

M/s. Athiappa Chemicals (P) Limited manufacturing Barium Carbonate (BaCO_3) and Sodium Sulphide (Na_2S) solution using Barium Sulphate (BaSO_4), Pet coke (C) and Soda ash (Na_2CO_3) as raw materials.

- 1) Subsequently, the industry was inspected and monitored by the Puducherry Pollution Control Committee (PPCC) and issued a closure notice to the industry on 16.11.2011. The industry had filed an appeal, against closure order at the Appellate Authority, Ministry of Environment and Forest, New Delhi on 12.01.2012 and the same was admitted as Appeal No.2 of 2012.
- 2) The Appellate Authority was of the view that an independent body should look into the pollution aspect of the industry and hence passed an order 05.07.12 directing National Environmental Engineering Research Institute (NEERI), Chennai to conduct scientific study. The team of officials from NEERI, Nagpur carried out the stack emission monitoring and NEERI, Chennai carried out the Ambient air quality monitoring on 14.09.2012. The Phase I of the monitoring was completed on 25.09.2012 after which the industry underwent shut down. During shut down also the ambient air quality monitoring was (Phase II) to ascertain the base line data. The Phase II monitoring was concluded on 05.10.2012. The industry was found to be met the standards prescribed for Ambient Air Quality Monitoring (AAQM) but exceeded the limit for Particulate Matter in the stack. NEERI, Nagpur submitted a report to the Appellate Authority, New Delhi in October 2012 at the same time industry continued to remain shut down due to pending on hearing.
- 3) Based on the report submitted by NEERI, the Appellate authority decided to conduct a long term study (bi-monthly over a period of six months) on the environmental pollution aspects of the industry. The authority constituted a joint team of National Environmental Engineering Research Institute (NEERI), Chennai and Central Pollution Control Board (CPCB) South Zonal Office, Bangalore. Both NEERI and CPCB mutually agreed that based on available expertise and man power, NEERI (jointly with CPCB), Chennai would conduct the Ambient Air Quality Monitoring in and around the industry and CPCB (jointly with NEERI), Bangalore

would conduct the Stack emission monitoring. The industry resumed its operation on 21.02.13 as per the order of Appellate Authority, New Delhi.

- 4) Meanwhile, PPCC filed an appeal against the order of the Appellate authority at the National Green Tribunal (South Zone) on 10.04.2013. An appeal was admitted at Appeal No.15 of 2013(SZ) and interim stay on the order of the appellate authority was granted. The industry has shut down its operation on 10.04.2013 in compliance to the order.
- 5) The tribunal then appointed Dr.R.Jayabalou, SIC, NEERI, Chennai (Retired) - NEERI as a single member expert committee to inspect the industry. Dr. R. Jayabalou inspected the industry on 02.05.2013 and submitted his report to the tribunal. In his report submitted to National Green Tribunal (South Zone), he had stated that “The environmental status of the small scale industry was assessed by visual inspection and verification of records when the plant was under shut down and found to be satisfactory. It is also recommended that the actual performance of the pollution control system be evaluated under full load conditions through stack and ambient air quality monitoring jointly by NEERI and CPCB”. Based on the report submitted by the single member expert committee, the tribunal dismissed the appeal and reinstated the order of the Appellate Authority, New Delhi and directed to follow the order of Appellate Authority to for carrying out the joint inspection and monitoring by NEERI and CPCB.
- 6) Followed by, CPCB, Delhi vide CPCB Delhi Letter No: B – 30029/1/00/PCI – I/4531 dt. 9.2.2013 directed Zonal office, Bangalore to inspect and monitor the industry bi-monthly over a period of six months jointly with National Environmental Engineering Research Institute (NEERI), Chennai.

2.0 Joint Inspection and Monitoring

Team of officials from Central Pollution Control Board, Bangalore and National Environmental Engineering Research Institute (NEERI), Chennai were jointly inspected and monitored the industry thrice on different dates as mentioned in table-1 to comply the order of the appellate authority and National Green Tribunal.

Table No.1 Details on number of Ambient and Source Emission monitoring and its duration

Sl.No.	Details of Inspection and Monitoring	Date of Source Emission Monitoring	Date of Ambient Air Quality Monitoring
1	First Round	30.07.2012 to 31.07.2012	29.07.2012 to 05.08.2012
2	Second Round	11.12.2013 to 12.12.2013	24.12.2013 to 02.01.2014
3	Third Round	18.03.2014 to 19.03.2014	29.03.2014 to 11.04.2014

As per the order of Appellate Authority, the inspection and monitoring have to be carried out once in every two months during the period June to November 2013. However, the second round of inspection and monitoring was delayed for the reason that industry has suspended the operation/production due to non-availability of raw materials. With the constant follow up (CPCB Letter No.Tech/legal/Puducherry/AA&NGT/1694-1697 November 29, 2013), the industry has resumed its operation at full load during December 2013 (M/s. athiappa chemicals (P) Ltd letter No.ACP/2012-13/M-043 dt30.11.2013.2013) and followed by CPCB in consultation with NEERI carried out the second inspection and monitoring.

3.0 Status of Operation during Inspection,

Industry was in operation at full load capacity manufacturing Barium Carbonate (BaCO_3) 300MTM and 40 MTM of Sodium Sulphide (Na_2S) solution using Barium Sulphate (BaSO_4), Pet coke (C) and Soda ash (Na_2CO_3) as raw materials during all three inspections. On verifying the records, it is found that industry is having air consent valid up to 28.2.2006 and water consent valid up to 31.10.2004 but the fee for renewal is being paid regularly as on date (Fee paid receipt enclosed in Annexure-I). The manufacturing process involving various steps are as mentioned bellow:

3a. Process Details:

Ore containing Barites and Barium Sulphate as main constituent is supplied by M/s. Andhra Pradesh Mineral Development Corporation Ltd to the neighboring industry of M/s. athiappa chemicals Pvt Ltd. The neighboring industry involved in pulverizing and the

pulverized powder is supplied to M/s athiyappa chemicals for their further processing to manufacture Barium Carbonate (BaCO_3) and Sodium Sulphide (Na_2S) solution.

Industry is equipped with two rotary furnaces operated in batch process parallel. During the time of survey at all three times, the plant was operating at full load capacity of 27.0 MT/day of furnace feed. Initially, the raw materials Barites (15 to 18 MT/day)



containing 59% of Barium and 41% of Sulphate with a specific gravity of 4.5 in its purest form, along with Pet coke (4.5 to 5.5 MT) and Coconut Shell powder (3.5 to 4 MT) are fed into the furnace as fuel, where the combustion process takes place at the temperature of 1100 °C. When the temperature reaches maximum, the carbon in the petroleum coke reacts with ore as $\text{BaSO}_4 + \text{C} \rightarrow \text{BaS} + \text{CO}_2$.

The end product from the combustion process is Black ash (BaS). The black ash from the furnace is fed into the leaching tank to remove the mud. Removed mud is stored away from the factory at a distance of 4 km in a 3 acre plot in Potpourri in Tamil Nadu.

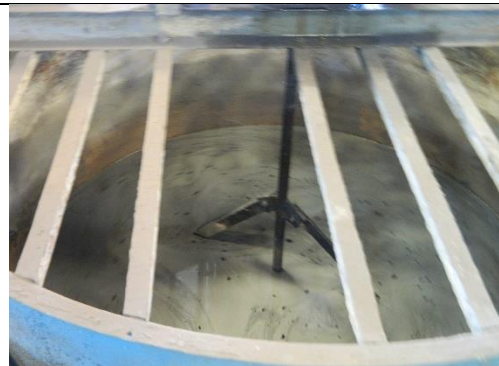


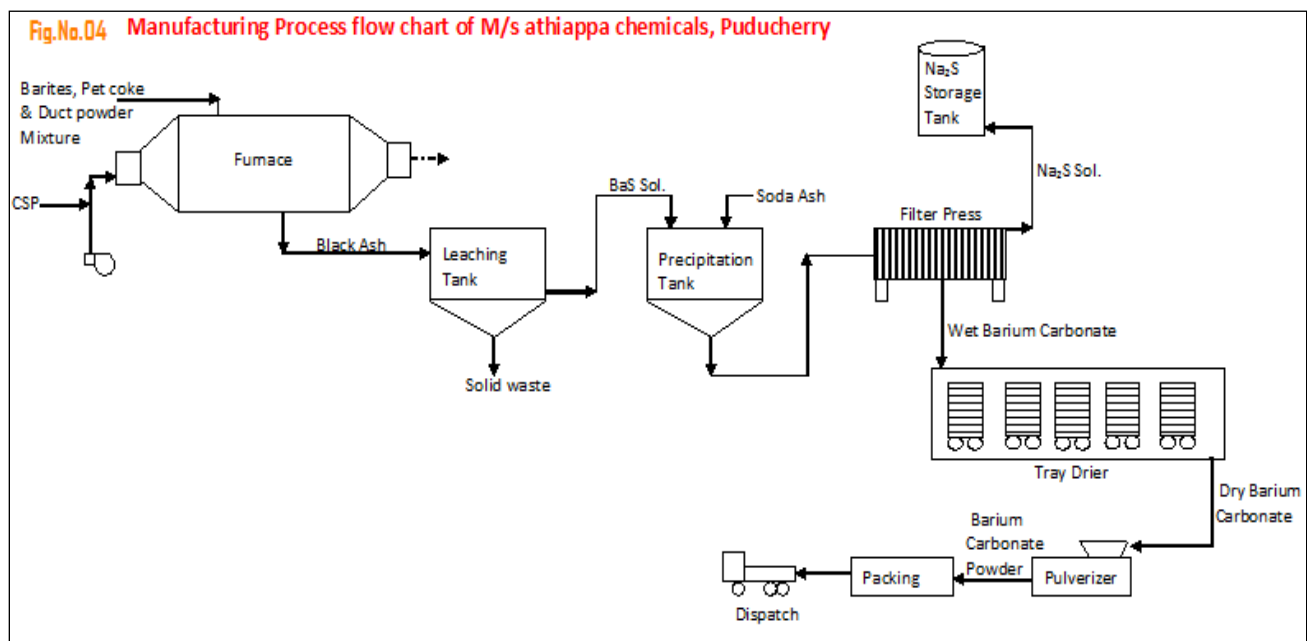
Fig No.3 Precipitation Tank

The BaS (60.0 MT/day) solution is pumped to the precipitation tank (PPT) followed by the addition of Na_2CO_3 (6.0 MT/day). The following reactions take place to give Barium Carbonate and Sodium Sulphide as products. $\text{BaS} + \text{Na}_2\text{CO}_3 \rightarrow \text{BaCO}_3 + \text{Na}_2\text{S}$. The reaction at the PPT tank results in the formation of BaCO_3 and Na_2S .

The slurry from the PPT tank is passed through Press to filter to separate the Barium Carbonate (BaCO_3) as wet cake and Sodium Sulphide (Na_2S) in the form of a solution.

Mechanical filter press is used to remove the water content of the precipitate. The filter press cake contains moisture content of about 20 - 30%.

The wet cake (BaCO_3) is dried in the tray drier using thermic fluid at a temperature of 160 - 180 °C. The temperature of the thermic fluid at the drier outlet is around 140 °C which is re-circulated and heated upto 160 - 180 °C again in the thermic fluid boiler. The waste water from the filter is re-circulated to the leaching tank. The dried cake from the drier is transferred to the pulveriser to break and reduce the size and then packed into bags of 50 kg. The flow chart of manufacturing process is in fig.No.4



4. Air Pollution Control Devices:

There are 3 chimneys (stacks), two are connected with rotary furnace process and another one connected with thermic fluid boiler. The industry has provided stack monitoring facilities as per the Emission Regulation Part-III (ERP-III) in all the 3 stacks.

1) Stacks connected with Rotary Furnace

- I. During first monitoring and inspection, it was observed that the flue gas generated in Rotary Furnace routed through dust filters of Cyclone, Tubular structure, Baffle filter and Wet scrubber in series to the stack.

II. During second inspection and monitoring, it is found that industry has modified and enhanced the capacity of the Air pollution control devices and routed the flue gas to the stack through dust jacketed-settling chamber, jacketed-cyclone dust collector, pulse jet bag filters and wet scrubber. The air pollution control devices adopted during first inspection and second inspection are depicted in Fig.5&6.

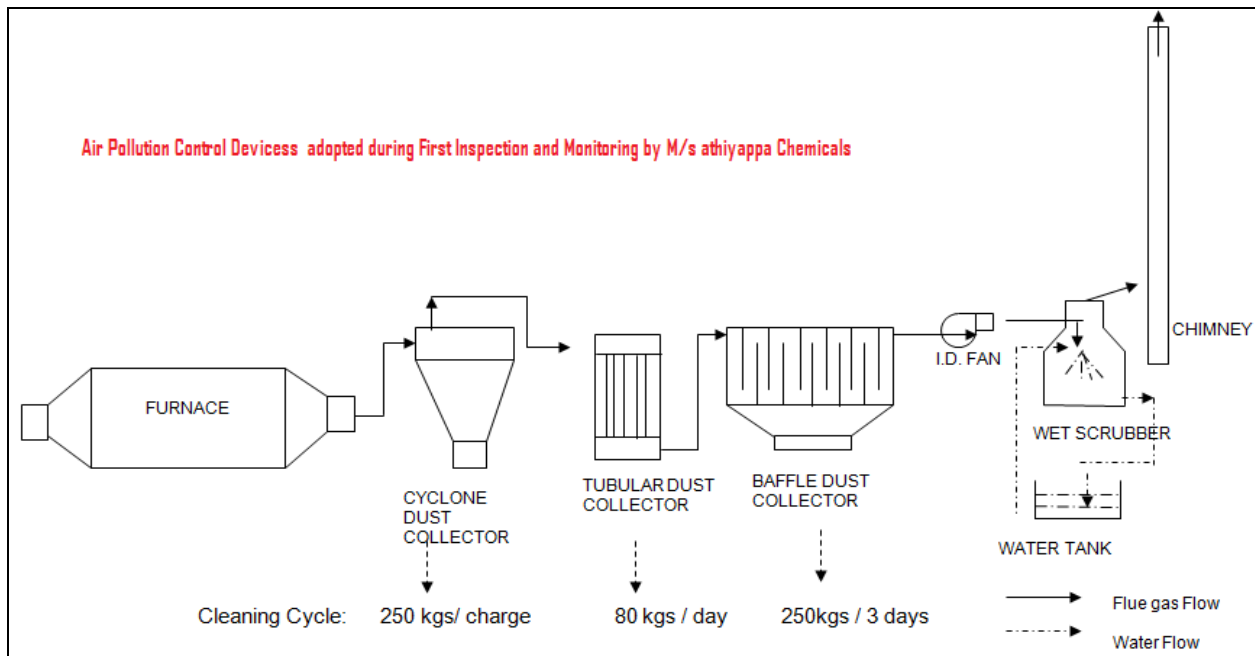


Fig.5. Air Pollution Control Devices during first joint inspection and monitoring

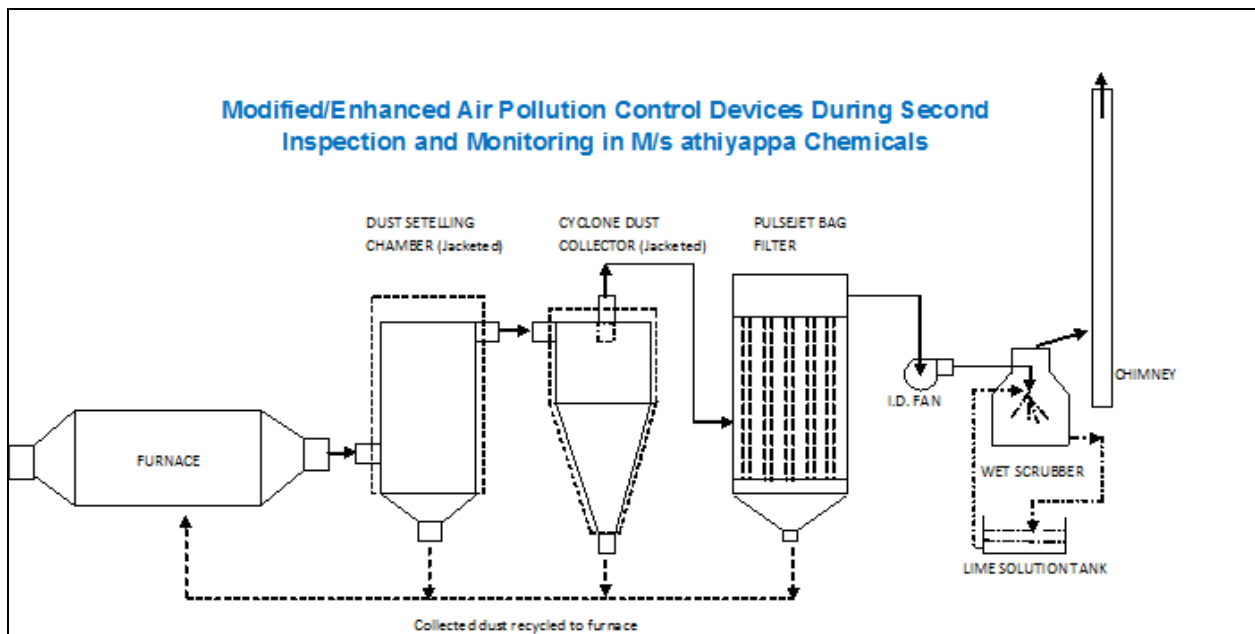


Fig.6. Air Pollution Control Devices during second joint inspection and monitoring
2) Stack connected with Thermic Fluid Boiler (2T/Hr)

- 3) During first monitoring and inspection, it is observed that the flue gas generated in Thermic Fluid Boiler was connected through dust collector and to the stack.
- 4) During third inspection and monitoring, it is found that industry has replaced the dust collector and provided cyclone. Fig.No.7&8 depicts the air pollution control devices adopted during first inspection and third inspection.



Fig.7. Air Pollution Control System in Thermic Fluid 2T/Hr Boiler during First Monitoring



Fig.8. Air Pollution Control System in Thermic Fluid 2T/Hr Boiler during Third Monitoring

5. Methods and Techniques followed for monitoring and analysis

The standard methods used for sampling and analysis of different pollutants are summarized as below.

Table No.2 Techniques/Methods followed for measurement of Ambient Air Quality and source emission monitoring

Pollutants	Technique / Method	Min. Detectable Limit, $\mu\text{g}/\text{m}^3$
Sulphur Dioxide (SO_2)	Colorimetric (West and Gaeke method)	4
Nitrogen Oxide (NO_2)	Colorimetric (Modified Jacob &Hocheiser method)	9
Suspended Particulate Matter	Gravimetric	5

(size less than 10 µm) or (PM ₁₀)		
Suspended Particulate Matter (size less than 2.5 µm) or (PM _{2.5})	Gravimetric	5
Particulate Matter in flue gas	Isokinetic Sampling and weighing	5 mg/Nm ³

6. Monitoring of (Stack) Source Emission

Considering the total work load, available manpower and expertise, it was mutually both NEERI and CPCB agreed that, NEERI (jointly with CPCB), Chennai would conduct the Ambient Air Quality Monitoring in and around the industry and CPCB (jointly with NEERI), Bangalore would conduct the Stack emission monitoring. Accordingly, a team of officials from CPCB, Bangalore jointly with NEERI, Chennai have monitored all three stacks on various dates. The analysis results carried out by CPCB, Bangalore are compiled in table No.3. Also the copy of analysis results obtained from laboratory of CPCB is enclosed in annexure-2.

Table No.3 Results of stack emission monitoring carried out during all three times on various dates in M/s athiappa Chemicals Pvt Ltd

Stack Details	No of Monitoring	Date of Monitoring	Fuel	Flue Gas Temperature in K	Average Stack Velocity(m/s)	PM (mg/Nm ³) Concentration	SO ₂ (mg/m ³) Concentration	Remarks
Rotary Furnace -I	First July-13	30.07.13	Coconut Shall (Biomass)	331 K	3.0	220	22.9	PM Concentration exceeded the prescribed limit against 150mg/Nm ³
	Second Dec-13	12.12.13		314 K	3.2	37	1232	Complied with Prescribed Limit
	Third Mar-14	19.03.14		327 K	3.4	73	134	Complied with Prescribed Limit
Rotary Furnace -II	First July-13	31.07.13	Coconut Shall (Biomass)	318 K	2.8	178	262	PM Concentration exceeded the prescribed limit against 150mg/Nm ³
	Second Dec-13	12.12.13		312 K	2.5	27	165	Complied with Prescribed Limit
	Third Mar-14	18.03.14		321 K	2.5	25	134	Complied with Prescribed Limit

Thermic Fluid Boiler (2T/Hr)	First July-13	31.07.13	Briquette (Biomass)	403 K	5.7	90	43.3	Complied against the limit of 1200mg/Nm ³
	Second Dec-13	11.12.13		394 K	5.2	47	24.6	Complied with Prescribed Limit
	Third Mar-14	18.03.14		347 K	5.4	78	12.7	Complied with Prescribed Limit

Source Emission Monitoring Result reveals that,

- **Out of three round of monitoring, in first round the Particulate Matter concentration in Rotary Furnace- I is 220 mg/Nm³& Rotary Furnace- II is 178 mg/Nm³ which exceeded the standard limit of 150 mg/Nm³ whereas, particulate matter concentration in Thermic Fluid Boiler is well within the prescribed limit against 1200 Mg/Nm³.**
- **In other two round of monitoring, the concentrations of Particulate Matter measured are 37mg/Nm³, 27mg/Nm³ 47mg/Nm³during second round of monitoring and 73mg/Nm³, 25mg/Nm³ 78mg/Nm³duringthird round of monitoring in Rotary Furnace-I, Rotary Furnace-II and in Thermic Fluid Boiler respectively. The Particulate Matter concentration measured are well within the prescribed standard limit of 150mg/Nm³ and 1200mg/Nm³in two Rotary furnaces and one Thermic Fluid Boiler respectively.**
- **The industry is having adequate air pollution control devices by adopting modification in the existing system.**
- **The industry is located in Industrial area of PIPPDIC, Mettupalayam, Puducherry.**

7. Monitoring of Ambient Air quality

7a. Micro-Meteorology Monitoring

Meteorological conditions play an important role to regulate the transport and diffusion of air pollutants released into the atmosphere. Though the principal variables of horizontal convective transport (wind speed and direction), vertical convective transport (atmospheric stability, mixing height) and topography of the area are the major

components, in general, this particular study necessitated to measure wind speed, wind direction, temperature and humidity on hourly basis during air quality monitoring survey. With the obtained data, a wind rose is plotted and depicted in Fig. Nos.9, 10 &11 and the data measured in respect of wind speed, wind direction, temperature and humidity are reflected in table No.4

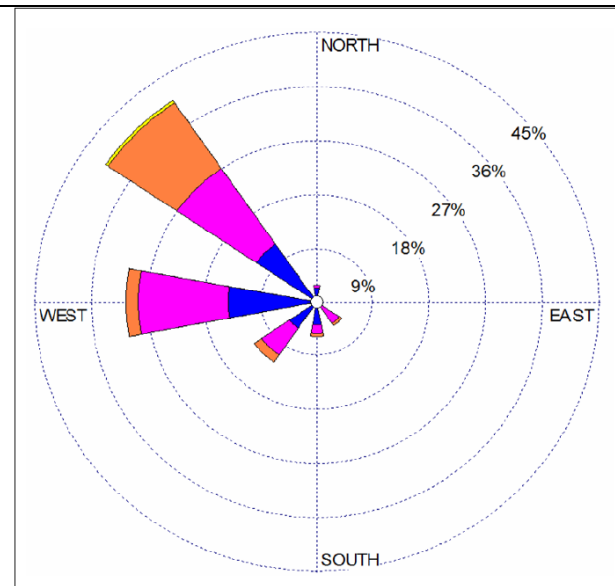


Fig.No.9 Wind Rose during July-2013 (First Monitoring)

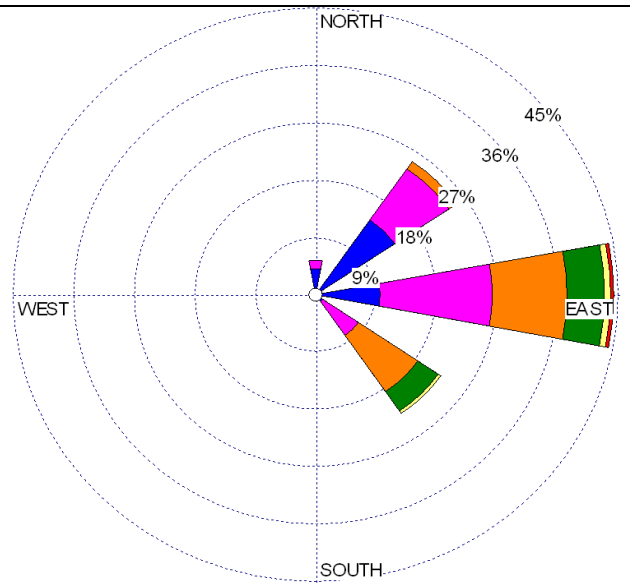


Fig.No.10 Wind Rose during Dec-2013 (Second Monitoring)

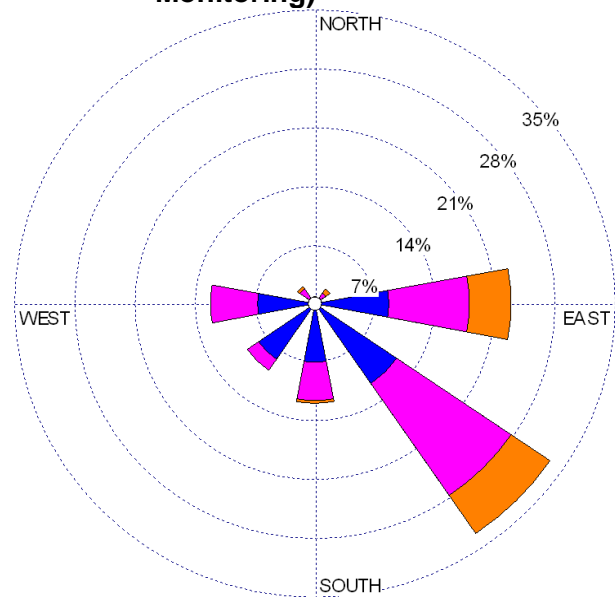


Fig.No.11 Wind Rose during March-2014 (Third Monitoring)

Meteorology Survey Reveals that,

The measurement reveals that the average wind velocity measured are 5.7Kmph, 7.6Kmph, and 5.0 Kmph during July-2013, Dec-2013 and March-2014 respectively.

The predominant wind direction observed is from North West to South East, East to west and South East to North West during Ist, IInd and IIIrd monitoring respectively.

The average temperature during first, second and third round of monitoring recorded was 32°C, 25°C, 31°C wherein the humidity recorded was 54%, 63% and 68% respectively.

Table No.4. Meteorological data observed during First Round of Monitoring (July 28 - August 6, 2013)

Date	Wind Speed, kmph	Wind Direction, Degree	Temperature, o C	Humidity, %
28.07.2013	3	144	32	64
29.07.2013	6	231	34	50
30.07.2013	7	289	33	40
31.07.2013	6	298	33	43
01.08.2013	6	263	32	49
02.08.2013	5	257	33	55
03.08.2013	6	268	33	51
04.08.2013	6	248	32	55
05.08.2013	6	246	31	60
06.08.2013	4	257	27	71
Average	5.5	250	32	54

Table No.5. Meteorological data observed during Second Round of Monitoring (December 24, 2013 - January 2, 2014)

Date	Wind Speed, kmph	Wind Direction, Degree	Temperature, o C	Humidity, %
24.12.2013	10	107	27	58
25.12.2013	10	92	26	63
26.12.2013	7	92	24	63
27.12.2013	7	99	25	59
28.12.2013	6	90	25	60
29.12.2013	7	137	25	57
30.12.2013	7	105	25	60
31.12.2013	8	120	25	65
01.01.2014	9	126	24	70
02.01.2014	3	79	24	72
Average	7.4	105	25	63

Table No.6. Meteorological data observed during Third Round of Monitoring (March 29, 2014 to April 11, 2014)

Date	Wind Speed, kmph	Wind Direction, Degree	Temperature, o C	Humidity, %
29.03.2014	4.0	147	32.0	56.7
30.03.2014	4.2	225	31.2	62.1
31.03.2014	4.1	256	31.8	62.4
01.04.2014	3.8	181	31.3	61.7
02.04.2014	5.8	206	31.6	67.8
03.04.2014	5.5	240	30.9	70.7
04.04.2014	5.5	245	31.0	65.5
05.04.2014	5.7	223	31.3	69.2
06.04.2014	5.3	281	31.5	69.9
07.04.2014	5.3	225	31.1	70.0
08.04.2014	5.4	277	31.2	70.5
09.04.2014	5.4	309	31.5	70.4
10.04.2014	5.0	292	31.2	69.3
11.04.2014	2.0	225	28.9	80.7
Average	4.8	238.0	31.2	67.6

7b. Ambient Air Quality Monitoring

To assess the ambient air quality status in and around the industry, 6 locations viz., South East (SE) corner (Admin block), North East (NE) corner (North gate), North West (NW) corner (Workers Quarters), South West (SW) corner, House site I: Gandhi Thirunallur (PillayarKoil Street) and House site II: Gandhi Thirunallur (Devi KarumariammanKoil Street) were chosen for monitoring. Various pollutants ieRespirable Suspended Particulate Matter (PM₁₀), Fine Respirable Particulate Matter (PM_{2.5}) on 8 hourly basis and gaseous pollutants ie Sulphur Dioxide (SO₂) and Nitrogen Dioxide (NO₂) on 4 hourly basis were monitored and analyzed. The details of locations monitored are mentioned in table no.7 and 24 hourly data computed are reflected in table Nos.7-13. However, the data generated on 4 hr and 8 hr basis and the photos reflecting the monitoring activities are separately enclosed in annexure –III(A,B &C).

Table No.7 Locations of Ambient air Quality Monitoring Stations inside and outside the premises of M/s. athiappa Chemicals Limited, Puducherry

Sl.No.	Station	Latitude,	Longitude,
		North	East
Inside - Industry Premises			
1	South East (SE) corner, (Admin Block)	11° 56' 77"	79° 47' 05"
2	North East (NE) corner, (North Gate)	11° 56' 81"	79° 47' 07"
3	North West (NW) corner (Workers Quarters)	11° 56' 82"	79° 47' 04"
4	South West (SW) corner	11° 56' 79"	79° 47' 02"
Outside - Industry Premises			
5	House site I: Gandhi Thirunallur (PillayarKoil Street)	11° 56' 75"	79° 47' 04"
6	House site II: Gandhi Thirunallur (Devi KarumariammanKoil Street)	11° 56' 81"	79° 47' 03"

Table No.8 Status of Ambient Air Quality at various locations in and around M/s athiyappa Chemicals Pvt Ltd during July 2013 (First Monitoring)

Pollutants	30.07.2013	31.07.2013	01.08.2013	02.08.2013	03.08.2013	04.08.2013	05.08.2013	Std Limit
1. SE corner (Admin Block)								
PM ₁₀ µg/m ³	55	58	55	52	61	57	44	100
PM _{2.5} µg/m ³	25	55	34	28	51	25	23	60
SO ₂ µg/m ³	24	27	10	16	48	6	19	80
NO ₂ µg/m ³	14	12	13	12	12	10	14	80
2. NE corner (North Gate)								
PM ₁₀ µg/m ³	58	78	86	58	81	62	51	100
PM _{2.5} µg/m ³	45	38	50	58	50	38	48	60
SO ₂ µg/m ³	77	74	69	52	59	71	76	80
NO ₂ µg/m ³	13	11	13	13	14	13	20	80
3. NW corner (Workers Quarters)								
PM ₁₀ µg/m ³	47	58	54	58	67	56	54	100
PM _{2.5} µg/m ³	40	43	43	57	46	54	51	60
SO ₂ µg/m ³	17	15	19	33	64	11	38	80
NO ₂ µg/m ³	14	16	13	13	19	21	16	80

4. SW corner								
PM ₁₀ µg/m ³	50	47	59	35	56	56	49	100
PM _{2.5} µg/m ³	47	45	50	31	46	49	46	60
SO ₂ µg/m ³	19	9	8	28	15	6	28	80
NO ₂ µg/m ³	16	10	14	15	14	15	24	80
5. PillayarKoil Street								
PM ₁₀ µg/m ³	27	41	36	19	56	32	35	100
SO ₂ µg/m ³	23	8	7	27	7	19	21	80
NO ₂ µg/m ³	11	9	15	11	9	9	27	80
6. Devi karumariammanKoil street								
PM ₁₀ µg/m ³	82	95	69	45	56	53	42	100
PM _{2.5} µg/m ³	50	58	53	40	48	44	39	60
SO ₂ µg/m ³	27	7	17	10	31	31	43	80
NO ₂ µg/m ³	12	9	14	15	15	14	21	80

Table No.9 Status of Ambient Air Quality at various locations in and around M/s. athiyappa Chemicals Pvt. Ltd during December 2013 (Second Monitoring)

Date	24.12.2013	25.12.2013	26.12.2013	27.12.2013	28.12.2013	29.12.2013	30.12.2013	Std Limit
1. SE corner (Admin Block)								
PM ₁₀ µg/m ³	94	65	98	64	63	71	73	100
PM _{2.5} µg/m ³	59	58	57	53	55	59	50	60
SO ₂ µg/m ³	64	78	69	68	70	60	74	80
NO ₂ µg/m ³	11	11	14	10	14	10	11	80
2. NE corner (North Gate)								
PM ₁₀ µg/m ³	96	92	74	85	87	82	83	100
PM _{2.5} µg/m ³	59	56	53	58	56	59	57	60
SO ₂ µg/m ³	17	70	46	73	71	14	60	80
NO ₂ µg/m ³	10	12	10	10	10	9	16	80
3. NW corner (Workers Quarters)								
PM ₁₀ µg/m ³	94	85	95	92	78	80	84	100
PM _{2.5} µg/m ³	59	57	56	58	55	53	56	60
SO ₂ µg/m ³	49	77	61	52	69	32	74	80
NO ₂ µg/m ³	14	15	17	13	14	12	15	80

4. SW corner (Workers Quarters)								
PM ₁₀ µg/m ³	93	91	90	92	85	96	94	100
PM _{2.5} µg/m ³	56	57	53	59	58	55	56	60
SO ₂ µg/m ³	34	75	76	74	75	75	72	80
NO ₂ µg/m ³	14	18	15	10	11	9	13	80
5. PillayarKoil Street								
PM ₁₀ µg/m ³	94	74	69	93	91	85	92	100
SO ₂ µg/m ³	36	78	46	31	33	30	23	80
NO ₂ µg/m ³	20	29	34	10	13	18	13	80
6. Devi KarumariammanKoil street								
PM ₁₀ µg/m ³	91	71	94	95	89	90	83	100
PM _{2.5} µg/m ³	57	54	59	55	44	44	54	60
SO ₂ µg/m ³	22	24	22	28	45	24	26	80
NO ₂ µg/m ³	16	15	10	10	12	13	11	80

Table No.10 Status of PM₁₀ Concentrations (µg/m³) at various locations in and around M/s. athiyappa Chemicals Pvt. Ltd during March 2014 (Third Monitoring)

Locations	29.03.2014	30.03.2014	31.03.2014	01.04.2014	02.04.2014	03.04.2014	04.04.2014	05.04.2014	Std. Limit
SE corner (Admin Block)	72	72	58	95	97	97	43	98	100
NE corner (North Gate)	92	95	98	98	84	79	65	55	100
NW corner (Workers Quarters)	97	99	94	94	81	96	64	88	100
SW corner	97	96	98	98	83	76	63	50	100
PillayarKoil Street	97	86	72	80	67	87	94	70	100
Devi KarumariammanKoil street	68	97	97	89	97	95	68	59	100

Table No.11 Status of PM_{2.5} Concentrations ($\mu\text{g}/\text{m}^3$) at various locations in and around M/s athiyappa Chemicals Pvt. Ltd during March 2014 (Third Monitoring)

Locations	30.03.2014	31.03.2014	01.04.2014	02.04.2014	03.04.2014	04.04.2014	05.04.2014	08.04.2014	09.04.2014	10.04.2014	Std. Limit
SE corner (Admin Block)	38	37	47	47	44	19	44	44	26	28	60
NE corner (North Gate)	57	58	58	44	58	54	40	45	57	53	60
NW corner (Workers Quarters)	47	51	49	39	58	42	57	47	42	48	60
SW corner	56	43	57	40	58	48	45	44	47	42	60
PillayarKoil Street	58	58	58	52	32	26	45	57			60
Devi KarumariammanKoil street	58	55	56	43	52	39	37	24	50	34	60

Table No.12 Status of Gaseous Concentrations at various locations in and around M/s. athiyappa Chemicals Pvt. Ltd during March 2014 (Third Monitoring)

Locations and Pollutants	29.03.2014	30.03.2014	31.03.2014	01.04.2014	02.04.2014	03.04.2014	04.04.2014	05.04.2014	08.04.2014	09.04.2014	10.04.2014
1.SE corner (Admin Block)											
SO ₂ $\mu\text{g}/\text{m}^3$	6.0	4.0	6.0	7.0	4.0	5.0	5.0	10.0	9.0	13.0	7.0
NO ₂ $\mu\text{g}/\text{m}^3$	10.0	10.0	12.0	22.0	10.0	21.0	13.0	14.0	11.0	11.0	13.0
2.NE corner (North Gate)											
SO ₂ $\mu\text{g}/\text{m}^3$	70.0	77.0	45.0	77.0	63.0	19.0	52.0	78.0	12.0	12.0	7.0
NO ₂ $\mu\text{g}/\text{m}^3$	14.0	9.0	10.0	12.0	10.0	11.0	9.0	9.0	10.0	11.0	29.0
3.NW corner (Workers Quarters)											
SO ₂ $\mu\text{g}/\text{m}^3$	78.0	78.0	68.0	57.0	78.0	79.0	79.0	76.0	8.0	18.0	8.0
NO ₂ $\mu\text{g}/\text{m}^3$	15.0	10.0	10.0	15.0	10.0	15.0	10.0	12.0	10.0	15.0	13.0

4.SW corner											
SO ₂ µg/m ³	12.0	4.0	5.0	5.0	4.0	4.0	6.0	9.0	4.0	8.0	7.0
NO ₂ µg/m ³	13.0	10.0	11.0	10.0	10.0	13.0	10.0	10.0	10.0	14.0	11.0
5.Pillayar Koil Street											
SO ₂ µg/m ³	7.0	5.0	4.0	9.0	7.0	4.0	4.0	9.0	8.0	9.0	6.0
NO ₂ µg/m ³	12.0	9.0	10.0	13.0	10.0	10.0	10.0	9.0	10.0	9.0	9.0
6.Devi KarumariammanKoil street											
SO ₂ µg/m ³	23.0	10.0	7.0	9.0	27.0	68.0	49.0	76.0	21.0	18.0	8.0
NO ₂ µg/m ³	18.0	17.0	13.0	14.0	11.0	18.0	10.0	9.0	9.0	9.0	10.0
Standard limit for SO₂ and NO₂ is 80 µg/m³											

Table No.13 Summary of ambient air quality status monitored at various locations on all three rounds during July 2013 to March 2014.

Data Range	PM₁₀, µg/m³	PM_{2.5}, µg/m³	SO₂, µg/m³	NO₂, µg/m³
First Round of Monitoring (July 2013)				
Min	19	23	6	9
Max	95	58	77	27
Average	54	44	29	14
Second Round of Monitoring (December 2013)				
Min	63	44	11	9
Max	98	59	77	34
Average	85	55	52	14
Third Round of Monitoring (March 2014)				
Min	43	19	4	9
Max	99	58	79	29
Average	83	44	25	12

[Ambient air quality monitoring data reveals that](#)

I. First Round of Monitoring (July 2013)

- a. The particulate matter (PM₁₀) 24 hourly average concentration ranged from 19µg/m³ to 95µg/m³ at all 6 locations in and around the industry during the first round of monitoring in the month of July 2013 whereas the concentration of

particulate matter (PM_{2.5}) was ranged from 23µg/m³ to 58µg/m³. The 24 hrly concentration of particulate matter (PM₁₀) & (PM_{2.5}) are below the prescribed 24 hourly standard limit of 100µg/m³ and 60µg/m³ respectively.

- b. The Sulphur Dioxide (SO₂) 24 hourly average concentration ranged from 6µg/m³ to 77µg/m³ at all 6 locations in and around the industry during the first round of monitoring in the month of July 2013 whereas the concentration of Nitrogen Dioxide (NO₂) was ranged from 9µg/m³ to 27µg/m³. The 24 hrly concentration of Sulphur Dioxide (SO₂) & Nitrogen Dioxide (NO₂) are below the prescribed 24 hourly standard limit of 80µg/m³.

II. **Second Round of Monitoring (December 2013)**

- a. The particulate matter (PM₁₀) 24 hourly average concentration ranged from 63µg/m³ to 98µg/m³ at all 6 locations in and around the industry during the second round of monitoring in the month of December 2013 whereas the concentration of particulate matter (PM_{2.5}) was ranged from 44µg/m³ to 59µg/m³. The 24 hrly concentration of particulate matter (PM₁₀) & (PM_{2.5}) are below the prescribed 24 hourly standard limit of 100µg/m³ and 60µg/m³ respectively.
- b. The Sulphur Dioxide(SO₂) 24 hourly average concentration ranged from 11µg/m³ to 77µg/m³ at all 6 locations in and around the industry during the second round of monitoring in the month of December 2013 whereas the concentration of Nitrogen Dioxide (NO₂) was ranged from 9µg/m³ to 34µg/m³. The 24 hrly concentration of Sulphur Dioxide (SO₂) & Nitrogen Dioxide (NO₂) are below the prescribed 24 hourly standard limit of 80µg/m³.

III. **Third Round of Monitoring (March 2014)**

- a. The particulate matter (PM₁₀) 24 hourly average concentration ranged from 43µg/m³ to 99µg/m³ at all 6 locations in and around the industry during the third round of monitoring in the month of March 2014 whereas the concentration of

particulate matter (PM_{2.5}) was ranged from 19µg/m³ to 58µg/m³. The 24 hrly concentration of particulate matter (PM₁₀) & (PM_{2.5}) are below the prescribed 24 hourly standard limit of 100µg/m³ and 60µg/m³ respectively.

- b. The Sulphur Dioxide(SO₂)24 hourly average concentration ranged from 4.0µg/m³ to 79.0µg/m³ at all 6 locations in and around the industry during the third round of monitoring in the month of March 2014 whereas the concentration of Nitrogen Dioxide (NO₂) was ranged from 9.0µg/m³ to 29.0µg/m³. The 24 hrly concentration of Sulphur Dioxide (SO₂)& Nitrogen Dioxide (NO₂) are below the prescribed 24 hourly standard limit of 80µg/m³.

8.0 Findings

The salient observations and findings are as follows:

A. On Source Emission Monitoring (Stack)

- Out of three rounds of monitoring, in first round the Particulate Matter concentration in Rotary Furnace- I is 220 mg/Nm³& Rotary Furnace- II is 178 mg/Nm³ which exceeded the standard limit of 150 mg/Nm³whereas, particulate matter concentration in Thermic Fluid Boiler is well within the prescribed limit against 1200 Mg/Nm³.
- In other two rounds of monitoring, the concentrations of Particulate Matter measured are 37mg/Nm³, 27mg/Nm³ 47mg/Nm³ during second round of monitoring and 73mg/Nm³, 25mg/Nm³ 78mg/Nm³ during third round of monitoring in Rotary Furnace-I, Rotary Furnace-II and in Thermic Fluid Boiler respectively. The Particulate Matter concentration measured are well within the prescribed standard limit of 150mg/Nm³ and 1200mg/Nm³in two Rotary furnaces and one Thermic Fluid Boiler respectively.
- The industry is having adequate air pollution control devices by adopting modification in the existing system.

B. On Ambient Air Quality Monitoring

In all three rounds of monitoring it is observed that the 24 hourly average concentration of SO₂, NO₂, PM₁₀ and PM_{2.5} at all the 6 locations in and around the premises of M/s. Athiappa Chemicals Pvt. Ltd, Puducherry are within the ambient air quality standard limits of 80 µg/m³ for gaseous pollutants and 100 µg/m³, 60 µg/m³ for PM₁₀ and PM_{2.5} respectively.

9.0 Suggestions

- The sludge generated in precipitation tank and other sources are to be properly stored at dedicated area having adequate boundary and lining provided with leach ate collection system.
- The fugitive emissions emanating from rotary furnace during unloading of product are to be further controlled.
- The entire structure of the Rotary furnace stacks are to be firmly fixed as per provisions of Emission Regulation Part-III.
- Monitoring of all stack emissions are to be carried out and reported regularly.
- Improvement on regular housekeeping particularly at product unloading area and drier area are to be carried out.

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Annexure -2

Plates depicts the Locations of ambient air quality monitoring carried out other Activities



Plate 1. Meteorological Data Recording



Plate 2. Ambient Air Quality Monitoring at North East (NE) corner (North Gate)



Plate 3. Ambient Air Quality Monitoring at North West (NW) corner (Workers Quarters)



Plate 4. Ambient Air Quality Monitoring at South West (SW) corner



Plate 5. Ambient Air Quality Monitoring at House site II: Gandhi Thirunallur (Devi Karumariamman Koil Street



Plate: 6 Recording of Global Positioning System reading



Plate 7. Laboratory Set up for Analysis of Gaseous Pollutants



Plate 8. Thermic Fluid Boiler and its APCs



Plate:9 Enhanced Air Pollution Control Devices installed



Plate:10 Stack Connected with Rotary Furnaces

Annexure -2

Plates depicts the Locations of ambient air quality monitoring carried out



Plate 1. Meteorological Data Recording



Plate 2. Ambient air quality monitoring at South East (SE) corner (Admin Block)



Plate 3. Ambient Air Quality Monitoring at North East (NE) corner (North Gate)



Plate 4. Ambient Air Quality Monitoring at North West (NW) corner-Workers Quarters



Plate 5. Ambient Air Quality Monitoring at South West (SW) corner



Plate 6. Ambient Air Quality Monitoring at House site I: Gandhi Thirunallur(Pillayar Koil Street)



Plate 7. Ambient Air Quality Monitoring at House site II: Gandhi Thirunallur (Devi Karumariamman Koil Street)



Plate 8. Recording of Global Positioning System reading

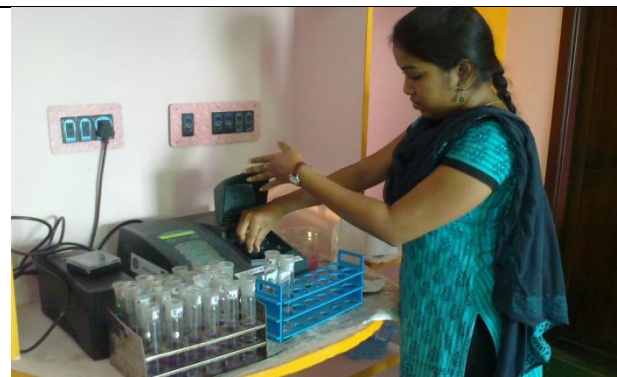


Plate 9. Laboratory Analysis