STUDY ON EFFECTIVENESS OF COMMERCIAL AND RESIDENTIAL NATURAL GAS ODORISATION SYSTEM IN PENINSULAR MALAYSIA

INTRODUCTION

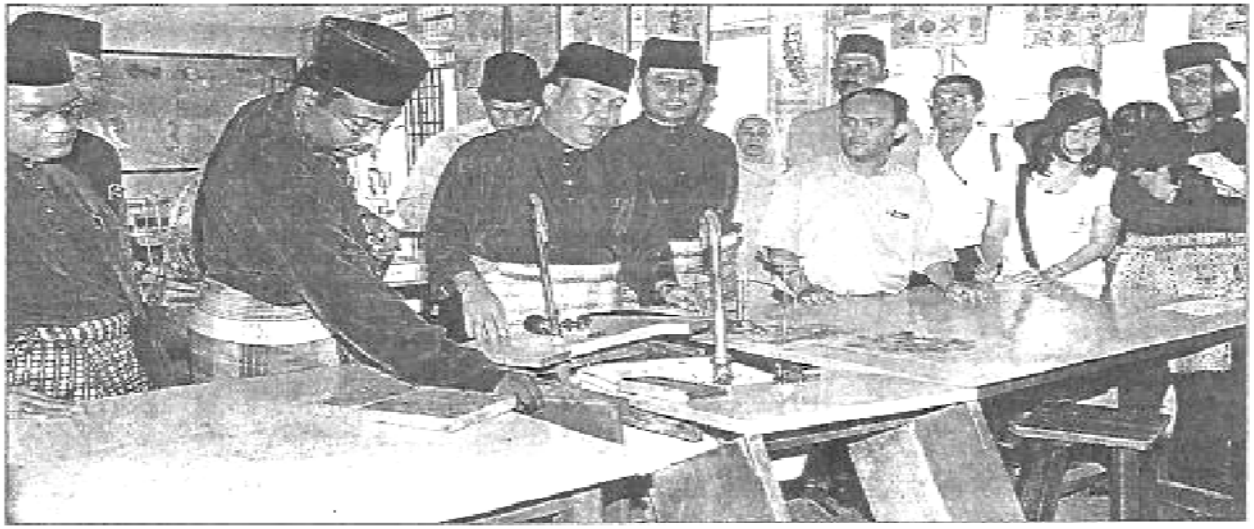
UTM-MPRC Institute for Oil and Gas
(*IFOG*)
Universiti Teknologi Malaysia

Tuesday, 29th October, 2013
ST Office

STUDY ON EFFECTIVENESS OF COMMERCIAL AND RESIDENTIAL NATURAL GAS ODORISATION SYSTEM IN PENINSULAR MALAYSIA

WHY?

Keratan Akhbar (2 Julai 2004)



GETTING TO THE BOTTOM OF THE MATTER: Adnan (third from left) being briefed on how the explosion happened. With him is State Executive Councillor for Education Datuk Dr Zambry Abd Kadir (second from left).

Gas pipe explodes in school lab

IPOH, Thurs. — A gas pipe exploded while Form One students of Sekolah Menengah Gunung Rapat, near here, were conducting a science experiment today.

Nineteen of the 45 students were sent to the emergency unit of the Ipoh Hospital for observation.

The students said there was a big explosion which sent tables and chairs flying. They said they were choked by smoke that enveloped the science laboratory, but there was no fire.

The class teacher immediately switched off the gas and led the students out.

State education director Datuk Adnan Ibrahim said the students were not badly hurt.

"They were lucky to get away. There were no serious injuries. Some were overcome by fumes and others had tears in their eyes.

"The five students nearest to the table where the explosion occurred were more shocked than hurt.

"They all received outpatient treatment and were allowed to go home," he told reporters during a visit to the school after the explosion.

Adnan said the explosion, which occurred just before noon, might have been caused by a leak in one of the underground gas pipes at the laboratory. The pipes are believed to be 20 years old.

He said it was fortunate that no one was hurt. He said schools must carry out periodic checks on their gas and water pipes and electricity cables.

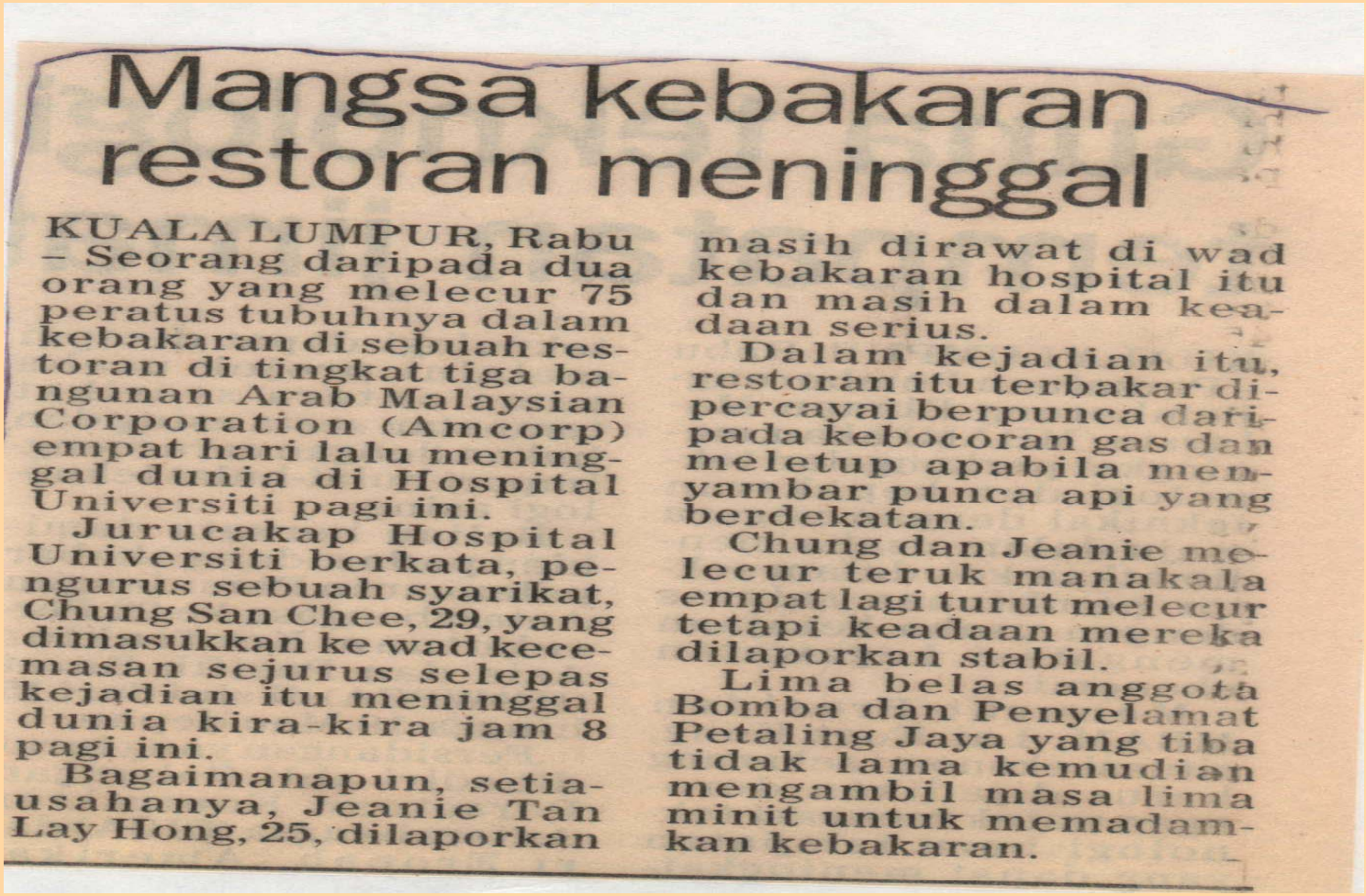
"I have directed education district officers to carry out checks in schools especially those which have not had their pipes checked or changed for more than 15 years.

"Today's incident is a warning, and we are acting on it. I also want a detailed report from all headmasters and principals on the condition of gas pipes in their schools and how often are they checked," he said.

Adnan said his department would hand a report to the Education Ministry urging it to carry out checks on schools which were more than 15 years old.

The laboratory, meanwhile, has been declared out of bounds to facilitate investigations.

Keratan Akhbar (18 Disember 1997)



Mangsa kebakaran restoran meninggal

KUALA LUMPUR, Rabu – Seorang daripada dua orang yang melecur 75 peratus tubuhnya dalam kebakaran di sebuah restoran di tingkat tiga bangunan Arab Malaysian Corporation (Amcorp) empat hari lalu meninggal dunia di Hospital Universiti pagi ini.

Jurucakap Hospital Universiti berkata, pengurus sebuah syarikat, Chung San Chee, 29, yang dimasukkan ke wad kecemasan sejurus selepas kejadian itu meninggal dunia kira-kira jam 8 pagi ini.

Bagaimanapun, setiausahanya, Jeanie Tan Lay Hong, 25, dilaporkan masih dirawat di wad kebakaran hospital itu dan masih dalam keadaan serius.

Dalam kejadian itu, restoran itu terbakar dipercayai berpunca daripada kebocoran gas dan meletup apabila menyambar punca api yang berdekatan.

Chung dan Jeanie melecur teruk manakala empat lagi turut melecur tetapi keadaan mereka dilaporkan stabil.

Lima belas anggota Bomba dan Penyelamat Petaling Jaya yang tiba tidak lama kemudian mengambil masa lima minit untuk memadamkan kebakaran.

Keratan Akhbar (18 Disember 1997)

The Malay Mail, Thursday, December 18, 1997

BLAST VICTIM DIES

Restaurant explosion injures six

PETALING JAYA: An explosion at a restaurant on the third floor of a multi-storey commercial building in Jalan Persiaran Barat here has left six people injured, two of whom were seriously burnt.

The incident occurred at noon yesterday when some 10 people were having lunch in the building, which was opened three days ago.

The victims were rushed to the University Hospital.

Hospital deputy director Latifah Endot confirmed that a man and a woman had been sent for surgery as they were badly burnt.

An employee of a landscaping company, Zainal Mohd Yaakub, 21, said his attempts to extinguish the fire with a hose failed as there was no water.

"I tried to sound the fire alarm but it too was not functioning," Zainal said.

Zainal said by that time passersby had gathered outside the restaurant to assist the victims and to help put out the flames.

Building developer, Melawangi Sdn Bhd's executive director Azlan Baqee Abdullah told reporters that the building had one of the most sophisticated equipment in fire prevention.

Officer-incharge-of-station Norizan Abu Bakar, who led a team of 14 firemen to the building said the department would investigate the building's safety measures.

"We will have to check the premises again," he said, adding that they are also investigating the cause of the explosion.

PJ police to investigate if negligence is cause of explosion at eatery

By EDDIE CHUA

ONE of the two who suffered serious burns in last Friday's explosion at a delicatessen in a Petaling Jaya shopping complex has succumbed to his injuries.

Chong Fen Sui, 29, who suffered 70 per cent burns on his face and body in the incident at Dave's Deli on the third floor of the five-storey Amcorp Mall in Jalan Timor, died at 2.20am yesterday without regaining consciousness.

His remains were claimed by his family from Hospital Universiti yesterday and taken to his hometown in Ipoh, Perak.

He and Jennie Tan Loy Chong, 25, were seriously injured in the blast while having lunch at the outlet. It is learnt that Tan's condition is stable.

Four other customers – Liew Tek, Tham Kim Long, Eren Katong and Jamel Ajan – suffered minor burns. They were also warded at the hospital.

Last Saturday, doctors performed minor surgery to remove dead skin and tissues on the two seriously injured victims.

Petaling Jaya police yesterday started investigations into Chong's death.

"We are investigating if negligence is the cause of his death," said a spokesman.

Police are expected to interview other victims, including eye-witnesses, to ascertain how the incident occurred.

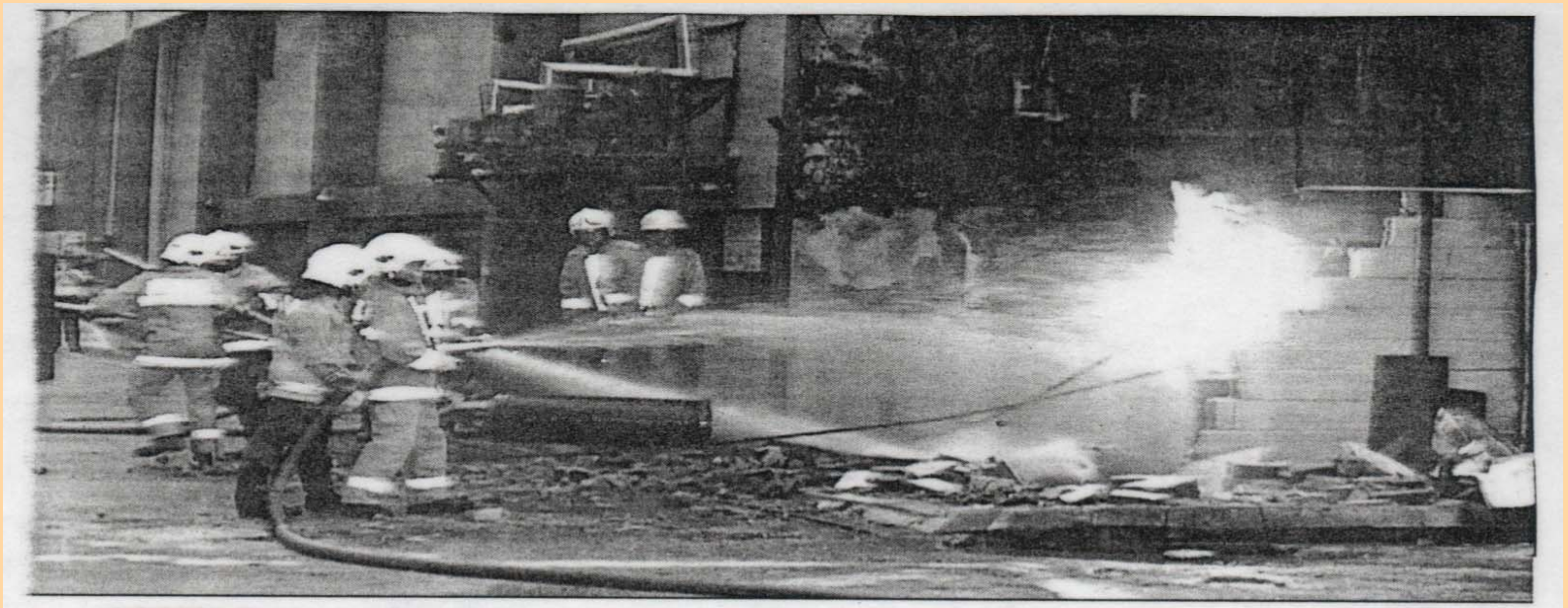
"We will wait for results of a test by the Electricity and Gas Department on the building's liquid petroleum gas (LPG) piping system, which is believed to have been the cause of the explosion," said the spokesman.

The department and three other independent agencies – two engaged by insurance companies and the third by the Dave's Deli management – conducted various tests and inspections on the built-in LPG pipings in and around the building to determine if there were leaks.

Amcorp Mall executive director Azlan Baqee Abdullah said the tests are expected to be completed by tomorrow.

"It will take several days after that before they can conclude what actually went wrong," he said.

Keratan Akhbar



ANGGOTA Bomba dan Penyelamat sedang memadamkan kebakaran di stor gas di kompleks membeli-belah di Sungei Wang Plaza, Kuala Lumpur, semalam. — Gambar HARUN OSMAN

Stor gas musnah dalam kebakaran

KUALA LUMPUR 2 Feb. — Sebuah stor gas di tingkat bawah kompleks membeli-belah Sungei Wang Plaza di sini musnah dalam kebakaran di sini, awal pagi ini.

Kejadian pada kira-kira pukul 3.45 pagi itu menyebabkan bekalan gas ke semua restoran di kompleks tersebut terputus.

Seorang saksi, Shahjehan Abdul Kadir, 24, berkata, beliau terdengar

a masih menyiasat punca ke- dan jumlah kerugian belum dipastikan," tambahnya.

an pulang ke rumah di Cheras selepas bekerja di sebuah syarikat berdekatan.

Menurutnya, api marak dengan cepat mungkin disebabkan tong gas yang banyak di stor berkenaan.

"Tetapi nasib baik Bomba dan Penyelamat cepat sampai untuk mengawal kebakaran," katanya ketika ditemui di tempat kejadian.

bunyi letupan semasa melalui Jalan Bukit Bintang.

Ketika itu beliau dalam perjalan-

Sementara itu, jurucakap Bomba dan Penyelamat berkata, dua jentera bomba dari Jalan Hang Tuah dikejarkan ke lokasi kebakaran sejurus menerima panggilan pukul 7.09 pagi.

Katanya, operasi yang diketuai oleh Baharom Othman bersama 12 anggota mengambil masa kira-kira sejam sebelum berjaya mengawal api.

Tinjauan mendapati sekurang- kurangnya 20 tong gas musnah dalam kebakaran itu.

"Kit jadian dapat

Keratan Akhbar (9 Mei 2011)

Keratan Akhbar Berita Harian Muka Surat 18 Bertarikh 9 Mei 2011

18 SENTRAL Isnin BERITA HARIAN

Letupan gas gegar kondo

Seorang penghuni warga Britain baru pindah cedera

Keratan Akhbar The Star Muka Surat N19 Bertarikh 9 Mei 2011

Towering inferno: The blaze that occurred at the 17th floor unit of the luxury condominium in Jalan Ampang, Kuala Lumpur, yesterday was caused by a gas leakage. — Xinhua

Briton hurt in gas leak explosion

By STEVEN CHIEW and FAHIMY RAHIM
newsdesk@thestar.com.my

PETALING JAYA: A big explosion suspected to have been caused by a gas leak at the 17th floor of a Jalan Ampang condominium left a Briton severely burnt in his hands and legs and the unit in flames.

Daniela Semerano, 42, secretary of the Dutch Ambassador to Malaysia, said the new tenant of the Hampshire Park unit was injured in the explosion and was rushed to a medical centre.

"His hands and legs were badly burnt but he was conscious when a friend sent him to the hospital for treatment," she said.

A source who wanted to remain anonymous identified the victim as Paul Level, 61, who is a consultant for a petroleum company.

She said the other residents, including the victim, had to use the stairs to escape the blaze as the lifts were not working.

"He was then taken to the hospital and was transferred to the ICU," she explained.

The explosion was heard at 7.45pm and its impact shattered windows of houses in Jalan Semarak, a few kilometres away from the luxury condominium.

Kuala Lumpur Fire and Rescue Department operations assistant director Azlan Ismail said four fire engines with 38 personnel rushed to the scene and the fire was put out at 8.45pm.

"Only one unit was burnt but we are still assessing the damage," he added.

Azlan said a gas valve at the unit was found to have been switched on.

He said the explosion had caused damage to circuits at levels 16 and 17.

According to Kuala Lumpur CID chief Datuk Ku Chin Wah, the fire was caused by an explosion.

"It is not a terrorist attack as speculated by certain sources," he said.

Keratan Akhbar (28 September 2011)

Keratan Akhbar (15 Disember 2009)

BH PILIH 8A 15 (emel)

Lelaki maut pasar raya meletup

20 turut cedera termasuk enam parah dipercayai sistem paip gas bocor

Oleh Amirullah Andi Nur
dan Badrul Hizar Ab Jabar
bhnews@bharian.com.my

MELAKA: Seorang maut manakala 20 cedera termasuk enam parah, apabila kawasan medan selera pusat belibelah Aeon Bandaraya Melaka di Jalan Lagenda, dekat Peringgit di sini, yang bakal dibuka pada Khamis ini, meletup dan musnah, tengahari semalam.

Kejadian berlaku jam 12.50, ketika ramai pekerja syarikat kontraktor dipercayai menjalankan kerja pemeriksaan kebocoran sistem pembekal paip gas cecair asli (LPG) kawasan berkenaan, apabila meletup tiba-tiba.

Mangsa yang mati dikenalpasti Tiau See Peing, 25, dari Kluang, Johor disyaki cedera parah di leher, dipercayai terhumban dan terkena serpihan siling runtuh akibat letupan yang dikatakan menggegarkan seluruh pusat belibelah itu dan kawasan sekitarnya.

Enam lagi rakannya yang parah dalam kejadian itu dipercayai turut terpelanting dan terkena serpihan sama. Mereka dikenali sebagai Mohd Tarmizi Jaafar, 23; Mohd Fadly Rosli, 28; Lai Soon Wee, 32; Ooi Kok On, Tan Kwan Hai serta Solehan Munari, 33, warga Indonesia.

Mereka semua dihantar ke Hospital Melaka sejurus kejadian untuk rawatan lanjut. Sehingga awal malam tadi, dua daripada mereka iaitu Mohd Tarmizi dan Lai Soon, disahkan masih ditempatkan di unit rawatan rapi (ICU), namun disahkan stabil.

Mangsa yang cedera hanya mendapat rawatan pesakit luar termasuk tujuh penduduk tempatan, enam warga Indonesia dan seorang Myanmar.

Penduduk tempatan dikenali sebagai Mohd Ikhwan M Salleh, 22; Lim Woon Pin, 23; Mohd Faizol Rozali, 24; Norzahisham Mohamad, 25; Tee Chin Huat, 26; Zawiyah Shakrie, 39, dan Nordin Abbas, 44 manakala enam warga Indonesia adalah Ariz Suharsono, 23; Rapi Man, 24; Horramah, 26; Raqib, 36; Musliyadi, 25; Samsul, 27 serta That Pain O, 25, dari Myanmar.

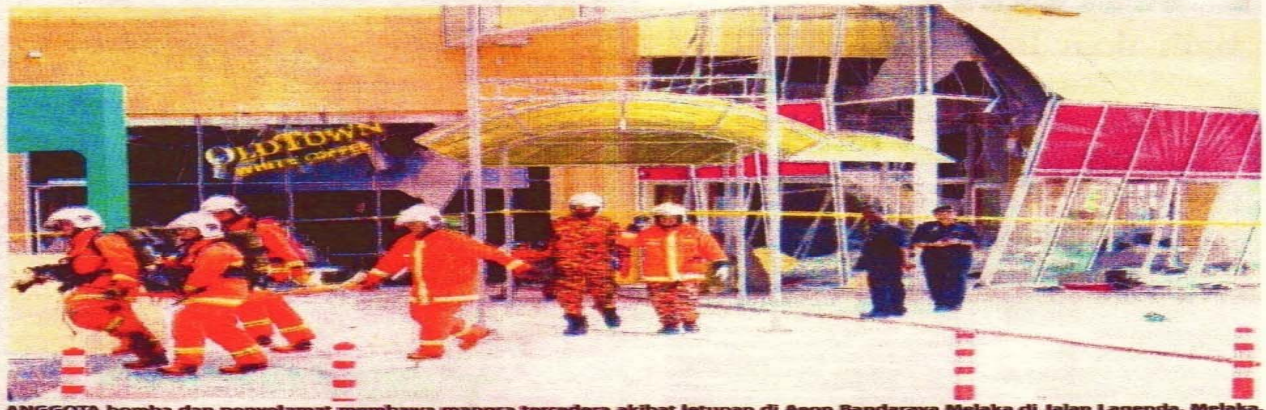
Ketua Polis Daerah Melaka Tengah, Asisten Komisioner Salehhudin Abd Rahman ketika ditemui di tempat kejadian petang semalam, mengesahkan kejadian itu dan memaklumkan siasatan lanjut dijalankan.

"Besar kemungkinan letupan ini berlaku disebabkan kebocoran gas pada paip di medan selera berkenaan. Bagaimanapun kita belum dapat mengesahkanya kerana pasukan kami sedang menjalankan siasatan lanjut," katanya.

Dalam pada itu, Penolong Pengarah Operasi Jabatan Bomba dan Penyelamat negeri, R Ezhumalai, berkata pihaknya menerima panggilan kecemasan berhubung letupan itu pada jam 12.59 tengah hari, sebelum menghantar dua jentera dari Balai Bomba dan Penyelamat Jalan Kubu bersama 30 anggota termasuk lima pegawai.

Katanya, ketika pasukan itu sampai enam minit kemudian di lokasi kejadian, empat mangsa sudah dikeluarkan dari tapak letupan oleh rakan mereka.

"Selepas itu, kami dimaklumkan, terdapat dua lagi mangsa masih terperangkap dalam runtuhan medan selera itu. Sejurus selepas gerakan mencari dilakukan, kami berjaya menjumpai dua lagi mangsa yang terperosok dibawah timbunan runtuhan siling," katanya.



ANGGOTA bomba dan penyelamat membawa mangsa tercedera akibat letupan di Aeon Bandaraya Melaka di Jalan Lagenda, Melaka, semalam.

POLIS menjalankan pemeriksaan di sekitar kawasan kejadian, semalam.

STUDY ON EFFECTIVENESS OF COMMERCIAL AND RESIDENTIAL NATURAL GAS ODORISATION SYSTEM IN PENINSULAR MALAYSIA

WHAT?

HOW?

OBJECTIVES

1. *To identify the concentration of odorant at selected locations from the city gate station to the customer's end particularly commercial and residential customers;*
2. *To determine whether the level of odorization is in compliance with local standards and international best practices;*
3. *To access the suitability of the odorant agent used in the odorization system;*
4. *To determine and mitigate the possible root causes of insufficient level of odorization and non-uniformity of odorization dispersion;*
5. *To provide appropriate recommendations for achieving effective odorization level at all times in order to ensure the safety of the gas installations.*

SCOPE OF WORK

1. *Carrying out measurements on odourant concentration at selected locations from city gate station to commercial and residential customer's end (predefined and selected to represents total user's population and operational reliability);*
2. *Carrying out study on factors that may have contribute towards odour fade by means of adsorption, absorption and oxidation towards pipeline materials, gravitational attraction, flow regimes, gas pipeline design and installations, pressure and pipe size variations, and travelling distances between odourant injection points and consumer's premises;*
3. *Assessing the adequacy of odourisation in the distribution system and determining its compliance with local standards;*

SCOPE OF WORK

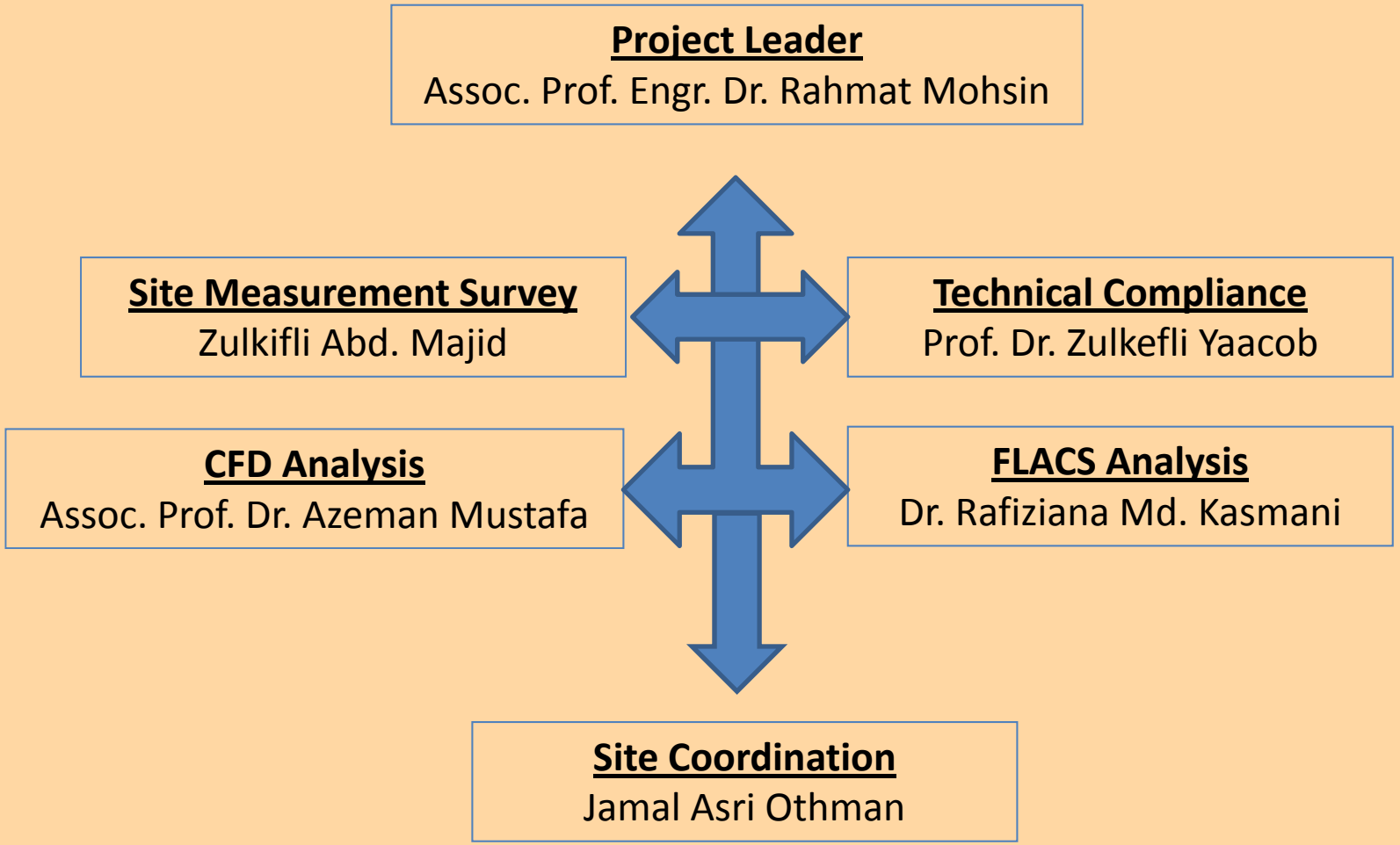
4. *Comparing and benchmarking the current level of odourisation against international best practices and standards;*

5. *Evaluating and determining the suitability of odourant agent currently being used in the odourisation system;*

6 *Investigating possible root-cause for insufficient level of odourisation and non-uniformity of odourisation dispersion;*

7 *Providing suitable recommendations to ensure the presence of gas is readily detectable at a concentration stipulated in the standards including special requirements for new pipeline or additions of new piping segments.*

Activities
Organisational Structure


Project Leader
Assoc. Prof. Engr. Dr. Rahmat Mohsin
Site Measurement Survey
Zulkifli Abd. Majid
Technical Compliance
Prof. Dr. Zulkefli Yaacob
CFD Analysis
Assoc. Prof. Dr. Azeman Mustafa
FLACS Analysis
Dr. Rafiziana Md. Kasmani
Site Coordination
Jamal Asri Othman

Project Activities

No	Tasks	Date
1	*Technical Coordination and Site Discussion*	9th May, 2012
2	*Measurement of odour intensity at consumer's premises according to their specific and strategic locations to represents the intensity pattern of residential and commercial sectors (by means of length of stain tubes or odourator)*	22nd June, 2012
3	*Measurement of odourant intensity at (by means of length of stain tubes or odourator) Steel and PE Pipe System:* Injection Points – Intermittent and Continuous (Odourisation Station) Mid-Distance Points (mid-distance: distribution length) Entry Points to Building (Building/Premise Entry Points)	4th July, 2012
4	*Measurements of odour concentration (by means of length of stain tubes or odourator):* Injection Points Entry Points to Building	3rd August, 2012

No	Tasks	Date
5	*Simulation of molecular dispersion using FLACS:* Dispersion pattern of odourant in natural gas parent carrier Concentration level of odourant within pipeline system Propagation of odourant with different path and altitude	30th Sept., 2012
6	*Simulation of odourant flow path using CFD system:* Flow trajectory of odourant in relation to pressure changes Flow dispersion of odourant in relation to pressure variation Effect of pipeline design towards odourant dispersion	30th Sept., 2012
7	*Natural gas with odourant characterisation using Gas Chromatography (GC):* Sampling analysis of different locations Characterisation of sampling and verification of sampling quality Characterisation and sampling standardisation across local and international standards	30th Sept., 2012

No	Tasks	Date
8	*Technical Reporting* *Inception Report – 2 Weeks after Award* *Interim Report – 3 Months after the date of commencement* *Draft Final Report – 5 Months after the date of commencement*	1st Nov., 2012
	Final Report – 1 Month after the submission of the draft final report	
9	*Technical Presentation* *Coordination, Planning and Execution* *Mid-Term Activity Reviews* *Final Presentation and Reporting*	15th November, 2012 9th May, 2012 2nd August, 2012 15th November, 2012

Natural Gas Odourisation

Why NG need Odourisation?

- Natural Gas is odourless and colourless flammable gas
- Thus odorant is added to establish pungent odour of natural gas
- When leaked, strong odour (very distinctive and unpleaseant odour) easily detected by human

Gas Odorants physiological properties

- Pierces, strong and unmistakable odour
- Odour must remain perceptible as long as the fault of technical equipment is detected and removed
- Odourant combustion must not produce toxic and irritating products

Gas Odorants physiochemical properties

- Odourant must be chemically stable, must not react with gas components, piping material, rust
- Must have high enough vapour pressure in order to avoid condensation at operating pressure
- Must not have a corrosive effect on gas equipment in concentrations used

Gas Odorants Physiochemical Properties

- Must have a minimum tendency to soil adsorption during gas leaks from pipes
- Odourant smell must not be masked by the presence of higher hydrocarbons
- Odorants must not contain water and must not be diluted with water due to possible subsequent corrosion of the equipment.

Type of Odorants

- Tetrahydrothiophene (THT)
- Dimethyl Sulphide (DMS)
- Diethyl Sulphide (DES)
- Methyl Ethyl Sulphide (MES)
- Secondary Butyl Mercaptan (SBM)
- Tertiary Butyl Mercaptan (TBM)
- N-Propyl Mercaptan (NPM)

Odorants Blend

- All mercaptan blend
- Mercaptan/Alkyl sulphide blends
- Tetrahydrothiophene/mercaptan blends
- Acrylates blends (sulphur free)

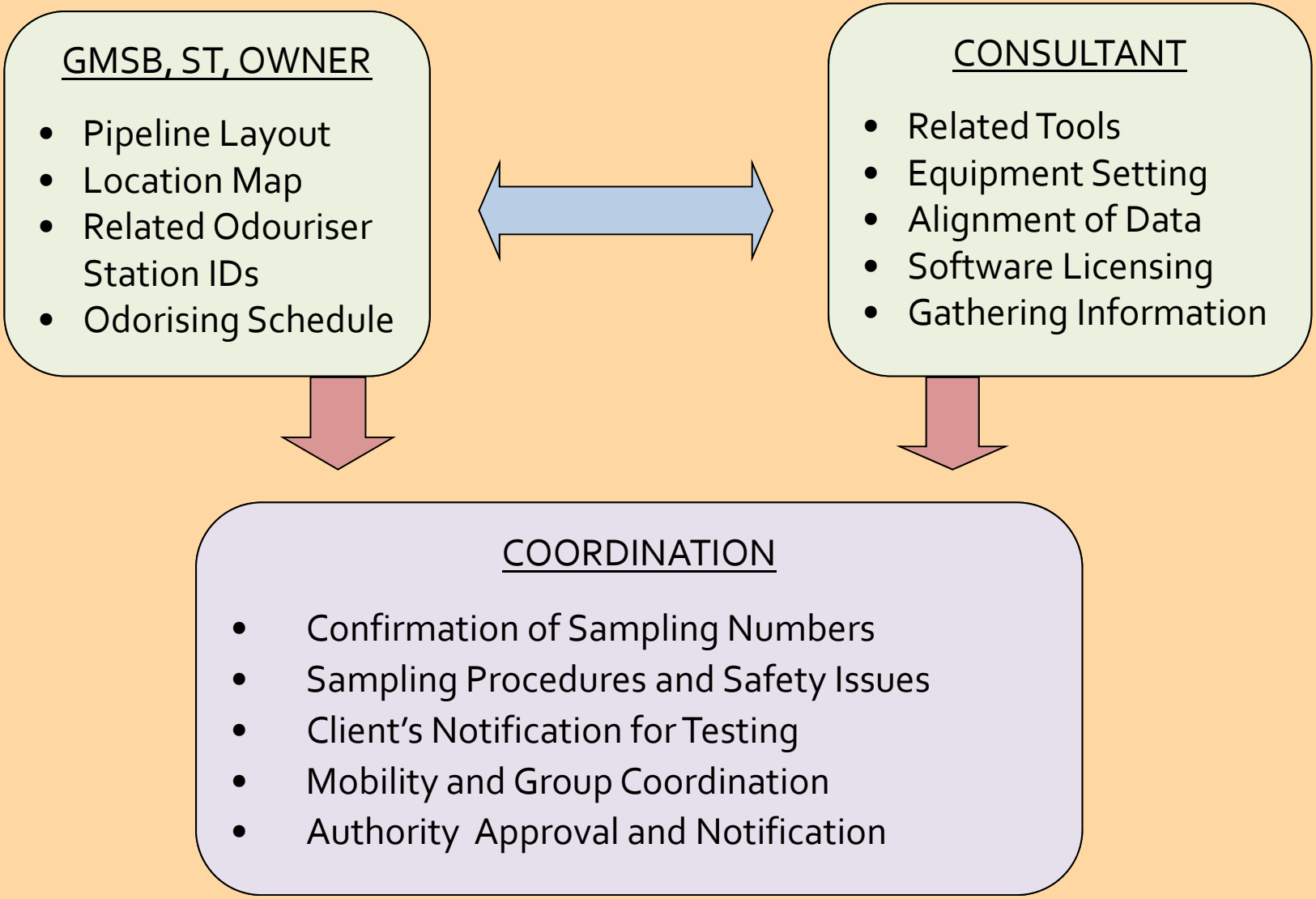
Odorants Blend used by GMB

79 wt% TBM + 20 wt% DMS + 1 wt% other mercaptans

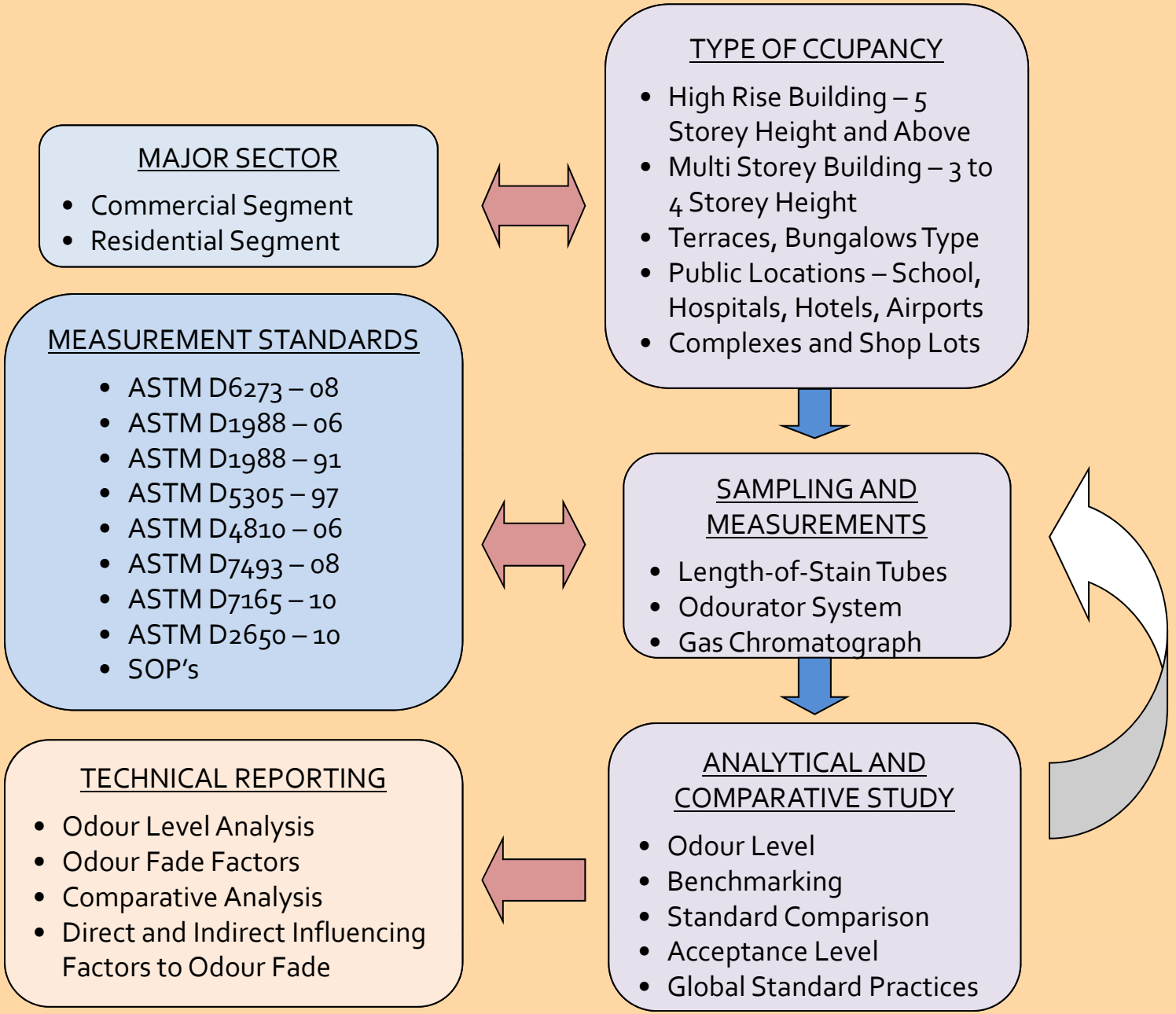
Odourisation Standards

- *ASTM D6273 – 08*: Standard Test Methods for Natural Gas Odor Intensity
- *ASTM D1988 – 06*: Standard Test Method for Mercaptans in Natural Gas Using Length-of-Stain Detector Tubes
- *ASTM D1988 – 91 (Reapproved 1995)*: Standard Test Method for Mercaptans in Natural Gas Using Length-of-Stain Detector Tubes
- *ASTM D5305 – 97 (Reapproved 2007)*: Standard Test Method for Determination of Ethyl Mercaptan in LP-Gas Vapor
- *ASTM D4810 – 06*: Standard Test Method for Hydrogen Sulfide in Natural Gas Using Length-of-Stain Detector Tubes
- *ASTM D7493 – 08*: Standard Test Method for Online Measurement of Sulfur Compounds in Natural Gas and Gaseous Fuels by Gas Chromatograph and Electrochemical Detection
- *ASTM D7165 – 10*: Standard Practice for gas Chromatograph Based On-line/At-line Analysis for Sulfur Content of Gaseous Fuels
- *ASTM D2650 – 10*: Standard Test Method for Chemical Composition of Gases by Mass Spectrometry
- *Occupational Safety and Health Guideline for Ethyl Mercaptan*: U.S. Department of Health and Human Services, 1988
- *Standard Operating Procedure (SOP) for Scentinel F-20 Chemical Transfer*: Process -3 Services Solution Sdn. Bhd. 2011

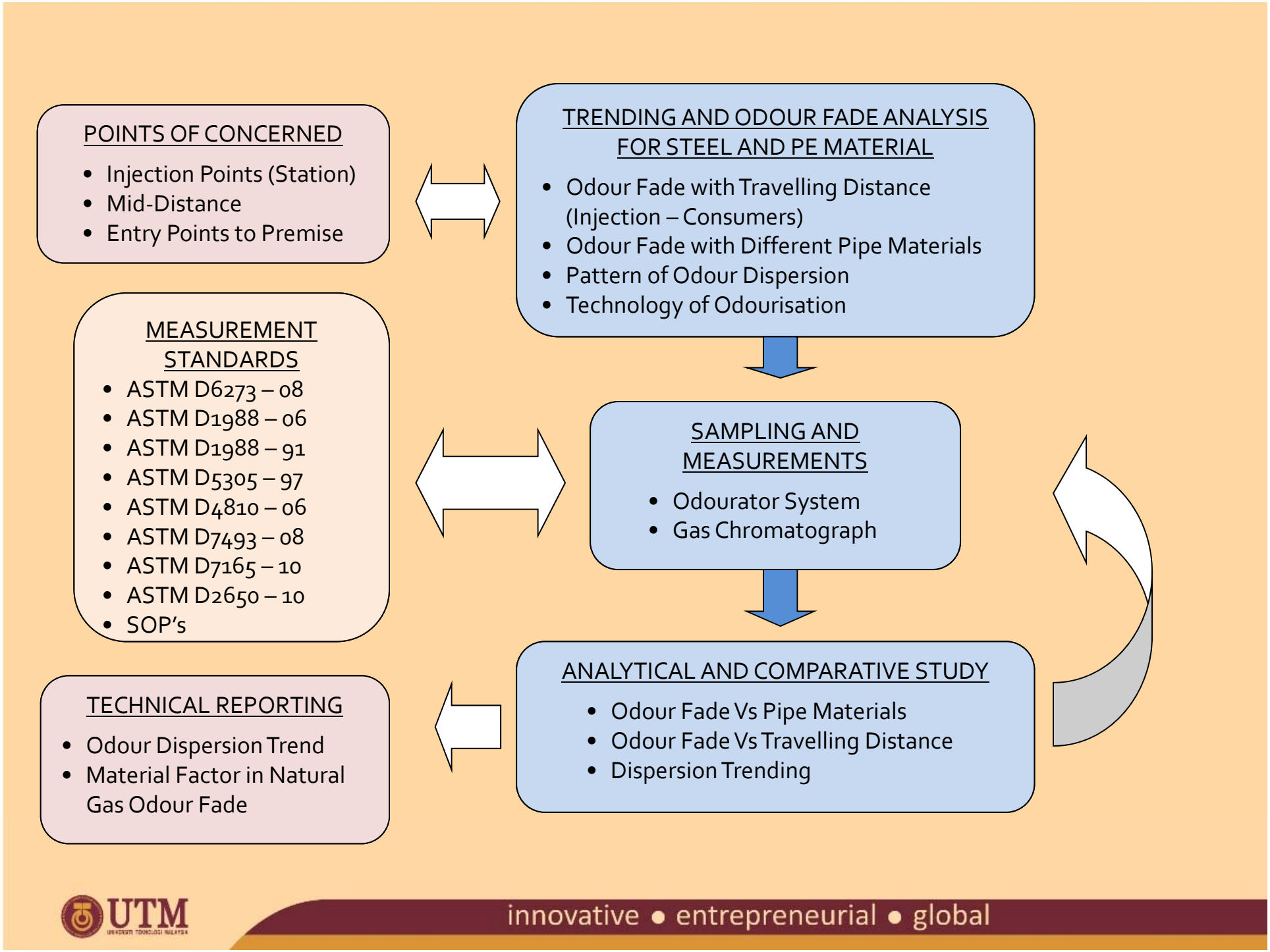
Technical Coordination and Site Discussion


GMSB, ST, OWNER
• Pipeline Layout
• Location Map
• Related Odouriser Station IDs
• Odorising Schedule
CONSULTANT
• Related Tools
• Equipment Setting
• Alignment of Data
• Software Licensing
• Gathering Information
COORDINATION
• Confirmation of Sampling Numbers
• Sampling Procedures and Safety Issues
• Client's Notification for Testing
• Mobility and Group Coordination
• Authority Approval and Notification

Process Methodology for Sampling, Measurement and Odour Level Analysis


TYPE OF CCUPANCY
High Rise Building – 5 Storey Height and Above
Multi Storey Building – 3 to 4 Storey Height
Terraces, Bungalows Type
Public Locations – School, Hospitals, Hotels, Airports
Complexes and Shop Lots
MAJOR SECTOR
Commercial Segment
Residential Segment
MEASUREMENT STANDARDS
ASTM D6273 – 08
ASTM D1988 – 06
ASTM D1988 – 91
ASTM D5305 – 97
ASTM D4810 – 06
ASTM D7493 – 08
ASTM D7165 – 10
ASTM D2650 – 10
SOP's
SAMPLING AND MEASUREMENTS
Length-of-Stain Tubes
Odourator System
Gas Chromatograph
ANALYTICAL AND COMPARATIVE STUDY
Odour Level
Benchmarking
Standard Comparison
Acceptance Level
Global Standard Practices
TECHNICAL REPORTING
Odour Level Analysis
Odour Fade Factors
Comparative Analysis
Direct and Indirect Influencing Factors to Odour Fade

Process Methodology for Sampling, Measurement and Odour Intensity Study


POINTS OF CONCERNED
• Injection Points (Station)
• Mid-Distance
• Entry Points to Premise
TRENDING AND ODOUR FADE ANALYSIS FOR STEEL AND PE MATERIAL
• Odour Fade with Travelling Distance (Injection – Consumers)
• Odour Fade with Different Pipe Materials
• Pattern of Odour Dispersion
• Technology of Odourisation
MEASUREMENT STANDARDS
• ASTM D6273 – 08
• ASTM D1988 – 06
• ASTM D1988 – 91
• ASTM D5305 – 97
• ASTM D4810 – 06
• ASTM D7493 – 08
• ASTM D7165 – 10
• ASTM D2650 – 10
• SOP's
SAMPLING AND MEASUREMENTS
• Odourator System
• Gas Chromatograph
TECHNICAL REPORTING
• Odour Dispersion Trend
• Material Factor in Natural Gas Odour Fade
ANALYTICAL AND COMPARATIVE STUDY
• Odour Fade Vs Pipe Materials
• Odour Fade Vs Travelling Distance
• Dispersion Trending

Process Flow Chart for Conducting FLACS Simulations on Odourisation Study

SELECTED PARAMETERS

- Pipeline Layout
- Selecting Points of Study
- Multi-Level Parameters
- Pressure, Altitude, Temperature

GEOMETRICAL CONSTRUCTION OF MODEL

- Floor Plan
- Pipe Design
- Alignment of Data
- Parameter Setting

SIMULATION PROCESS

- Dispersion Pattern of Odourant
- Intensity of Odour: Enclosed System

ANALYTICAL ANALYSIS

- Confirmation of Dispersion Pattern
- Changes of Odour Intensity Vs Pressure and Altitude Changes

Process Flow Chart for Conducting CFD Simulations on Odourisation Study

SELECTED PARAMETERS

- Pipeline Layout
- Selecting Points of Study
- Multi-Level Parameters
- Pressure, Altitude, Temperature

GEOMETRICAL CONSTRUCTION OF MODEL

- Floor Plan
- Pipe Design
- Alignment of Data
- Parameter Setting

SIMULATION PROCESS

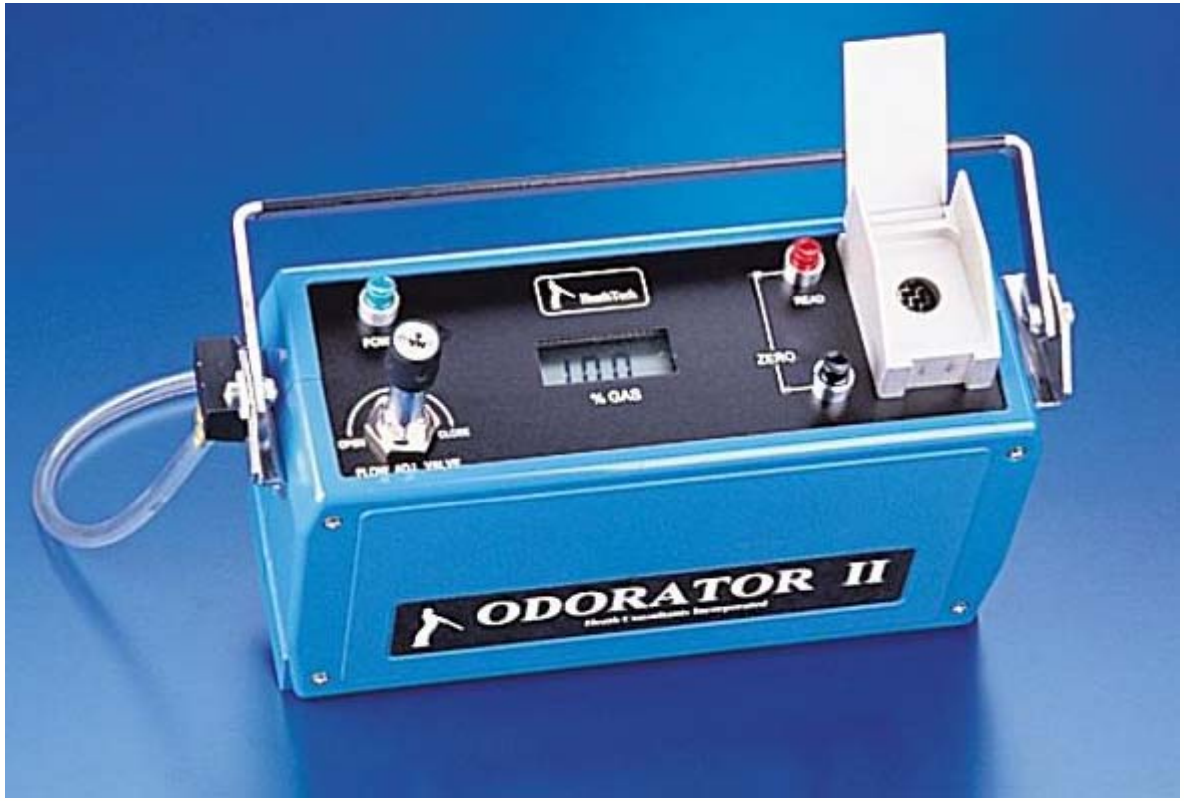
- Dispersion Pattern of Odourant
- Intensity of Odour: Enclosed System
- Pressure and Level Based Analysis

ANANALYTICAL ANALYSIS

- Confirmation of Dispersion Pattern
- Changes of Odour Intensity Vs Pressure and Altitude Changes

Tools and Equipment

- *Gas Chromatography: Portable and Bench Type: eg Agilent Micro GC*
- *Odourator System: eg Sewerin Ex-Tec OD4*
- *Length of Stain Tube: eg Gastec Tube No. 72*
- *Suction Pump: Gastec Pump 100 ml*


% GAS
READ
ZERO
ODORATOR II


GASTEC

Site Measurement Schedule

Site Survey and Measurement of Odourisation Level

At Various Identified and Selected Locations around Klang Valley

July 2 – 11, 2012 (First Session) September 3 – 7 (Second Session)
9:00 a.m. – 5:00 p.m.

Site Survey and Measurement Staff:

Members:

1. Assoc. Prof. Engr. Dr. Rahmat Mohsin (Leader)
2. Assoc. Prof. Dr. Azeman Mustafa (Advisor)
3. Zulkifli Abd. Majid
4. Jamal Asri Othman
5. Mohd. Redhuan Ramlee
6. Abu Samah Nasir
7. Mohd. Zaid Rozlan
8. Samsol Mahadi

Accompanying Members:

ST and GMSB Technical Staffs

Note: *Site coordination is required to acquire permit entry and agreement between parties involved, as well as preparing the necessity safety exercise. (Administered by: Gas Malaysia Sdn. Bhd. (GMSB) and Respective Building Management Staffs)*

Measurement Points Identification:

High-Rise Building(Four (4)-Buildings)

- Selecting 5 separate locations comprises of:
  i. Entry Point Floor (Single Point – Riser Tap)
  ii. Mid-Level Floor (Single Point – Riser Tap)
  iii. Top Level Floor (Single Point – Riser Tap)
  iv. Selected Mid-Level between Entry to Mid-Level Floor (Single Point – Riser Tap)
  v. Selected Mid-Level between Mid to Top Level Floor (Single Point – Riser Tap)

- Selecting 3 Customer's Premise at
  i. Entry Point Floor (Single Point – Prior to Appliance Entry)
  ii. Mid-Level Floor (Single Point – Prior to Appliance Entry)
  iii. Top Level Floor (Single Point – Prior to Appliance Entry)

Measurement Points Identification:

High-Rise Building(Four (4)-Buildings)

- Selecting 5 separate locations comprises of:

  i. Entry Point Floor (Single Point – Riser Tap)
  ii. Mid-Level Floor (Single Point – Riser Tap)
  iii. Top Level Floor (Single Point – Riser Tap)
  iv. Selected Mid-Level between Entry to Mid-Level Floor (Single Point – Riser Tap)
  v. Selected Mid-Level between Mid to Top Level Floor (Single Point – Riser Tap)

- Selecting 3 Customer's Premise at

  vi. Entry Point Floor (Single Point – Prior to Appliance Entry)
  vii. Mid-Level Floor (Single Point – Prior to Appliance Entry)
  viii. Top Level Floor (Single Point – Prior to Appliance Entry)

TOTAL SAMPLING POINTS: 32 POINTS

Medium Height Building (Three (3)-Buildings)

- Selecting 3 separate locations comprises of:

    i. Entry Point Floor (Single Point – Riser Tap)
    ii. Mid-Level Floor (Single Point – Riser Tap)
    iii. Top Level Floor (Single Point – Riser Tap)

- Selecting 3 Customer's Premise at

    iv. Entry Point Floor (Single Point – Prior to Appliance Entry)
    v. Mid-Level Floor (Single Point – Prior to Appliance Entry)
    vi. Top Level Floor (Single Point – Prior to Appliance Entry)

TOTAL SAMPLING POINTS: 18 POINTS

Terraces/Bungalow Building (Six (6) Building Occupancies)

- Selecting 6 separate locations comprises of:
  i. Entry Point (Single Point – Riser Tap)
  ii. End Point (Single Point – Riser Tap)

TOTAL SAMPLING POINTS: 12 POINTS

Commercial Building (Three (3)-Buildings)

- Selecting 3 separate locations comprises of:

  i. Entry Point (Single Point Tap)
  ii. Mid-Length (Single Point Tap)
  iii. Extreme Length - Furthest (Single Point Tap)
  iv. Mid-Position between Entry to Mid-Length (Single Point Tap)
  v. Mid-Position between Mid-Length to Extreme Length (Single Point Tap)

- Selecting 3 Customer's Premise at

  vi. Entry Point (Single Point – Prior to Appliance Entry)
  vii. Mid-Length (Single Point – Prior to Appliance Entry)
  viii. Extreme Length (Single Point – Prior to Appliance Entry)

TOTAL SAMPLING POINTS: 24 POINTS

OVERALL SAMPLING POINTS AT CUSTOMERS PREMISES: 86 POINTS (TBM/DMS/OD4)

Odourisation Station (Five (5)-Locations) – SERDANG Station

- Selecting 5 separate locations comprises of:

    i. Entry Point of Odour (Single Point – Riser Tap)
    ii. Mid-Distance (Single Point – Riser Tap)
    iii. Customers' Entry Point (Single Point – Riser Tap)
    iv. Mid position between Entry of Odour to Mid-Distance Location
    v. Mid position between Mid-Distance to Customers' Entry Point

Odourisation Station (Five (5)-Locations) – GLENMARIE Station

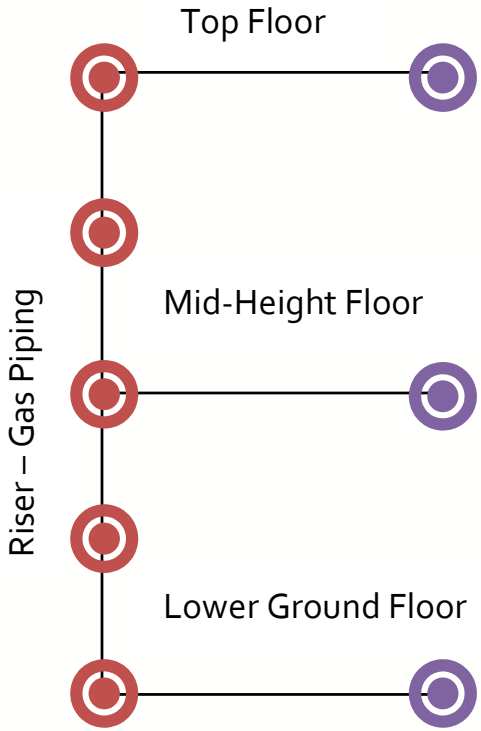
- Selecting 5 separate locations comprises of:

    i. Entry Point of Odour (Single Point – Riser Tap)
    ii. Mid-Distance (Single Point – Riser Tap)
    iii. Customers' Entry Point (Single Point – Riser Tap)
    iv. Mid position between Entry of Odour to Mid-Distance Location
    v. Mid position between Mid-Distance to Customers' Entry Point

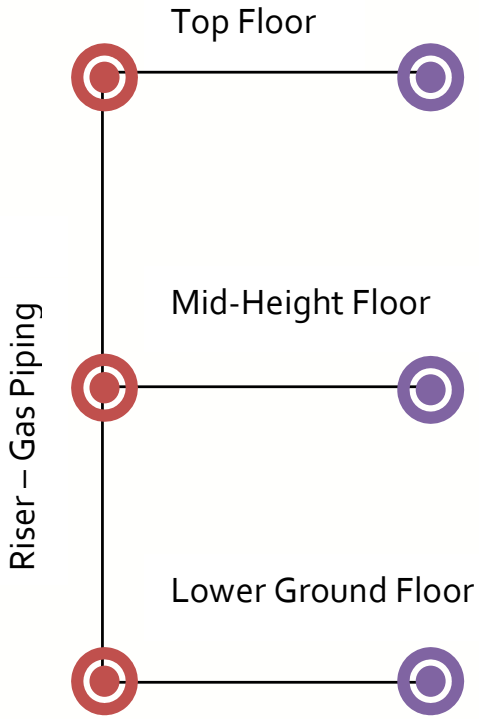
OVERALL SAMPLING POINTS ALONG DISTRIBUTION SYSTEM FROM ODOURISER STATION TO CUSTOMER ENTRY: 10 POINTS (OD4/SAMPLING BAG)

SAMPLING POSITIONS

HIGH RISE BUILDING



MEDIUM HEIGHT BUILDING



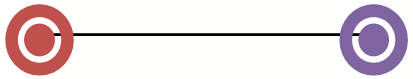
Lagends:

Pipeline Stretch

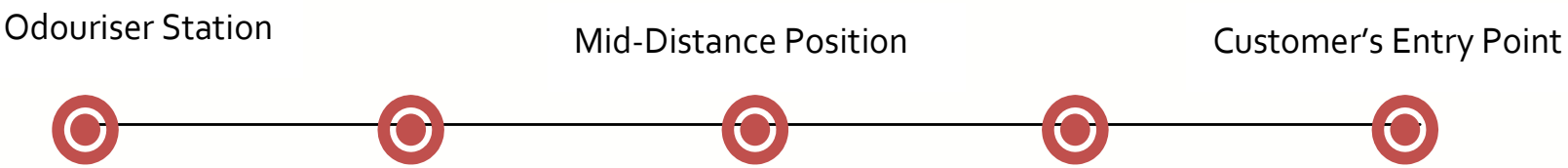
Sampling Point (External)

Customer Premise Point (Internal)

TERRACES/BUNGALOW BUILDING



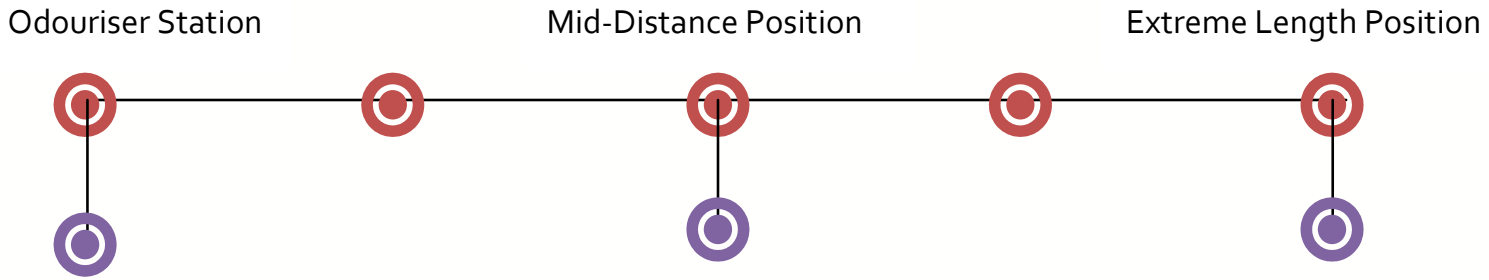
ODOURISATION SYSTEM ALONG DISTRIBUTION PIPING



Lagends:

Pipeline Stretch
Sampling Point (External)
Customer Premise Point (Internal)

ODOURISATION SYSTEM ALONG COMMERCIAL SECTOR



Lagends:

Pipeline Stretch

Sampling Point (External)

Customer Premise Point (Internal)

THANK YOU