

Continuous Ambient Air Quality Monitoring Station (CAAQMS)

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Introduction of CAAQMS

CAAQMS:

- 1. Fixed CAAQMS
- 2. Mobile CAAQMS
- 3. Portable CAAQMS





Introduction of CAAQMS











Ambient Air Quality

Manual Vs. Continuous Ambient Air Quality Monitoring:







Ambient Air Quality

Manual Vs. Continuous Ambient Air Quality Monitoring:







Commonly Measured Parameters

- 1. Ambient air quality monitoring for: SO2, NOX, CO, O3, CO2, H2S, NH3
- 2. Dust monitoring: PM10, PM2.5, TSP and visibility
- 3. Data capture, validation and reporting
- 4. Pollution stream predictive modeling (dust, noise, ambient plumes)
- 5. Air Toxics: VOCs, M/NMHC, XAD and PUF
- 6. Industrial hygiene: pollens, dust, fumes, aerosols,
- 7. Automotive emissions: diesel, petrol and particulate (soot)
- 8. Meteorological (w/s, w/d, temp, RH, solar radiation, barometric pressure, rain gauge etc.)



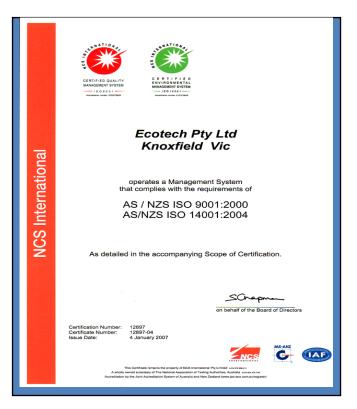
Certifications

- 1. US EPA
- 2. M-Cert European
- 3. TUV European (EN)
- 4. Some countries have its own standard

Umwelt Bundesamt		FÜVRheinlant Precisely Right.	UNITED STATES ENVIRONMENTAL PROTECTION AGENCY National Exposure Research Laboratory Research Triangle Park, NC 27711
C	Certificate No.: 0000040204	Ecotech 1492 Fer Knoxfiel Australia	Pty Ltd ntree Gully Road d. Victoria 3180
Certified AMS:	Serinus 40 for NO, NO ₂ and NO _x	Dear Mr	Re: Reference Method Application No. 08-291-16; <u>Ecotech Serinus</u> 30 CO Analyzer Staples:
Manufacturer:	Ecotech Pty Ltd. 1492 Ferntree Gully Road Knoxfield, VIC, 3180 Australia TÜV Rheinland Energie und Umwelt GmbH	reference Modelin associate designati method l	This office has completed its evaluation of the information that you submitted for the above method application. Based on the technical review of the information submitted, the Process g Research Branch of the U.S. EPA's National Exposure research Laboratory has found that the d candidate method has been shown to reasonably satisfy all applicable requirements for on as a reference method for measuring carbon monoxide in the ambient air. Accordingly, the was been recommended for reference method designation to the Director of the National Research Laboratory. Please note that the method will not be considered as a U.S. EPA-
Test Institute:		designate	Research Laboratory. Please note that which the memory has been authorized by the Director sed equivalent method until an official Notice of Designation has been authorized by the Director seen published in the U.S. Federal Register. I will notify you when the Notice is published, watch for the Notice publication at <u>www.epa.pov/fedrastr/</u> .



ISO 9001 and ISO 14001



Ecotech has achieved ISO 9001 accreditation and ISO 14001 certification on Environmental Management System



NATA and NIST



NATA ISO/IEC17025 (National Association of Testing Authorities) accreditation for Ambient Air Quality Monitoring, Meteorological and Continuous Emission Systems (CEM)



Analyzer Details

Particulars	Measurement Techniques	Instrument Model	Instrument Make		
Inorganic Pollutants		•			
Particulates ($PM_{2.5} \& PM_{10}$)	Beta Ray Attenuation	BAM 1000 & 1100	Ecotech, Australia		
SO ₂	Pulsed fluorescence	Serinus50	Ecotech, Australia		
NO, NO _{2,} NO _x & NH3	Chemiluminescence	Serinus44	Ecotech, Australia		
СО	Non Dispersive Infrared	Serinus30	Ecotech, Australia		
0 ₃	UV Absorption	Serinus10	Ecotech, Australia		
Organic Pollutants					
BTX (Benzene, Toluene, Xylene)	GC PID	GC 955 601	Synspec, Netherlands		
Meteorological Parameters					
Temperature (°C)	Thermistor				
Relative Humidity (%)	Capacitor				
Barometric Pressure (mm Hg)	Pressure Transducer				
Solar Radiation (Watts/m ²)	Photo Cell				
Wind Direction (Degrees)	Potentiometer	Met One, USA			
Vertical Wind Speed (m/sec)	Gill Propeller anemometer]			
Wind Speed (m/sec)	Anemometer		STANDARDS_09.pdf		
Rainfall (mm)	Tipping bucket				



Site Criteria for CAAQMS

- MODELING
- SOURCES AND EMISSIONS
- METEOROLOGY
- TOPOGRAPHY
- PROXIMITY TO PUBLIC EXPOSURE
- TREES & BUILDINGS
- SECURITY & SITE ACCESS
- ELECTRICITY AND PHONE

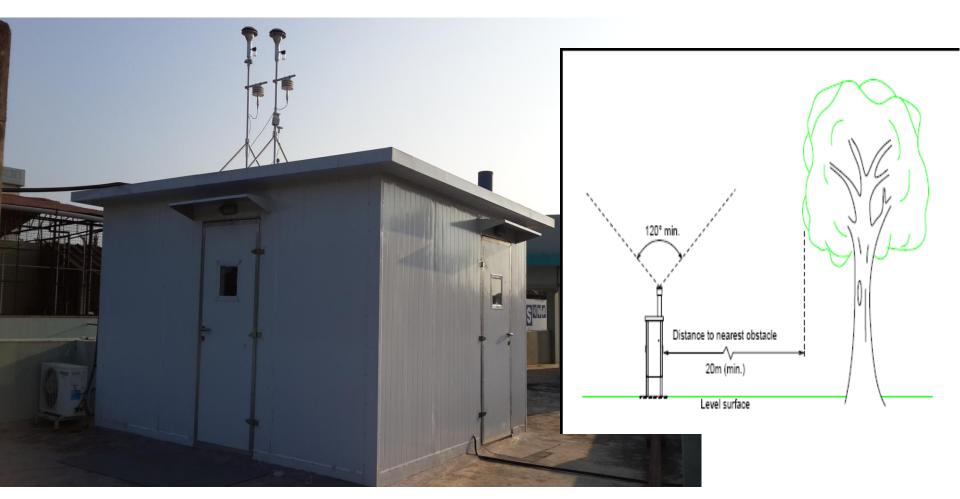


Location of AQMS

- Multiple factors are considered when deciding the location of air monitoring station. Sites are selected based on the pollutant or pollutants to be monitored, the population density, proximity to other monitoring stations and operational efficiency. The U.S. EPA has developed siting requirements for each of the "criteria" air pollutants. These requirements include distance from trees, buildings and roadways, distance from major point sources, and probe height. Other factors include site security and access, availability of electricity and telephone service, aesthetics and local zoning issues, and long term (+10 years) site availability. Unfortunately the ideal monitoring site is virtually impossible to acquire, especially in urban areas.
- There currently 6 criteria pollutants: sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, particulate matter less than 10 microns in diameter (PM 10), and particulate matter less than 2.5 microns in diameter (PM 2.5).



Station Sitting





CAAQMS includes

- Gas Analyzers, Particulate Monitors, Meteorological sensors, calibration systems, data acquisition systems, reporting and software.
- Installation & Commissioning
- Training to operators and technicians
- Operation, Maintenance & Data Reporting.





Data Acquisition & Control System WinAQMS



Operating on a MS Windows latest platform,

WinAQMS can collect and store up to 20 years of environmental data.

It interfaces with a wide variety of instruments digitally and provides advanced remote control functions.



WinAQMS Agent

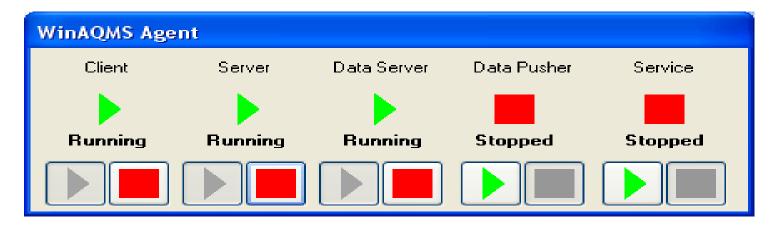
WinAQMS uses four main software components:

Client: Is the user interface used to view data and alter the setup of the logger components

Server: Collects, stores and manages data collection.

Data server: Responds to requests for data.

Data pusher: Pushes data to a FTP server.





WinAQMS Window

e <u>E</u> dit ⊻iew Manual <u>H</u> elp									
1:20.14 2:15.82 3:0.068 4:243.1			1517 1.72 15.8 1.43 15.0 1.21 15.2 0.00	REPORT				l	
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2: RH 💌 102.7 %		8.0-	\pm		6 L .		102.6	0.0640	- 1002.0
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		5.0-	N V V /	V IM NAME	SUUZI	$r v \sim$	102.4	- 0.0550	- 1002.0
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4: WD 181		3.0-	M.N		V MN V	. M	102.2	0.0490	- 1002.0
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102: Sigma 💌 180.9 deg									
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	► 1 2002/05/22	15.4	103 29	22.4	47	22.4	1.6	214	0.0132
Wind Speed and Direction	1 2002/05/22 00:05:00	15.3	103.1 29	22.4	47	22.4	1.8	207	0.0129
	1 2002/05/22 00:10:00	15.4	103.1 29	22.3	47	22.4	1.9	211	0.0129
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	1 2002/05/22 00:35:00	15.4	103.2 29	22.3	47	22.3	2.9	198	0.0107
_ ▼ /	1 2002/05/22 00:40:00	15.3	103.3 28.9	22.2	47	22.3	3.2	198	0.0102
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o Channel Data	Data Good - all OK) ata Bad - Not En	ough Samples	Data Bad - I	Out of Service			Print
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Wind Direction 14: WD 196	Data Good - Low Alarm	C	Data Bad - Data in	Calibration	Data Bad -	Instrument Faul	lt	Exp	port to Text
	Display Scheme Defa			-					



Powerful remote control functions

- Rebooting WinAQMS
- Changing instrument parameters and settings.
- Viewing and/or collecting data.
- Setting reporting periods.
- Setting alarms.
- Configuring and initiating calibrations.



Additional features

DATA REPRESENTATION

WinAQMS presents data in a number of different formats. Data can be instantaneously generated and displayed as it's logged, or historical data logged from a user defined time period.

Graphical representation

Instantaneous data or historical data can be displayed as a line graph with multiple parameters plotted in different colour lines.



Graphical representation

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Instantaneous data table

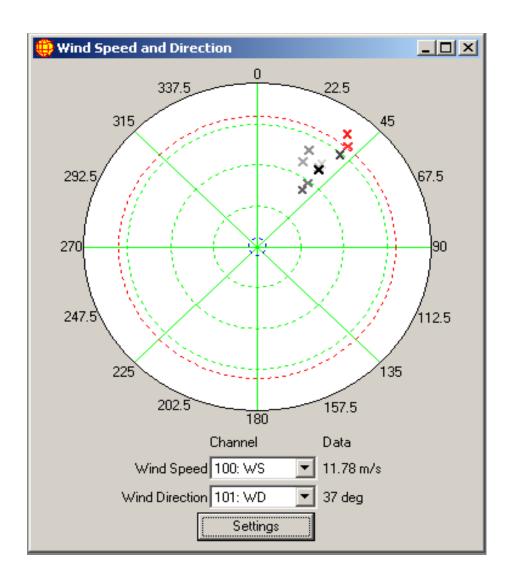
Data can also be displayed in multiple data tables allowing up to 100 parameters to be displayed at once. The parameter displayed can be selected with drop down menus.

🌐 Instantaneous D	ata	×
Channel	Data	Unit
1: NO	20	ppb
2: NO2	-14	ppb
3: NOx 💌	7	ppb
4: CO 💌	0.01	ppm
10: Temp 💌	19.9	°C
11: BH 💌	74.6	%
12: Pressure	895	mbar
13: WS	6.6	m/s
14: WD 💌	356.2	٠
20: RTemp	28.8	°C
Display Scheme		
Default		•



Wind Rose

WinAQMS displays wind speed and direction information in an easy to interpret Wind Rose graph. This information is useful when viewing data and the effects wind has on maggiiramonta





WinAQMS SPECIFICATIONS

- Stores greater than 20 years of data
- Windows 7 Operating System (Windows XP optional).



Central Software - AIRODIS

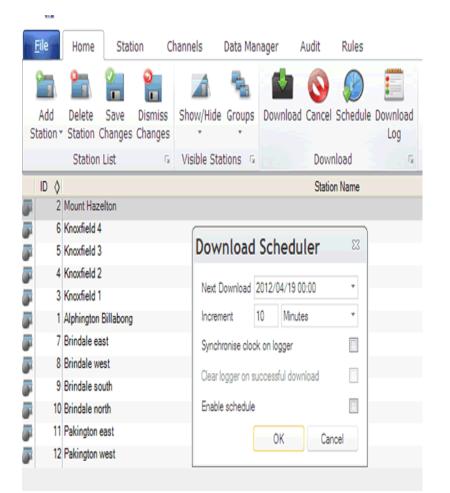
Data collection, validation & reporting software

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1 THOOTHUKUDI		Rack Temp		Ozone	NO	NO2	NOx	NH3	SO2	This Station
2 KODUNGAIYUR		•c	ppm	ppb	ppb	ppb	ppb	ppb		■ General
3 ROYAPURAM	27-11-2015 00:25:00	19.2	0.36	4.1	3.9	0.8	4.7	8.3	0.9	■ AQS
4 PERUNGUDI (Sai Nagar)	27-11-2015 00:30:00	19.6	0.36	5.3	3.8	0.8	4.7	8.2	0.9	
5 KOYAMBEDU	27-11-2015 00:35:00	19.3	0.37	3.4	3.8	0.9	4.7	8.2	0.9	
6 GUMMIDIPOONDI	27-11-2015 00:40:00	19.5	0.36	2.1	3.8	1.0	4.8	8.2	0.9	
	27-11-2015 00:45:00	19.9	0.36	3.4	3.7	0.9	4.7	8.3	0.9	
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	27-11-2015 00:55:00	20.4	0.36	3.1	3.6	0.7	4.3	8.5	0.9	
	27-11-2015 01:00:00	20.4	0.36	3.8	3.7	0.7	4.4	8.5	0.9	
	27-11-2015 01:05:00	20.4	0.36	3.2	3.7	0.7	4.4	8.3	0.9	Select Information
	27-11-2015 01:10:00	19.9	0.36	2.4	3.6	0.7	4.3	8.3	0.9	
	27-11-2015 01:15:00	19.5	0.36	2.8	3.5	0.7	4.1	8.3	1.0	Selected: 18
	27-11-2015 01:20:00	19.8	0.36	3.2	3.5	0.6	4.1	8.3	1.0	
	27-11-2015 01:25:00	19.5	0.36	3.1	3.6	0.5	4.2	8.2	1.0	Period: 1 hour, 30 minutes
	5 4 3 2 1 Fri 27	••		/	0:30				1:00	



Data collection

Data can be collected from a wide variety of loggers over multiple communication media. CSV file import is also supported and communication scripts for non-supported data loggers can easily be produced.





Data management

- Data can be easily validated or invalidated with the click of a button.
- Data validation graph enabling easy selection of data.
- Graphical representation of data allows quick visual inspection for outliers and data errors.
- Drag and drop functionality.
- Configurable data validation reasons.
- Data in the data table can be highlighted

depending on its status. ie calibration data, validated data etc



Data management

- Data can be imported with predefined "ranges" that data must be within or outside to be tagged as valid.
- Fully traceable auditing of data with audit log.
- Changes to data can be viewed in audit log.
- Multi-lingual support including Spanish, Chinese.
 Additional languages can be configured upon request.



Reporting

Data can be presented in reports using tables, bar graphs, distribution graphs, frequency graphs, polar plots and/or wind roses. Text and images can also be inserted.

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Calibration System

Data acquisition system (DAS) periodically controls the zero and span calibration checks for each gas analyser. Usually every 24 hours. When each analyser is set into either span or zero calibration mode, they will send a signal to the Gas Calibrator. The gas calibrator will then deliver a preset gas concentration to the instrument being calibrated.

There are four main components to the gas calibration system.



There are four main components to the gas calibration system.

Zero Air Source

- **Thermal Oxidiser**
- **Calibration Gas Cylinder**
- **Gas Calibrator**



The Gas Calibrator consists of three precision Mass Flow Controllers (MFC).

One controls the flow for the Dilution (zero) air.

The other one controls the flows for the calibration gas.

The third one (optional) controls the flow of the Ozone if the Ozone generator option is installed.



The calibrator has two modes of operation.

Automatic:

the span or zero points are remotely activated by the Data Logger, via the instruments.

Manual:

can be activated from either the Data Logger, the Instrument or the Gas Calibrator.

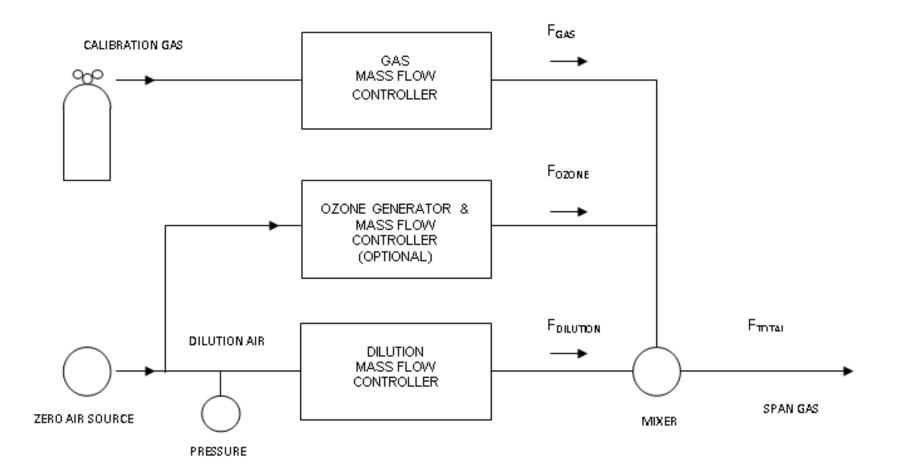


SPAN GAS =
$$\frac{GAS \times F_{GAS}}{F_{DILUTION} + F_{GAS}}$$

Where:	SPAN GA GAS F _{DILUTION} F _{GAS}	 S = Output concentration of calibration gas from calibrator. = Concentration of calibration gas from the cylinder. = Flow rate of zero air through Dilution MFC. = Flow rate of calibration gas through MFC.
Example	: GAS	 80 ppm. (Concentration of the Cylinder). 5000 co/min

 $F_{DILUTION} = 5000 \text{ cc/min.}$ $F_{GAS} = 25 \text{ cc/min.}$



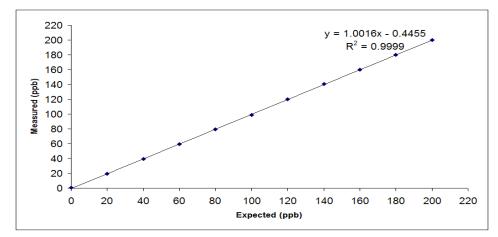


#ecotech

ECOTECH Quality Procedure EC9841T Multipoint

Ref: EC3841Tdata.sls Revision 1.0 Date: 04408/05 Location S:\ECOTECH\ISO\FORMS\3800\DATASHEETS\CURRENT

ID Number	Date		Service Nu	mber	Engir	neer Initials
05-0330	20-Sep-0)5				TFS
7. Calibration Equipme	nt					
Calibrator Model	GasCal 1000)	Cylinder Se	erial Number		CG-183
TE / Serial Number	TE-183		Cylinder	Conc (ppm)		60.4
Zero Air Source	System Air		Cylinder Pre	essure (Bar)		90
ID / Serial Number	TE-160		Cal	ibration Gas		NOx
8. Multipoint Calibratio	n Results					
Instrument Range	200	pp	b Inst	rument Gain		0.766
Set Point	Zero (sccm)	Sp	an (sccm)	Measured (pp	b)	%Error
200	19934		66.16	200.0		0.00
180	19940		59.56	180.1		0.05
160	19947		52.95	159.8		-0.10
140	19954		46.34	140.4		0.20
120	19960		39.73	119.7		-0.15
100	19967		33.12	98.8		-0.60
80	19974		26.50	79.3		-0.35
60	19980		19.90	59.3		-0.35
40	19987		13.29	39.6		-0.20
20	19993		6.70	19.5		-0.25
0	20000		0.00	0.4		0.20



 1.00164
 Note: Linear line of best fit shall have a gain between 0.99995

 0.99995
 0.99 and 1.01 and a R2 value greater than 0.9995

 PASS

Technician's Signature

Gain

Pass /

Fail

R²





Why Measure Particulate Matter?

Scientifically-established harmful effects leading to regulations.

- Human health.
- Environment.

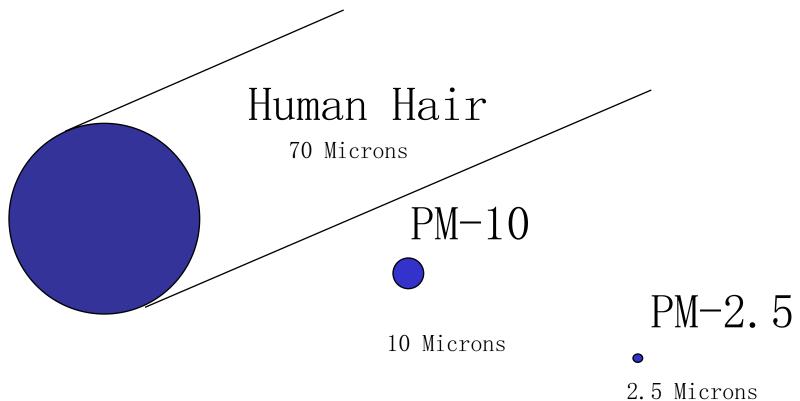
Nuisance effects.

- Visibility.
- "Dirty" environment.



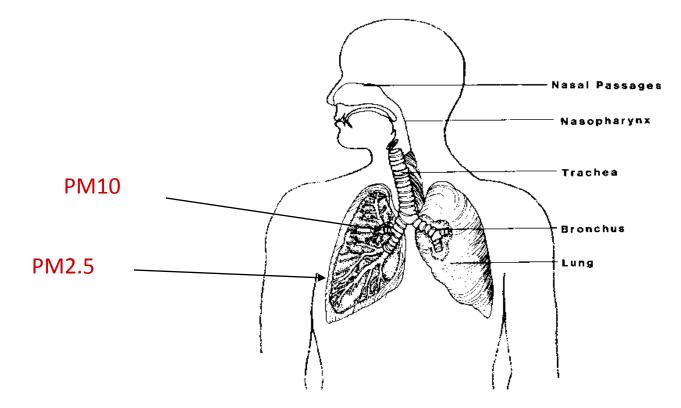
Particulate Size Classifications

How small is 10 microns and 2.5 microns?





Size Classification Based On Human Health Effects



Source: Air Quality, Godish, 1991, p. 143



CAAQM Stations in INDIA > 80

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IITM - Phase I (Chennai) Bangalore ITM - Phase II (ThicuyananGhapuram)	AS1km



THE END