

ASIA CLEAN ENERGY FORUM 2016



Manila 6 - 10 June, 2016

LANDFILL GAS UTILISATION

Session B – WtE Technology

dr Rafal Lewicki

7 June 2016

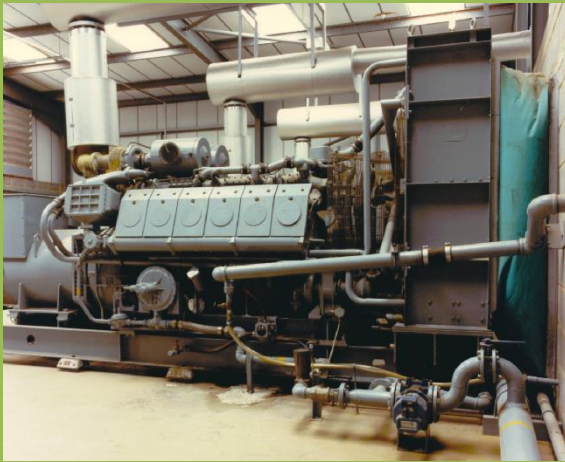


BACKGROUND

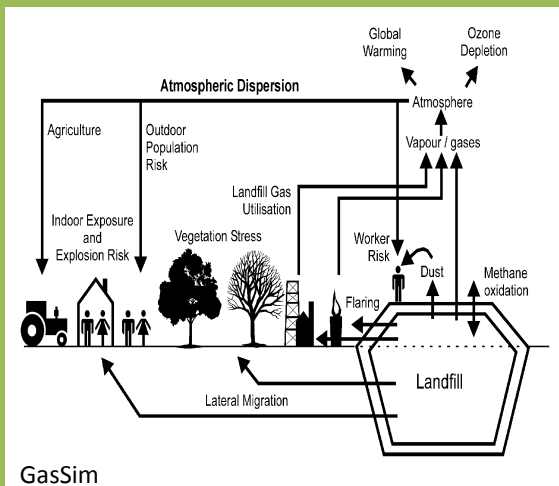
- Almost 60 years world's experience in landfill gas utilisation
- **UK:**
 - leading country in Europe
 - pioneer in LFG recovery
- Exporting the know-how but...
 - **no direct transfer**
- Site & country specific issues
 - law
 - technical
 - waste management strategy
 - operational practices



WHY TO UTILISE LANDFILL GAS?



- Environmental
 - local effect: odours, migration, safety – fires & explosions, toxic emissions
 - global effect: GHG emissions (methane)
- Commercial
 - source of renewable energy
- Impact scale
 - aftercare: time ~30 – 70 years
 - volume: global CH₄ emissions ~10% waste management ~20%



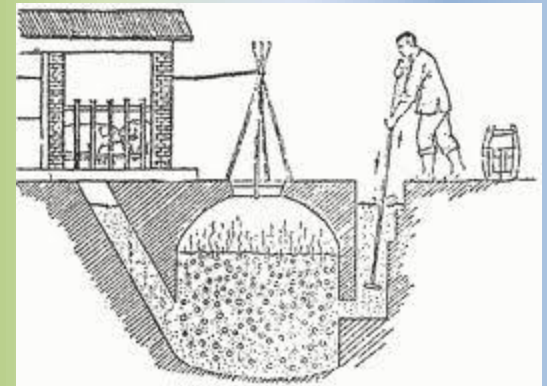
BENEFITS OF LANDFILL GAS CONTROL

- Safety
 - control of gas migration off site
 - prevention of fires and explosions
 - prevention of worker's and neighbours exposure to toxic components
 - prevention of odours
- Environment protection
 - **reduction of methane emissions**
 - **reduction of trace constituents emissions**
- Legal liability under control
 - landfill gas is a permanent liability for the owner
 - minimum 30 years aftercare



LOCAL CONDITIONS

- Country's waste management strategy
 - landfill operational practices
 - other waste management technologies
- Best approach
 - optimisation of existing facilities
 - thinking ahead
 - avoid creation of environmental problems
- Project scale: **MICRO – SMALL – LARGE**
- Regulations
- Energy prices and demand



LFG UTILISATION TECHNOLOGIES

- **DIRECT USE**
 - brick and cement kilns
 - infrared heaters
 - boilers
 - cooking & lighting
- **RAW MATERIAL FOR CHEMICAL TECHNOLOGIES**
 - methanol production



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LFG UTILISATION TECHNOLOGIES



- **FUEL**

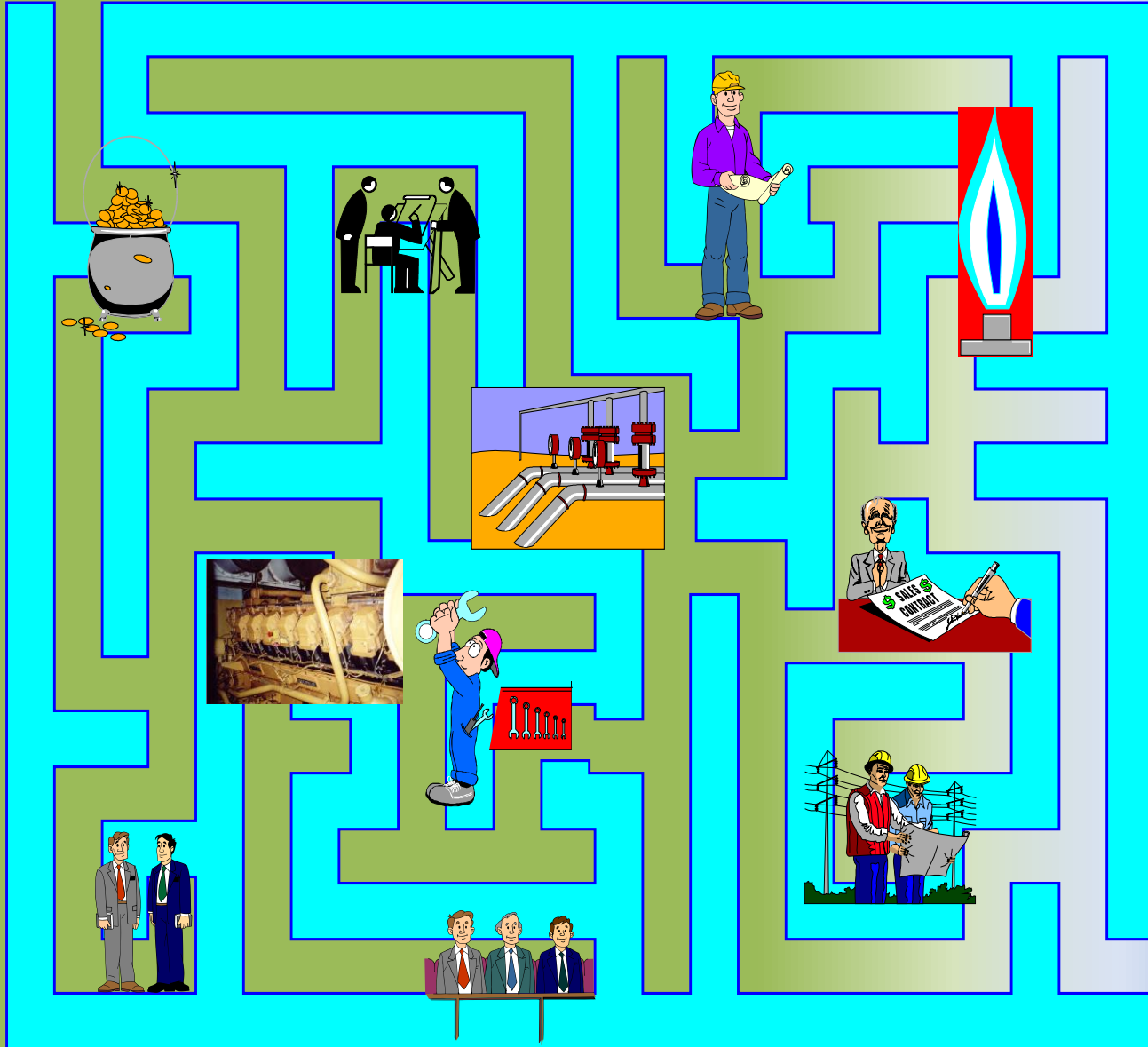
- Internal combustion engines
- External combustion engines
- Gas turbines
- Steam turbines
- Organic Rankine Cycle installations
- Fuel cells
- Thermoionic cells
- Vehicle fuel - biomethane



START TO FINISH

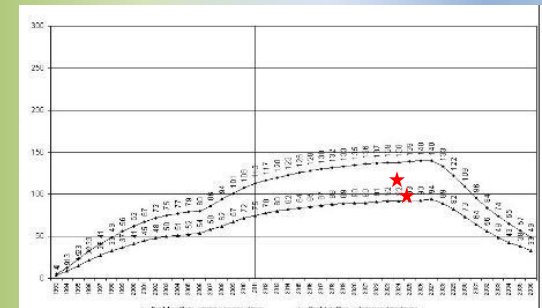
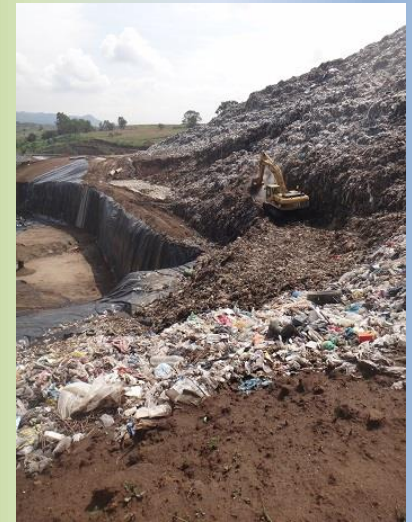


PROJECT PATH...



PROJECT PROCESS

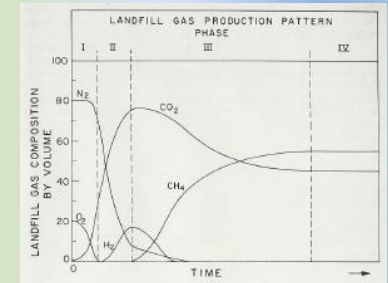
- **Site preparation:**
 - identification
 - assessment (theoretical & practical)
 - visit
- **Verification of theoretical assumptions**
 - Pumping trial
 - Gas model calibration
 - Feasibility study
- **Decision – technology selection**
- **Securing financing**
- **Project implementation**
 - Phased approach
 - Landfill gas collection infrastructure design & construction
 - Personnel training
 - **Operation: energy generation and utilisation**
 - Decommissioning



OPPORTUNITIES AND CHALLENGES



- **Beware of traps:**
 - gas potential overestimation
 - altitude
 - climatic conditions
 - environmental problems
 - missed opportunities
 - timescale
 - lack of training
- **Long term operation**
 - LFG system optimisation
 - energy export
- **e.g. Philippines (2012 source) :**
 - 38 sanitary landfills
 - 384 controlled disposal facilities
 - 643 open dumps
- **How many opportunities in your country?**



BARRIERS

- Lack of environmental awareness
- Lack of lost opportunity awareness
- Change in historical waste management strategy
- Lack of regulations
- Lack of technology and equipment suppliers
- Lack of renewable heat and electricity market
- Electricity grid connection issues
- Poor incentives for project development
- Uncertain investment climate
- Lack of financing
- History of failed projects



**TREAT PROBLEMS
AS
OPPORTUNITIES !**



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WISH LIST ☺

- High level of awareness – political & environmental
- Stable regulations
- Stable economical and political climate
- Availability of financing
- Environmental and financial incentives
- Willing investors and business partners
- Renewable energy incentives
- Use of heat - network and local
- Easy electricity grid connection
- Local use of energy (no grid connection)
- Reliable technology providers
- Trained personnel

**Success is not final,
failure is not fatal:
it is the courage to
continue that counts**

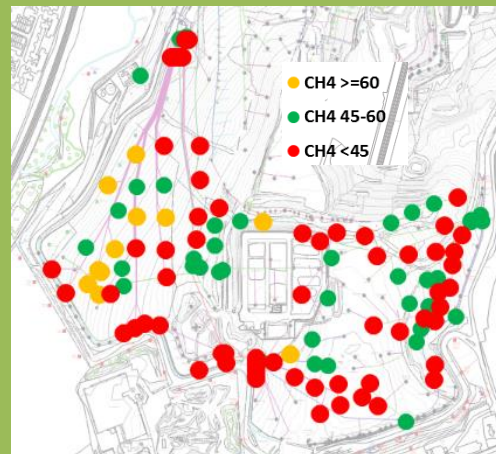
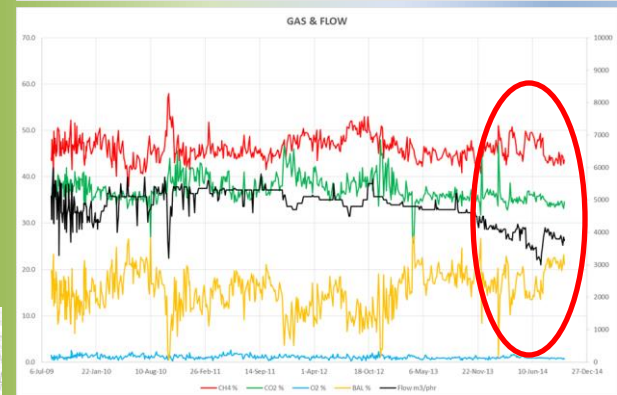
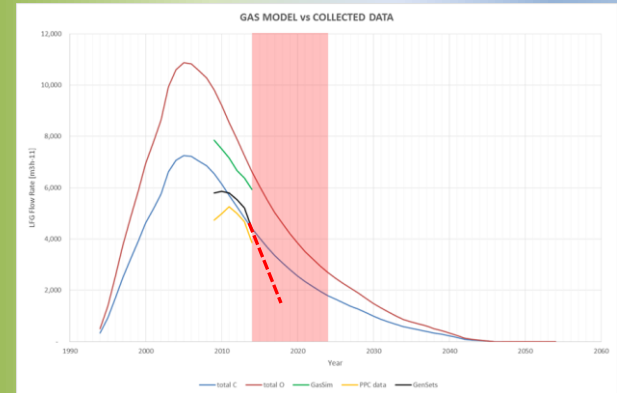
Winston Churchill



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TROUBLESHOOTING – A CASE STUDY

- LFG system underperformance
- Loss of power generation
- Investigation
 - gas & leachate infrastructure failures
 - operational procedures errors
 - management expectations
- **Solution**
 - gas field recovery
 - data management
 - personnel training



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ANY QUESTIONS ?

THANK YOU FOR YOUR ATTENTION

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