- PCB analysis report (Concentration 10.68ppm)



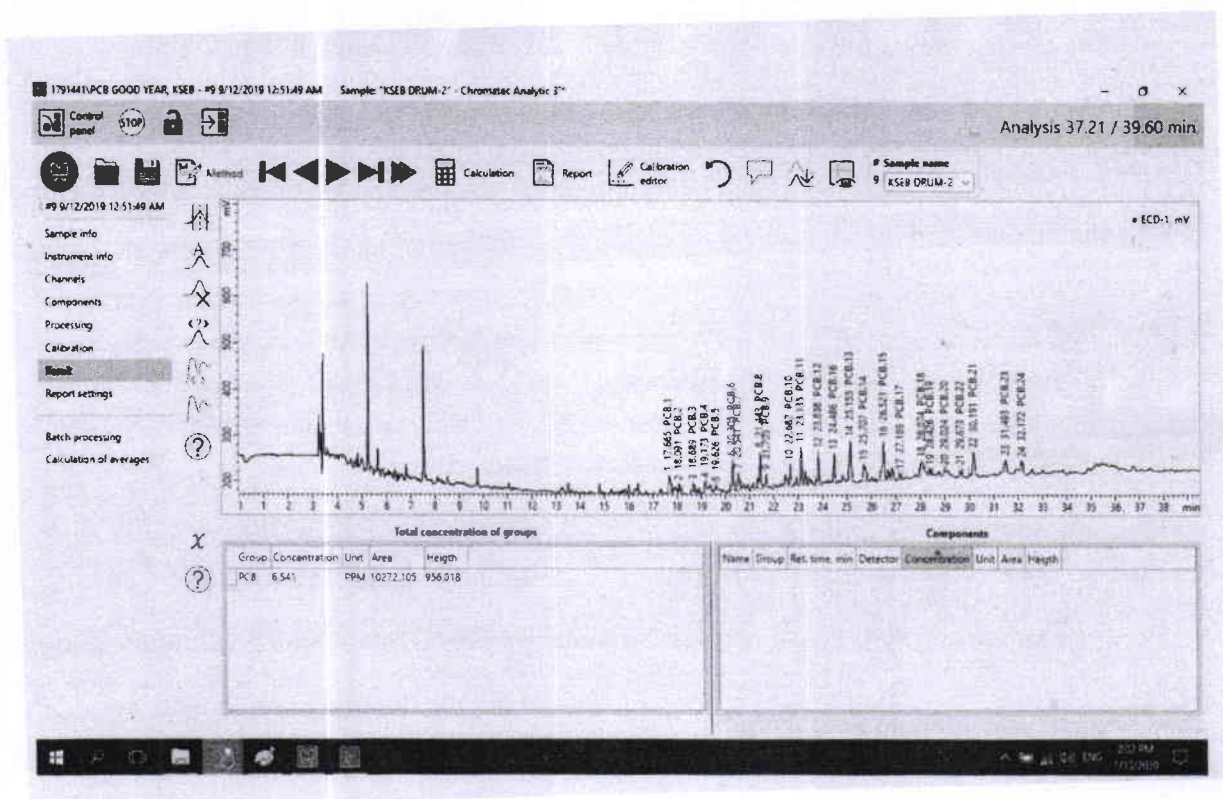


Fig.2: Drum No.2- PCB analysis report (Concentration 6.54ppm)

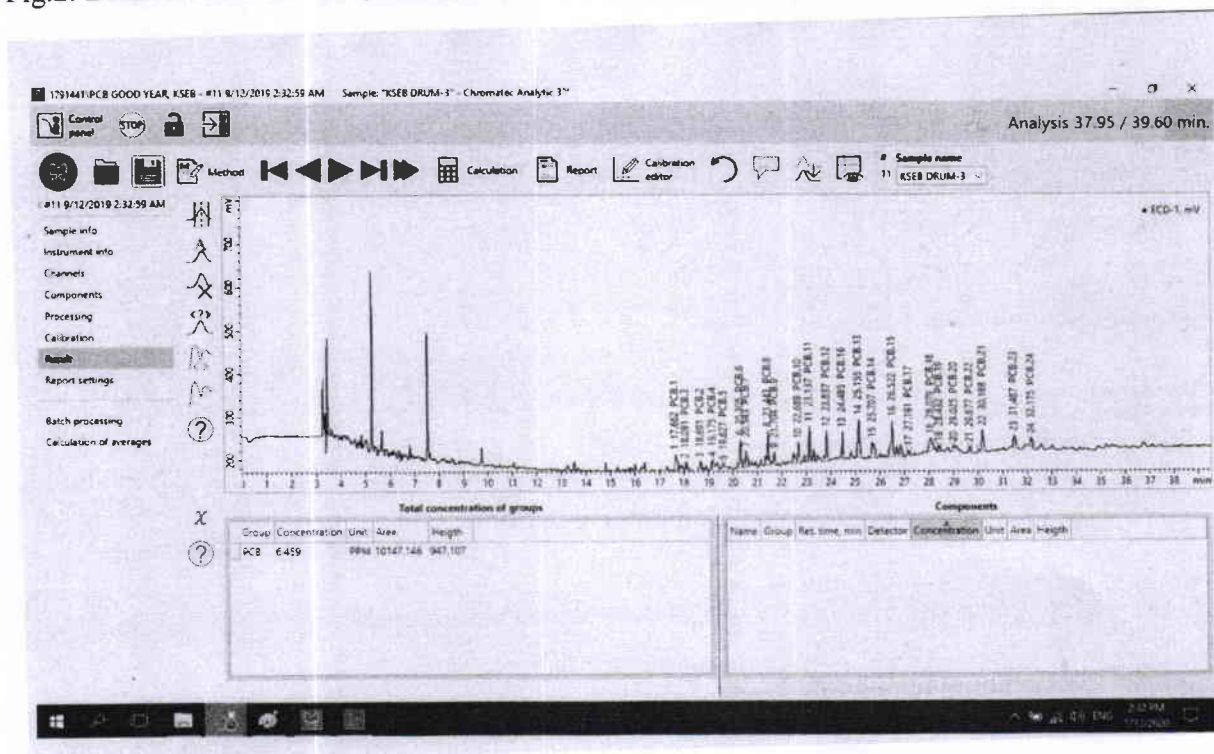


Fig.3: Drum No. 3- PCB analysis report (Concentration 6.45ppm)

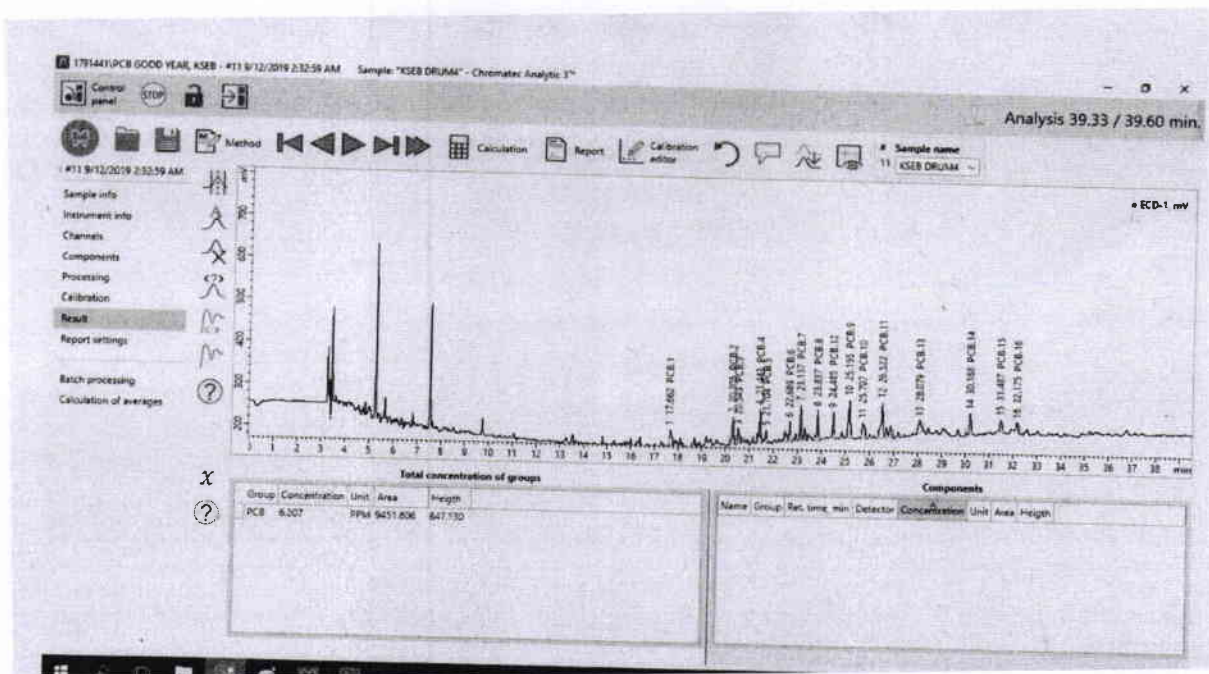


Fig.4: Drum No.4- PCB analysis report (Concentration 6.2ppm)

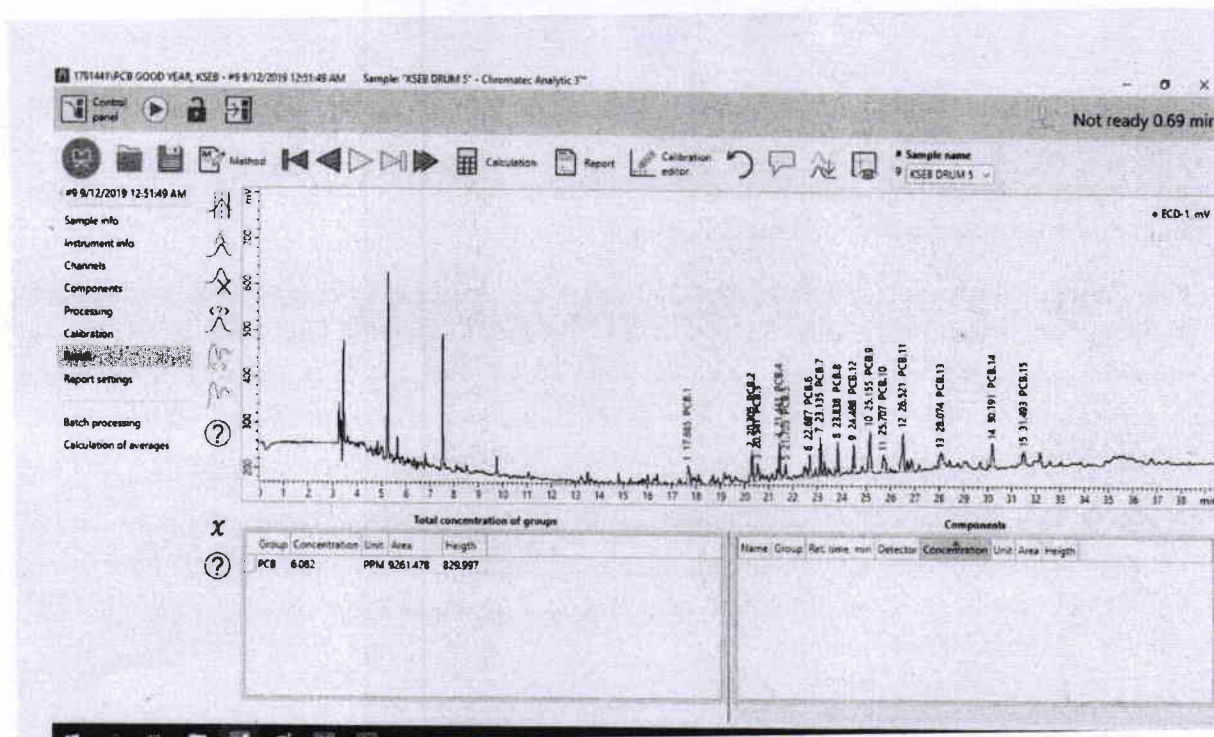


Fig.5: Drum No. 5- PCB analysis report (Concentration 6.08ppm)

The PCB contaminated oil in the barrels were transferred and stored in 6kl MS tank available at CPRI (Fig.6&7).





**Fig.6: Unloading of PCB contaminated transformer oil drums received from M/s KSEB vehicle**



**Fig.7: PCB contaminated oil stored in 6kl MS tank**

Around 300kg of sodium dispersion was prepared using sodium metal and mineral oil in the ratio 40:60 in sodium dispersion unit. This sodium dispersion is used during PCB de-chlorination reaction.

The PCB dechlorination process was operated in batches with minimum batch size of about 3000 l/batch and can be treated up to 10000ppm of PCB content in oil. To makeup the batch size of the reactor, the PCB contaminated oil pertaining to other PCB stake holder was mixed with this oil and loaded into reactor (Fig.8).

The oil was passed through two heaters and degasifier, where water and volatile compounds were removed. This PCB contaminated oil was stirred for one hour and a sample was drawn from the reactor to check the initial concentration of PCB content. Depending upon the initial concentration of PCB content in the oil, calculated amount of sodium dispersion was added into the reactor.

The PCB de-chlorination reaction was carried out at a temperature of 120 degree Celsius with nitrogen purging in the reactor. The samples were drawn at every hour and analyzed using GC-ECD to check the level of PCB content (Fig.9). The reaction was continued till the PCB content less than 2 ppm achieved.

After completion of reaction, excess of sodium in the reaction vessel was neutralized by adding water and the hydrogen gas released during the neutralization is purged with nitrogen and vented to atmosphere. Then the reaction mass in the reaction vessel is transferred to settling tank. The reaction mass was kept for one day to separate sludge by gravity and it was settled at the bottom of the settling tank. The sludge generated in the PCB de-chlorination contains sodium chloride, sodium hydroxide, Water and biphenyls and this was drained into barrels and kept in safe custody for disposal. The oil from the settling tank also drained to the

barrels. The PCB de-chlorination activity was carried out on 06.11.2019. The PCB content after PCB de-chlorination was found to be 0.672ppm. The results are given in Fig.10.



*Fig.8: PCB staff members loading transformer oil to reactor through inlet hose pipe of PCB de-chlorination unit.*

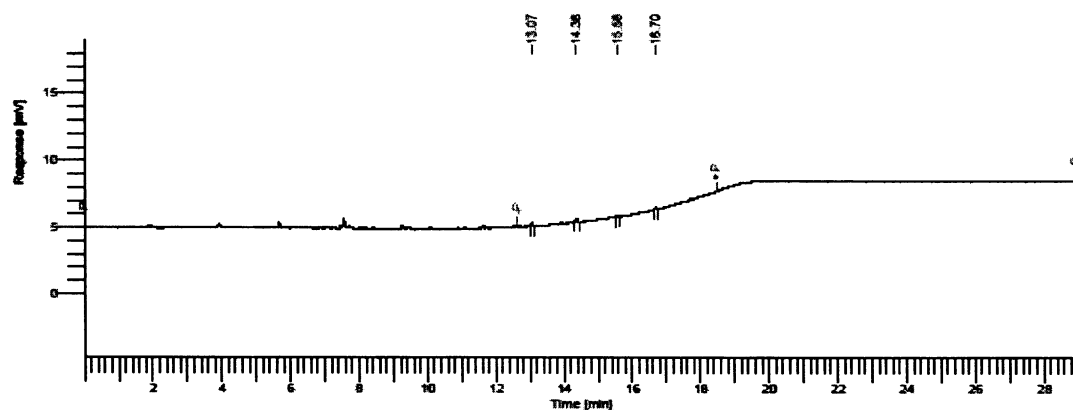


*Fig.9: Sampling of oil from the reactor for PCB analysis by PCB team member.*

Software Version : 6.3.2.0646  
 Sample Name : pcb  
 Instrument Name : Clarus 680  
 Rack/Vial : 0/0  
 Sample Amount : 1.000000  
 Cycle : 1

Date : 05-12-2019 15:18:02  
 Data Acquisition Time : 05-12-2019 13:42:05  
 Channel : A  
 Operator : manager  
 Dilution Factor : 1.000000

Result File :  
 Sequence File : C:\GC PCB Analysis\Sequence\05.12.2019.seq



### PCB ANALYSIS

Peak #	Component Name	Time [min]	Area [uV*sec]	Height [uV]	Area [%]	PCB IN PPM
	PCB	16.000	2427.24	773.23	100.00	0.6722
			2427.24	773.23	100.00	0.6722

Fig.10: PCB test report after PCB de-chlorination.

**Details of PCB de-chlorinated oil and sludge generated during PCB de-chlorination process.**

During the PCB de-chlorination process, around 250 Kg of sludge (Fig.11) and the treated oil free from PCBs (Fig.12) around 800 lts has been generated. The amount of oil sludge generated and the total quantity of oil after PCB treatment is given in the Table.2. CPRI had identified a recycler M/s KarRecycle centre LLP, who is authorized by Karnataka State Pollution control Board to handle both treated oil and sludge. The generated, sludge and the oil were sent to M/s KarRecycle Centre LLP, for disposal (Fig.13).



*Fig11: Sludge stored in drums for incineration*



*Fig.12: Oil after PCB de-chlorination stored in 5Kl Plastic tank for disposal*



**Table. 2:** Details of PCB de-chlorinated oil and sludge generated.

Sl. No	Details of work done	PCB Contaminated oil	Oil after de-chlorination	Qty. of Sludge Generated
1.	M/s KSEB, Kakkayam	1.05 Kl	800 lts	250 Kg



**Fig.13:** Loading of PCB de-chlorinated oil and sludge to the vehicle of M/s KarRecycle Centre LLP, for disposal.

The 5 drums (1050 ltrs) of PCB contaminated oil with 6 -10 ppm belonging to M/s KSEB, Kakkayam was successfully dechlorinated to less than 2 ppm using PCB mobile dechlorination unit at CPRI, Bangalore on 06.11.2019.

Annexure A



**KERALA STATE ELECTRICITY BOARD LIMITED**

(Incorporated under the Indian Companies Act, 1956) CIN:40100KL2011SGC027424  
Registered Office: Vidyuthi Bhavanam, Pattom, Thiruvananthapuram-695 004 Website: www.kseb.in

**Office of the Executive Engineer,**

**Kuttiady Generation Division, Kakkayam-673 527.**

Phone: 0496 2698224; FCT: 9496009918, E-mail: eekgdkm@gmail.com

No. DB 4/PH-GENL/2018-19/ 1693

Date 28.01.2019.

To

The Additional Director,  
Dielectric Material Division,  
P.B.No.8066, Sadashivanagar (P.O)  
Prof.Sir.C.V.Raman Road,  
Bangalore- 560 080.

Sir,

Sub:- KHEP- PCB Content in Transformer Oil- Report submitting- reg -

Ref:-

1. That Office Lr. No.DMD/DDL/PCB-1318-1325/KSEB, Kakkayam dtd 26.07.2016.
2. Lr. No.DB/EMSD/18-19/PCB-Transformer/137 dtd 22.12.2018 of the Assistant Executive Engineer, E.M Sub division, Kakkayam.

It was reported vide ref(1) cited above that two transformers at KHEP are filled with PCB content and also directed to ensure that this transformers as well as oil is not disposed, recycled or filtered without co-ordination with that office. Hence several requests were send to that office via email and contacted through telephone by the Assistant Executive Engineer, E.M Sub Division, Kakkayam. But reply is not yet received regarding your visit to dispose the transformer and oil. The transformers are kept at Power House premises till now. Hence your kind co-ordination is requested to dispose the PCB contaminated transformers and oil at the earliest.

Yours faithfully,

**EXECUTIVE ENGINEER,  
K.G DIVISION, KAKKAYAM**

Copy submitted to: The Chief Engineer (Generation), Moolamattom.

: The Deputy Chief Engineer, Generation Circle, Thrissur.

Copy to: The Asst. Exe. Engineer, E M Sub Division, Kakkayam.

: File.

*Handwritten notes:*  
→ 3/4  
→ per 20.  
No. Sreedat.

## Annexure B

**DIELECTRIC MATERIALS DIVISION  
LIQUID DIELECTRIC LABORATORY  
CENTRAL POWER RESEARCH INSTITUTE**  
SIR C. V. RAMAN ROAD, P. B. No. 8066, BANGALORE - 560 080  
PHONE : 080 - 22072429  
Email : thomas@cpri.in, pcbgroup@cpri.in

### Proforma Invoice

No. : DMD/PCB/2019/KSEB

Date : 13.02.2019

To,  
Office of the Executive Engineer  
M/s.Kerala State Electricity Board Limited  
Kuttiady Generation Division,  
Kakkayam-673 527

19  
EK81866561

Sub : Dechlorination of PCB contaminated transformer oil at KSEB  
Ref : DB4/PH-GENL/2018-19/1693 dated 28.01.2019

Sl. No.	Description	Rate (Rs.) Per Litre
1	PCB dechlorination of PCB contaminated transformer oil at site.	20.00
		Plus 18% GST

#### Terms and Conditions:

1. 50% advance to be paid in advance by DD/Cheque drawn in favour of Accounts Officer, CPRI, Bangalore or by NEFT. Balance 50% payment should be made within 30 days from the date of work completion.
2. deducted towards TDS, your company TAN No. and also issue FORM-16A for Tax deducted.
3. PAN NO. AAAAC0268P , GST Provisional ID 29AAAAC0268P1ZF & SAC code is 998346
4. Validity : 3 months
5. GST as applicable at the time of billing.
6. Please provide your GSTIN, HSN and SAC No.

13/02/19  
(Dr.P.Thomas)  
Additional Director-HOD

o/c

13/02/19 / Despatched on  
14 FEB 2019



## Annexure C



**KERALA STATE ELECTRICITY BOARD Ltd.**  
Office of the Assistant Executive Engineer,  
Electrical Maintenance Sub Division, Kakkayam, Kozhikode-673 615  
Mob No: 9496012191, FCT:9496009916, Ph: 04962698366  
email:info.ksebkakkayam@gmail.com

**DB No: EMSD /PCB/2019-20/**

**28 /**

**18.05.2019**

To,

The Additional Director –HOD  
Dielectric materials division  
CPRI, Sir.CV Raman Road,  
Sadashivanagar PO  
Banglore -560080

Sir,

**Sub:** Dechlorination of PCB contaminated transformer oil at KSEB Kakkayam reg;

Ref : Your letter No DMD/PCB/2019/KSEB Dated 13-02-2019

As per your vide reference above a DD has taken in favor of Accounts officer CPRI Bangalore for the amount of Rs 24,780/- In this amount Rs 21000/- is for the Dechlorination charge of PCB contaminated oil of 1050 Lt (5 Barrels) and its GST amount is of Rs 3780/-

The other details requested from you are as follows

1) E-way bill No 5911 0730 8435 Dated 18-05-2019 from Deputy Chief Engineer Generation Circle Trissur.

2) HSN No 27109100-WASTE OIL

3) GSTN OF Supplier - 32AAECK2277NBZ1, KERALA STATE ELECTRICITY BOARD LTD

We have planned to report your office with the above PCB contaminated transformer oil on 20-05-2019. Necessary arrangements may kindly be taken for the dechlorination of the above PCB contaminated transformer oil as far as possible

Yours faithfully,

for

**Assistant Executive Engineer  
EMSD, KHEP, Kakkayam**

Acc:-

1. DD
2. E-way bill
3. Copy of your Ref: Letter

Registered Office: Vidyuthi Bhavanam, Pattom, Thiruvananthapuram 695 004, Website: www.kseb.in